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Official Journal of ARRL The national association for AMATEUR RADIO™

Bring out your best ham for the holidays!

IC-7700

Perfect for your favorite contester or DX'er

Carve up the airwaves with the best of 'em. Thanks to advanced DSP technology, Icom's IC-7700 pulls out the weak signals like no other. Enjoy a just-right size and the smart ergonomics that make spending hours in the operating chair a pleasure, not a chore. Make this the year to treat your favorite ham, even if it's yourself! Get your IC-7700 today!

ICOM®

hy-gain ROTATORS

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

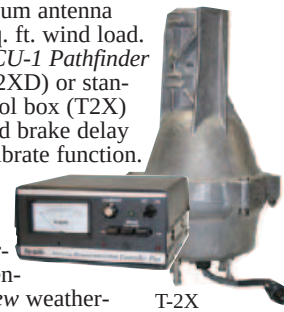
HAM-IV

HAM-IV
$649.95

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

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

TAILTWISTER SERIES II



T-2X
$799.95

T-2XD
$1229.95
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
$449.95

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to $2^{1}/_{16}$ inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V
$1099.95
with DCU-1

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

ROTATOR OPTIONS

MSHD, $109.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $49.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

AR-40

AR-40
$349.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. $2^{1}/_{16}$ inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1499.95

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

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

Digital Automatic Controller

DCU-1
$749.95

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

AR-35 Rotator/Controller

AR-35
$89.95

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

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NEW! Automatic Rotator Brake Delay

RBD-5
$29.95

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

hy-gain

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

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

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN

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

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN

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

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN

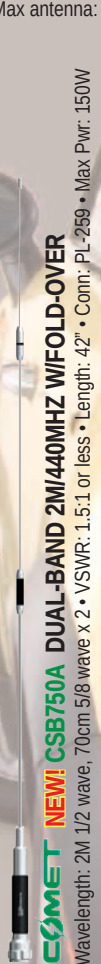
COMET **HD-5M** SO-239 / PL-259
COMET **HD- 5 3/8-24** 3/8-24 / PL-259
Footprint: 3.75" x 1.1 "
Max antenna: 80"

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

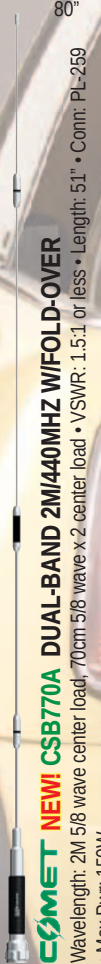
COMET **SMA-24** **DUAL-BAND 2M/70CM HT ANTENNA** RX range: 100-1200MHz
• Wavelength: 2M 1/4 wave • 440MHz 1/2 wave • Length: 17" • Conn: SMA Super flexible featherweight whip

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

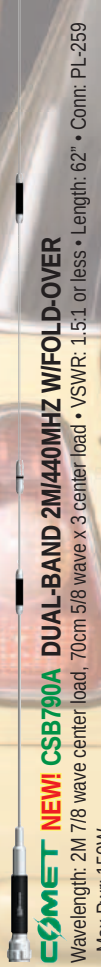
Maldol **MH-209** *(BNC Conn)* **MH-209SMA** *(SMA Conn)* **2M/70CM DUAL-BAND HT ANTENNAS**
3" length, soft rubber cover. Good performance in a small package!



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



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



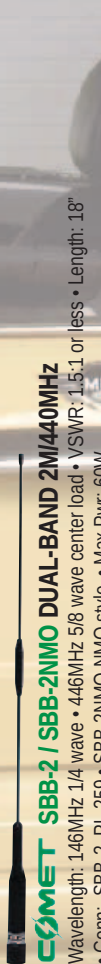
COMET **NEW! CSB790A** **DUAL-BAND 2M/440MHZ W/FOLD-OVER**
Wavelength: 2M 7/8 wave center load, 70cm 5/8 wave x 3 center load • VSWR: 1.5:1 or less • Length: 62" • Conn: PL-259 • Max Pwr: 150W

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

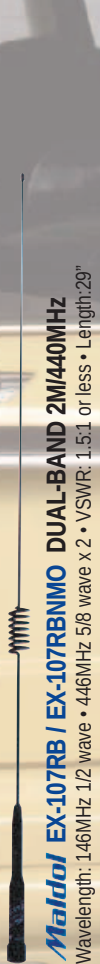
Maldol **AX-75** **DUAL-BAND 2M/440MHz W/FOLD-OVER**
Wavelength: 2M 1/2 wave center load • 70cm 5/8 wave x 2 • Length: 30" • Conn: PL-259 • Max Power: 60W

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

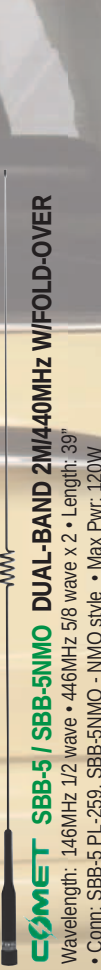
COMET **B-10 / B-10NMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/4 wave • 446MHz 1/2 wave • Length: 12"
• Conn: B-10 PL-259 ,B-10NMO - NMO style • Max Pwr: 50W



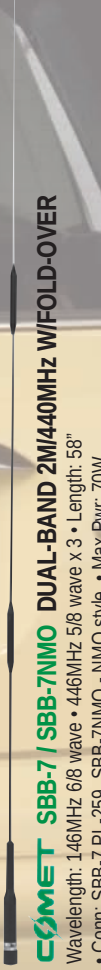
COMET **SBB-2 / SBB-2NMO** **DUAL-BAND 2M/440MHz**
Wavelength: 146MHz 1/4 wave • 446MHz 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18"
• Conn: SBB-2 PL-259 • SBB-2NMO NMO style • Max Pwr: 60W



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



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



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

COMET and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
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News and Features

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Radiosport

Our Cover
As we approach this holiday season, may we come to truly know peace and joy — both in our hearts and in each other — all the year long. Just above the snow-capped trees under a waxing crescent moon and a star-filled night, this 20 meter fixed array is located just north of Stockholm, Sweden. Photo by Henryk Kotowski, SMØJHF.

Departments

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QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: QST, 225 Main St, Newington, CT 06111-1494, USA. Canada Post: Publications Mail Agreement #40612608. Canada Returns to be sent to Bleuchip International, PO Box 25542, London, ON N6C 6B2.

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Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

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- Massive Heatsink guarantees 75 Watts of Solid RF Power with No Cooling Fan Needed
- Loud 3 Watts of Audio Output for noisy environments
- Large 6 Digit Backlit LCD for excellent visibility
- 200 Memory Channels for serious users

75 WATTS

HEAVY-DUTY 75 W 2 m FM TRANSCEIVER

FT-2900R

Size: 6.3" (W) x 2.0" (H) x 7.3" (D) / Weight: 4.0 lb

NEW

2 m MONO BAND

55 WATTS

Best Selling, Reliable Mobile

- 55 Watts of Solid RF Power within a compact footprint
- Loud 3 Watts of Audio Output Power for noisy enviroments
- Large 6 Digit Backlit LCD for excellent visibility
- 200 Memory Channels for serious users

NEW

ULTRA RUGGED 55 W 2 m FM TRANSCEIVER

FT-1900R

Size: 5.5" (W) x 1.6" (H) x 5.8" (D) / Weight: 2.2 lb

2 m MONO BAND

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Choice of the World's top DX'ers℠

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Heavy-Duty FM Dual Band Mobile with Exceptionally Wide Receiver Coverage*

*108 to 520 MHz/ 700 to 999.99 MHz (Cellular blocked)

- Large Backlit LCD Display for easy operation
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- Reliable performance in harsh environments
- 5 ppm Frequency Stability (-4° F to +140° F)
- 1000 Memory Channels for serious users
- Yaesu Unique Power Saving Circuit Design Minimizes Vehicle Battery Drain

Actual Size

NEW

2 m/70 cm DUAL BAND FM TRANSCEIVER

FT-7900R

Size: 5.5" (W) x 1.6" (H) x 6.6" (D) / Weight: 2.2 lb

2 m/70 cm DUAL BAND

- Separation Kit for Remote Mounting (optional separation kit YSK-7800 requires)

50 W 10 m/6 m/2 m/70 cm* Quad Band FM Mobile

FT-8900R

*70 cm 35 W

QUAD BAND DUAL RECEIVE

50 W 2 m/70 cm* Dual Band FM Mobile

FT-8800R

*70 cm 35 W

DUAL BAND DUAL RECEIVE

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The Totally New - Advanced Dual Band Mobile Radio
GPS / APRS® / Bluetooth® Features

Actual Size

2 m / 70 cm Dual Band
FTM-350R

•The Ultimate Mobile Communications Tool is packed with the latest advanced communications technology, including a multi-purpose Global Positioning System display, APRS®, Bluetooth®, Event Timer functions, simultaneous Dual Band Receive, and Full-Duplex operation.

•50 Watts of Reliable Power on BOTH 2 m and 70 cm!

•Large dot matrix LCD display for comfortable viewing – night or day

•Choose your favorite LCD display from 8 vibrant color options.

•Incredibly Flexible Dual Band Display. You can easily set your individual preferences for Dual Receive and Full-Duplex operation.

•Numerous useful displays are available with the optional FGPS-1 GPS Receiver and Antenna.

•Compatible with various APRS® information and functions – Receive WX info from other APRS® weather stations, exchange messages (max 67 characters) using the APRS® function, etc.

•High-speed Band Scope for rapidly checking band activity.

•Built-in Dual Speakers on the rear of the Control Head with Independent Volume Controls for maximum flexibility.

•Optional Voice Guide Unit speaks your operating frequency and records received signals.

•1200 / 9600 bps packet port (8-pin mini DIN)

•The Display Control Head is designed for easy separation from RF Power Unit – 10 ft control cable included. Optional 20 ft control cable available.

•Yaesu's renowned high quality Die Cast Aluminum Chassis design allows stable continuous high power operation when you need it most.

•Wideband RX:
L-band: 0.5 MHz – 1.7 MHz (AM Broadcast band)
76 MHz – 108 MHz (FM Broadcast band)
108 MHz-250 MHz / 300-1000MHz
R-band: 108-250 MHz, 300 MHz-1000 MHz
US Version only: TBD

•Built-in stereo decoder for FM Broadcast: Listen to FM Broadcast in Stereo with dual speakers on the rear of the control head!

•"Line In" input permits playing your favorite stereo music from other devices.

•Enhanced Yaesu ARTS (Automatic-Range Transponder System) displays distance and direction to other APRS® stations using FTM-350R and VX-8R transceivers.

•Huge memory channel management capability! 500 Independent memory channels with memory name tag function (up to 8 characters) for each L and R band (1000 channels total), + 9 PMS (Programmable Band Limit Memory Scan) channels for each L and R band (18 channels in total),

•Monitor Unit (Option)

+ a rewritable preferred channel for each L and R band, + 31 channels specifically allocated for the Smart Search function.

•DTMF Autodial (Memory) Feature: 9 memories (16digits each) x 3 CH

•Built-in Barometric Pressure Sensor - The radio can monitor and display your altitude and pressure.

•Easier Menu setup - Menu items are associated with the various operations for easier and faster setup modifications.

•Bluetooth Capabilities - The optional Bluetooth Unit (BU-1) provides hands-free radio operation with the optional Bluetooth headset BH-1A!

•The front panel Built-in Microphone activates PTT transmission. (A conventional hand microphone MH-42C6J with DTMF is optional)

The FTM-350R has not been approved by the FCC. This device may not be sold or leased, or offered for sale or lease, until FCC approval has been obtained. Technical specifications are subject to change without notice.

For the latest Yaesu news, visit us on the Internet:
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Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

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"It Seems to Us"

Appropriate Use: Guidelines and Waivers

"For the final time this year, we again take up the issue of the appropriate use of Amateur Radio: the extent to which radio amateurs may (and should) provide communications on behalf of others, particularly their employers."

The Amateur Radio Service has a well-deserved reputation for taking the FCC rules seriously, so it is not surprising that the subject of "pecuniary interest" has attracted a lot of attention and discussion. The relevant rules have not changed since 1993, but recent years have seen growing interest in the use of Amateur Radio as an alternative, supplemental, or backup communications medium by commercial, non-profit and government entities. When those rules changes were adopted, that was not the expectation.

In 1993 the FCC concluded that, while it is important to avoid exploitation of the amateur service, "[t]he capabilities of modern mobile communication services have all but eliminated the incentive to use the amateur service instead of those services." The Commission found that the rules then in effect "hamper amateur operators from serving the public as well as diminish the value of the amateur service in satisfying personal communication needs." Accordingly, the rules were amended to give amateur licensees greater flexibility. The FCC declined the ARRL's request for anecdotal examples of permitted and prohibited communications, preferring to "rely on the amateur service's traditions of self-regulation and cooperation between licensees, the cornerstone of the amateur service, to determine whether specific communications should be transmitted on amateur service frequencies."

In September 1993 we editorialized that the rules changes "remove the ambiguities that have plagued public-service communications for the past two decades and have generated endless hair-splitting discussions about whether particular communications were permitted." That proved to be the case for a decade and a half until — in the aftermath of 9/11 and Hurricane Katrina — Amateur Radio came to be viewed as a communications solution by a growing number of businesses and other organizations. On this page in April we noted that "there are limits to what an amateur can do on behalf of his or her employer" but did not go into detail since the rules seemed rather clear, as did the FCC's desire not to answer questions about exactly what is permitted and what is not.

By the time of the July 2009 meeting of the ARRL Board of Directors, the FCC had been asked enough questions by amateurs — and had given answers that apparently were unexpected — that quite a controversy was developing about the appropriate uses of Amateur Radio. As explained on this page in September, an ad-hoc committee was put to work to develop suggested guidelines. The committee delivered the guidelines and recommendations for further ARRL action to the ARRL Executive Committee, which made some edits and scheduled a conference call of Board members to discuss the nine-page document. By subsequent mail vote the Board adopted the guidelines and recommendations and approved the release of the document, which was put on the ARRL Web site on September 25 (see **www.arrl.org/news/files/ARRL_AppropriateUseGuidelines.pdf**).

The main purpose of the document, entitled *Commercialization of Amateur Radio: The Rules, The Risks, The Issues*, is to educate amateurs and the organizations we serve about what the FCC rules permit us to do and to assist amateurs in making reasoned decisions about the appropriateness of services we may offer to organizations in our communities. While there are only two narrow exceptions to the "no communications on behalf of an employer" rule, neither of which applies to disaster relief, the guidelines note that "paid emergency personnel who are licensed amateurs and who find themselves needing to use Amateur Radio in disaster relief operations can rely on the Commission's statements that they may do so." However, this applies *only* to actual disaster relief operations and *not* to training exercises or drills.

On the subject of what communications are appropriate for volunteers to provide on behalf of businesses and other organizations, the guidelines note that such communications by volunteers are legal as long as they are not conducted on a regular basis and otherwise comply with the rules. Organizations that envision using Amateur Radio volunteers on a regular basis should be referred instead to other radio services and communications systems. A good rule of thumb for other requests is, "Who benefits?" If the public is the principal beneficiary, then the basis and purpose of the Amateur Radio Service is being fulfilled. If the entity itself and not the general public is the principal beneficiary, then the use of other services should be encouraged.

In introducing the guidelines, ARRL First Vice President Kay Craigie, N3KN — who chaired the ad-hoc committee — observed that they "are not intended to be the last word on the subject, and surely will not be." Little more than three weeks later the FCC fulfilled that prophecy by issuing a Public Notice, DA 09-2259, to emphasize that the rules prohibiting communications on behalf of an employer apply to emergency preparedness and disaster drills. The Public Notice entertains waiver requests from *government entities* (and *only* government entities) conducting such drills. The requests must be in writing and must include the information listed in the article on page 59 of this issue. Use the following address: Wireless Telecommunications Bureau, FCC, 445 12th St SW, Washington, DC 20554, Attn: Scot Stone. The government entity may send a copy of its request by e-mail to **Scot.Stone@fcc.gov**, but we have been advised that this is not a substitute for submission of the waiver request on paper.

We understand there are petitions for rulemaking being drafted to address perceived shortcomings in the existing rules. The ARRL Board has taken no position on possible rules changes, but the subject is likely to occupy the Board's attention between now and its January 2010 meeting. As always, your own Division Director (see page 15) will be interested in your thoughts.

David Sumner, K1ZZ
ARRL Chief Executive Officer

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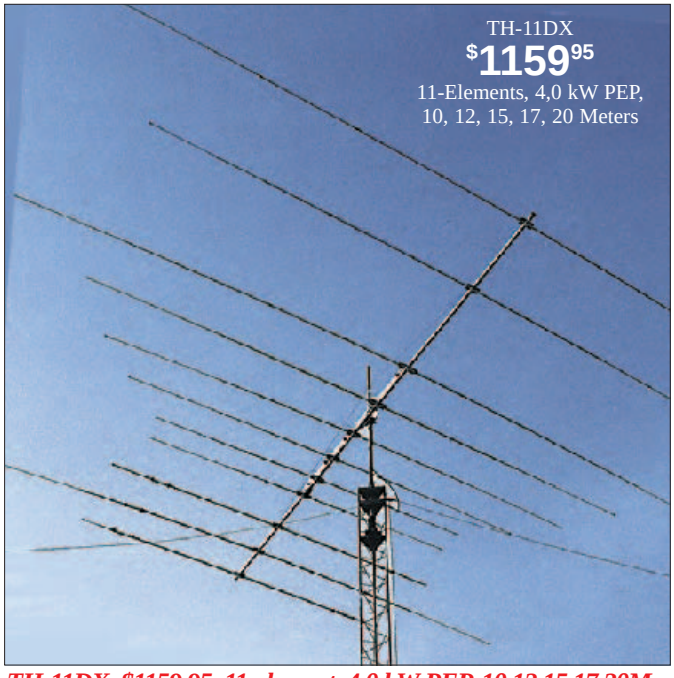

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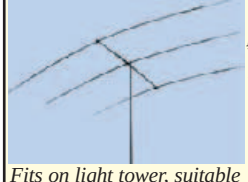

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TH-5MK2	5			1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	**3**			**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3			600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	**2**			**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
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This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- The ARRL Board of Directors has adopted guidelines on the appropriate use of Amateur Radio on behalf of commercial, non-profit and government entities. In addition, the Board adopted recommendations for additional steps to be taken by the ARRL to educate radio amateurs and others on how to prepare and train for public service and emergency communications while complying with the current FCC Rules.
- The FCC has issued a *Public Notice* clarifying its rules about using Amateur Radio during drills on behalf of a ham's employer. See Happenings, this issue, for more information.
- Senate Bill 1755, *The Amateur Radio Emergency Communications Enhancement Act of 2009*, a companion to HR 2160, has been introduced by Senators Joe Lieberman (ID-CT) and Susan Collins (R-ME).
- The 14th Triennial Conference of IARU Region 3 took place in Christchurch, New Zealand. ARRL President Joel Harrison, W5ZN, represented the ARRL, and ARRL Chief Executive Officer and former IARU Secretary David Sumner, K1ZZ, also attended.
- Brian Plumb, KE7HNW, provided CPR to a runner in Utah's St George Marathon.
- *The ARRL Letter* is now published in HTML format.
- Three people were killed while installing an antenna after dark in Florida.
- The extensively revised 2010 *ARRL Handbook for Radio Communications* is available for sale.
- The annual Simulated Emergency Test took place October 3-4.
- ARRL HQ hosted a meeting of the Global Emergency Radio Coalition and the annual Amateur Radio Administration course sponsored by the US Telecommunications Training Institute.
- The 2009 AMSAT Space Symposium took place in Baltimore.
- The organizers of the 2010 World Radiosport Team Championships (WRTC), to be held near Moscow, have selected 44 Team Leaders.
- On September 28, the FCC issued a Notice of Apparent Liability for Forfeiture (NAL) to a California firm that the Commission maintains was using amateur frequencies to conduct business.
- The winner of the *QST* Cover Plaque Award for September is Paul Danzer, N1II, for his article "A Simple Transformer to Measure Your Antenna Current."
- Registration remains open through November 22 for these online course sessions beginning December 4: Amateur Radio Emergency Communications Level 1, Antenna Modeling, Radio Frequency Interference, Antenna Design and Construction, Ham Radio (Technician) License Course, Propagation, Analog Electronics and Digital Electronics.

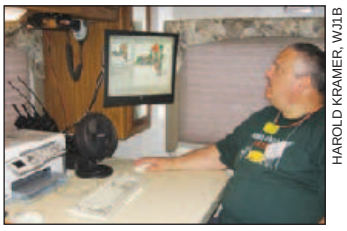
Media Hits

Allen Pitts, W1AGP
Media & Public Relations Manager

- Amateur Radio's people love to play with new technologies. We like new "toys," and the chance to modify them and put them to new and creative uses. This inventive streak is celebrated at the ARRL's Web site **www.WeDoThat-Radio.org** and was also highlighted in many media hits this past month.
- Leading the list has got to be the *HP in Real Life* article "Behind the voices of ham radio" on Hewlett Packard's Web site, **hp.com**. Andy Vavra, KD3RF, and Irwin Darack, KD3TB, are featured using Amateur Radio and HP computers together in their DXpedition to the far northern reaches of Canada. Their team, which includes Bill Ballantine, K3FMQ, and Ken Nicely, N3PSJ, were interviewed at length and resulted in an excellent article in a wonderful location. **www.hp.com/united-states/reallife/hamradio.html**
- Hams are also very active on the Apple side of the digital world. Steven Sande, KCØEZH, wrote for *TUAW — the unofficial Apple weblog*. "5 Mac applications for ham radio fans" listed apps for everything from iPhones to logging. **www.tuaw.com/2009/10/14/5-mac-applications-for-ham-radio-fans/**
- Ron Meadows, K6RPT, scored several media hits launching a high altitude balloon in September. By building his own tracking system and installing a camera to take pictures from up to 20 miles high, he got the attention of *The Mercury News* (San Jose, CA).
- Using Amateur Radio to track things with APRS systems may not be exactly "new" anymore, but it is still exciting to many people — especially when they can do it with inexpensive equipment on a network that is already in place and free. That was the theme of Joe Murphy, N4PAT, in an excellent video podcast on **www.hak5.org**. Episode 608 showed Joe demonstrating APRS to the excited host and opened the doors for more of Amateur Radio's opportunities to be shown on this popular video site for hackers. (By the way, "hacking" is not a pejorative term anymore; it simply means someone who creates new applications for computer uses.)
- *Popular Mechanics*, the well-known magazine that has displayed new technologies for decades, also endorsed Amateur Radio and referred people to the ARRL for information. Glenn Reynolds concluded his piece "How Self Reliance Can Get You Through Any Disaster" with the advice, "One underappreciated resource is the amateur radio community. Acquire a ham radio license (American Radio Relay League) and you can become a major resource if disaster strikes. It's fun too."
- Finally, "open source" style technologies in which the creators not only allow but actually invite others to develop the application even further, have been the breeding ground for most Amateur Radio growth. One hot spot for this open source activity has always been the Linux computer operating system community. The close relationship between Amateur Radio and Linux developers, often the same people, was noted by David Lane in "Open Source Ham — Is that like free range chicken?" in the *Linux Journal* (**www.linuxjournal.com**).

EmComm East

EmComm East 2009, an ARRL-sanctioned event in Rochester, New York, brought together professionals and volunteers involved with emergency communications. Participants attended training sessions on technical topics, heard presentations from served agencies and interacted with other area EmComm operators. ARRL CEO Harold Kramer, WJ1B, gave the keynote address. EmComm East is sponsored by Monroe County ARES® Inc.



HAROLD KRAMER, WJ1B

Inside an EmComm van at EmComm East: Fred Halley, W2EMS.

HAROLD KRAMER, WJ1B

ARRL Leadership at the ARRL Forum: **AEC Steve Piotrowski, KC2QZF; Atlantic Division Vice Director Tom Abernethy, W3TOM; Atlantic Director Bill Edgar, N3LLR; Western New York SM Scott Bauer, W2LC; Ohio ARES District 10 DEC Matt Welch, W8DEC.**

Puerto Rico Hams Meet with Communications Director of AEMEAD

On the eve of the 20th anniversary of Hurricane Hugo sweeping through Puerto Rico, a group of Amateur Radio operators met with Gisela Rosario, Director of Communications of the State Emergency Management Agency and Disaster Administration (AEMEAD). The goal was to bring together the radio operators who will form part of the Amateur Radio Voluntary Corps (Cuerpo de Voluntarios Radioaficionados) of AEMEAD, group that will be offering emergency communications when the normal systems fail in different situations. Aside from AEMEAD Executive Director Heriberto Sauri, also present were Pedro Otero, WP4NFB, and Angel Torres, KP4ATP, the coordinators at the Agency's level. They shared their ideas and expectations with the 20-plus ham radio operators who are part of the program. — *Angel Santana, WP3GW*

PHOTOS COURTESY ANGEL SANTANA, WP3GW

The group that will be part of the new Amateur Radio Volunteer Corps in Puerto Rico.

Pedro Otero, WP4NFB, Gisela Rosario and Angel Torres, KP4ATP, coordinators at the Agency level.

Inside HQ

Bit by Bit

Every day, we are receiving more information digitally on our Web browsers, cell phones and e-readers. How is the ARRL reacting to this ongoing migration from print to digital platforms? I first discussed this topic last month when I wrote about the *ARRL Letter*'s conversion to an HTML format. The new *ARRL Letter* has been well received and we continue to improve it based on members' suggestions and comments. We had a very positive response to the short product review video in the first *Letter* so we will be doing more of these in the future. We have now organized all of our video clips into the ARRL YouTube Channel (**www.youtube.com/ARRLHQ**).

Our major digital publishing project for the last year and a half has been the new ARRL.org Web site that we plan to debut in late January. If you would like to learn more about the new Web site, our student intern, Katie Glass, has written a first-hand account about her experiences supporting the building and designing of the new site. Her article can be found on page 55.

If you are a Kindle, iPhone, or other epub device user, we will be publishing the *ARRL's Tech Q & A* manual in this format later this year or early in 2010. This will be our first publication for these e-reader platforms. We plan to expand our e-reader offerings during the next year. One problem that we are facing is that, at this stage of their development, these platforms do not display graphics, schematics and other technical material well. Our production and graphics departments have been working to modify our printed publications so that graphic material displays properly on the new digital platforms.

Another new digital offering will be the new *Public Service and Emergency Communications Management Course for Radio Amateurs* that will debut in late December or early January. This course will be offered on our new Web site in HTML format and will be available for any member to view. Among other requirements, course completion will require completion of a number of FEMA Distance Learning courses (**training.fema.gov/IS/**). Similar to PR101 course that is offered on CD (**www.arrl.org/shop/?item=0133**), the final examination for this course will also be conducted on a Web site that specializes in online testing. Later in the year, we also plan to offer a CD version of this course and, perhaps, an e-reader version as well. We will also offer a new version of EC-001, the basic Emergency Communications course, on similar platforms sometime in 2010.

A number of our print publications are now available as both printed versions and Web based versions. These currently include the *VEC Manual* (**www.arrl.org/arrlvec/vemanual/**) and the ARRL Catalog (**www.arrl.org/shop/spring_catalog.pdf**). We continue to experiment with placing other publications both as print and online publications.

In the future, we will be looking at more Web based and downloadable publications along with digitized options for our other publications. We are moving in this direction bit by bit.

73,

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

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QEX — Forum for Communications Experimenters:
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The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communication in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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

Membership inquiries and general correspondence should be addressed to the administrative headquarters:
ARRL, 225 Main Street, Newington, Connecticut 06111-1494.

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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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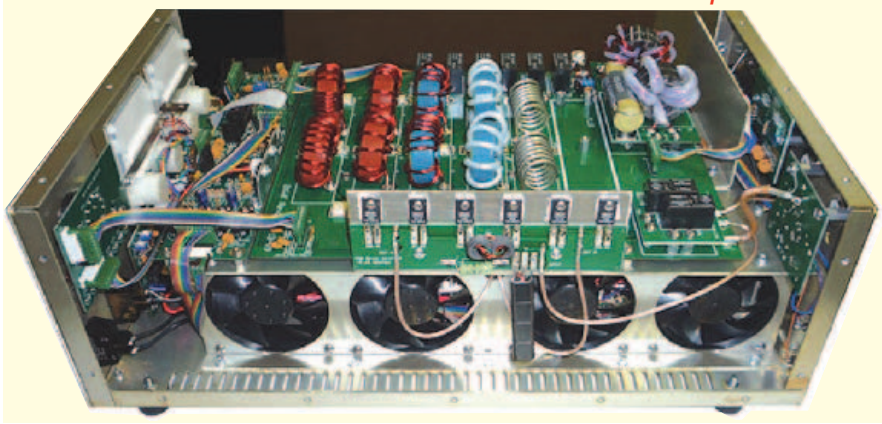

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The Many Faces of Field Day 2009

From sea to shining sea, hams of all shapes and sizes (and ages) hit the airwaves June 27-28, pursuing contacts from backyard decks and mountaintops, beaches and even fields. Complete results begin on page 67, this issue. It's not too early to start thinking about FD10, coming to a site near you June 26-27.

MARILYN BAGSHAW, N6VAW

Young GOTA op: **The Marin Amateur Radio Society and the Redwood Empire DX Association again teamed up this past Field Day using the call W6KB. Highlights were a visitation by Marin County's Search & Rescue team. Also visiting was 6 year old Nikole at the GOTA station. Named after Nikola Tesla, she is the daughter of Josh, W6XU. She held the pile-ups at bay, contributing to our total score of 10,014 points. Little sister Corinne provided backup. —** ***Marilyn Bagshaw, N6VAW***

DAN BROWN, W1DAN

Show and tell: **Two groups of high school aged girls stopped by our site in Needham, Massachusetts as they were doing a scavenger hunt. They spent time learning about what we were doing with the help of Tom, N1CPE.** ***— Dan Brown, W1DAN, Wellesley ARC, W1TKZ (2A)***

DEBORAH KOEHLER, KB2WEY

Still smiling after all these years: **Sam Scholes, KG2HA, Keuka Lake (NY) ARA's oldest club member. Sam never misses a meeting and has attended every Field Day as long as I can remember (and operates CW — usually from his favorite card table under his favorite umbrella). Sam is a spry 94 years old! —** ***Deborah Koehler, KB2WEY***

RON SANS, WA4EZF

Telling the world: **Hamilton County (IN) RACES Public Information Officer Joe March, KJ9M, explains the purpose of Field Day 2009 during an on-camera interview in Noblesville, Indiana.**

Special QSL, Special Family

Recently, a most delightful Georgia ham became a Silent Key. Her name was Florence Montgomery, N4TNZ. She and her husband Bruce, W4BFR (SK), were long-time ARRL life members and charter members of the SE DX Club. Bruce was on the DX Honor Roll, and was an avid ham for quite a few years before Florence got her license. In fact, he was licensed for more than 75 years. In the late '50s, they had a special Christmas card made, showing Bruce at his rig with their two sons, Carl and Don, beside him, both wearing earphones. Florence is standing to the side, holding up a sign that says "DINNER." Following Florence's funeral, one of her sons was kind enough to scan the card and send it to me. It provides a tiny glimpse of a very special, and much-loved, Amateur Radio couple.
— Susan Swiderski, AF4FO

GREG BROWN, KTØK

Finally, we discover the British secret to DXing success...a real "DX Window" all their own. But don't despair...it's for rent! I found the window on King Street in Bristol, UK. — ***Greg Brown, KTØK***

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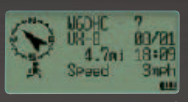

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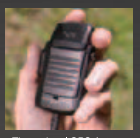

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*1 With optional accessories
*2 US Version - Cellular band blocked
*3 Assuming a duty cycle of 6-second transmit, 6-second receive, and 48-second standby (50 MHz 5 W)
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Dual Band FM Hand held (220 MHz: 1.5 W)
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CORRESPONDENCE

AMATEUR RADIO IS ACCESSIBLE RADIO

♦ Contrary to some opinions expressed on this page in the past, Amateur Radio is not necessarily an expensive hobby. For $500 or less, you can be on the air on HF. Granted that $500 will not buy the latest transceiver/antenna setup, but $500 can buy a good used HF transceiver, antenna tuner, power supply and materials to make an antenna (or three). One of the nice things about Amateur Radio is that a modest station will allow an amateur to get on the air, make contacts and have fun. You may not break the pile-up for a DX station on the first try very often, but you can usually eventually get through.

While $500 may seem a lot to spend in one shot, consider it this way: Divide that $500 by 52. That's less than $10 a week. Even if you spent $3000 for a modern station setup, when you consider that it should run fine for 5 to10 years or more without any serious problems, the investment is minimal. Some new hams, with the assistance of some generous and helpful Elmers, have even gotten on the air almost for free. I know I have certainly benefited from the generosity of some local ham friends and I appreciate it very much!

MARTIN CAMPBELL, KBØHAE
Burlington, Iowa

HIGH PRAISE FOR THE HIGH BANDS

♦ "The Past, Present and Future of VHF Contesting," by Kevin Kaufhold, W9GKA [Oct 2009, pages 80-83] presented an excellent analysis on the trends of the three major ARRL VHF contests. It correlated the noticeable trends over the years with the corresponding changes in the license class and in the contest rules.

The Single Operator Portable QRP category and the Rover category are two great things about the VHF contest that I like very much. I believe that the rules should be structured to encourage more activity in these two categories. I have observed that January is not very friendly time for rovers and portable operators, due to the high likelihood of bad weather. I think that serious consideration should be given to trimming the contest period to ending on Sunday afternoon of that weekend, since weather-related issues and darkness can impact rover and portable stations during January.

It may make sense to focus the June and January event to just the lower four bands (50, 144, 220 and 432 MHz) in order to keep the focus on VHF. There is some likelihood of sporadic-E activity at that time that would keep 6 meters as the main focus. All three contests should play to the potential propagation conditions associated with that time of year in the North America, and efforts should be toward structuring the contest to capitalize on the unique things that make VHF contesting fun, such as portable operating and fleeting propagation.

KEN NEUBECK, WB2AMU
East Patchogue, New York

BLAST FROM THE PAST

♦ At age 60, I'm a new ham, but I have hovered around the edges of the hobby for years. I was reading about the new *ARRL Handbook* ["Inside HQ," Oct 2009, page 14] and was reminded of a way-distant memory: In 1968, I was a Fire Control Technician on a heavy gun cruiser in Vietnam. We occasionally pulled in to port at Kaohsiung, Taiwan. On one of my trips into town, I found a market that sold pirated/counterfeit record albums and books. They had a 1967 or 1968 *ARRL Handbook*. They had copied the paper jacket, the inside liner, the copyright — the whole nine yards — but it was printed on newsprint; the edges of the pages were cut with pinking shears. I know I didn't pay any more than $2 for it, because that's all I had back then. Since all the stuff back then was vacuum tubes — and the stuff I was using in the Navy was vacuum tubes — I found that handbook very useful for the odds-and-ends projects I worked on for years, even after I got out of the Navy. I sure wish I had that book now! It's probably a museum piece. I have ordered a 2010 *Handbook* and am looking forward to getting my hands on a copy of your latest and greatest, and getting and continuing on with my new ham hobby.

MIKE NEAL, KJ4OMB
Norfolk, Virginia

SPY vs SPY

♦ Thanks for the response to the question posed by Doug Nielson, N7DGN, about WW II spy transmitters ["The Doctor Is IN," Oct 2009, page 55]. It reminded me of a pal from the good old days, Bill Sturmey, G8KL/W6 (SK), a transplanted Brit and an Elmer of mine, who, back in 1969, once gave me some insight into "spy" antennas.

Bill told me that he was night-dropped during WW II to provide radio communications for the partisan guerillas into what was then Yugoslavia. His equipment was the Collins-made TCS-13 transmitter and receiver. Bill told me his story when, through Navy MARS, I came into possession of a 25 year old TCS-13, brand-spanking new in the packing material; I was going to set it up for portable use in my van. Bill was able to come up with a 12 V dynamotor power supply and a complete military manual and I soon had the TCS-13 transmitting on 1.5-12 MHz. As for an antenna, Bill assured me that the rig had such a robust built-in antenna tuner that it would "load up a bedspring." I only used the rig a few times on CW, but it was a beautiful piece of equipment and built like a tank.

DENIS FRANKLIN, W6EW
Berkeley, California

SHOWING WHO'S BOSS

♦ I couldn't help but laugh when I read "How to Win the ARRL Sweepstakes with 11 QSOs" by John Kanode, N4MM [Oct 2009, page 79]. Now, it is not my intention to upstage, top or best any contest winner. My purpose is only to share a similar experience, relive a memory and laugh at myself once again.

Sometime back in the late '70s or early '80s, the ARRL changed a rule in the International DX Contest. I don't remember what the change was, but I got into a hissy snit about it. To show my dissatisfaction, I figured I'd show 'em: I waited until the very end of the contest, tuned up the rig, found a loud DX station in the Caribbean and at 2359, gave him a call. He came back to me, we exchanged reports and that was the end of the contest. I filled out all the paperwork and sent in my entry: One QSO, Single Operator, 20 meters — 3 points. I figured I'd wind up at the bottom of the heap with that one.

A couple of months later, I got an envelope from ARRL HQ. In it was a First Place certificate, Wisconsin Section, Single Operator, Single Band, 20 Meters!

ART PAHR, K9XJ, ARRL Life Member
Plymouth, Wisconsin

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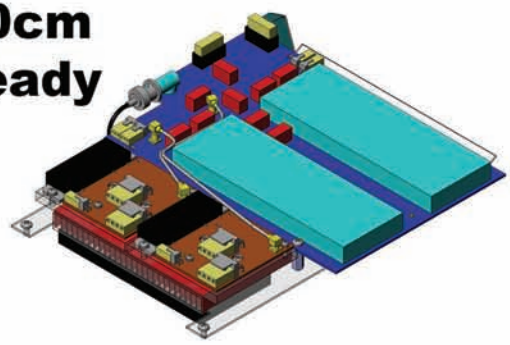

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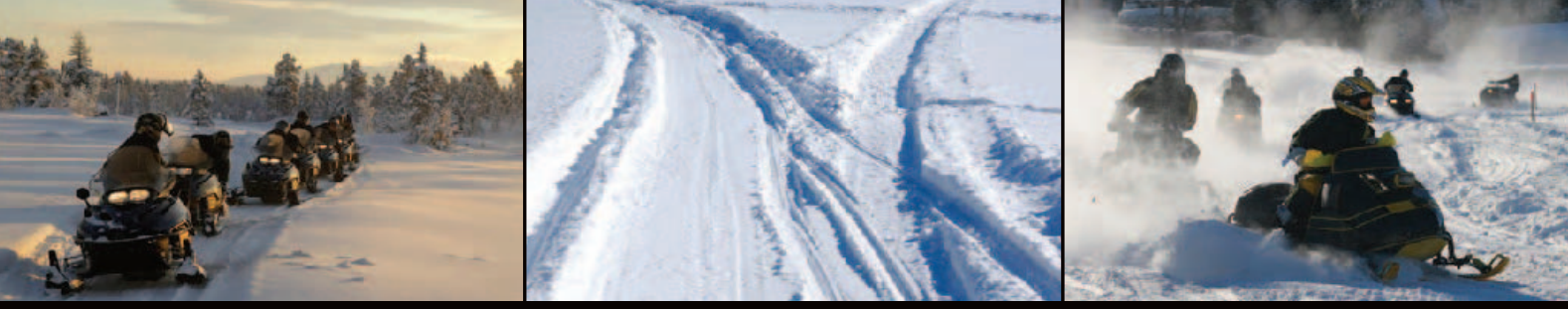

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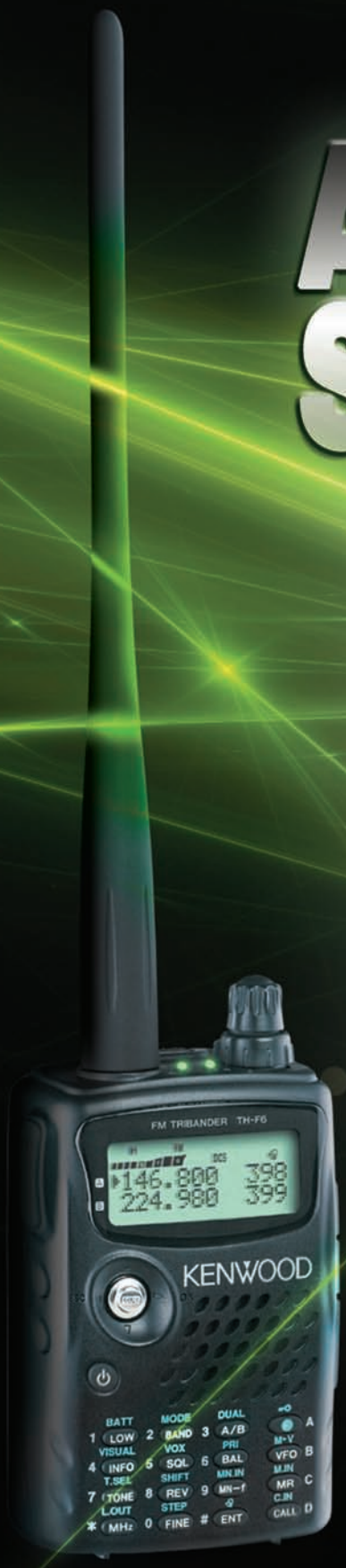
[1]Note that certain frequencies are unavailable. [2]5W output



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160 and 80 Meter Matching Network for Your 43 Foot Vertical — *Part 1*

The popular 43 foot vertical works best with matching at the antenna base — here's a way to do it for our two MF bands.

Phil Salas, AD5X

I've recently made the move to a 43 foot vertical for much of my lower frequency operations. This length antenna offers higher radiation resistance than shorter loaded monopoles. Increased radiation resistance improves efficiency by reducing the effects of ground losses, especially when you have an electrically short antenna — a characteristic of even a 43 foot antenna on 160 and 80 meters. If fed with a 1:4 unbalanced to unbalanced transformer (unun), a 43 foot antenna has a reasonable compromise SWR on 60 through 10 meters, which means that cable and unun losses are pretty much negligible on these bands.

This antenna is really not a good performer on 160 meters, and to a lesser extent on 80 meters, unless you provide matching right at the antenna base. This is due to the high capacitive reactance and still relatively low radiation resistance of a 43 foot antenna on 160 and 80 meters. This makes the mismatch so bad that it is almost impossible to efficiently match from your shack. If you can match the antenna system from your shack, you will throw away a lot of power in your coax and unun due to the very bad mismatch at the antenna.

I thus started experimenting with matching networks and wound up with two external impedance matching devices designed to significantly reduce SWR related coax losses and unun mismatch losses, and to help the inside tuner match on 160 and 80 meters. This month we'll look at the simpler version of the two matching networks. This version requires manual insertion of the matching network whenever you want to operate on 80 or 160 meters.

The Matching Requirement

According to my AIM4170C antenna analyzer, my 43 foot vertical antenna has a capacitive reactance of about 580 Ω on 160 meters. This will vary based on the particular construction of your 43 foot vertical, its proximity to other objects, and other factors. The reactance will almost certainly be in the 550 to 650 Ω range. This amount of capacitive reactance needs approximately 50 µH of inductance in order to resonate the antenna. On 80 meters, approximately 9 µH is needed to resonate the antenna. A 50 µH high Q inductor is going to be large. For this first solution, I elected to go with a toroidal inductor in order to keep the matching unit as compact as possible.

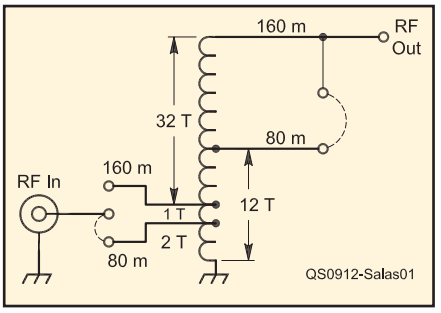


Figure 1 — Schematic diagram of the two band matching unit. 80 meter connections shown with dashed lines.

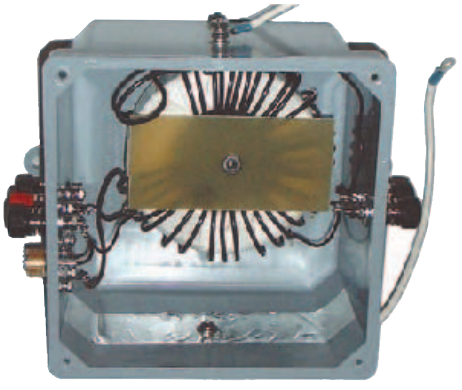


Figure 2 — T400A-2 160 and 80 meter matching unit.

Toroid Inductor Matching Solution

This compact design will handle the full legal limit on 80 and 160 meters for low duty cycle SSB and CW modes. The inductor consists of 35 turns of #14 AWG solid copper insulated house wiring wound on a T400A-2 toroid core. The antenna feed point is tapped two turns from the ground end for 80 meters, and three turns from the ground end for 160 meters. You should start with 38 turns total on your toroid, but then remove turns as necessary to get the network to resonate where you want it in the 160 meter band (more on this later).

I mounted the toroid assembly in a 6 × 6 × 4 inch NEMA enclosure using a 2½ inch long #10 machine screw and associated hardware along with a 2 × 4 inch piece of unplated fiberglass PC board material. Before you mount the toroid, prepare

Table 1
160 Meter Toroid Impedance Matching Assembly Parts List

Description	*Source/Part Number**
Banana plug (4 required)	Mouser 174-R802-EX
Binding post, black (4 required)	Mouser 164-R126B-EX
Binding post, red	Mouser 164-R126R-EX
NEMA Enclosure, 6 × 6 × 4 inch	Lowes/Home Depot
Glass cloth tape, 3M #27	ACE Hardware
SO-239 connector	Mouser 601-25-7350
Toroid, T400A-2 powdered iron	Amidon T400A-2

*Amidon parts are available from **www.amidoncorp.com** and Mouser parts from **www.mouser.com**.

Figure 3 — 160 and 80 meter input tap points.

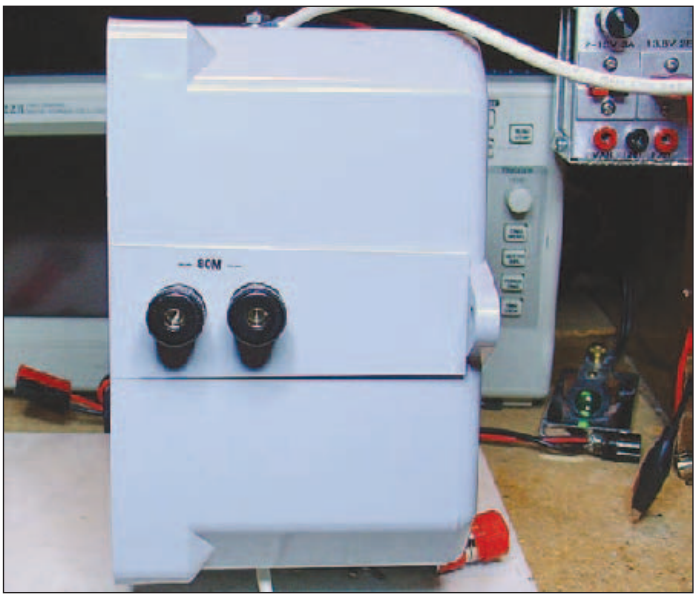


Figure 4 — 80 meter coil shorting jacks.

it by scraping the insulation off the outside second, third and 11th through 13th wire turns. Because of the high voltages possible at legal limit power levels, especially on 160 meters, wrap the toroid with two layers of 3M #27 glass cloth electrical tape for added insulation between the #14 AWG wires and the toroid core.

Figure 1 is the schematic of the matching assembly, Figure 2 shows the internal details of the assembly, and Table 1 lists the parts necessary. To select between 160 and 80 meter operation, I used external jumpers across binding posts as shown in Figures 3 and 4. Stainless steel #8 hardware (screws, washers, lockwashers and nuts) are used for the matching unit ground and RF output terminals. Internal to the matching unit, I used a 2 inch wide strip of aluminum duct repair tape as a good low impedance ground between the UHF connector and the ground screw on the bottom of the case. Finally, I used #14 AWG stranded insulated wire for all internal connections.

Tuning the Matching Network to Resonance

Your particular installation will almost certainly require you to change the resonant frequency of the matching network. This is because there will be some variations of the antenna impedance based on your particular antenna physical construction, proximity to other objects and final length, as well as your desired operating frequency range. The design is such that the overall inductance is too large for 160 meters, so the network should resonate at or below the lower band edge. Therefore, you will need to remove one or more of the upper inductor turns in order to resonate the network for the desired frequency on 160 meters.

To do this, first solder wires from the second and third turn tap points on the coil to the two outer binding posts by the SO-239 connector. The input tap points tend to be fairly noncritical and will probably be the same for all installations. Now solder a short wire from the SO-239 center pin to the middle binding post. Next, externally jumper the middle binding post to the 160 meter binding post (third turn).

Connect the matching assembly to the base of your 43 foot vertical and see where the minimum SWR point is on 160 meters using your antenna analyzer. If the resonant frequency is too low, remove a turn of wire and see where the minimum SWR point is again. You'll see about a 50 kHz upward move in frequency per turn of wire removed. When you have your desired resonant point on 160 meters, it is time to move to 80 meters. Externally jumper the input tap middle binding post to the 80 meter binding post (second turn), and use a clip lead to short from the top of the coil to turn number 12 and see where your minimum SWR frequency occurs. Move the tap point up or down until your resonance point (lowest SWR) is where you want it. Solder a wire from this tap point to one of the binding posts. Solder another wire from the top of the coil to another binding post. Now you will be able to externally jumper these binding posts to select either 160 or 80 meters.

My final test results for 160 and 80 meters are shown in Figures 5 and 6 as measured with my RigExperts AA-200 antenna analyzer connected directly to the matching network input at the base of the antenna. I'm a CW operator, so I favor resonance in the lower part of these bands, but you can adjust for your favorite portion of each band. The 2:1 SWR bandwidth on 160 meters is about 50 kHz, and about 150 kHz on 80 meters. Even a 3:1 SWR on these bands results in negligible SWR related cable losses for any reasonable length cable and is easily matched with my MFJ-998 in-shack tuner or most transceivers' internal tuners.

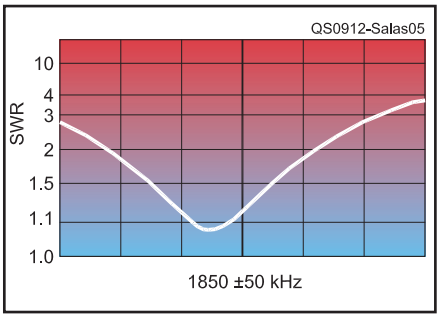


Figure 5 — Measured SWR across 160 meters indicating a 2:1 SWR bandwidth of approximately 50 kHz.

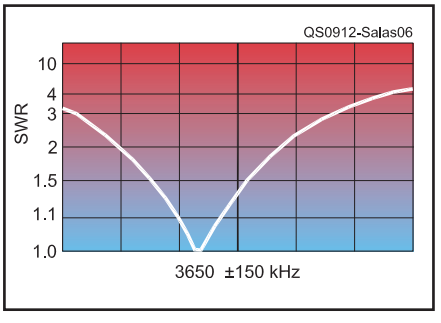


Figure 6 — SWR across 80 meters indicating a measured 2:1 SWR bandwidth of about 150 kHz.

Figure 7 — Matching unit at the base of the author's 43 foot antenna. In this view, it is strapped for 80 meters.

Conclusion

The matching network discussed in this article will permit very effective operation of your 43 foot vertical on the 160 and 80 meter bands. In Part 2, we'll look at a remotely switchable 160, 80 and 60 through 10 meter base matching unit. It is more complex, but it is also more convenient. Until then, see you on top band!

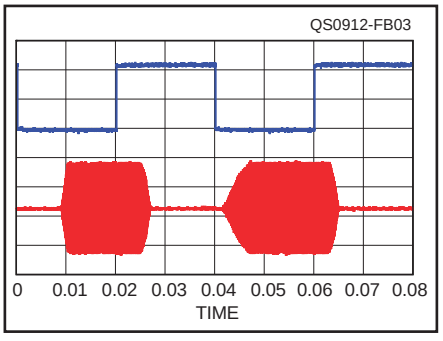
Amateur Extra class operator and ARRL Life Member Phil Salas, AD5X, was first licensed as WN3BCQ in 1964. Ham radio became the reason he subsequently pursued a career in electrical engineering. Phil earned BSEE and MSEE degrees from Virginia Tech and SMU, respectively, and worked in new product development for the next 33 years. Phil is now retired and spends his days split between ham radio related projects and enjoying time with his wife, Debbie, N5UPT. You can reach Phil at 1517 Creekside Dr, Richardson, TX 75081 or at **ad5x@arrl.net**. QST

Operation

Using the matching unit is simple. Just disconnect your normal unun when you want to operate on 160 or 80 meters and connect this matching unit to the base of the antenna. Select either 160 or 80 meters with the external straps. You can connect both the unun and this matching unit to the antenna at the same time, and just leave off the ground wire from the unit that is not used. The matching unit connected to the base of my 43 foot vertical is shown in Figure 7.

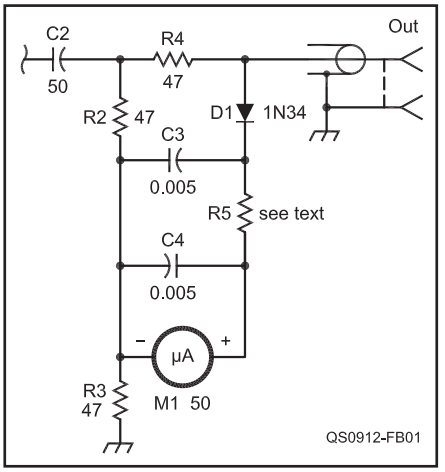
Feedback

♢In "Product Review — the ICOM IC-7600 HF and 6 Meter Transceiver" [Nov 2009, pp 54-59], Figure 3 shows the CW keying waveform with default transceiver settings. ARRL Lab Test Engineer Bob Allison, WB1GCM, noted the keying as soft at the 60 WPM test keying speed but acceptable at more common operating speeds. From the manual we learned that the rise time is adjustable, and shortening it to the 2 ms setting (4 ms is default) improved the soft keying at the 60 WPM test speed without creating hard keying or clicks as shown in the revised Figure 3.



Revised Figure 3 — Product Review — the ICOM IC-7600 HF and 6 Meter Transceiver. CW keying waveform for the IC-7600 showing the first two dits in full-break-in (QSK) mode using external keying with rise time set to 2 ms. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

♢In Figure 1 of "The Antenna Dipper" [Nov 2009, p 53], the bridge portion has a few errors. The correct schematic of the bridge portion is shown below. Note that while R5 could be 47 Ω as on the original, it should be selected to give around full scale sensitivity on the meter with the antenna disconnected. The optimum value will depend on the meter characteristics. In addition to the wiring changes shown, L1 should be around 1 to 2.5 mH.



Revised Figure 1 — The Antenna Dipper, bridge portion.

New Products

MFJ MIGHTYMITE INTELLITUNER

♢The MFJ-925 automatic antenna tuner is designed for use with compact mobile/home station transceivers. Measuring 2⅛ × 6½ × 8¼ inches, the MFJ-925 is rated for output power of 2-200 W SSB/CW from 1.8-30 MHz. It's specified for use with antenna impedances from 6 to 1600 Ω. Use an optional MFJ-911H external balun for balanced feed lines. Price: $179.95; MFJ-911H balun, $29.95. To order, or for your nearest dealer, call 800-647-1800 or see **www.mfjenterprises.com**.

The Collins 30L-1 Linear Amplifier — Nearing 50, Still Going Strong

This old amplifier's still good gear, but now it's ready for an update.

Fred Archibald, VE1FA

Next year the Collins 30L-1 HF linear amplifier will be 50 years old. By that age most ham equipment is completely obsolete. The 30L-1, however, remains an attractive, instant-on, desktop 3.4 to 30 MHz medium power linear amplifier in daily use by many amateurs. When it appeared in 1960, it was radically light (38 pounds), compact and efficient for its power (1000 W CW or PEP SSB plate input). This was especially the case if compared to typical late 1950s 1000 W amplifiers, most of which weighed hundreds of pounds. Hams, commercial interests and the military all responded by buying thousands of 30L-1s. In 1970 and '71, a 30L-1 in Vietnam linked to a New England MARS phone patch often connected me with my much missed family on Cape Cod. Today, many of the innovations introduced by the 30L-1 in 1960 are found in all modern tube-type linear amps.

Figure 1 — The Collins 30L-1 linear.

I bought my 30L-1, the military veteran shown in Figure 1, in 1995 for our island DXpeditions. Since then it has voyaged 11 times in its plastic tub to various Maritime islands, where it operates for 5 to 7 days continuously, piling up IOTA (Islands on the Air) points and DX contacts. It has taken those years of bumps, vibration, fluctuating voltages, heat and humidity, without a single failure! However, how long can those obsolescent top-hat rectifiers and 40 something year old electrolytic filter capacitors be trusted? This is especially a concern, because to fit so much linear in a small cabinet Collins runs the four 811-A tubes and the power supply components at very near their limits.

Because the 30L-1 remains popular, a number of amateur designed power supply upgrade boards are now available. At least four of these replace the original two boards (rectifier and filter/bleeder) with a single board stuffed with modern devices having higher ratings and improved performance.[1] I decided to install one of these as the heart of an overall update of my 30L-1.

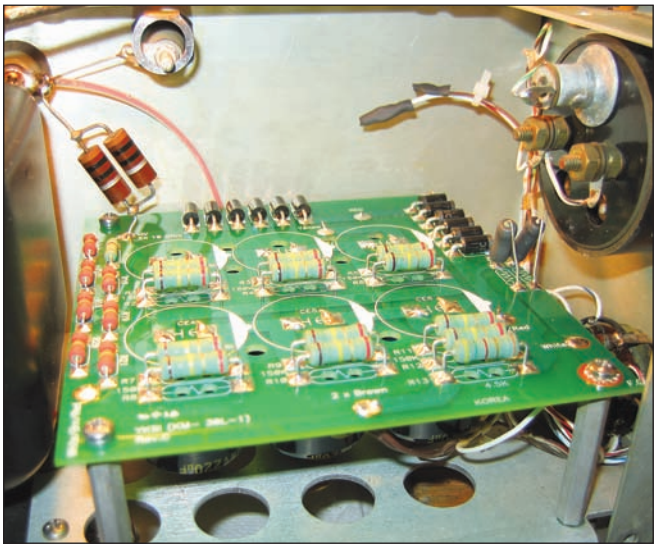


Figure 2 — The K6HM power supply board installed. The filter capacitors can just be seen under the board. Two unused wire ends were protected with heat-shrink tubing (upper right). A star washer (lower right corner) was used to ensure a good ground contact for the board.

Warning

As with all tube linear amplifiers, the 30L-1 uses lethal voltages (1600 to 2000 V) at heart-stopping currents. Never defeat the safety interlocks and never poke around inside when the unit is on. Work on it only when it is unplugged and the filter capacitors are discharged. If you are new to high voltage electronic repairs, try to find an experienced amateur to guide you.

Plate Power Supply Upgrade

I purchased the assembled K6HM rectifier, filter and bleeder board. As noted, there are other sources of such boards, but I have had good luck with this one. It replaces the two original boards and the 47 1960s resistors, capacitors and diodes on them with one new board containing 45 modern resistors, diodes and capacitors. This board replaces a large proportion of the most failure-prone components in the linear for just $60.

The new board is very well made, with all components identified by clear silk-screen lettering (see Figure 2). The wire solder points are likewise labeled with the color codes of the correct wires in the linear.

[1]Notes appear on page 35.

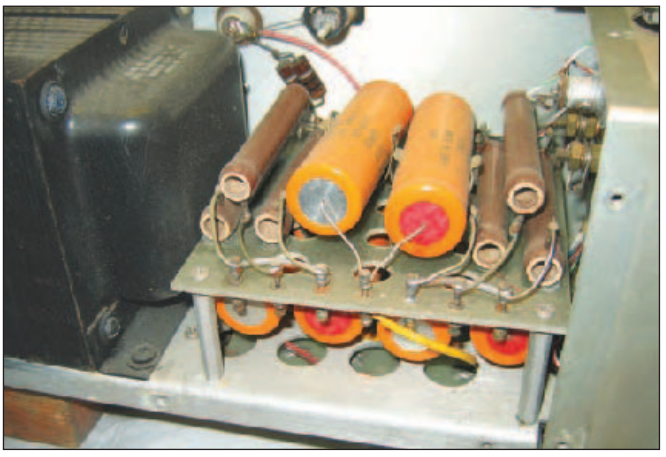


Figure 3 — The original filter-bleeder board (on posts) and the rectifier board (below the chassis) before replacement.

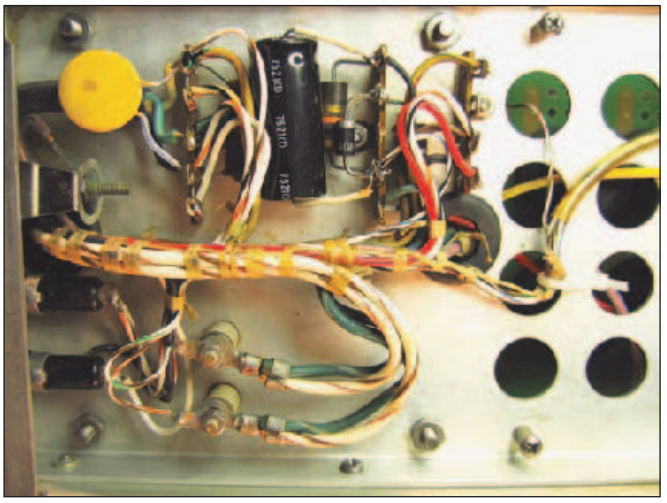


Figure 4 — Below the power transformer. The MOV (yellow disc) and upgraded bias supply (diode, capacitor and resistor on the middle terminal strip) are visible. On the right is the space formerly occupied by the rectifier board. Note the fine (#30) wire between two lugs on the right-hand terminal strip. This is the plate current fuse.

For example, you simply solder the white wire with the brown and red tracers to the solder pad labeled WHITE/BROWN/RED. There are just six wires and a ground to attach.

The old boards are easily accessible after removing the 30L-1's outer case and the bottom and left-hand side inner panels. Both old boards are freed by removing four corner screws each, then unsoldering all wires (see Figure 3). A red wire that ran between the boards is removed, and two other wires (brown and white/red tracer) have their free ends sealed with heat-shrink tubing. All other wires go to the appropriately labeled solder pads on the new board, which fits exactly on the four mounting studs of the old filter-bleeder board next to the transformer. Proceed very carefully to avoid mistakes. The whole disassembly and board replacement took about 2 hours.

Bias Supply

The new board doesn't contain the components for the grid bias and transmit receive relay supply, so they were replaced separately. The old 1N458 diode was replaced by a 1N5408 (overkill, but I had one: a 1N4007 would be fine) and the old 10 µF filter capacitor replaced by 33 µF on a terminal strip adjacent to the fuse holders under the transformer (see Figure 4).

At different times in the 19 year production of the 30L-1, Collins used 39, 47 and 58 Ω resistors for R28, which establishes the key down grid bias. The earliest manuals (1960-61) recommended a static plate current of 130 mA, but that's not good as it exceeds the dissipation rating of the 811As. Collins subsequently recommended 110 mA. If the static current exceeds 100 mA by much, increase R-28's value by 10 Ω or so to develop a bias of –3 V or greater and drop the plate current. Your linear will run cooler and your 811As will thank you.

Supply Protection

I had just renewed both power supplies, and didn't want to damage them with power line transients, so an MOV (metal oxide varistor) spike suppressor was put across the 120 V ac input to the power transformer. A Z131 20UL (130 V ac, 20 A) device was soldered on TB#1 (terminal strip #1) under the transformer as shown in Figure 4. Further good insurance — be sure that the two input fuses are 8 A, no larger, whether your 30L-1 is wired for 120 or 240 V ac. Each fuse carries a normal maximum of 5.5 A, so you can even use 7.5 A or 7 A fuses. Also check that the tiny piece of #30 AWG wire serving as a plate current fuse between the filament lead and ground just forward of the bias supply terminal strip (Figure 4) is in good condition and not shunted by a heavier wire.

Meter Accuracy

Assuming your meter movement doesn't have mechanical problems, your 30L-1 voltmeter and ammeter will be accurate. The old 1.0 Ω plate current shunt and 4.0 MΩ voltmeter series resistor were replaced as part of the new supply board.

The third meter function, the TUNE meter, is more complex and troublesome. It is a clever bridge circuit that zeroes the meter when the TUNING and LOADING controls have resonated the output tank and exactly matched it to the plate impedance of the tubes. When calibrated, it speeds and simplifies tune ups. Early versions of the 30L-1 manual said not to touch factory set trimmer C18, but today age has caused most TUNE meter circuits to drift, and tuning for zero needle deflection usually leaves the linear mistuned, producing too much heat and too little RF power.

Undoubtedly over the years hundreds of 811As have developed those amusing big holes in their plates and entered the trash far too soon due to ops trusting the tune meter that used to work so well. To obtain the Collins

Table 1

Changes in the Collins 30L-1 Linear Amplifier With Updating

Parameter	*Original*	*Updated*
Power requirement, no input[2]	400 W @ 122 V ac	385 W @ 122 V ac
Power requirement, @ 650 W[3]	1300 W @ 118 V ac	1300 W @ 118 V ac
Rectifier stack rating	0.75 A @ 4.8 kV	3.0 A @ 6.0 kV
Effective filter capacity	16.7 µF	37 µF
Bleeder dissipation	23.8 W	8.7 W
Input spike protection	0.01 µF bypass	0.01 µF and MOV
Plate supply ripple	87 V p-p	28 V p-p
Static keyed I_{PA}	100 mA	100 mA
Static keyed E_{PA}	1800 V	1900 V
Unkeyed E_P	1900 V	1980 V
Bias filter	10 µF	33 µF
Bias ripple (unkeyed)	9.5 V p-p	4.0 V p-p
Bias E (unkeyed)[4]	–172 V	–176 V

TUNE meter alignment procedure, look at page 4-2, paragraph 4.7 of the 1965 30L-1 military manual accessible (and downloadable) on the BAMA (Boat Anchor Manual Archive) Mirror Web site.[5]

I used a quicker and less precise method, which was to apply about 25 W at 14.1 MHz from an exciter/transceiver into the 30L-1, then adjust the TUNING and LOADING controls very carefully for maximum output at 400 mA into an RF power meter and 1000 W, 50 Ω, dummy load. The excitation was then increased to give 600 mA plate current and the TUNING and LOADING knobs quickly tweaked for maximum output.

When you're satisfied you're getting maximum power out at 600 mA, switch the meter from current (DC AMPS) to TUNE, and quickly zero the meter with C-18. Now tune up using the tune meter on the other bands and check for good power output at 600 mA.

Check it Out

Each resistor in the 30L-1 was measured and determined to be within 10% of its correct value. Particularly likely to change (due to overdriving, mistuning, or grid shorts) are the four 47 Ω grid resistors. The signal diodes in the ALC and tune-meter circuits were checked for good front to back ratios with an ohmmeter. A tiny drop of oil was put on each switch, motor and capacitor shaft bearing point, and a little anti-oxidizing contact cleaner on each switch contact.

A Cool Linear

Perhaps the weakest part in the 30L-1 is that refugee from an old record player, the cooling fan motor. It stirs the air a bit, but prolonged contesting or rag chews make the tubes and amplifier very hot, shortening tube life and stressing components. A 3 × 3 inch, 120 V, Rotron muffin fan placed over the tubes on the 30L-1 inner screen produces a dramatic temperature reduction during prolonged use. A little felt glued to the bottom of the fan frame keeps fan vibration from transferring into the metal screen and making noise. With the original filter and bleeder board, the power supply compartment also got quite hot after a few hours; the new board decreases heat generation there by 15 W, making it much cooler.

Results

With well used 811As and the new board, at 600 mA plate current, my 30L-1 produces 650 W CW carrier out on 80, 40, and 20 meters, and 600 W on 17, 15, 12, and 10 meters, using a Collins power meter checked for accuracy (it is slightly conservative). This is close to what the old boards produced, but the dynamic range (sharp voice peaks) on SSB should be increased by the much larger B+ filter capacitance.

Table 1 shows the effects of the upgrade on the 30L-1. Many of the changes, such as the MOV, increased current and voltage ratings, decreased heat production and new versus ancient filter capacitors and diodes should provide improved reliability for my 30L-1's next 50 years.

Notes

[1]There are presently at least four modern 30L-1 single power supply boards available: Young Kim, K6HM; Harbach Electronics (Jeff Weinberg, W8CQ); Bill Noonan at **W6BN.com**; and Steve Pautard, W4NI. I have not evaluated or compared them, but available Internet information on these boards suggests that all are taking similar approaches in their designs, but with variations in at least filter capacitor working voltages and capacities. Prices also vary from $60 to $150. My apologies to any suppliers that I've overlooked.

[2]Measured with 30L-1 keyed, no signal input (filament, bleeder and static plate I being drawn).

[3]CW carrier output at 14.2 MHz into 50 Ω, 1000 W dummy load.

[4]This voltage appears on the PTT (keying) jack. If the 30L-1 is used with a modern solid state transceiver, an intermediate relay (typically with a 12 V dc coil) should be used so that the transceiver switches only a low voltage. The 30L-1 ALC output can be adjusted with R-16 to nicely match most modern rigs' ALC input, providing increased RF compression and preventing overdriving.

[5]**bama.edebris.com**.

Fred Archibald, VE1FA, is a semi-retired microbiologist who got his PhD. at McGill University in Montreal, worked as a professor there on oxygen toxicity and as a Senior Scientist at the Pulp and Paper Research Institute of Canada (Paprican) on biotechnology and wastewater biotreatment.

He has been interested in electronics since his teens, received training in HF transmitter repair at Fort Monmouth, New Jersey, then repaired army HF transmitters in Vietnam and Arizona. He received his 10 WPM amateur license in 1986 and his Canadian Advanced license in 1987.

His interests are in IOTA island expeditions (16 so far), restoring classic radios, antennas, DXing and ragchewing. His wife, Helen, VA1YL, is very active in various YL nets and activities, as well as the island expeditions. Fred and Helen live at 25 Canard St, RR #1 Port Williams, Canard, NS B0P 1T0, Canada, and can be contacted at **hfarchibald@ns.sympatico.ca**.

In The November/December 2009 Issue:

■ Jim Koehler, VE5FP, describes "A DDS-Based Signal Generator." Based on the NimbleSig III direct digital synthesizer described by Tom Alldread, VA7TA, that appeared in the Jan/Feb, Mar/Apr and May/Jun 2009 issues of *QEX*, VE5FP has created a laboratory grade test instrument with features most home builders would want.

■ Horst Steder, DJ6EV and Jack Hardcastle, G3JIR, describe their computer program to design "Crystal Ladder Filters for All." In this article, the authors describe the design and crystal selection process, and lead us through the use of their program to design crystal ladder filters. The program is available on the Downloadable Files section of the *QEX* Web site (**www.arrl.org/qexfiles/**).

■ Rudy Severns, N6LF, presents the next stage of his research in "Experimental Determination of Ground System Performance for HF Verticals." Part 6 focuses on ground radial systems for multiband vertical antennas.

■ Victor Kean Jr, K1LT, presents a way to use a phased array of four shortened vertical antennas for the "top band" in "Beam Steering on 160 Meters." His system uses four Softrock software defined radio modules to create the phasing needed to steer the array in any direction.

■ Paul Wade, W1GHZ, begins a series on "Waveguide Filters You Can Build *and* Tune" with "Part 1 — A Tour of Filters." UHF and Microwave enthusiasts won't want to miss this series!

■ Ray Mack, W5IFS, continues his software defined radio column. In this installment of "SDR: Simplified," Ray teaches us about "Sampling, Nyquist and Spectrum." He also gives us more detail about Discrete Fourier Transforms.

QEX is edited by Larry Wolfgang, WR1B, (**lwolfgang@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. For First Class US delivery, it's $37; in Canada and internationally by airmail it's $31. Nonmembers add $12 to these rates. Subscribe to *QEX* today at **www.arrl.org/qex**.

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Antenna Patterns — What Do They Mean?

Most antenna articles include these diagrams — but how do you interpret them?

Joel R. Hallas, W1ZR

A truth about antennas is that all real antennas radiate better in some directions than in others. It is thus important for hams to know which directions will work best, so the appropriate antenna, antenna height and orientation can be selected. A good way to describe how antennas perform is to plot their response. To some of us, the meaning of such plots is intuitive — but perhaps that's not true of all our readers. In this short article, we'll try to take some of the mystery out of this topic.

For a horizontal half wave dipole, the radiating field that leaves with maximum strength is in a direction perpendicular to the dipole. The field strength is reduced as we move in the direction of the ends. Near the earth, the field cancels at the horizon and increases to a maximum at some angle above the horizon depending on how high off the ground the antenna is.

Plotting Antenna Response

Rather than discuss this in general terms, we can represent the directional effects of the antenna in plotted form that can be easily interpreted. We could plot the field strength as a function of azimuth angle, the angle moving from, for example, far left to far right at a particular elevation angle, using familiar rectangular coordinates. We have plotted both the relative strength of the radiated power of such a half-wave antenna in Figure 1.

Polar Plots

While a representation such as Figure 1 is correct and useful, it is more common to show the information in something called a *polar plot*. This kind of plot represents the intensity in a particular direction by the length of a line from the center of the plot to the curve at any angle. This gives what seems to me to be a more intuitive view of the performance of the antenna as a function of the angle.

Figure 2 is a representation of the field strength from a thin 40 meter dipole 60 feet above typical ground. This is shown as a function of elevation angle taken in the direction perpendicular to the antenna wire, the azimuth angle of maximum output. Note that the field at the horizon is zero, as we would expect for a horizontal antenna over real earth. Note also that at this height of 60 feet, the radiation upward is reduced and the maximum radiation is at an elevation angle of 32° above the horizon. It is easy to see from the rings, shown in decibels, that the response straight up is down 10 dB from the maximum. This will be different for different heights. Although this antenna is bidirectional, only one set of arrows is shown.

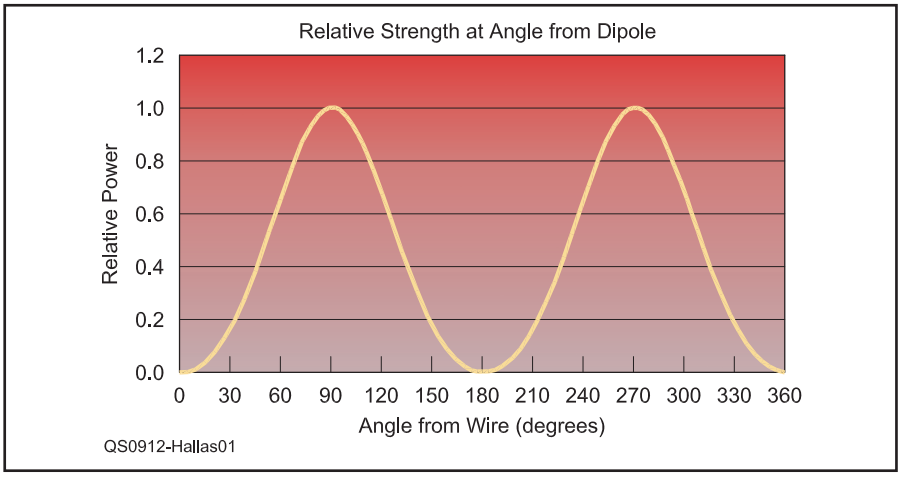

Figure 1 — Calculated relative field strength shown in rectangular coordinates.

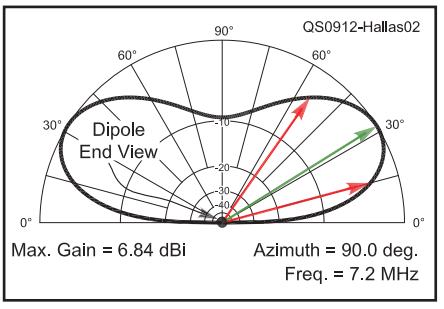

Figure 2 — Polar plot of modeled relative power vs elevation angle. The end view of the wire antenna is shown as a dot. The green arrow points in the direction of maximum signal strength and its length represents the maximum signal amplitude. The red arrows point to the elevation angles at which the relative power has dropped to half that (–3 dB) of the maximum signal strength; the angle between them is the *3 dB vertical beamwidth.*

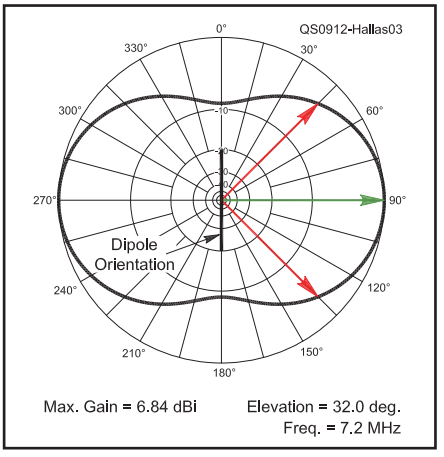

Figure 3 — Polar plot of modeled signal strength in decibels (dB) as a function of azimuth angle at the maximum elevation angle, 32° for this height. The antenna orientation is shown, so consider this looking down from above. As in the elevation pattern, the green arrow points to the azimuth angle of maximum strength at 90°, or perpendicular to the wire, as we would expect. The red arrows point to the azimuth angles at which the power has dropped to half the maximum, the *3 dB horizontal beamwidth.*

Figure 3 is a polar plot of the radiation from the same dipole at an elevation angle of 32°, the angle of maximum radiation. The angles correspond to the same angles as shown in Figure 1 and represent the relative strength in different directions going around the antenna from 0° at a wire end all the way around clockwise to the same point, 360°.

The relative power is generally shown in *decibels* (dB), a convenient logarithmic representation that makes it easy to add up system gains and losses. Note that the dB scale is compressed to show additional detail in the more significant portion.

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

How the Ionosphere Was Discovered

Today we take it for granted, but it took the efforts of many to figure out what was happening.

Robert H. Welsh, N3RW

For decades, *QST* readers have studied articles describing the best methods for getting their signal from point A to point B. Past articles have taught us how to build or improve receivers, transmitters, filters and antennas (my favorite). From the 160 meter band through the HF spectrum to VHF, we are subject to one part of radio communications beyond our control. That part is the Earth's ionosphere. Its discovery, aided in part by radio amateurs working with government and university scientists, makes an interesting story.

I suspect that most readers of *QST* recognize Guglielmo Marconi as one of the earliest radio "amateurs." Marconi's efforts using radio to cover long distances over water is well documented. There is still a question as to whether in 1901, he actually received the Morse code letter S transmitted from Poldu in Cornwall, England to St John's, Newfoundland; nevertheless, it is accepted that his efforts led to radio as a viable means of long-distance communications.[1,2,3] Keep in mind that prior to radio as a communications tool, wire telegraphy was the primary tool for long distance communications. Wires cannot easily span the surface of the world's oceans, but radio waves can.

Laying the Ground Work

The physics community of the early 20th century investigated this new phenomenon. Several theories were proposed by prominent physicists to explain how radio signals propagated over long distances. One of the several theories proposed was that the Earth's upper atmosphere acted as some sort of a reflector. Another theory took into account the optical phenomenon of superposition of waves. Another wave phenomenon was suggested — radio waves were diffracted just as light waves were diffracted, or bent, around an obstruction. Diffraction could not explain how these waves bent around the smooth curvature of the Earth.

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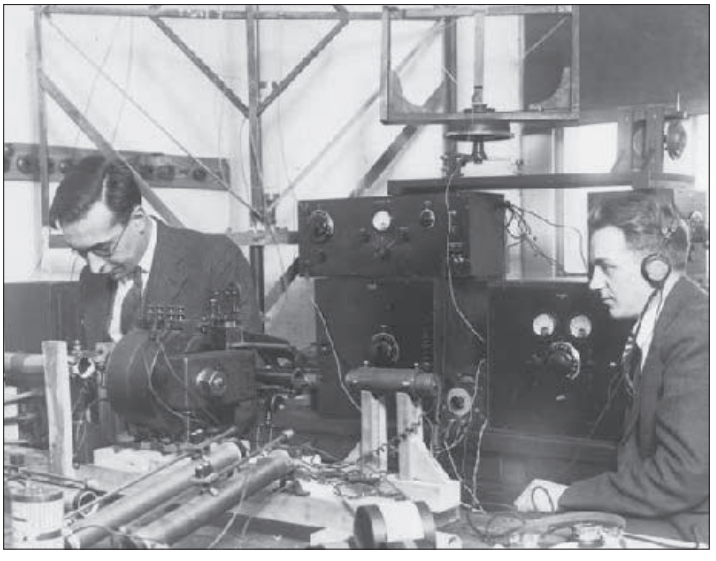

Figure 1 — Early pioneers in ionospheric research. Dr Merle Tuve and Dr Gregory Breit (at left) at the pulsed echo sounder for ionospheric research located at the Department of Terrestrial Magnetism, Carnegie Institution, Washington, DC. The photo is dated February 14, 1927.

Even the great Marconi attempted to explain how radio waves traveled. He observed the difference between day and night propagation of radio waves. His explanation was based on the presence or absence of sunlight; that is, during the day, the Sun's rays falling on the antenna acted as a shield.[4] Not a bad explanation for those amateurs active on 160 and 80 meters during daylight hours.

According to the scientific method, a theory must be tested to confirm its validity. One of the equations developed to support a scientific theory proposed to show that as the wavelength decreased, the radio waves traveled over longer distances. This was the Austin-Cohen equation. Given this hypothesis, the shorter wavelengths were considered useless for long-distance radio communications and were relegated to those folks called radio amateurs. How fortuitous for us! The professional scientific community slowly began to take notice that radio amateurs using shorter wavelengths were having great success in communicating over long distances.

An Answer Comes into View

In 1902, two scientists independently suggested that radio waves were bent by a conducting layer in the Earth's atmosphere. Those scientists were Arthur Edwin Kennelly in the US and Oliver Heaviside in England.[5] The reflecting layer that we now call the ionosphere became known as the Kennelly-Heaviside layer. It took two decades of experimenting before this hypothesis was proven to be the correct explanation for long-distance high frequency radio communications. As stated in the previous paragraph, the Kennelly-Heaviside layer hypothesis required experimental testing before it could be accepted.

Lee De Forest is well-known as the inventor of the triode vacuum tube. By inserting a third element between the cathode and the anode, this third element (the control grid) is able to control the flow of charge from cathode to anode, thus producing amplification. Not as well-known is De Forest's work in radio propagation. During the period 1912 to 1914, De Forest and Dr Leonard F. Miller of the Federal Telegraph Company made the first crude measurements of the Kennelly-Heaviside layer height using a spark transmitter. The spark transmitter delivered 1200 kW (that's

[1]Notes appear on page 39.

1.2 MW) to an antenna at currents approaching 750 A. The wavelength of this transmitter was 3260 meters (a frequency of 92 kHz). Signals from this transmitter located in Los Angeles were received 350 miles north in San Francisco and 300 miles east in Phoenix. De Forest published the results of these tests in the journal *London Electrician* in 1912. De Forest hypothesized that the main wave was returned by a reflecting layer whose heights were 17, 27 and 37 miles above Earth.[6] De Forest makes an interesting comment regarding his experiments: "I know nothing about what goes on up above, and that attempts at exact explanation are silly." Perhaps not the best attitude for an experimenter.

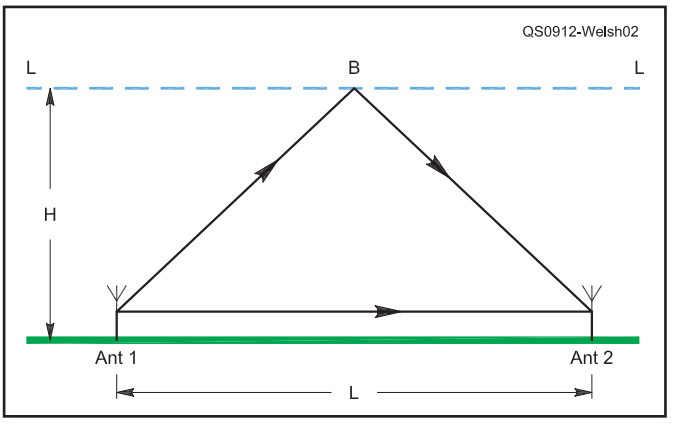

Figure 2 — Ray-path drawing representation of that from Tuve and Breit's March 1925 article. LL is the postulated reflecting layer. Ant 1 is the transmitting antenna location. Ant 2 is the receiving antenna location. The distance along the surface is L and the height of the layer is H.

Development Continues

During the period of the 1920s, radio grew exponentially through increased commercial broadcasting and the use of shorter wavelengths for long distance communications. During that same period, there was an increased interest in the physics of subatomic particles. Much of the particle physics research was based on an increased understanding of the nature of matter. By the 1930s, this led to that branch of physics known as quantum mechanics. Pulse techniques were developed to accelerate charged particles. The offshoot of this research for radio physics was the introduction of high-power pulse generators. Hams think of these as CW transmitters. The two scientists recognized as the discoverers of the pulse technique for confirming the existence of the ionosphere were Merle Tuve and Gregory Breit.

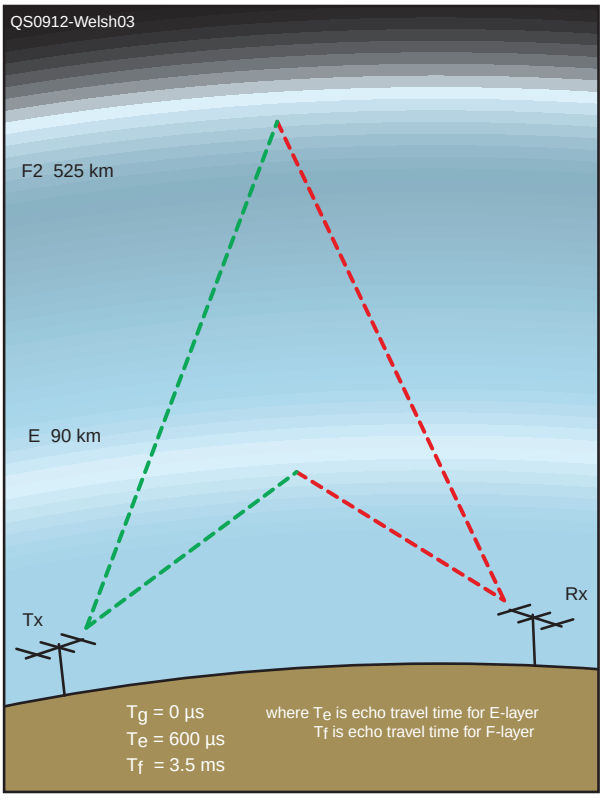

Figure 3 — Illustration of the operation of a Digisonde that has the capability of portable operation. The system can measure seven observable parameters of reflected or refracted signals as described in the text.

Tuve was an active amateur during his undergraduate days at the University of Minnesota. He spent considerable time operating the club station, 9NB. It is interesting to note that one of Tuve's friends in Amateur Radio was Ernest Orlando Lawrence, for whom the Lawrence-Berkeley Laboratory at the University of California is named.

Lawrence eventually went into the field of nuclear physics. He used the accelerated charged-particle concept to construct the atom-smashing machine known as a *cyclotron*, for which Lawrence earned the Nobel Prize in Physics. Tuve received his undergraduate degree in electrical engineering. Some time after graduation, Tuve received a letter from Lawrence wherein Lawrence suggested that the two of them start a business selling and installing radios.[7] It is important to note here how young Amateur Radio operators set the stage for great work later in life within the physics community.

Two years later, Tuve earned a master's degree in physics. Following graduation, he was employed by the Carnegie Institution of Washington in a program to measure the height of the radio conducting layer. Tuve worked under Gregory Breit, who held the position of Mathematical Physicist in the Department of Terrestrial Magnetism at the Carnegie Institution. This experiment would lead to Tuve's doctoral dissertation. Breit began ionospheric measurements in 1924. He assumed a layer height of 62 miles; the same height suggested in a 1913 publication by De Forest. In addition, Breit was aware of propagation experiments by Albert Hoyt Taylor of the Naval Research Laboratories.[8]

The ARRL Joins In

Albert Hoyt Taylor and his colleagues at NRL, in cooperation with John Reinartz (1XAM and 1QP) of the ARRL and other radio amateurs, had discovered that high frequency radio waves could be transmitted to a distant receiver while being imperceptible at many points in between.[9] Taylor labeled the gaps *skip distances* and conducted an in-depth investigation to determine their characteristics. He published detailed experimental measurements of skip distances in early 1925, including with them estimates of the height of the conducting layer previously suggested by Kennelly and Heaviside.

By 1925, Breit and Tuve designed an experiment to measure the height of the conducting layer by transmitting pulsed signals, then receiving the echoes and measuring the time lapse from transmitted pulse to received echo from both the sky wave and the ground wave. Considering the speed of radio waves is the same as the speed of light — that is, constant at 3×10^8 meters per second — Breit and Tuve used basic physics to calculate the distance traveled by the pulse. During a meeting in Washington, DC during November 1924, Breit and Tuve met with several leading radio experts. A plan was conceived in which several powerful radio transmitters would provide the source signal and the received signal would be at the Carnegie Institution. The transmitters were station KDKA in Pittsburgh, Pennsylvania, the National Bureau of Standards station

WWV, the Naval Research Laboratories station NKF and coastal station WSC operated by the Radio Corporation of America in New Jersey. (See Figure 1.)

The best results were received from the NRL transmitter, one of the earliest crystal controlled transmitters in use. Breit and Tuve used the new technique of oscillograph recording to analyze the received pulses. On July 28, 1925, they received the first conclusive results of ionospheric reflection at a frequency of 4.2 MHz from a 10 kW transmitter sending 200 µs pulses.[10]

One of the most interesting aspects of their results was that the height of the reflecting layer varied from day to night. Their calculations indicated that the height ranged from 55 miles (88 km) during the day but rose to 130 miles (208 km) at night. They were not yet aware that the layers varied as a result of solar ultraviolet and X-ray emissions, which did not excite the atmosphere when the Sun was not visible. Today, hams recognize that the ionosphere behaves as if it were in several distinct layers at different heights. These are referred to as the D layer at a height of about 30 miles (50 km), the E layer at about 60 miles (100 km) and the F_1 and F_2 at heights ranging from about w180 miles (300 km).[11]

The method[12] used by Breit and Tuve to directly measure the ionosphere's height was to:

- Use directional loop antennas for receiving.
- Record the received pulses from both the sky-wave signal and ground-wave signal.
- Apply the time difference between the sky-wave signal and the ground-wave signal.
- From the difference, use their derived equation to measure the layer height.

The derived equation was a slight modification of the Euclidean geometry statement about right triangles known to legions of high school students as the Pythagorean theorem. (See Figure 2.) From this equation and comparing the time for the sky wave to reach the receiver compared to the time for the ground wave to reach the receiver, Breit and Tuve calculated the height of the reflecting layer for 4.2 MHz transmission.

From Tuve and Breit's 1925 paper, the equation suggested that the time of arrival of the sky wave is given by

$$T_{sky\ wave} = (2\times H/C)(1 + (L/\{2\times H\}))^{1/2}$$

where $T_{sky\ wave}$ is the arrival time, C is the speed of light, H is the height and L is the length over the surface of the Earth.

Whereas the time of arrival of the ground wave is given by:

$$T_{ground\ wave} = L/C.$$

From the difference in the two arrival times, the experimenters could arrive at a virtual height for the reflecting layer. Their results obtained from recording several different transmitting stations suggested a reflecting layer height of about 80 miles (128 km).

From their initial experiments in the 1920s, sounding the Earth's ionosphere has developed into a remarkable analytical tool. Prior to the WWII, there were few ionospheric sounders in operation — those in England; Washington, DC; Peru; Australia, and the Soviet Union. During the war, the number increased to about 50 stations. By the time of the International Geophysical Year (1957-58), the numbers had increased to about 150.

The techniques used today are a direct offshoot of Breit and Tuve's 1925 experiments. One of the most common systems is a vertical incidence sounding, referred to as an ionosonde. The ionosonde is basically a pulsed radar operating at a frequency range of about 1 MHz to 40 MHz. The measurement is based on the equation:

$$H = 0.5 \times C \times T$$

where C = the speed of light, T = is the travel time of the pulse, and H is the layer height (also known as the virtual height).[13]

An example of current ionospheric studies comes from the University of Massachusetts Lowell Center for Atmospheric Research. They developed a low power (300 W) ionosonde named Digisonde that has the capability of portable operation.

The system has the following capabilities: the simultaneous measurement (see Figure 3) of seven observable parameters of reflected, or in oblique incidence, refracted signals received from the ionosphere including frequency, range (or height for vertical incidence measurements), amplitude, phase, Doppler shift and spread, angle of arrival and wave polarization.

This is just one example of the on going research to understand the Earth's ionosphere. As amateurs who use the HF and VHF regions of the electromagnetic spectrum, we owe much to past and present experimenters. They provide us with an understanding of how our signals propagate around our planet. As either a DXer or ragchewer, we rely on this information to better communicate via radio.

I would like to thank Dr Nelson Klein, Professor of Physics at Bucks County Community College for his valuable discussions while I researched this article.

Notes

[1]J. Belrose, VE2CV, "A Radioscientist's Reaction to Marconi's First Transatlantic Wireless Experiment — Revisited," *Antennas and Propagation Society, 2001 IEEE International Symposium*, Vol 1, 2001, pp 22-25.

[2]S. Nichols, GØKYA, "GB3SSS — Marconi's Transatlantic Leap Revisited," *QST*, Dec 2007, pp 40-42.

[3]J. Belrose, VE2CA, "Technical Correspondence — Marconi's First Transatlantic Experiment," *QST*, Mar 2008, pp 53-54.

[4]C. Gillmor, "The Big Story: Tuve, Breit, and Ionospheric Sounding," *History of Geophysics,* Vol 5*, American Geophysics Union,* 1994, pp 133-134.

[5]P. Nahin, *Oliver Heaviside: Sage in Solitude*, IEEE Press, 1988, pp 277-281.

[6]O. Villard Jr, W6QYT (SK), "The Ionospheric Sounder and its Place in the History of Radio Science," *Radio Science*, Vol 11, No. 11, 1976, pp 847-860.

[7]See Note 2, p 136.

[8]R. Welsh, N3RW, "Commander Albert Hoyt Taylor: The Navy's Radio Pioneer," *Proceedings of the Radio Club of America*, Spr 1995, pp 28-34.

[9]R. Welsh, N3RW, "Propagation Pioneers: The ARRL-Bureau of Standards Experiment," *QST*, Oct 1995, pp 46-49.

[10]L Gebhard, "Evolution of Naval Radio-Electronics and Contributions of the Naval Research Laboratory," *NRL Report 8300*, 1979.

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[12]M. Tuve and G. Breit, "Note on a Radio Method of Estimating the Height of the Conducting Layer," *Terrestrial Magnetism*, 30, Mar 1925, pp 15-16.

[13]K. Davies, "Ionospheric Radio Propagation," *National Bureau of Standards*, Apr 1965, pp 101-107.

ARRL member and Amateur Extra class licensee Robert H. Welsh, N3RW, was first licensed as a Novice in 1959 and has held an Amateur Extra class license since 1977. He is active in contesting as a member of the Frankford Radio Club. Rob enjoys chasing DX, islands and Worked All Britain squares. He operates primarily CW, some phone, RTTY and now PSK31. This is his fourth article published in QST.

He worked in the defense electronics industry, has taught high school physics and is now an Instructor in Physics and Astronomy at Bucks County Community College in Newtown, Pennsylvania. Rob served on active duty in the US Army Security Agency as an Electronic Warfare Equipment Technician.

He holds undergraduate degrees in Radio Engineering and later Electronic Physics, obtained with the help of the GI Bill Rob completed graduate work in Science Education and later in Astronomy. He is a Fellow of the Radio Club of America.

You can reach Rob at 48 Rembrandt Ln, Holland, PA 18966 or at **n3rw@arrl.net**. QST

PRODUCT REVIEW

ICOM IC-80AD Dual Band Handheld Transceiver

Reviewed by Steve Ford, WB8IMY
QST *Editor*

One of the main stumbling blocks to widespread adoption of D-STAR technology is cost, especially in today's economy. At about $100 less than its sibling, the IC-92AD, the new IC-80AD transceiver marks ICOM's attempt to lower the economic threshold.[1] But is it enough to get more hams to open their wallets for D-STAR? Perhaps, especially when you consider that there is much more to the IC-80AD than D-STAR.

One Tough Radio

When you first pull the IC-80AD from its box, you realize that this radio was designed with rugged use in mind. There are no plastic chassis here; the case is aluminum with a finish that makes is easy to grip when wet. Speaking of wetness, the IC-80AD carries a Class 4 Japanese Industrial Standards (JIS) rating that means, among other things, that the radio is splashproof, but is not waterproof.

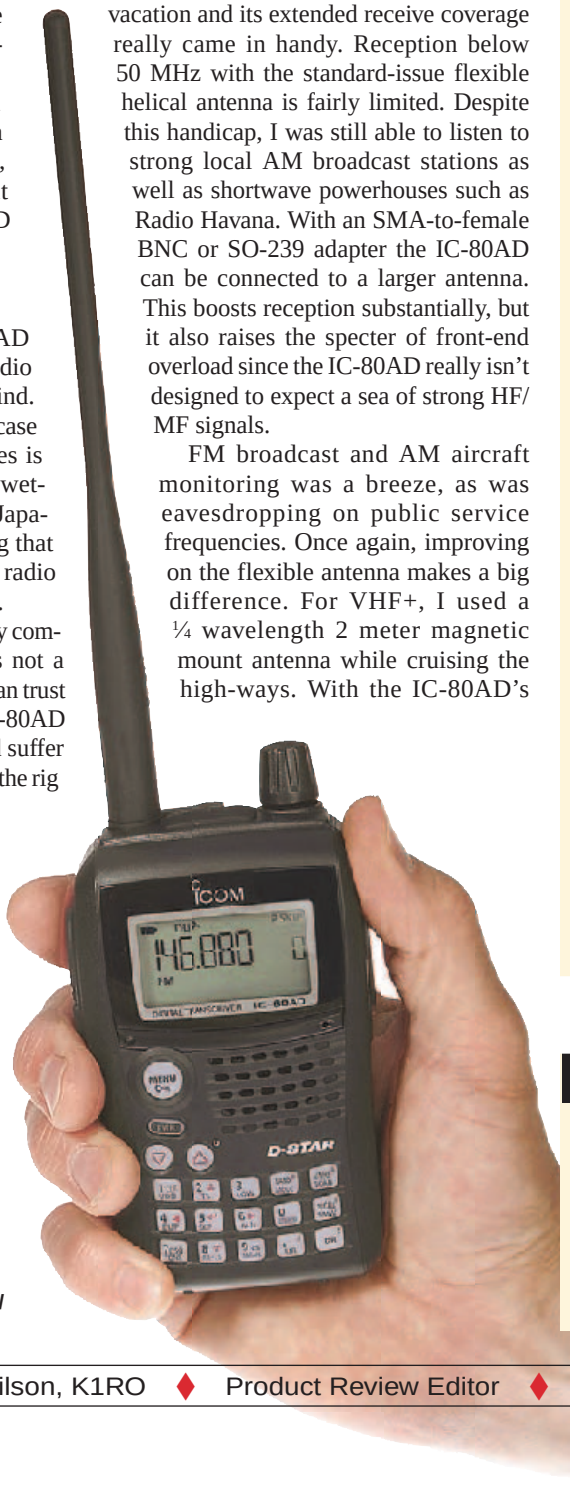
For amateurs involved in emergency communications, durable construction is not a trivial feature. They want radios they can trust to withstand brutal conditions. The IC-80AD has a sizeable LCD display that could suffer scratches, but otherwise I'm confident the rig could survive a fair amount of abuse.

Extended Receive Coverage

A major difference between the IC-80AD and the IC-92AD is that the '92AD includes a *dualwatch* feature so that you can listen to a main and sub receiver simultaneously. With the IC-80AD you can listen to one band at a time. Another difference is that the IC-80AD doesn't have the simple band scope display found in the '92AD.

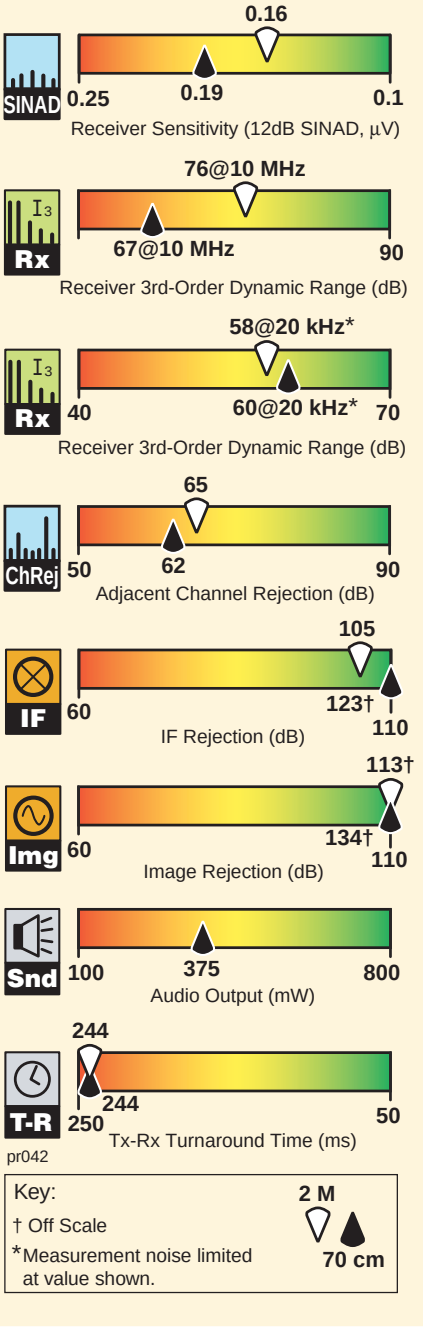
From a reception standpoint, the IC-80AD is a "dc-to-daylight" rig spanning 500 kHz to almost 1 GHz. I had the pleasure of taking the IC-80AD on a family vacation and its extended receive coverage really came in handy. Reception below 50 MHz with the standard-issue flexible helical antenna is fairly limited. Despite this handicap, I was still able to listen to strong local AM broadcast stations as well as shortwave powerhouses such as Radio Havana. With an SMA-to-female BNC or SO-239 adapter the IC-80AD can be connected to a larger antenna. This boosts reception substantially, but it also raises the specter of front-end overload since the IC-80AD really isn't designed to expect a sea of strong HF/MF signals.

FM broadcast and AM aircraft monitoring was a breeze, as was eavesdropping on public service frequencies. Once again, improving on the flexible antenna makes a big difference. For VHF+, I used a ¼ wavelength 2 meter magnetic mount antenna while cruising the high-ways. With the IC-80AD's



[1]G. Pearce, KN4AQ, "ICOM IC-92AD Dual Band Handheld Transceiver," Product Review, *QST*, Sep 2008, pp 39-43. *QST* Product Reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

Key Measurements Summary



Bottom Line

With the IC-80AD, ICOM offers a less expensive alternative for hams interested in getting involved with D-STAR digital operation. It's also a full-featured analog FM dual-band handheld and includes a wide coverage receiver.

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

flexible scanning functions there was no end of stations to fill the memory channels. Speaking of memory, the IC-80AD allows you to store your scanning discoveries in more than 1000 channels that you can configure in 26 separate groups. Alphanumeric tagging allows you to keep track of the memory channel contents when your own *wetware* memory fails you.

The IC-80AD has NOAA weather radio frequencies preprogrammed in dedicated memory slots. You just press the M/CALL button several times until you select the weather channel mode, then rotate the dial to select the desired station. There is a weather alert function that commands the IC-80AD to monitor the selected weather channel every 5 seconds, listening for a NOAA weather alert tone. When it detects the tone, you hear a persistent beep.

The only downside of monitoring with the IC-80AD is its very small speaker. It produces a tinny sound that is prone to distortion at higher volume levels. In most instances I used earbuds or a headset for improved fidelity. If you plan to use the IC-80AD in the car, adding an external speaker is a good idea.

Analog FM

The IC-80AD did a respectable job with analog FM on both 2 meters and 70 cm. Transmit audio reports were consistently good.

With selectable RF output levels at 5, 2.5, 0.5 or 0.1 W, you have the option of using full power in fringe areas, or extremely low power when you need to squeeze the last drop of life from the battery. I generally operated the IC-80AD at 2.5 W, which worked well in just about every application. On a few occasions I needed the 5 W boost, but I noticed that the radio became rather warm to the touch.

Naturally, the IC-80AD offers a huge array of features for analog operation including CTCSS (continuous tone coded squelch system) encoding and decoding and digitally coded squelch (DCS) functionality. CTCSS decoding was particularly convenient when I took the IC-80AD on the road. Many repeaters require CTCSS access and retransmit the low-frequency audio tones on their outputs. If the repeater doesn't announce the CTCSS frequency, or if you don't have an *ARRL Repeater Directory* or *TravelPlus* software at hand to look it up, the IC-80AD can decode the CTCSS tones as they are transmitted and display the results.

Digital Operating with D-STAR

I've dabbled in D-STAR before, but the IC-80AD provided my first opportunity to try it for an extended period. For the

Table 1

ICOM IC-80AD, serial number 0501001

Manufacturer's Specifications	Measured in ARRL Lab
Frequency coverage: Receive, 0.495-823.990, 849-868.990, 894-999.990 MHz; transmit, 144-148, 420-450 MHz.	Receive, FM, FM narrow, AM, DV, as specified. WFM, 0.495-809.990 MHz. Transmit, as specified.
Modes: FM, FM narrow, AM (receive only), WFM (receive only), DV.	As specified.
Power requirements: 10-16 V dc. Receive, 170 mA typical (215 mA DV), standby, 62 mA typical (106 mA DV), power save, 30 mA typical (38 mA DV); transmit, 2.1 A (max, high power).†	Receive (max vol, lights on, no signal): external 13.8 V dc, 400 mA; 8.1 V measured battery voltage, 200 mA; power save, 49 mA. Transmit, 13.8 V dc at 2 A max; high/med/low/s-low with battery: 146 MHz: 1.80/1.13/0.63/0.45 A; 440 MHz: 2.04/1.46/0.73/0.43 A.‡
Receiver	**Receiver Dynamic Testing**
FM sensitivity: 12 dB SINAD, 1.6-30 MHz, 0.4 µV; 30-118 MHz, 0.25 µV; 118-174 MHz, 0.14 µV; 174-350 MHz, 0.32 µV; 350-470 MHz, 0.16 µV; 470-600 MHz, 0.32 µV; 600-999.99 MHz, 0.56 µV.	For 12 dB SINAD, 29 MHz, 0.16 µV; 52 MHz, 0.18 µV; 146 MHz, 0.16 µV; 222 MHz, 0.21 µV; 440 MHz, 0.19 µV; 902 MHz, 0.25 µV.
WFM sensitivity: 0.495-108 MHz, 1 µV; 175-222 MHz, 1.8 µV; 470-770 MHz, 2.5 µV.	100 MHz, 1.2 µV.
AM sensitivity: 10 dB S/N, 0.495-5 MHz, 1.3 µV; 5-29.995 MHz, 0.56 µV; 118-137 MHz, 0.5 µV; 222-247 MHz, 0.79 µV; 247-329.995 MHz, 1 µV.	10 dB S+N/N, 1-kHz, 30% modulation: 1 MHz, 0.53 µV; 3.8 MHz, 0.42 µV; 14 MHz, 0.41 µV; 29 MHz, 0.42 µV; 50 MHz: 0.5 µV; 120 MHz, 0.41 µV; 146 MHz, 0.38 µV; 222 MHz, 0.48 µV; 440 MHz, 0.46 µV.
DV sensitivity: VHF (144-148 only), 0.22 µV; UHF (420-450 MHz only), 0.22 µV.	Not tested.*
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 29 MHz, 60 dB; 52 MHz, 64 dB; 146 MHz, 58 dB; 222 MHz, 59 dB; 440 MHz, 60 dB; 902 MHz, 65 dB.** 10 MHz offset: 146 MHz, 76 dB; 440 MHz, 67 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	146 MHz, 72 dB.
FM adjacent-channel rejection: Not specified.	20 kHz offset: 29 MHz, 60 dB; 52 MHz, 58 dB; 146 MHz, 65 dB; 222 MHz, 62 dB; 440 MHz, 62 dB; 902 MHz, 57 dB.
Spurious response: VHF, 60 dB; UHF, 50 dB.	IF rejection, 29 MHz, 71 dB; 52 MHz, 31 dB; 146 MHz, 105 dB; 222 MHz, 112 dB; 440 MHz, 123 dB; 902 MHz, 96 dB. Image rejection, 29 MHz, 93 dB; 52 MHz, 87 dB; 146 MHz, 113 dB; 222 MHz, 440 MHz, >134 dB; 902 MHz, 2 dB.
Squelch sensitivity: Not specified.	At threshold, VHF, 0.41 µV; UHF, 0.45 µV.
Audio output: >300 mW at 10% THD into 8 Ω.	375 mW at 10% THD into 8 Ω; 2.7% THD at 1 V_{RMS}.
Transmitter	**Transmitter Dynamic Testing**
Power output: VHF and UHF, 5.0 W high; 2.5 W med; 0.5 W low; 0.1 W s-low.	With battery pack or external 13.8 V dc: VHF, 5 / 2.6 / 0.5 / 0.1 W. UHF, 4.9/ 2.5 / 0.5 / 0.1 W.
Spurious signal and harmonic suppression: >60 dB (high, medium), –13 dBm (low, s-low).	VHF, >70 dB; UHF, >70 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal: VHF, 244 ms; UHF, 244 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 72 ms; UHF, 70 ms.

Size (height, width, depth): 4.1 × 2.3 × 1.3 inches; weight, 10.3 ounces.

Price: IC-80AD, $450; HM-189GPS speaker/mic, $200.

†BP-217 battery pack (7.4 V, 1500 mAh Li-ion) and BC-167 battery charger supplied. Available options: Replacement BP-217, $90; BC-139 desktop drop-in rapid charger (2.5 hours), $100; BP-216 battery case (2 AA cells; TX power limited), $35; CP-19R cigarette lighter cable with filter, $40; OPC-254L external dc power cable, $15.

‡Current consumption was typically 5 mA higher in receive and 50 mA higher on transmit in DV mode.

*No PN9/GMSK signal generator was available at the time.

**20 kHz offset measurements were noise limited at the values shown.

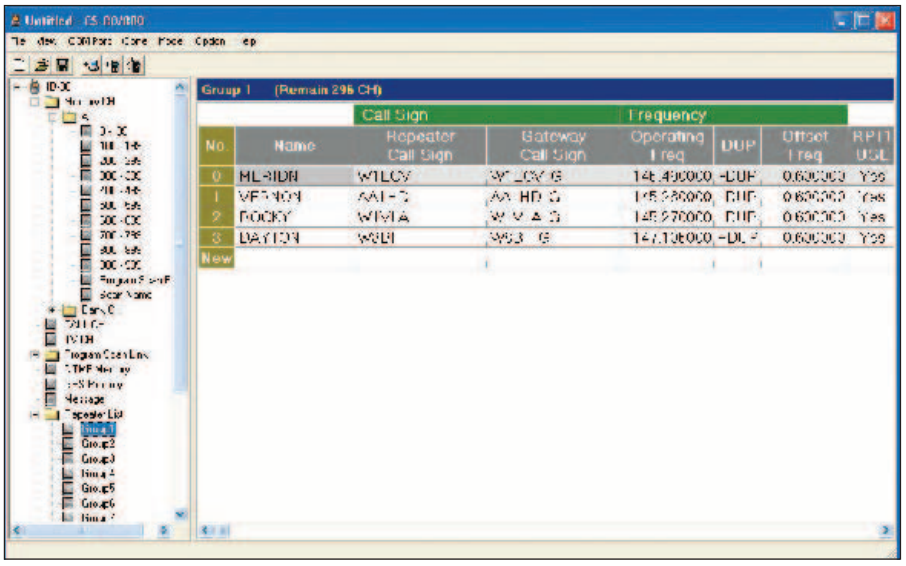


Figure 1 — The ICOM *CS-80/880* cloning software makes it easy to configure the IC-80AD for D-STAR operation.

uninitiated, D-STAR is a digital protocol developed by the Japan Amateur Radio League (JARL). Most hams think of it as a form of digital voice, but D-STAR is also capable of transporting any sort of data you desire. The IC-80AD supports the D-STAR "DV" mode, which transmits digital voice concurrent with a low speed (1200 bps) data stream. At 1200 bits per second you aren't going to swap large files or surf the Internet, but you can efficiently communicate other information such as short text messages and GPS position data. In fact, ICOM offers a microphone equipped with a GPS receiver (the model HM-189GPS), but I did not test it for this review. (We covered the similar HM-175GPS speaker/mic in the IC-92AD review. Since that review was published, ICOM has substantially reduced the price of these accessories.)

D-STAR operating is substantially different from analog FM, so much so that the learning curve is rather steep for most individuals. There are some similarities to packet radio in which call signs are used as digital addresses. To use a D-STAR repeater, for instance, you need to program its call sign into the radio beforehand. Then, your transmitted data (included your digitized voice) will be routed appropriately through the system, either locally or through gateways to distant repeaters.

You can talk to other D-STAR users "in the open" (similar to conventional analog FM operation in which everyone can hear all the stations), or you can use call sign routing to keep your radio quiet when you're not communicating with specific stations. Call sign routing keeps your radio squelched until someone directly addresses you by putting your call sign in the "your call" field of their radio. Then you hear them, and only them, until you turn off call sign squelch, but everyone else listening can still hear both sides of the conversation. You can even set the radio to respond only when specific stations are on the air.

Operating Aids

The free ICOM *CS-80/880* cloning software for *Windows* (Figure 1) is a blessing when you need to set up multiple D-STAR system call signs. That's not to say that you can't program the radio based on the instructions in the IC-80AD user manual, but it is slow going. By investing in a data cable and downloading the free software **(www.icom.co.jp/world/support/download/firm/)**, you'll find it much easier to enjoy D-STAR with the IC-80AD.

For this review I used a serial data cable, the OPC-1529R ($16), to connect the IC-80AD to my computer. If your computer lacks serial ports, you can try the OPC-478UC USB cable ($50), but the drivers included with the cable don't support *Windows Vista*. For *Vista* drivers you'll need to visit **www.icomamerica.com/en/support/kb/Article.aspx?ArticleNumber=812A2A454A** on the ICOM Web site. Note that the optional RS-92 PC remote control software for the IC-92AD does not work with the IC-80AD.

With the IC-80AD and companion ID-880 mobile, ICOM introduced a new DR mode to make programming easier. It adds the ability to designate up to 300 D-STAR repeaters as additional memories that can be addressed quickly. Unfortunately, DR mode is not compatible with add-on *DPLUS* software, commonly used to link D-STAR repeaters, nor with stations accessing the network with a DV Dongle connected to their computers.

Another good investment is the new *Nifty E-Z Guide to D-STAR Operation* by Bernie Lafreniere, N6FN. The *Guide* gives you practical instruction on how to use this innovative technology. It was a great help during my review. You'll find it for sale in the ARRL online store at **www.arrl.org**.

On the Air with D-STAR

So what was it like to operate D-STAR with the IC-80AD? In a word, fascinating. I programmed several D-STAR repeaters for my destination cities prior to leaving for vacation. On the road I used the open *CQCQCQ* mode to scare up conversations on several systems.

While in Dayton, Ohio, I listened to a D-STAR roundtable on the W8BI system. There was never any doubt about who was transmitting because I could see their call signs on the IC-80AD display. Some transmissions were also accompanied by short lines of text declaring names or locations.

The voice characteristics can be unusual at times, with some voices having what might be described as a compressed, "robotic" quality. This isn't a pronounced effect, but it is noticeable if you listen closely.

And unlike analog FM with which signals can still be understood in noisy conditions, D-STAR transmissions are all-or-nothing propositions. While listening to conversations when mobile, for example, voices would abruptly drop out for several seconds at a time, and then suddenly return. When I reached the edge of a repeater system's coverage, I fell off a digital cliff. One moment the repeater was there; the next moment it wasn't.

Balancing Cost and Benefit

Compared to ICOM's top-shelf IC-92AD, the IC-80AD is a less expensive way to get started in D-STAR and its analog features are certainly attractive. Current ICOM owners will appreciate that it shares accessories and connectors with other models such as the IC-W32A, IC-T90A and IC-91AD, making the switch less painful. With an average street price of $450, however, the IC-80AD still costs significantly more than a comparable dual-band analog-only handheld transceiver.

Are the benefits of D-STAR worth the higher price? That decision depends on how much you value having the ability to participate in the D-STAR network and whether you are willing to invest the time necessary to become familiar with D-STAR technology.

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

Ten-Tec 715 RF Speech Processor

Reviewed by Bob Allison, WB1GCM
ARRL Test Engineer

Most modern SSB transceivers incorporate speech processing to boost overall average power output. Tune around the bands and you'll likely hear speech processing in use to varying degrees, especially during contests or in DX pileups. Your voice will sound louder with the processor on, up to a point. It's tempting to increase microphone and processor gain with the hope of being heard better, but when you turn them up too much, audio quality suffers and you generate unwanted "splatter" that can interfere with nearby stations. The goal is to be heard and understood, but with a clean signal. The Ten-Tec 715 RF speech processor can help you achieve this goal.

Speech Processing Methods

Speech processing has been around since the early days of radio. It was first used in the audio chain of AM broadcast transmitters. Competition was great and owners wanted their station to be the loudest, but within the legal limits permitted. The method of processing used was, and still is, *speech compression*. Speech compression works by limiting the amount of gain on high energy audio peaks while letting the quieter sounds pass through. In a sense, the speech compressor is an automatic gain control (AGC) with audio limiting or clipping.

Most amateur transceivers use this method and have automatic level control (ALC) to help keep the signal from over driving stages. ALC is an important parameter to watch! When you exceed the normal ALC range window indicated on your transceiver's ALC meter, audio does not get any louder. Your signal widens and causes unnecessary interference to those working close to your frequency.

Enter RF speech processing. It's not new and was introduced to radio amateurs by Harold Collins, W6JES, in January 1969 *QST*.[2] Audio from the microphone is converted to a signal sideband signal, which is then filtered and converted back to an audio signal and fed to your transceiver. Specifically, Ten-Tec's 715 RF speech processor mixes the microphone audio with a local oscillator signal, with the resultant output of a double sideband, suppressed carrier signal at 455 kHz. Filters then remove the opposite sideband and this signal is then amplified and clipped. A harmonic *clean-up* filter removes harmonic distortion and intermodulation products. Finally, the 715 converts the amplified and clipped 455 kHz SSB signal back to an audio signal, which is fed to the microphone jack of your transceiver.

According to Ten-Tec, this RF speech processor will boost the average output power by 6 dB, a factor of four. This translates to a full S unit of signal strength compared to your signal without speech processing. While a normal audio speech compressor also allows for a higher average power output, it is more prone to harmonic and intermodulation distortion. Thus, the real advantage of using an RF speech processor is a cleaner signal while maintaining a higher overall power output.

Features

Upon unpacking the box, I was very pleased to find a 120 V ac wall transformer since my 13.8 V dc distribution system was already at its limit. Right away, I spotted what makes this device very flexible: it has two microphone jacks. An 8 pin round microphone jack wired for late model Ten-Tec or Yaesu transceivers serves as the primary microphone input. Wiring instructions are included in the manual for other brands, and Ten-Tec offers adapters for ICOM and Kenwood mics. Next to it is an auxiliary ⅛ inch microphone jack compatible with popular headset/microphones such as those from Heil Sound. Any microphone with an impedance of 50 kΩ or less can be used.

The audio output of the 715 is a three conductor ¼ inch female jack. You specify the brand of transceiver when ordering and Ten-Tec supplies the proper audio output cable. Available cables include 4 pin Ten-Tec, 8 pin Ten-Tec/Yaesu, 8 pin ICOM and 8 pin Kenwood/Elecraft. One output cable is included with the 715 and additional cables are available separately.

Front panel controls are straightforward: ON/OFF, PASSBAND and PROC GAIN (processor gain). A five segment LED display shows the clipping level in 3 dB segments. The rear panel sports a POWER INPUT jack, AUDIO OUTPUT jack and the PROCESSOR LEVEL control. This control rarely needs to be adjusted once the device is set up and running. Overall construction appears very sturdy.

Lab Testing

In the Lab I measured frequency response at –3 dB bandwidths at various clipping levels to compare with Ten-Tec's specifications. Also, –6 dB bandwidths were measured at various indicated clipping levels with a 1 mV peak-to-peak input level to check for variations of low and high frequency response. See Table 2 for details.

The 715's manual states: "Low frequency response varies with the amount of clipping added." This indeed is true and I found that the higher frequencies varied as well. These variations, however, do not come into play for SSB operation as they occur outside the typical audio passband of an SSB transmitter (usually 300 to 2700 Hz for effective communication). They might make a difference on AM, however.

Other tests included the maximum input level before significant distortion occurs,

Bottom Line

The Ten-Tec 715 speech processor effectively increases average transmitter output power while maintaining intelligibility and signal cleanliness. Consider it for transceivers with less effective or no built-in speech processing.

[2]H. Collins, W6JES, "Ordinary and Processed Speech in SSB Applications," *QST*, Jan 1969, pp 17-22.

Table 2
Ten-Tec 715 RF Speech Processor

Manufacturer's Specifications	Measured in ARRL Lab
Power requirements: 12-20 V dc. 120 V ac wall adapter provided.	0.28 A at 13.8 V dc; 6 W with ac adapter.
Microphone input impedance: 50 kΩ, maximum.	As specified.
Low frequency response, no clipping:	
–3 dB at 800 Hz with passband centered;	800 Hz, centered.
–3 dB at 450 Hz with passband full clockwise;	434 Hz, full clockwise.
–3 dB at 1300 Hz; with passband full counter.	1260 Hz, full counterclockwise.
High frequency response, no clipping:	4700 Hz, centered.
–3 dB at 4500 Hz.	4340 Hz, full clockwise. 5170 Hz, full counterclockwise.
Clipping: 15 dB maximum.	As specified.
Microphone input level: 1 mV or greater.	0.7-35 mV.
Output level: Not specified.	0-14 mV.

Size (height, width, depth): 5.6 × 6.0 × 5.5 inches; weight, 16.5 ounces.

Price: Model 715 RF speech processor, $249; Model 720 adapter for ICOM mics, $19.90; additional transceiver cables, $35 each.

Frequency response, –6 dB, 1 mV input level

Passband Knob Position	*Indicated Clipping Level**					
Centered	*0 dB*	*3 dB*	*6 dB*	*9 dB*	*12 dB*	*15 dB*
Low frequency (Hz)	580	560	367	120	192	53
High frequency (Hz)	6100	6000	5800	5690	5710	5730
Bandwidth (Hz)	5520	5540	5433	5570	5518	5677
Fully Clockwise	*0 dB*	*3 dB*	*6 dB*	*9 dB*	*12 dB*	*15 dB*
Low frequency (Hz)	284	211	185	92	100	76
High frequency (Hz)	5640	5340	5330	5150	5250	5260
Bandwidth (Hz)	5356	5129	5165	5038	5150	5184
Fully Counterclockwise	*0 dB*	*3 dB*	*6 dB*	*9 dB*	*12 dB*	*15 dB*
Low frequency (Hz)	1000	965	771	580	590	559
High frequency (Hz)	6590	6480	6240	5940	6170	6230
Bandwidth (Hz)	5590	5515	5469	5360	5580	5671

*Clipping level set at middle of passband.

output level and power consumption. In the Lab, using power attenuators and a Heil headset, my very critical ear did not detect any noticeable transmitted distortion until the PROC GAIN control was set too high, past the point where all clipping level LEDs were lit continuously. Visually, the average power output was noticeably higher, using a late model transceiver with its internal speech processor off and indeed, the S meter read nearly an S unit higher on our late model test receiver.

Setup

Hookup is easy. Plug in a compatible microphone to the 8 pin or ⅛ inch jack on the front panel. The audio output cable attaches at the rear of the device and plugs into your station transceiver. Connect power. It's best to use a dummy load for the following steps.

Turn your transceiver's speech processing off. Set your transceiver's microphone gain to mid scale. With the 715 turned on, adjust the PASSBAND control to 12 o'clock and adjust the PROC GAIN for a clipping level of about 9 dB. Next, while speaking and watching your transceivers ALC meter, adjust the rear panel mounted LEVEL control for normal ALC action, not exceeding the operating range. From this point on, you only need to adjust the PROC GAIN control. You can now proceed with either monitoring your off-air signal or asking a friend to help you set the PASSBAND control, which shifts the audio bandwidth higher or lower. Adjust this control to fit your voice characteristics.

On Air Testing

At station WB1GCM/KA1RWY, we happen to own a transceiver with a built in RF speech processor, our venerable Yaesu FT-990. How would the 715 stack up against it? Well interestingly enough, I started out with a mode in which the Yaesu's speech processor is disabled: AM. With my wife Kathy, standing by at the mic, I hopped into my rowboat at Coventry Lake (half a mile away) and after a short row, met her on 29.0 MHz with my handheld AM transceiver (a converted CB set).

The difference between the 715 off and on was quite dramatic — the increased volume startled a nearby fisherman. I would say the sound of Kathy's voice was reminiscent of a high quality amplified microphone, except without any distortion. Moving the PASSBAND control around to the 1 o'clock position seemed to sound the best with her voice. Clearly, this control is effective for different voice ranges.

After a few mosquito bites, I was back in the shack and met up with Craig, KA1GYB, a talented musician with a very critical ear, to try out the 715 on SSB. I picked 80 meters since there was a considerable amount of static that night with only fair signal strengths. The Ten-Tec 715 was very successful with improving readability compared to no RF speech processing. Comparison between the Ten-Tec 715 and the Yaesu RF speech processor was a toss up, with the Yaesu providing slightly more sound on the lower frequencies. Several other QSOs were made at 100 W output, with returns after the first call. All audio reports were favorable with the 715 and I was grateful for the many enthusiastic hams who helped out by listening and commenting on my signal.

Other Notes

If you are configuring this device for the first time, adjust all other frequency settings on your mic and transceiver to mid range, or "flat." This is a good starting point. You can experiment later with these settings. By all means, make certain your transceiver's speech processor is off! Running two processors in line will not help your audio and will more than likely hinder it.

This device clearly has many uses, especially with older equipment with ineffective or no speech processing. Public address systems would also benefit from the higher average audio output. It's a natural for early AM rigs too.

There was one small issue that could be improved upon. Placing the 715 in line at my station disabled the UP/DOWN scan buttons on my microphone. The 8 pin microphone jack and three conductor output jack pass only audio and PTT signals. Pins 1, 3 and 4 have no connections, so a modification could be made by either adding an extra jack on the rear panel or replacing the current jack with an 8 pin type and adding the additional wires. Ten-Tec considered this but decided it was not practical due to the number of different mic wiring plans. Still, you could do it for your mic if it were important.

Conclusion

The Ten-Tec 715 is a very practical RF speech processor that will be an improvement to many modern transceivers that have a traditional audio speech processor and certainly a big improvement for those with no processor at all. It is important to know what method of speech processing your radio uses while considering the purchase of this device. No matter what speech processor you use in your shack, please remember not to exceed your ALC "window."

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

W1ZR

THE DOCTOR IS IN

Q Martin, WN2SJL, asks: What does the term "armchair" refer to when someone mentions that word in the context of received signal quality?

A It means your signal quality is so good that the receiving station operator can casually sit back in an armchair — as opposed to having to pay close attention — to understand the signal. It is not unusual for operators listening to weak signals to be hunched over their radio, busily adjusting knobs in an effort to pull out the signal.

Q Jim, KN6TC, asks: My repeater's PC controller to radio interface provider requires a "COS signal from the radio." The manufacturer states that this "greatly reduces drop out and falsing" that are sometimes experienced while using VOX receive/transmit control. It seems to be an alternate for VOX, but I have failed to receive an answer as to what it is in terms I can understand. Neither radio nor interface providers have responded to my e-mail questions.

A Early repeaters were generally switched to transmit by a carrier operated relay (COR). The relay would be actuated if the repeater receiver detected a carrier on frequency, as indicated by the opening of the squelch. This was a much more reliable switching mechanism than if the repeater transmit switching responded to detected speech (VOX), since VOX could toggle back and forth due to gaps in speech.

In the early days of repeaters the equipment was constructed around vacuum tube and relay technology. Current technology is based on solid state devices including transistor switching that is more reliable than the earlier electromechanical relays. Thus the more general term COS for carrier operated signal, carrier operated squelch or carrier operated switch is often used instead of COR. For more information, check out **www.repeater-builder.com/tech-info/repeaterterm.html**.

Q Walt, KB5HOV, asks: What is the maximum power handling capability of RG-174 miniature coaxial cable in the HF range of 3-30 MHz?

A It is always a good idea to check with the manufacturer of your particular cable since the generic RG designations often refer to a number of different specific cable types. Times Microwave provides an online calculator that is quite useful for their products at **www.timesmicrowave.com/cgi-bin/calculate.pl**. It provides a power rating ranging from 610 W at 3 MHz to 190 W at 30 MHz. Note that this rating assumes a matched termination. If the SWR is higher than 1:1, more power will be dissipated in the coax so the rating must be reduced.

Q John, AD6KT, asks: While looking for used equipment, I often see equipment listed as "repeater voting receiver." What is meant by a *voting receiver*?

A In the simplest repeater configuration, a single repeater location houses both the transmitter and receiver. In some cases, reception from mobile stations at the repeater coverage fringes is not up to the desired signal to noise ratio standards making copy difficult for other users. Figure 1 illustrates the point. The two mobile operators are partially blocked by terrain between them and the repeater site.

One way to improve the performance of such a repeater is to have multiple receivers at different locations, especially those that cause problems. Each receiver, RX 1 and RX 2 in Figure 1, is connected back to the main repeater site, either by leased telephone lines, or by a radio link on a different frequency. The repeater site decides which receiver (including its own) is receiving the highest quality signal, usually by the AGC level that is sent along with the audio. The one with the highest "vote" is used to feed the repeater transmitter. Thus the receiver isn't really doing the voting, it is just submitting its ballot.

A receiver designed to be a voting receiver is likely designed to operate on a single fixed frequency and to operate 24/7 via remote control. In addition to audio output, it would also provide an indication of signal strength for use by the vote processor. Such a receiver would likely make a fine monitor receiver for a single channel, although it may have an output appropriate for a phone line (typically 0 dBm at 600 Ω) rather than for a speaker, and thus may need an audio amplifier to drive a loudspeaker.

Q Robert, KB5QN, asks: In amateur single sideband (SSB) voice operation, why is the upper sideband (USB) used on 20 meters and higher frequency bands while lower sideband (LSB) is used on the lower bands (except the 60 meter channels)?

A This goes back to the early days of SSB. At that time, the early 1950s, there was no 40 meter phone band (it was opened to voice on February 20, 1953), so the majority of SSB activity was on 75 and 20 meters. One common design configuration used an SSB generator that produced an upper sideband SSB signal at 9 MHz using a filter or phasing SSB generator. The 9 MHz signal was then heterodyned with a VFO covering 5 to 5.5 MHz, often made from a (then) $5 WWII surplus ARC-5 transmitter.

The additive (9 + 5 = 14, 9 + 5.5 = 14.5) translation to 20 meters maintained the upper sideband. The subtractive translation (9 – 5 = 4, 9 – 5.5 = 3.5) reversed the frequency relations (and the VFO tuning direction) to result in LSB. By just using those sidebands, they did not need to buy a second carrier oscillator crystal and worry about sideband filter symmetry, or put switching into their phasing rigs. It could have just as

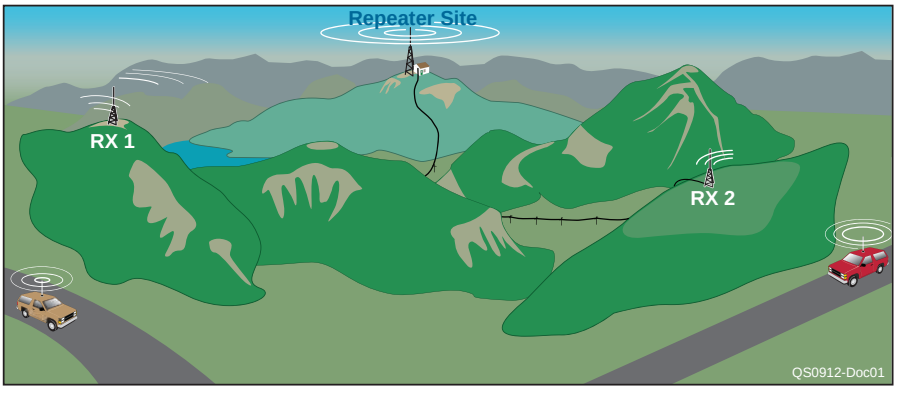


Figure 1 — Illustration of the benefit of multiple "voting" receivers in a repeater system. While they don't help with the signal from the repeater to the vehicle, often that transmitter is higher powered and will get through.

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

easily gone the other way, I guess.

It just went on from there. 40 meters went LSB and the upper bands went USB. The US military appears to have settled on USB on all HF frequencies, so the "green radio" guys with SSB-capable military surplus gear use USB, especially on 40 meters. Compatibility with the government protocol explains why we are required to use USB on the five 60 meter channels that we share with government users. Other than that requirement, there is no regulation specifying which sideband be used on any band.

Q Ed, W9EGS, has a problem with noise received on his HF transceiver that seems to be coming from his TV set, since turning off the TV eliminates the noise. It shows up on the receiver dial about every 15 kHz. It is not on every band but is especially bothersome on 40 meters.

A It sounds like you are hearing harmonics of the TV's horizontal sweep oscillator. The horizontal sweep uses a 15.75 kHz sawtooth waveform to move a traditional analog TV scan across the display. This system has a high harmonic content because of its waveshape. If the TV is of the traditional CRT type, the same sawtooth signal is used to generate the high voltage for the CRT anode, so the signal is at a high amplitude in the TV.

The first step is to find out how the harmonics are getting to your HF set. To validate your suspicion that it is coupling from your TV antenna to your ham antenna, temporarily disconnect the TV antenna at the set and see if it eliminates the interference. If so, a high pass filter on the antenna cable, perhaps supplemented by a common mode choke as close to the set as possible, should eliminate the problem.[1,2]

If disconnecting the antenna doesn't eliminate the problem, I would look to other connections. First the power connection. If you're very lucky, moving the TV power plug to a different outlet may reduce the interference. Otherwise a common mode choke on the power cable should reduce the coupling considerably.

Q John, N5JLZ, is planning to install an automatic packet reporting system (APRS) in his truck and asks: I know that I need a global positioning system (GPS) unit to provide position information. I would also like to install a navigational GPS in the same vehicle. Prices are now about the same. I can't find any information from the manufacturers of the navigational units about whether or not they can export the position data that I need to feed into the APRS terminal node controller (TNC). I really don't want to buy two units if I can use the same one for both applications. Any suggestions?

A You will need a GPS that outputs position information in a data format called NMEA-0183. This is fairly common, but might not be available in all units, especially some small handheld receivers. I recently purchased a GPS chartplotter for my boat that supports such communication. Many GPS manufacturers offer user/installation manuals on their Web sites and those should indicate what data is available.

My GPS manual listed the available data formats, described how to set them using the menus and how the connections needed to be run. In the case of my unit the data was available on a pair of pins that were part of a large supplied multipin connector. You will need to fabricate a cable to go between the GPS and your TNC, but the needed connection information should be available in the manuals for each.

Q Bob, KE7WPK, asks: How can I estimate signal to noise ratio (SNR) using the S-meter on my receiver? What is the relationship between S-meter reading and dBm or signal voltage?

A Sadly, many receiver S-meter indications are just useful as a relative indicator unless you are able to calibrate them against an accurate source. There is actually an S-meter standard that was proposed by Collins Radio decades ago and is now accepted as an industry standard. It is defined as follows: S9 is 50 µV into 50 Ω at the antenna terminals, or equivalently –73 dBm.[3] Each S unit represents a change of 6 dB, or a voltage change of a factor of two. Table 1 shows the results for such an ideal S-meter.

If you have a calibrated S-meter, it is easy to determine the signal plus noise (you can never measure just the signal) to noise ratio, just subtract the power associated with the S-meter reading of the noise floor in dBm (from Table 1) from the power of the signal plus noise in dBm and you have the (S+N)/N in dB (not dBm). The (S+N)/N is close to S/N for high values. If you want to convert to signal to noise ratio, you need to subtract the noise power from S+N, but not in dBm. You can use the power (mW) column in Table 1.

Note that with the definition based on antenna terminal voltage, a truly calibrated S-meter would stay the same if you put the preamp or the attenuator in line, or reduced the RF GAIN control. I'm not aware of any transceiver based on analog technology that does this, so the best you can hope for is that it be calibrated for one set of control settings. Some software defined radios (SDRs) are able to compensate for such changes. The Elecraft K3, as an example, has a menu selection that lets you decide whether you will have constant calibrated readings or ones that indicate changes in receiver settings.

If your receiver doesn't include a calibrated S-meter, and you can borrow an accurate signal generator with a calibrated attenuator, or use a mediocre generator and a good microwatt meter, you can make up a calibration chart for your S-meter so you know what it means. It will likely be different on each band, and it will only hold for one combination of RF gain, preamp and attenuator settings. It is still useful, however, if you make note of all those settings. Once you have the calibration in hand, you will find it a useful laboratory instrument for measuring other signal levels as you work on projects in your workshop.

Another possibility is to use an external S-meter calibrator to set up your meter. One was described in a *QST* Product Review some time back.[4] That review (available on the ARRL members Web site, **www.arrl.org/members-only/prodrev**) also includes some examples of ARRL Lab data taken to see how some commercial gear compared to the standard.

Table 1
Relationship Between Industry Standard S-Meter Reading and Signal Strength

S-Meter Reading	Signal Voltage (µV)	Signal Power (mW)	Signal Power (dBm)
S-9 +60 dB	50,000	5.0×10^{-2}	–13
S-9 +50 dB	15,811	5.0×10^{-3}	–23
S-9 +40 dB	5000	5.0×10^{-4}	–33
S-9 +30 dB	1581	5.0×10^{-5}	–43
S-9 +20 dB	500	5.0×10^{-6}	–53
S-9 +10 dB	158	5.0×10^{-7}	–63
S-9	50	5.0×10^{-8}	–73
S-8	25	1.3×10^{-8}	–79
S-7	12.5	3.1×10^{-9}	–85
S-6	6.25	7.8×10^{-10}	–91
S-5	3.13	2.0×10^{-10}	–97
S-4	1.56	4.9×10^{-11}	–103
S-3	0.78	1.2×10^{-11}	–109
S-2	0.39	3.1×10^{-12}	–115
S-1	0.20	7.6×10^{-13}	–121
S-0	0.10	1.9×10^{-13}	–127

[1]A high pass filter on a TV is traditionally used to keep harmonics from an amateur HF transmitter from interfering with the VHF TV receiver without attenuating the TV signal. In this application, it will keep HF harmonics of the horizontal sweep system from going up the TV antenna cable.

[2]For a description of common mode chokes, see R. Kriss, AA5VU, "An RFI Story with a Happy Ending," *QST*, Jul 2009, p 40.

[3]Decibels with respect to a reference of 1 milliwatt.

[4]M. Tracy, KC1SX, "Product Review — Elecraft XG1 Receiver Test Oscillator," *QST*, Apr 2005, pp 78-79.

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/.

SHORT TAKES

microHAM USB Interface III

Thanks to the increasing popularity of digital operating with sound-card software, *sound card interfaces* have become standard equipment in many Amateur Radio stations. The first interfaces were straightforward devices; they simply allowed the computer to toggle the transceiver between transmit and receive. A few "deluxe" models also offered isolation for the audio lines between the computer sound card and the radio.

But like all technology, sound card interfaces have evolved over time. Lately the trend has been to remove the sound-processing function from the computer entirely, placing it within the interface itself. Modern interfaces are also embracing USB technology in the face of rapidly disappearing computer serial ports.

The microHAM USB Interface III takes these trends to their logical conclusions. The Interface III is, among other things, a sound device unto itself. That is, when you plug it into your computer's USB port, the Interface III is recognized as a sound device on the same footing as your existing sound card or sound chipset. The Interface III also performs the required transmit/receive switching, isolates both the transmit and receive audio lines, and acts as an interface for transceivers that allow direct computer control — all this in a 6×1×4 inch package.

Simple Setup

When you order the Interface III, the purchase price includes a cable that's custom designed for your radio. The custom cable goes a long way toward making the installation process absurdly simple. Before you connect the cable, however, you'll need to open the Interface III case and position a couple of small jumper blocks according to the type of data communication required by your transceiver. This is an easy operation that takes all of 60 seconds.

The next step is to install the *Device Router* software that runs the Interface III. Unlike less sophisticated interfaces, the Interface III has its own circuitry that "talks" to your computer. With *Device Router* managing the Interface III, you can easily manipulate the settings and reconfigure the unit as your needs change.

You can see an example of *Device Router* in Figure 1. This application really shines in situations where you have several pieces of software that need to communicate with the Interface III in differing ways. You can create groups of settings known as "presets" that are unique for each application. For instance, I created one preset for use with *WriteLog* and *MixW*, and another for *WSJT*. When I switch from operating a RTTY contest with *WriteLog* to hunting digital meteor scatter contacts with *WSJT*, all I have to do is click my mouse cursor on the appropriate preset button.

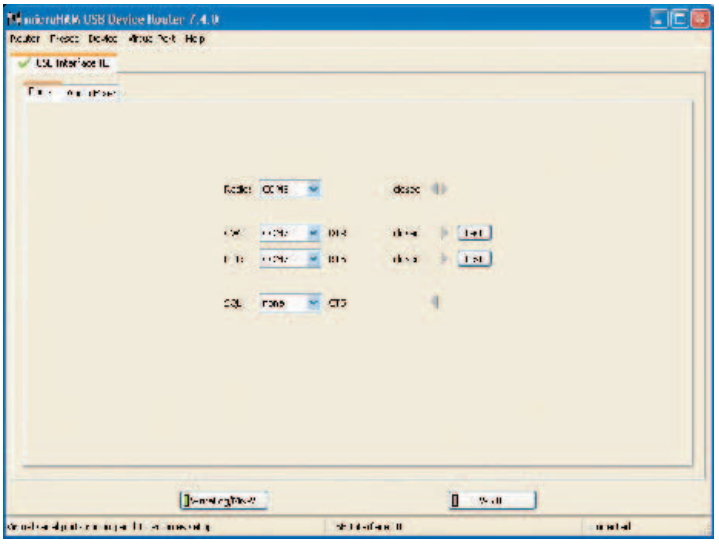


Figure 1 — microHAM's *Device Router* software allows you to reconfigure the Interface III as your needs change.

Device Router must be up and running if you intend to use the Interface III to make contacts. I kept *Device Router* running constantly in the background, minimized to a discrete icon in the *Windows* taskbar. I also added *Device Router* to my *Windows* Startup so that it started automatically every time I booted my computer.

Interface III on the Air

Once *Device Router* was up and running, my Interface III worked flawlessly. With my antennas being close to the house, my station is awash in RF energy. Even so, the Interface III never hiccupped. From a convenience standpoint, I enjoyed having the transmit and receive audio adjustments on the Interface III's front panel, even though you can also adjust audio levels from within *Device Router*. The panel knobs are rather "stiff," but this is deliberate; you don't want these controls to move with the slightest jolt.

Looking at my *MixW* waterfall display, I noticed right away that the Interface III audio was extremely clean — no ground loop hum, distorted signals or other oddities. The outstanding performance of the Interface III was most evident when working digital meteor scatter with *WSJT*. This mode depends on the ability of the software to decode extremely weak signals, so the audio must be free of extraneous noise and relatively flat in terms of frequency response. Nothing else at my station has changed, yet I've been able to consistently decode more signals since installing the Interface III.

The Interface III's flexible design allows it to perform many tasks despite its diminutive size. In addition to working with every sound-card digital mode imaginable, the Interface III offers CW, true FSK RTTY (with EXTFSK for *MMTTY* or "software generated FSK" in *WriteLog*) and reliable rig control for use with logging programs, contest software and other applications. That's a lot of power in one little box!

Manufacturer: microHAM, s.r.o., Nadrazna 36, 90028 Ivanka pri Dunaji, Slovakia, **www.microham.com**. *Distributor (North and South America): microHAM America, LLC, PO Box 1257, Geneva, FL 32732;* **www.microHAM-USA.com**. *$229.* QST

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

NØAX

HANDS-ON RADIO

Experiment #83 — Circuit Simulation, *Part 1*

This month, we're going to begin a multipart article to get you started with circuit simulation. The 2010 edition of *The ARRL Handbook* has a brand new chapter on computer aided design (CAD) by Dave Newkirk, W9VES. Many readers will want to try out some of the suggestions and techniques in that chapter, so this seems like a good time to get started with a professional quality circuit simulator. This column will lead you through the process of downloading and installing your very own simulation software, Linear Technology's *LTspiceIV*, which comes at a ham-friendly price — free![1]

Simulation tools are ubiquitous in the engineering world these days. In fact, it's quite unusual for a product design to be created purely on paper or amid swirls of rosin smoke on the workbench. Circuit designers stay at the computer until they are confident in their creation before picking up a soldering iron. Hobbyists also use simulation tools, but before we start, some general cautions are in order.

"Here be Dragons!"

That legend prominently indicated *terra incognita* on early maps. As with exploring a new world, simulation is often full of dragons for the beginning circuit designer for whom everything is unfamiliar. Nevertheless, this is no reason to avoid taking the simulation plunge! Amateurs use antenna modeling programs — electromagnetic simulators — to great effect. They have learned to recognize the trickery of a "trouble dragon," unrealistic gain; excessive bandwidth; extreme sensitivity to small changes in frequency, orientation, or size, bizarre impedances and so forth. *Caveat simulator!* By knowing and respecting the limits of the tool, excellent and useful results can be obtained.

Trouble dragons live at the numerical limits of the models and mathematics on which the simulation is based. Circuit simulators create equations for voltage and current at each point in the circuit. All of the equations are then solved simultaneously for one instant in time, called a *time step*. This data is stored and used as input to solving them all again one time step later. By repeatedly solving, storing and solving again, a numerical picture of the circuit's behavior is built up.

Computers have their limits. The equation variables have limited precision so that every value is rounded by a tiny amount. Time steps, while very short, are still finite, leading to problems if their duration becomes significant with respect to the frequency at which the simulation is performed. The circuit models used to describe the components themselves approximate how a real world component actually behaves. These small cracks are how the trouble dragons get in.

If your design involves very high or very low power, very low noise or very high frequency signals, then you should be using a simulator designed specifically for that type of application. For example, the *Handbook's* CAD chapter uses examples generated by the free SV2 student-version of *Ansoft Designer*.[2] That software package is designed for use at RF and has a number of special tools for use in RF systems.

The Simulation Cycle

There is no smell of burning resistor or overheated transistor in a simulation. The placement of components on the screen has no effect on the behavior of the circuit, so a high-gain stage whose input is too close to its output will never break into oscillation. The dc power sources are free of ripple and noise. These effects and many more can only be experienced (and remedies learned) by building real circuits.

Figure 1 shows the process by which you really, really learn circuit design — from concept to finished project. The first step is to select a type of circuit and describe what it is supposed to do — the *performance requirements*. For example, an amplifier will need to achieve some level of gain over some frequency range. You may need a certain input impedance and output impedance. Armed with that information, choose a circuit and come up with a preliminary set of component values by using pencil and paper or a computer design tool. This is your *design*.

Next, *simulate* the circuit's performance. If the result satisfies your performance requirements, you can move to the next step. If not, change the circuit in some way (or change your requirements) until you are satisfied.

Now *build* your design as a real world collection of components and verify that the circuit works. This is where the real fun begins as the effects of construction and actual component variation take effect. Are you done? Not yet!

To soak up every bit of design experience and know-how, go back and *compare* your actual measured performance to what the simulator predicted, particularly near the limits of the circuit's function. Look for design sensitivities by substituting different parts or values. If the circuit's behavior diverges from the simulator's predictions, now is the time to take a closer look. You may not be able to say exactly why differences are present, but you'll be aware they exist and that will map a bit more of the unknown coastline.

[1]Linear Technology, **www.linear.com**. *LTspiceIV* is the simulator portion of the switchmode power supply design package, *SwitcherCAD III*. It has been made available for use subject to the restrictions described in the *LTspice User's Guide*.

[2]Ansoft, **www.ansoft.com**. *Ansoft Designer SV2* is a student version of the full-featured *Ansoft Designer* simulator package for signal analysis and communications applications.

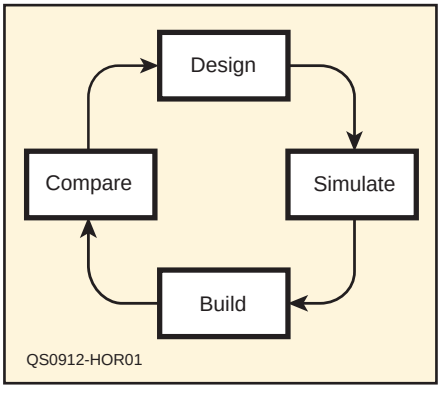


Figure 1 — Getting the most out of circuit simulation requires that you compare what the simulator predicts with how the actual circuit behaves.

H. Ward Silver, NØAX ♦ 7427 California Ave SW, Seattle, WA 98136 ♦ n0ax@arrl.org

Setting Up Your Simulator

Okay, enough philosophy! Start by browsing to Linear Technology's Web site, **www.linear.com/software**. Download the following three items: *LTspiceIV*, the *LTspice User's Guide*, and *LTspice Getting Started*. Register with Linear Technology in order to receive notices of new versions of the software and other related information.

To run *LTspiceIV* effectively, your PC will need to have at least 128 kB of RAM and at least 200 MB of free hard drive space available as simulations can generate a large amount of data. If the program runs out of space, you'll get an OUT OF MEMORY message. See the FAQ section of the *User's Guide* for information on system requirements. (*Linux* users can run *LTspiceIV* in the emulator software *WINE*.) The file containing *LTspiceIV* is a self-extracting .exe file. Double click on the file to begin the installation process. The process takes only a few moments and installs a shortcut to *LTspiceIV* on your desktop.

You immediately clicked on the shortcut and launched the program, didn't you? Admit it! Okay, so did I! What you need to do now is to open the PDF document *LTspice GettingStarted*. For general-purpose use, review pages 14 to 26 that show the simulator's basic operating tools.

Entering a Circuit

This month, we will just enter a very basic circuit to get used to the controls. Start a new schematic as shown on page 14. (The section "Schematic Capture" in the *LTspice Userguide* will provide additional information.) You should see the *LTspice* toolbar and status bar at the top of the screen, and window tabs at the top left. Under the VIEW menu, left click to turn on a field of guiding dots. (From here on, "click" means "left-click" unless stated otherwise.)

Now you'll create the two resistor voltage divider shown in Figure 2. Click the RESISTOR button in the toolbar and move the cursor into the schematic area. You'll see a black resistor symbol with two blank boxes next to it. Click once to create R1, then move the cursor and click again to create R2. (Creating R2 below R1 will make wiring the circuit a little easier.) Press the ESC (escape) key to turn off the resistor tool.

Move the cursor over R1 and the hand symbol appears. Right-click to open the PROPERTIES window for R1, enter 1000 in the RESISTANCE (Ω) window and click OK. R1 is now shown on the screen as having a value of 1000 (Ω assumed). Assign R2 a value of 2200 Ω in the same way.

Click the WIRE button in the toolbar and a set of crosshairs will appear. Move the center point of the crosshairs over one of the R1 terminals and click. Move the crosshairs to one of the R2 terminals and click again, then press the ESC key. A blue "wire" now connects R1 and R2.

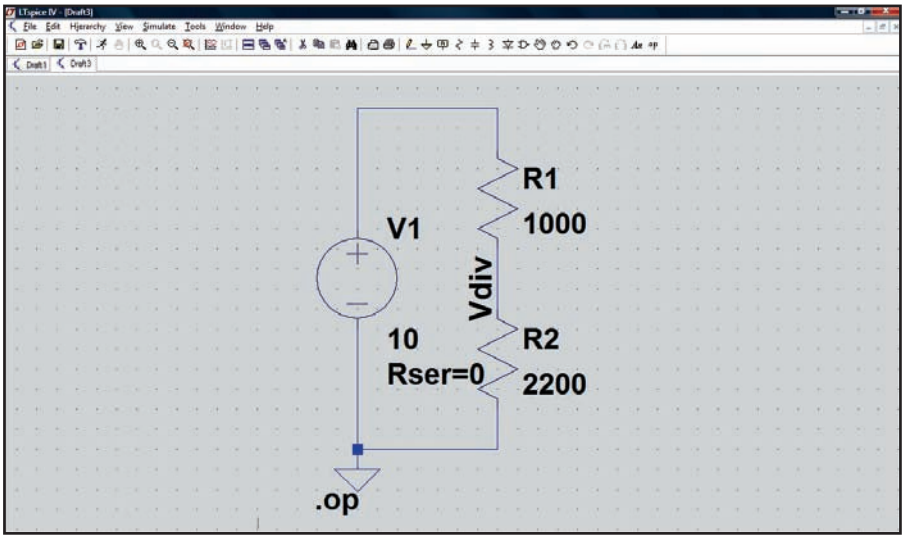


Figure 2 — A simple two resistor voltage divider. Each component is labeled with a designator and value. The ground symbol establishes a reference voltage point for the simulation. The simulator command to compute the circuit's dc operating point is .op.

Table 1
DC Operating Point

V(n001):	10	Voltage
V(Vdiv):	6.875	Voltage
I(R2):	0.003125	Device_Current
I(R1):	0.003125	Device_Current
I(V1):	–0.003125	Device_Current

Click the 'Component' button in the toolbar, scroll right to find the word VOLTAGE and click once to highlight it. The voltage source symbol will appear above the list of components. Click OK, then place the voltage source on the schematic by clicking once at the desired location and press the ESC key. Open the voltage source's PROPERTIES window and assign a value of 10 V for voltage and 0 for series resistance. Use the WIRE tool to connect the positive terminal of the source to the remaining terminal of R1 and the negative source terminal to the remaining terminal of R2.

Circuit simulators require that you identify a specific point to use as a reference voltage. This is what the GROUND symbol means — not that the circuit is necessarily at Earth potential. Click the GROUND button in the toolbar, place a ground symbol near the negative source terminal and connect it to the terminal or to the wire connected to the terminal, which forms a connection dot. You should now have a circuit that looks something like Figure 2.

Running a Simulation

Each of the connections between components is called a *node*. The simulator calculates current through every circuit branch and voltage at every circuit node, assigning each node a label. To make it easier to read, the computer's output labels the nodes. In the divider circuit, label the connection between R1 and R2 as *Vdiv* by clicking on the LABEL NET toolbar button, entering Vdiv into the text window, click OK, placing the attachment point (the small box) on the "wire" between R1 and R2, then click once, followed by pressing the ESC key.

Under the SIMULATION menu, click RUN. In the EDIT SIMULATION window, select the DC .op PNT tab. Click OK and two things happen: the label .op appears on the schematic and a window appears with the results of the simulation in Table 1.

Here's what Table 1 is telling you, line by line: V(n001) is the source's 10 V output voltage. V(Vdiv): 6.875 is the voltage at the Vdiv label you placed and is equal to 10 × 2200 / (1000 + 2200) = 6.875 V. I(R2) is the 3.125 mA current through R2, which in a simple series circuit like this is also equal in magnitude to the current through the source, I(V1), and R1, I(R1). The current in the source is negative because it flows *out* of the positive terminal. This is the circuit's dc operating point — you've just run your first simulation! Under the FILE menu, click SAVE AS and save the schematic. You can now experiment to your heart's content!

Further Reading

This would be a good time to join the *LTspice* User's Group at **groups.yahoo.com/group/LTspice** where you'll find tutorials and other useful information. The CAD chapter of *The 2010 ARRL Handbook* will also start making sense. QST

AG1YK

HINTS & KINKS

WEATHERPROOFING YOUR AUTOMATIC ANTENNA TUNER

◊As an avid Amateur Radio operator, I sometimes use an automatic antenna tuner to operate more than one band with the same antenna. My mobile unit uses an LDG RT-11 autotuner to feed a pair of "Hamstick" style antennas on several different bands. One antenna covers the lower bands and another antenna covers the higher ones. An excursion into operating "fixed portable" with a telescopic vertical had me looking for another solution.

In order to minimize the coax losses when feeding a vertical monopole away from its resonant band it is necessary to reduce the distance between the tuner and the antenna to a minimum. The use of ladder line is not feasible when the antenna is fed almost at ground level. In order to do this, it is necessary to place the tuner almost directly at the base of the antenna and thus reduce the coax run from the tuner to the antenna to nearly nothing. The coax from the tuner to the transmitter can then be any appropriate length since the mismatch has already been corrected.

Owning an LDG Z-100 automatic tuner already, I looked for a way to mount it at the base of the antenna and yet protect it from the elements. A phone call to LDG gave me the necessary specifications for a 50 foot extension of the control cable so the only thing left was to find a workable enclosure for the tuner itself. I discussed the requirements for such an enclosure with my spouse, Audrey. Without a word, she rummaged through a kitchen cabinet and produced a semi flexible plastic container that had a snap-on lid and fit my Z-100 and its cables to a T.

I drilled four small holes in one end of the container into which I fitted two short coax jumpers, one for the antenna and one for the radio. I also made up and installed a short 4-conductor cable to connect the stock control harness to the 50 foot extension. The fourth opening was used for a similarly short insulated wire to connect the grounding stud on the Z-100 to the radial system of the antenna. Once these four cables were in place, I sealed the drilled openings with hot glue. Silicone caulk could be used just as easily, provided it will stick to the container. I did not try that because the hot glue was at hand so you are on your own there (see Figure 1).

With the jumpers connected to the tuner, the extension cable and coax were run to the transceiver and the antenna erected. Now, testing was in order. The pressing of the TUNE button on my IC-706MKIIG did exactly what it was supposed to do. The Z-100 ran through its paces and signaled a good match. Now if the afternoon showers come while I am operating "fixed portable," the only thing I have to worry about is keeping me and the radio dry. The tuner is cozy in its own little raincoat (see Figure 2).

Total cost, even if you had to buy the container new at the discount store, would probably not exceed $10. That does not include the extension control cable, of course. The container was already here and I had enough UHF connectors, coax, wire and weatherproofing on hand for the project. The only thing I had to buy was the 4-conductor cable and Molex connectors to build the 50 foot extension cable.

This project has enabled me to comfortably operate "fixed portable" from the beach, at Field Day and many other events where a vertical was the only feasible antenna. As long as the container can handle the physical size of the tuner with room for the connecting cables, any automatic tuner could be protected in this way. — *73, Geoff Haines, N1GY, 904 52nd Ave Blvd W, Bradenton, FL 34207*, **n1gy@arrl.net**

Note: The plastic container, being airtight, will tend to accumulate condensation inside. If the weatherproof tuner is used for an extended period, you should either punch a weep hole in the bottom to allow water to drain or periodically open the top to vent the interior. — *Ed.*

IC-706MKIIG SO-239 PROBLEM

◊The IC-706MKIIG radios are made to be disconnected and reconnected to an antenna for mobile and portable use. Repeated reconnections may cause a problem — at least it did for me.

I have owned my ICOM IC-706MKIIG for about 2 years now. When I attached my antenna's PL-259 to the radio's HF SO-239 connector tightly, I would lose my received signal and the radio would not transmit. If I loosen the PL-259 slightly signals would be received and I could transmit as well.

I tightened the screws that hold the SO-239 to the radio thinking that I had a bad ground at this point — no luck. I made up a new cable with a new PL-259 and still no resolution. In

GEOFF HAINES, N1GY

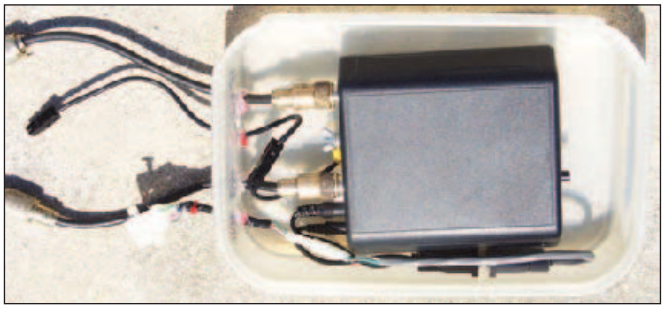


Figure 1 — A detailed view of the autotuner and its wiring mounted inside its "raincoat."

GEOFF HAINES, N1GY

Figure 2 — The autotuner all "buttoned up" and ready for heavy weather.

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

the time that I have owned this radio I have used it less than a dozen times mobile. The HF SO-239 connector gets connected and disconnected more than other radios resulting in more "wear and tear" on them.

I decided to go into the radio. I removed the top cover so I could see what the SO-239 was connected to and then I saw what was happening. The center insulator along with its center pin was loose and moving in the SO-239 metal housing. When a PL-259 was inserted, the insulator would move out of the metal housing and touch a metal part of the chassis. Also, the wire going to the center of the SO-239 was hanging by only about one strand because of this movement.

In order to make a repair, I had to remove the top cover and five screws that hold a circuit board to access the SO-239 wire connections. I could only lift this circuit board slightly and when I moved the SO-239, the center wire broke right off. At this point, I decided to pull the SO-239 from the chassis. Be sure to unsolder the ground wire before removing it. Now I could see that the insulator in the SO-239 was actually loose and would slide back and forth with the insertion and removal of a PL-259.

As this is a special type of SO-239, I decided to "lock" the insulator in the housing by using a couple of drops of "thin" CA (cyanoacrylate), a type of glue which I use in my model airplane construction. CA adhesives are available in thin, medium and heavy; the thin is the consistency of water and flows ready into the joint by capillary action then cures almost instantly (*protect your eyes and fingers*). [Be aware of the drying time for any glue you use. Make sure it is completely dry before inserting the PL-259. — *Ed.*] I then pulled the two wires from inside the chassis out through the SO-239's hole and did my soldering safely on the outside of the chassis.

I am pleased with the repair and now the HF SO-239 connection works perfectly. While I had my CA out, I added a couple of drops around the insulator in the VHF/UHF SO-239 connector just to be on the safe side (without removing it from the chassis).

Also, when I solder all of my PL-259s, I always make sure that no excess solder gets on the outside of the center conductor; if it does, I take a small file and remove it. *Any excess solder on the center pin would cause excessive insertion force into an SO-239 possibly causing this failure. — 73, Karl Schwab, KO8S, 30752 Ridgefield Ave, Warren, MI 48088-3174,* **ko8s@arrl.net**

Note: You should check with ICOM to determine if these changes will affect your radio's warranty. — *Ed.*

12 V SPICE JAR ADAPTER

◊I had a 12 V socket I had mined from an old portable air compressor that didn't work. My small camping power supply (a 14 A switching Jetstream) did not have a 12 V socket. I had hoped to run my handheld transceiver and another radio from the power supply, but my only option was a 12 V adapter.

I took an onion salt spice jar I had cleaned out and took the lid with all the shaking holes off to mount the 12 V socket to. I used my calipers to determine the diameter of the hole to drill. I then used a Forstner bit to slowly drill the hole in the lid. I then attached the 12 V socket to the lid and wired it up with a small jumper of #16 AWG wire (see Figure 3). (This was more than sufficient for my application. Heavier gauge wire should be used for higher amperage equipment.)

I then drilled a small hole in the side of the jar near the bottom for the wires to come out. In my case I put Powerpoles on the wires (see Figures 4 and 5). I had originally thought to tin the wires and use the banana plugs that screw down on the wire. This would allow you to push the wires all the way in the jar when packed up. Drop the banana plugs in the jar as well and put a piece of electrical tape over the hole for transport.

I do not know if the seal made when the spice jar lid is screwed down over the 12 V socket is waterproof. — *73, Greg Lott, K4HOE, 611 Hambaugh Ter, Homewood, AL 35209,* **k4hoe@arrl.net**

GREG LOTT, K4HOE

Figure 3 — An exploded view of the spice jar power adapter.

GREG LOTT, K4HOE

Figure 4 — The adapter ready for action.

GREG LOTT, K4HOE

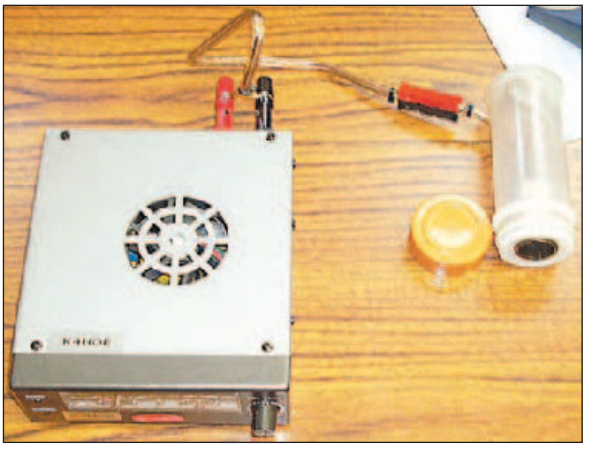


Figure 5 — The adapter attached to the power supply.

FEET FOR HEATHKITS

◊When the plastic feet are missing from a Heathkit radio, it can be a little hard to find a suitable replacement. For a Heathkit GR-81 receiver, I substituted a stack of 37/64 inch flat faucet washers, secured by a long 6-32 flat slotted screw, flat washer, lock washer and nut. When the 6-32 screw is tightened, the head of the screw causes the bottom washer to become concave and will not scratch anything that the radio is placed upon.

This substitute foot will not peel off with age. Since the feet are largely hidden by the radio, no one will ever notice the substitution. Best of all, if you encounter a source for vintage feet, it is easy to unscrew the substitute feet and install the originals. — *73, Michael Davis, KB1JEY, 533 Tennis Ave, Ambler, PA 19002-6016,* **michael.davis@alumni.duke.edu**

MORE ON THE RECEIVE INDICATOR

◊The September "Hints and Kinks" column contained George Allen's, N1NBQ, circuit to indicate which of several radios was active. His circuit was designed for radios that have one side of the speaker grounded. George has found that this is not the case for Motorola radios. If your radio's speaker does not have a grounded terminal, use a 1:1 transformer for isolation.

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

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

So Near, Yet So Far — The K5D Desecheo DXpedition Story

The team leaders share the inside story of a Top 10 DXpedition.

Glenn Johnson, WØGJ, and Bob Allphin, K4UEE

Desecheo Island (KP5) was added to the DXCC list in 1979. KP4AM/D was the first DXpedition in March 1979, exactly 30 years before the K5D Desecheo DXpedition earlier this year.

There were six DXpeditions in the 1980s and three in the early 1990s, the last one ending in January 1993. There had been no official permission given since that time for Amateur Radio activity. Naturally, over the last 16 years, its position on The Most Wanted List steadily climbed toward the top. In early 2009, Desecheo was #6 on the Most Wanted List. It was #2 in Asia and #3 in Europe.

Interesting History

Desecheo Island, a mountainous island of about 360 acres with a generally tropical climate, is "only" 14 miles west of Rincon, Puerto Rico. It was acquired by the United States in 1856.

With the outbreak of World War II, the island was used as a bombing and gunnery range until 1952. Between 1952 and 1964, the US Air Force used Desecheo for survival training. In July 1966 it was acquired by the Department of Health, Education and Welfare, which introduced a colony of rhesus monkeys in 1967. In December 1976, Desecheo was transferred to the US Fish and Wildlife Service (USFWS), which is now responsible for its management as a wildlife refuge.

Because of the critical habitat area and severe UXO (Un-eXploded Ordnance) hazard, Desecheo was closed to all visitors in 1993. Also, because of its location between Puerto Rico and the Dominican Republic, drug and human trafficking are often problems. The USFWS has been very concerned about the safety of any visitors as well as the potential detrimental impact they might have on the island's ecology.

Over the last 10-15 years, the USFWS has had many applications from Amateur Radio operators to activate Desecheo. In 2002, a group of individuals formed the KP1-5 Project (**www.kp1-5.com**) to seek a way to gain supervised access to Desecheo. In mid 2008, the USFWS asked for proposals for a Special Use Permit for amateur operation on Desecheo. Seven proposals were received.

On October 1, 2008 we received word that The KP1-5 Project proposal was selected. It was scheduled for late 2008 for a maximum of 14 days with no more than 15 operators. The operations site would be the helipad and surrounding area at the very west end of Desecheo. The USFWS, after coordination with their security personnel and biologists, set the dates for February 12-26, 2009.

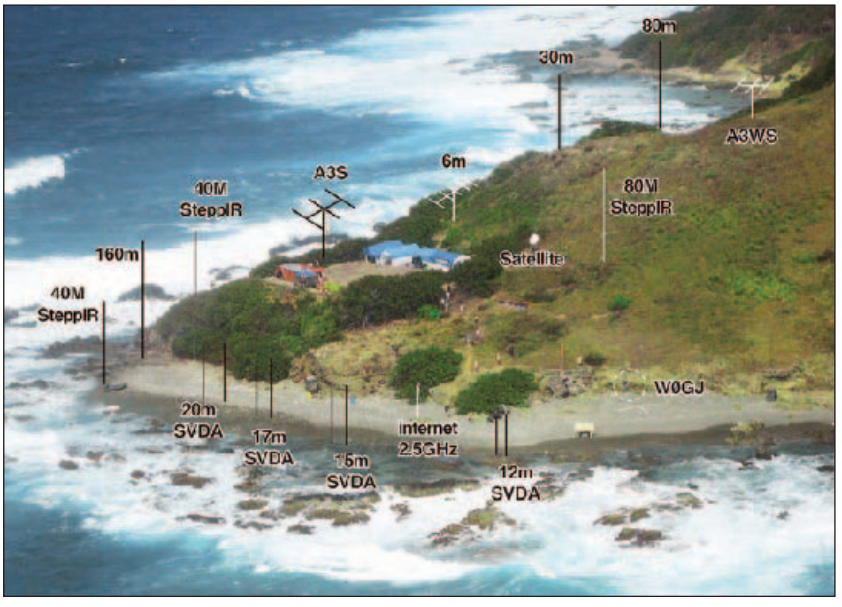
Bob Allphin, K4UEE, and Glenn Johnson, WØGJ, long-term members of The KP1-5 Project, were selected to be coleaders of the radio operation. Mike Thomas, NA5U, was Project Director. The minimum time commitment for a team member to participate in the entire operation would be 3½ weeks. Many on our team had situations that prohibited such a long commitment, while others could find the time. So we devised a plan for a "shift change" about halfway through the operation. This worked well as USFWS also planned to rotate security personnel and some biologists about midway through the 2 week period.

We formed three teams. Team 1 would be present from start to finish. Team 2 would arrive with Team 1 on February 12 and rotate off the island on the 19th. Team 3 would arrive at the midpoint and stay to pack things up. This gave seven more people a chance to participate in activating a very rare DX entity and, most importantly, provide new fresh operators to handle the never diminishing pileups.

The Work Starts and Plans Change

There were many requirements that had to be met for the Special Use Permit. One of the most important and one that was absolutely non-negotiable was that our campsite and all antenna locations be "swept" or scanned for UXO. This additional expense was absolutely necessary. Five of us (K4UEE, N4GRN, KØIR, WØGJ and WP3MW) visited Desecheo in December 2008 along with USFWS law enforcement personnel and a hired UXO technician. We set up a safe perimeter (green zone), selected all of our antenna locations and had the areas swept.

We negotiated a variation in the original plan



Here is an aerial view of the K5D DXpedition site showing Camp Desecheo and its surrounding antenna farm.

K5D Teams

TEAM 1 (February 12-26)

K4UEE	Bob Allphin (coleader)
WØRUN	Gordon Hardman
WØNB	Jim Livengood
N4GRN	George Nicholson
W8OI	Garry Ritchie
K9SG	Gary Stouder
NA5U	Mike Thomas
VE7CT	Steve Wright

TEAM 2 (February 12-19)

WØGJ	Glenn Johnson (coleader)
KØIR	Ralph Fedor
W2GD	Jon Crovelli
K5AND	Dick Hanson
W6IZT	Gregg Marco
N6MZ	Mike Mraz
WB9Z	Jerry Rosalius

TEAM 3 (February 19-26)

WP3MW	Eladio Acevedo
NP4Z	Felipe Hernandez
N4NX	Bill Barr
KØJGH	Glen Kesselring
K1KD	Grant Kesselring
K5AC	Tim Pearson
VA7DX	Neil King

OFF-ISLAND TEAM

JA1ELY	Toshi Kusano, pilot
W4GKF	Chaz Cone, Webmaster
NØSM	Steve Miller, weatherman
K9LA	Carl Luetzelschwab, propagation
W8AEF	Paul Playford, antennas
K4DLI	Jim Streible, antennas
N2OO	Bob Schneck, QSL manager
SQ8X	Stan Strzyzewski, QSL designer

that allowed antennas to be set up on the ridge behind the campsite. Now we had a clear shot at Europe and because the antennas overlooked the sea 200 feet below — we would be loud. It was an invaluable reconnaissance trip. How often is it possible to scout out a "top ten" DXCC entity before activating it?

We also made the decision to hire a helicopter to transport the men and equipment because of February's high surf conditions. We found a company with a Super Puma helicopter. This helicopter can carry 9000 pounds of cargo or 18 passengers. Between internal loads and sling loads, it would only take 3 or 4 trips to haul all of our equipment and team from the west coast of Puerto Rico to Desecheo.

All of our radios, antennas, amplifiers, medical supplies and hundreds of other items were shipped to our storage facility during January 2009. Then, 5 days before we left, we were informed that the Super Puma helicopter would *not* be available.

We were back to square one with transportation and only a week to go. With less than 48 hours before our permit became effective, we found two companies, each with an A-Star helicopter. The A-Star could carry only four passengers or 900 pounds using sling loads. Suddenly the number of trips required and the costs increased tremendously.

Teams 1 and 2 arrived in San Juan on Saturday, February 7. The next morning we received the mandatory UXO training. After the training, we took a bus to the west coast, stopping to visit the Arecibo Radio Telescope. Angel, WP3R, arranged a private, behind the scenes tour for us. This fantastic facility is one of the wonders of the modern world. Afterward, we continued our trip to the Lazy Parrot Hotel in Rincon within sight of Desecheo, and the team saw the island for the first time during a beautiful sunset.

Departure Day

By the evening of February 11, we had staged all of our equipment for an early morning departure. It took a total of 39 helicopter flights over 1½ days to get all of our gear to Desecheo.

On Desecheo, the first loads were people and antennas. During the first day, antennas were assembled, coax run and the generators set up. It was after dark when we finally were able to assemble our four 10 × 20 foot tents. Two were used for sleeping and two were placed end-to-end for the operating tent. It would have been impossible to do this with the helicopter traffic during the day.

Operations

At first light on our second day, we completed setting up the operations tent, a few stations and enough antennas to get on the air. At 1600Z operations began. We opened on 20 meter CW with John, W2GD, and on 17 meter SSB with Jerry, WB9Z. The pileups were a huge "wall of sound." After a brief celebration, which included the FWS security personnel, antenna work and station setup continued. Twenty-four hours later, we had 10,000 contacts in the log as we ramped up radio operations.

On Saturday, February 14, Camp Desecheo was fully operational. We had eight stations, each with ICOM IC-756PROIIIs, Alpha amplifiers, ICE band-pass filters and MicroKeyer II controllers. We used *Win-Test* for logging. Each station was set up to run any mode and use any antenna. All antennas came to a single bulkhead. The 6 meter station used an ICOM IC-7000 and a 6 meter Alpha amplifier. The operator schedule was implemented and everyone started the daily routine of operating, eating, antenna and camp maintenance, and rest. Sleeping during the day was difficult because of the heat. On the warmest of days, it was well over 100°F in the operations tent.

The pileups were tremendous. Bob, K4UEE, a veteran of eight "Top-Ten" DXpeditions said, "I've never heard anything like this." Because Desecheo was ranked #2 in Asia and #3 in Europe, the team was very diligent about exploiting the openings to these areas on every band. As the days passed, the contact count rapidly climbed.

Antennas

The two Yagis and the 30 and 80 meter verticals were on a ridge with a clear path in all directions except for Africa. The 160 meter vertical, the four Switchable Vertical Dipole Arrays and one of the 40 meter SteppIRs were at the water's edge. The 160 meter vertical and one 40 meter SteppIR were at the very northwestern tip of the island on the beach with a clear shot to Europe and Asia. Each person operated a minimum of 12 hours a day, some much more.

Resupply, Team Changeover and the Weather

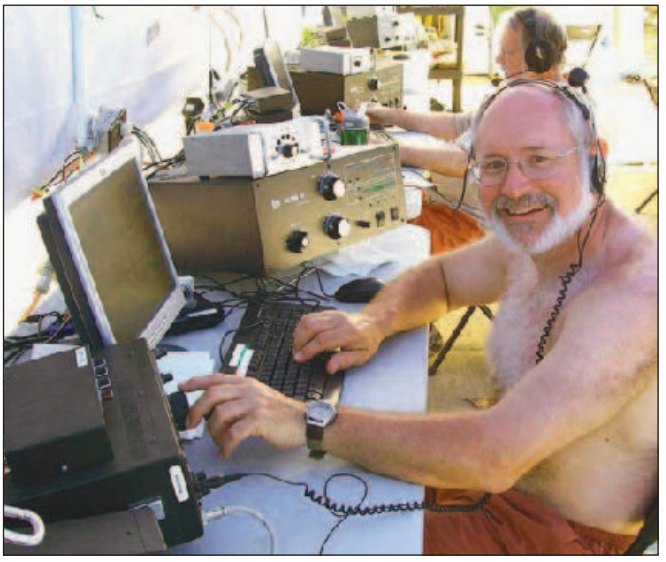
On February 19, Team 3 was scheduled to replace Team 2. The highest surf of the year was that day. Breakers came in and took down all of the beach antennas except for the 160 meter vertical. In the "protected" bay that had been used for the Zodiac, 6 to 10 foot breakers were rolling in. No one would have survived a landing there. We had no alternative but to go by air. Back on Puerto Rico, Team 3 arranged for helicopter transport from a third helicopter company. The team exchange then took place quickly and safely and our basic time schedule remained intact.

Results

We had propagation to North and South America 24 hours a day on several bands at a

The K5D QSL card sent to the 115,787 contacts we made, 40 percent of which were to the high need areas of Asia and Europe.

Mike, NA5U, keeps the log while Gary, K9SG, operates satellite mode working AO-51 and the International Space Station.



Glenn, WØGJ, is having a grand time in the foreground working CW while George, N4GRN, works the phone bands.

time. We had long, deep openings to Europe. Our windows to Japan and Asia were short (as predicted) but they were the highlights of the day. Our goal was to maximize the number of contacts to these hard to reach areas.

Overall, 40 percent of our contacts were with Europe and Asia. We greatly appreciated the cooperation from North American hams in helping us work these high-need areas. The total number of contacts was 115,787. Fifty-five percent were on CW, 40 percent on Phone and 5 percent on RTTY. We made 51 satellite contacts and two 6 meter EME contacts. We had 41,783 contacts with Europe and 4202 with Asia. We had 32,807 unique call signs in the log, a number we are most proud of.

QSL Information

QSLs can be requested directly from N2OO. Bob and his crew from the South Jersey DX Association (SJDXA) deserve a lot of thanks for this very time consuming job. Online QSLs are also available. Details are on the Web site under "QSL Information." LoTW logs will be available in early 2010.

We Tried Hard

We tried hard, very hard, to make the most of every propagation opportunity to Asia and Europe, our hard to reach areas. Due to the extremely low sunspot numbers in this 2 week period, even with many stations on at once, we only worked *eight* lucky JAs on 15 meters (we worked more on 160 meters). We were very happy with our JA contact results on the low bands.

USFWS is evaluating our behavior, cooperation and consideration for the fragile environment. If the USFWS decides that we met our mutual goals, we hope they will ask for proposals to operate from KP1 Navassa, the #1 Most Wanted Entity in Asia and some places in Europe.

You Tried Hard

It takes a lot of effort, both in time and resources, to plan and execute a DXpedition from a remote location so that it can be done safely and effectively. Several of us worked many hours each day for months. The tiniest details and contingency plans had to be worked out and planned for. The expenses were and are significant.

The Desecheo DXpedition Japan Foundation was our single largest contributor and sponsor. Special thanks are due to Toshi, JA1ELY, who was our pilot, for overseeing this special help. We also had enthusiastic support from many clubs and organizations, as well as many individual contributors. Without this support, support from the Northern California DX Foundation and International DX Association (INDEXA), the K5D DXpedition would not have been possible. We also want to thank our equipment sponsors that include: Alpha Radio Products, ICOM America, SteppIR antennas, MicroHam, Heil Sound, The RF Connection, AY Technologies, Spiderbeam, Radioware, WXØB and the Wireman among others. All of our corporate sponsors, DX Club sponsors and individual DXers are listed on our Web site. Thanks to *everyone* who contributed.

And a special thanks to our wonderful team of DXpeditioners who made the adventure so enjoyable, and to the USFWS for their support and cooperation.

We also want to thank *you*, the DXers, for your cooperation and patience as we did our level best to give you a contact with this very rare DXCC entity. It was *you* who *really* made the K5D DXpedition a success. Thank you all so very much for your generous support and for working us. We heard many positive comments about the patience of North American hams standing by while we worked the narrow windows of propagation to our hard to reach areas. Thank you very much.

More pictures about Desecheo are on the K5D Web site and a DVD is available. Go to either **www.kp5.us** or **www.k4uee.com/dvd** for more information.

Very 73.

All photos courtesy of the The KP1-5 Project.

Glenn Johnson, WØGJ, an ARRL Life Member, was first licensed in 1966. He was very active as a Novice, achieving WAS in 3 months, and he passed his General test at 4 months. He upgraded to Extra class in 1987. Glenn is a very active DXer having achieved DXCC Honor Roll for both Mixed and SSB and he is closing in on CW. He also has 352 entities confirmed, 5BDXCC and 5BWAZ. Glenn is married to Vivien, KL7YL, and has four children, Melissa, K1MJ; Mark, NØMJ; Paul, WØPJ, and Carrie, NØCMJ. Glenn can be reached at 207 Bear Creek Ln NW, Bemidji, MN 56601-8072, **w0gj@arrl.net**.

Bob Allphin, K4UEE, an ARRL member, has visited 97 DXCC entities and operated from 54. He has participated in 30 DXpeditions and specializes in activating "top ten" most wanted. So far he has activated: Heard Island, Bhutan, Kingman Reef, South Sandwich Islands, South Georgia Island, Peter I Island, Lakshadweep and now Desecheo. He has eight "DXpedition of the Year" plaques hanging on his shack wall. Since retiring 10 years ago to pursue DXpeditioning more or less full time, Bob has participated in seven major DXpeditions that have made over 650,000 contacts. Bob has set five single operator/single band World Records and was a competitor in two World Radio Team Championships (WRTC) events, in 1996 and 2000. Bob can be reached at 4235 Blackland Dr, Marietta, GA 30067-4705, **mallphin@aol.com**. QST

ARRL's New Web Site: Designed with You in Mind

Coming to a computer near you: a greatly enhanced online experience. The redesigned site rolls out in late January.

Kathleen Glass

If someone had asked me about Amateur Radio six months ago, I would have had no answer. Today, however, I am able to hold what I consider to be a relatively intelligent conversation on bands, coaxial cables and antennas.

Why the sudden ability to talk ham radio? Because for the last several months, I have been interning at ARRL, working on writing, editing and gathering content for ARRL's new Web site. While I've been working with a team from the ARRL HQ staff, the Web designers at Fathom (**www.fathom.net**), a Hartford-based design and consulting firm, have been redesigning and rebuilding the ARRL Web site, pretty much from scratch.

The existing site is the first place to go if you're looking for anything related to Amateur Radio: an upcoming hamfest, the rules for this weekend's contest, an explanation of VHF propagation or the latest news. The current site has enough data and information to provide answers to just about any question, but those answers are not always easy to find. In addition, the design, once state of the art, is getting long in the tooth.

Pulling it All Together

To help bring things up to speed, I was tasked with making sense and order out of the 40,000 or so pages currently on **www.arrl.org**. The good news for me was that there was a team of experts behind me. Some members of the ARRL staff were on teams that were responsible for devising practical features and in many cases brand-new content within their areas of expertise. The ARRL team leaders worked closely with the team at Fathom, who are, as this is written, putting the final touches on the ambitious redesign of the ARRL site.

The team leaders met nearly every week

This screen shot shows a working design for the Technology Landing Page. Notice how you can access several stories at once at the top of the page.

with the team at Fathom to flesh out the content and functionality of each section. Wouldn't it be great to include an interactive US map showing ARRL divisions and sections, with links to Division and Section leaders? How about a form to make it easy to apply to be a Volunteer Counsel? And so it went.

How did the teams tackle so many pages in a short time? Piece by piece, page by page. What will be different on the Web site, you ask? Space won't allow us to list everything, but a section-by-section summary will provide the basic idea.

JOEL P. KLEINMAN, N1BKE

Brent Robertson, KB1PYY, and Kim Mitola of the Web design firm Fathom present plans for the new site to the ARRL Board of Directors in July.

Licensing, Education and Training

This area will be your one-stop for all things related to earning a license, upgrading a license, instructing a license class, conducting an exam session and bringing Amateur Radio into schools. How to find a class or exam session, the Question Pools, FCC requirements — it's all here. From the School Club Roundup to Kids Day, these pages are meant to help teachers put that first spark in the eyes of future hams.

Membership

An enhanced Member Profile will allow you to upload photos, find events in your geographical area, connect to your social networks — and much more. You'll still be able to manage your information (renew your membership, change your address, subscribe to newsletters and bulletins, and so on), but the opportunities for customizing your online experience will add a whole new dimension.

On the Air

Everything you need to know about participating in on-the-air Amateur Radio is in this section: contests, awards, clubs, DXing, operating in foreign countries — you'll find it all here. The new contesting pages will feature easy to read rules for each ARRL contest throughout the year.

Publications and Store

The new ARRL online store will provide a faster, more efficient and more enjoyable shopping experience. You'll get your *2010 ARRL Handbook* in no time!

Technology

The Technology pages are sure to be among the most viewed. With an improved search function, you'll be able to get all of your questions answered, be they about safety or station layout and accessories. Want a video tour of the ARRL Lab? You'll find it here.

About ARRL

Need a question answered? Find out here whom to contact. Looking for employment information? Directions to ARRL HQ/W1AW? A description of how the ARRL is organized? This section will have the answers.

Get Involved

Not sure how to use your skills to help others? Get Involved provides the means to find ways to volunteer, connect to other hams, recruit new hams and give back to ARRL. The Youth pages are by youth, for youth — everything a young ham needs to know to discover the fun of ham radio.

News and Features

Head to this area to find articles from *QST*, *QEX* and *NCJ*, as well as Web-only feature articles and columns. You'll also find all the latest news (and a news archive), and everything the media should know about the positive contributions hams make to their communities and the nation.

Public Service

This new section is where you'll go to find opportunities to offer your communications skills to your community. Read about others' extraordinary experiences in the Public Service Stories pages. Want to join ARES®? Learn about the ARRL's affiliation with served agencies? Here's where you'll find out what's going on in the public service realm.

Regulatory and Advocacy

These pages reflect ARRL's robust efforts to protect our frequencies, here in the US and internationally. Here you'll find out how a Volunteer Counsel can assist you with a zoning issue, how the next World Radiocommunication Conference will affect the Amateur Radio Service, the latest news about Amateur Radio-related bills in Congress and what the ARRL Technical Relations Office is doing internationally.

Look and Feel

Overall, the new Web site will incorporate the latest Web technology that will make it easy to navigate and enjoyable to use. A few simple clicks will get you where you want to go.

One of the most significant features is the new mapping capability. You'll be able to find your way to a class, a club or a hamfest — all with the click of a mouse. You can even get directions.

Clear, easy-to-read pages will help you find everything you're looking for — and more! Instead of large chunks of information on each page, the material will be broken into bite-sized pieces.

Let's say you've landed on the Technology page (or you've chosen it as your Landing Page). From here, you'll be able to see up to four different technology-related articles in the carousel, read reviews of new products, get helpful hints and tips, and learn how the ARRL Lab contributes to the technical advancement of the Amateur Radio Service.

Surfing the site will provide a true multimedia experience. State of the art tools, photo galleries, *PowerPoint* presentations and videos will provide ways to tell the story of ham radio in ways plain text can't.

The new ARRL Web site is expected to launch in late January. During the first few weeks we'll be looking to you for feedback. Our goal is to have a Web site that serves your needs.

Shortly after launch, we'll announce even more new features — forums, photo-uploading capability, space to share your experiences — and more.

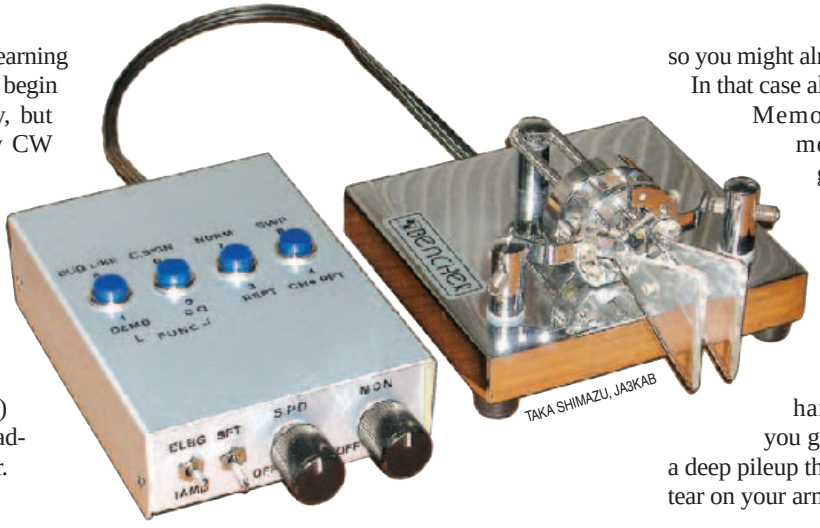
Kathleen Glass recently received her Master's degree in Journalism from Quinnipiac University in Hamden, Connecticut. She can be reached at **kglass@arrl.org**.

Beyond the Straight Key

Tips and techniques for moving into the CW fast lane.

Richard Arnold, AF8X

Those interested in learning Morse code usually begin with a straight key, but those who come to enjoy CW eventually outgrow it. As your proficiency and speed increase, the need for more advanced tools and techniques becomes apparent. Switching from a straight key to a semi-automatic key (bug) or to an electronic keyer/paddle combination is in order.



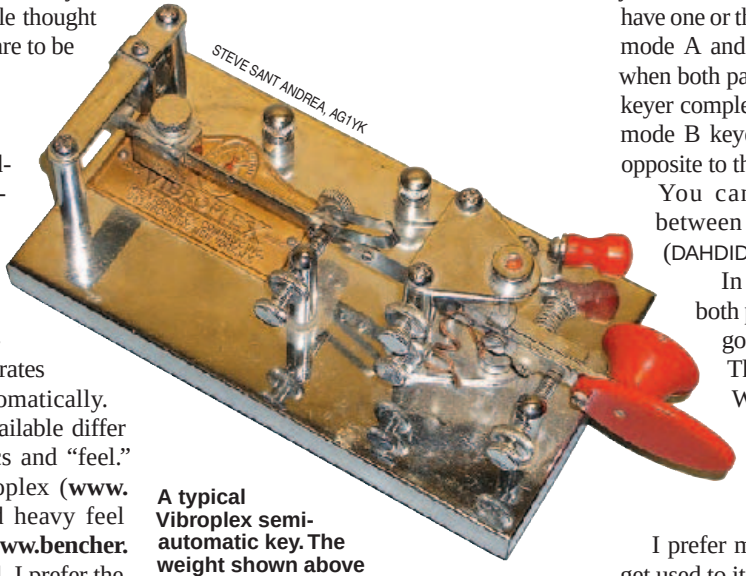
Here is a Bencher double-lever paddle connected to a homebrew keyer — all you need for CW speed.

The Next Step

Usually when the new ham masters the straight key, the next step is an electronic keyer/paddle combination or a semi-automatic key. There are many of both on the market, but a little thought should be given as to how they are to be used and your preferences.

Paddles

There are two types of paddles, single-lever and double-lever. Most advanced CW operators who prefer electronic keyers choose the double paddle. The double paddle is used for iambic keying, a keying system that generates alternating dits and dahs automatically. The various double paddles available differ in their appearance, mechanics and "feel." Some paddles, like the Vibroplex (**www.vibroplex.com**), have a solid heavy feel and some, like the Bencher (**www.bencher.com**), have a more delicate feel. I prefer the latter type, adjusted for a very light touch. You will need to try different types to decide which fits your fist best.



A typical Vibroplex semi-automatic key. The weight shown above the "V" in Vibroplex is the pendulum that oscillates to generate a stream of regularly spaced dits.

Keyers

The next thing to consider is an electronic keyer. Electronic keyers send an alternating stream of dits and dahs when both paddles are squeezed. Depending on which paddle is squeezed first, the keyer will send either DIDAH, DIDAH, DIDAH (dit paddle squeezed first) or DAHDIT, DAHDIT, DAHDIT (dah paddle squeezed first) and it will continue to send as long as the paddles are held together. There are basic keyers and there are the more sophisticated (and expensive) memory keyers suitable for contesting. Also, many recent transceivers have electronic keyers built-in, so you might already have one in your shack. In that case all you will need is the paddle.

Memory keyers contain, well, memories that can be programmed with various Morse code phrases. For example, you could program CQ DE AF8X into the keyer's memory. When triggered, the keyer will send out your CQ automatically, freeing up your hands for another task until you get a call. During a contest or a deep pileup this can save a lot of wear and tear on your arm.

Keyer Modes

Another choice: In which mode do you want your keyer to operate? Some keyers give you a choice of two modes, A or B; some only have one or the other. The difference between mode A and B lies in what the keyer does when both paddles are *released*. The mode A keyer completes the element being sent. The mode B keyer sends an additional element opposite to the one being sent.

You can tell the basic difference between the modes with the letter C (DAHDIDAHDIT).

In mode A, you could squeeze both paddles (dah before dit) then let go of both after hearing the last dit. The mode A keyer stops sending. With mode B, you start the same but let go of both paddles after hearing the second dah. In mode B the keyer will automatically add the last dit.

I prefer mode B, but some people never get used to it. I like it because it makes sending certain letters easier for me. Sending CQ uses a character insertion. The letter C is sent by holding the dah paddle (dah) and then holding the dit paddle until you hear the complete character (didahdit) then the Q is formed by holding the dah paddle (dahdah) and tapping the dit paddle (dit) and then releasing both (dah).

To learn iambic keying to the point where it becomes an unconscious effort, start slow, learning one letter at a time. Start with the

letter K (dahdidah). In mode B, hold the dah paddle then tap the dit paddle and release. When that becomes natural, try the letter R (didahdit), sent just the opposite. Hold the dit and tap the dah paddles and release. With some practice it will become second nature and the only time you will even notice it is if you use another keyer that is programmed for mode A. Whichever mode you decide on, it will take a bit of practice to become comfortable, but worth it.

A HamGadgets digital keyer with a wide range of capabilities that include operating in either mode A or B, 30 memories that can store up to 255 characters each and speed adjustable from 5 to 99 WPM.

Semi-automatic Keys

The semi-automatic key, or "bug" as it is called, is a mechanical key. The bug is the oldest "automatic" keyer, having been first patented in 1904. It uses a single lever that the operator pushes back and forth. When the operator pushes the lever to the right an oscillating pendulum sends a series of dits at a constant rate. Pushing to the left sends one dah for each push. Bugs are generally designed for speeds from 20 to 60 WPM.

I have become proficient at using a bug. I have always liked the rhythmic, musical sound of a well-trained fist using a properly adjusted bug. I admit that there are a lot of horrible sounding bugs on the air because the operators do not adjust the dits to dah ratio correctly. These sound even worse when they send their text with no discernible space between letters or words.

I originally started using a bug to communicate with some of the slower CW operators because when I tried to use my electronic keyer I would release the paddle too quickly causing a lot of mistakes. I found that adding more weight to the bug slowed the dits down to a 12 to 15 WPM rate and it was much easier to operate than the keyer at that speed. Soon I found that I was enjoying using the bug for most of my contacts. The one most important thing about using a bug is the adjustment. Full adjustment instructions are included with the purchase of a Vibroplex bug and are also available online at the Vibroplex Web site.

You may be interested to learn that the Vibroplex Company, the original manufacturer of semi-automatic keys, is still in business making the same design semi-automatic keys almost 100 years since they started. The new ones have an optional finished base of a crackle/powder-coat, chrome or gold plate. I personally prefer the powder-coat finish, but have to admit, the others are very pretty. The latest in their bug line is the Blue Racer, which has a very nice cobalt-blue base, is smaller than the Original model base and has jeweled pivots. Both the Original and Blue Racer units are a pleasing aesthetic sight if you like machinery.

There are a couple of accessories available from Vibroplex to help keep the dits under control. One is the Bug Tamer, which is an extension of the lever arm to allow adding weights farther away from the pivot point. The other is the Vari-Speed, which is a weighted lever that is swung forward or back to vary the dit speed. I have used both and find them very useful when operating at different speeds. [As of September 2009 neither the Bug Tamer nor the Vari-Speed is available from Vibroplex, although I was informed that this is a temporary situation. — *Ed.*]

After the adjustments are done, the next thing is practice. If you are used to operating an electronic keyer, it takes some time to overcome the urge to hold the dah side to form dashes. Persistence will pay off and soon you will be able to handle the bug with enough confidence to try it on the air. That's the test: If the other station can copy you, you have done well. If after trying a bug you decide it is not for you, it still makes a great looking paperweight and is a unique conversation piece.

Full Break-in

Right after I received my ticket, I bought a Ten-Tec Century 21, a CW only rig. Like all Ten-Tecs, it featured full break-in (QSK). Not knowing any other way of operating, I soon adapted and enjoyed the advantages of this mode.

In full break-in operation, during your transmission your receiver is active between the dits and dahs. The atmospheric noise during this mode is distracting and it takes some getting used to before you can start to enjoy it. Full break-in makes it possible for the operator at the other end to interrupt you for a comment or a fill just by tapping his key.

Years ago, during my every evening schedule with John, W8URM, he and I would discuss the day's events and break each other with a remark or just a HI HI in the appropriate places.

As time passed, I bought several different rigs, most being very disappointing when operating CW due to the clatter and delay of the transmit/receive relay changeover. Even at the shortest delay, the relay was so distracting that it made operating much less pleasurable.

If your rig is capable of full break-in and you haven't tried it yet, you may discover a new way of operating. As mentioned, it does take a while to get used to, but once you do, you may even look for full break-in contacts by calling CQ QSK.

I especially like the idea when calling CQ as I can hear another station if he starts to call before I am done sending. It is a valuable tool for DXing, too. You can be sure you are not covering the DX station during your transmission.

So, whether you decide to go for the class of the mechanical bug or the high tech efficiency of an electronic keyer/paddle combo, either road will be your on-ramp to the high speed CW lane.

Richard Arnold, AF8X, enlisted in the Air Force right out of high school and spent 4 years as a Medical Equipment Repairman. After his discharge in 1955, he trained as an electrician and worked in the Detroit area until his retirement in 1984. Since then he has been pursuing his interest in flying and radio. He enjoys riding his bicycle to local parks near his home in Clinton Township, Michigan and operating with his Elecraft K1 and KX-1. He also likes to play golf and is developing an interest in writing. He can be reached at 22901 Schafer, Clinton Twp, MI 48035, **af8x@comcast.net**.

New Products

HAMCALC ELECTRONICS UTILITY SOFTWARE

◊ Version 113 of *HAMCALC* software for *Windows* or *MS-DOS* contains more than 300 utility programs for radio amateurs and electronics professionals. Developed by George Murphy, VE3ERP, the software is said to be easy to use for nontechnical hobbyists. *HAMCALC* is available free of charge by download from **www.cq-amateur-radio.com**.

HAPPENINGS

ARRL Board Adopts Guidelines and Recommendations on the Appropriate Use of Amateur Radio

The ARRL publication *FCC Rules and Regulations for the Amateur Radio Service* contains the complete Part 97 rules.

On September 25, the ARRL Board of Directors adopted guidelines on the appropriate use of Amateur Radio on behalf of commercial, nonprofit and government entities, as well as recommendations for additional steps to be taken by the ARRL to educate radio amateurs and others on how to prepare and train for public service and emergency communications while complying with the current FCC Rules.

At its meeting in July 2009, the ARRL Board created an ad-hoc committee to study the issue and prepare suggested guidelines. The committee submitted its report to the ARRL Executive Committee, which reviewed and revised the document. After additional discussion among Board members by electronic mail and teleconference, the Executive Committee submitted the document to the Board for formal adoption.

Entitled *The Commercialization of Amateur Radio: The Rules, The Risks, The Issues*, the document offers guidelines to assist radio amateurs and anyone wishing to utilize the capabilities of Amateur Radio in understanding the FCC Rules that prohibit communications in which the amateur has a pecuniary interest, including communications on behalf of an employer. While the FCC Rules in this regard have not changed in many years, there has been increasing discussion of the issue as growing numbers of employers and nonamateur organizations recognize the value of Amateur Radio as an emergency communications resource and encourage their employees to obtain amateur licenses. Also included are guidelines for evaluating the appropriateness of Amateur Radio volunteers providing communications services to commercial enterprises and other entities for which other communications systems are available.

"The guidelines are not intended to be the last word on the subject, and surely will not be," observed ARRL First Vice President Kay Craigie, N3KN, and chair of the ad-hoc committee. "The report includes several recommendations for additional steps that the ARRL needs to take to help amateurs and the organizations we serve to better understand the Rules and to ensure that what we do to prepare to be of service in emergencies is consistent with the current Rules."

The document is available on the ARRL Web site (**www.arrl.org/news/files/ARRL_AppropriateUseGuidelines.pdf**).

FCC ISSUES *PUBLIC NOTICE* ON AMATEUR SERVICE COMMUNICATION DURING GOVERNMENT DISASTER DRILLS

On October 20, the FCC released a *Public Notice* clarifying the Commission's rules as they relate to the use of Amateur Radio by licensed amateurs who participate in drills and exercises on behalf of their employers.

Entitled *Amateur Service Communications During Government Disaster Drills* (DA 09-2259), this *Public Notice* addresses participation by paid employees of organizations taking part in drills and affirms that the Commission's rules "specifically prohibit amateur stations from transmitting communications 'in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer.'"

ARRL Regulatory Information Manager Dan Henderson, N1ND, said that "This *Public Notice* is intended to clarify a difficult issue. A wide range of unofficial — and frankly some incorrect — interpretations have been offered on this topic in various public forums recently. DA-09-2259 is the official FCC notice on this issue. Though issued jointly by the Wireless Telecommunications Bureau (WTB), the Enforcement Bureau (EB) and the Public Safety and Homeland Security Bureau (PSHSB) under delegated authority from the Commission, the *Notice* makes it clear that WTB is the Bureau at the FCC with jurisdiction over the Amateur Radio Service rules and their interpretation."

The *Public Notice* states that, in order to facilitate participation by employees who wish to engage in government-sponsored drills and emergency exercises on behalf of their employers, a waiver can be requested from the WTB *by the government agency sponsoring the drill or exercise* (and not by the individual who wishes to participate in the drill or exercise). Such a request must follow established procedures for requesting a temporary waiver of the Commission's rules.

The government entity conducting the drill must include in its waiver application the following information:

- When and where the drill will take place,
- Identification of the amateur licensees expected to transmit amateur communications on behalf of their employer,
- Identification of the employer(s) on whose behalf the amateur(s) will be transmitting, and
- A brief description of the drill.

"It should be noted," Henderson said, "that the waiver request must be filed and acted upon *in advance* of the drill. The waiver must be actually granted by the Commission *before* the amateurs participate in the drill. It is not enough to apply — the waiver must be granted first."

The public notice also emphasizes that in an *actual emergency*, the Part 97 rules "provide that an amateur station may use any means of radiocommunication at its

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

disposal to provide essential communication needs in connection with the immediate safety of human life and the immediate protection of property when normal communications systems are not available. In those specific circumstances, rule waiver is not necessary."

The Commission's *Public Notice* is on the FCC Web site (**hraunfoss.fcc.gov/edocs_public/attachmatch/DA-09-2259A1.pdf**).

FOUR RADIO AMATEURS KILLED IN PLANE CRASH EN ROUTE TO CQWW PHONE CONTEST

Just after take-off — around 6:30 AM on October 21 — a twin-engine plane carrying four Amateur Radio operators crashed into the woods, only 250 yards off the end of the runway in Jedburg, South Carolina, about 20 miles northwest of Charleston. The plane — piloted and owned by Peter Radding, W2GJ — carried Ed Steeble, K3IXD; Dallas Carter, W3PP, and Randy Hargenrader, K4QO. The four men were on their way to the Bahamas, after a stop in Florida, to operate in the CQ World Wide Phone Contest as C6APR, competing in the Multi/2 category.

Radding, of North Charleston, South Carolina, was 69; Steeble, of Summerville, South Carolina was 68; Carter, of Laurel, Delaware, was 67 and Hargenrader, also of Summerville, was 55. All were ARRL members; Radding and Steeble were Life Members.

According to Dorchester County Coroner Chris Nisbet, the four hams had made this trip before with Radding piloting the plane. Nisbet said Radding had flown to Delaware to pick up Carter earlier in the week.

"How quickly can a joyous event — setting off with close friends in anticipation of a weekend of intense radio activity — turn to unfathomable tragedy," said ARRL Chief Executive Officer David Sumner, K1ZZ. "As we mourn the loss of these four well-known members of our global Amateur Radio community, our hearts go out to their families."

Dorchester County Administrator Jason Ward characterized the crash site as "extremely severe" and that the plane was fully engulfed in flames when firefighters arrived; investigators were hindered by the flaming wreckage and "charred foliage" at the scene; a crew from the county public works department had to create a path to the wreckage. The coroner said it appears the severity of the crash, and not the fire, is what killed the men.

COURTESY ROBERT BISS, W8ZA

Robert Biss, W8ZA (far right), accompanied Ed Steeble, K3IXD/C6AXD (left); Dallas Carter, W3PP; Pete Radding, W2GJ/C6APR, and Randy Hargenrader, K4QO (not pictured), to the Bahamas last year for the 2008 running of the CQWW SSB Contest.

One of the victims was found beneath some of the wreckage, Ward said. Debris was spread around an area several yards wide at the crash site, and the wrecked plane was apparently upside down, he said.

Ward said that it was extremely dark when the plane took off, and airport manager Don Hay said the weather was clear at the time. "[Radding] was a very experienced pilot who knew the area," Ward said. "He had been flying for over 40 years." Nisbet said Radding filed a flight plan detailing his route and who was on board, but the plane never climbed high enough for those plans to be activated.

Stella Bazzle, who lives about a half-mile from the airport, described to *The Summerville Journal Scene* what she heard right before the plane went down: "The motor sounded like it was coming over the house. I heard the first explosion...then the second (explosion) wasn't as loud." She described the engine noise as "kind of a funny noise, like a grinding type thing." Bazzle said she then heard ambulances and called her neighbor, who had heard similar noises.

Carter, Steeble and Radding were members of the Potomac Valley Radio Club (PVRC); Carter and Radding were also members of the Frankford Radio Club (FRC). PVRC President Ken Claerbout, K4ZW, told the ARRL that he was "stunned and saddened" when he heard the news of the crash:

"I had several e-mail exchanges with Dallas over the last two weeks about our Sweepstakes effort. He spoke with excitement of the group's trip to C6 for CQWW SSB and vowed to be on for Sweepstakes CW. He said he might have to work during Sweepstakes SSB, but if not, he would be there! Dallas joined PVRC in 1963. Ed was also a very active member of PVRC before moving to South Carolina. Ed joined PVRC in 1992 and is a past chairman of our Northwest Chapter. Our thoughts and prayers go out to the friends and families of all four gentlemen. Another stark reminder of how fickle life can be." — *Thanks to the many friends of these four hams, the Associated Press and* The Summerville Journal Scene *for the information*

TEAM LEADERS SELECTED FOR WRTC 2010

After a grueling selection process, the organizers of the 2010 World Radiosport Team Championships (WRTC) have selected team leaders representing all six continents. Of the 76 applications submitted, 44 were chosen as Team Leaders. These Team Leaders will then choose a partner. WRTC, held every few years, takes place during the IARU HF World Championships, July 10-11. In 2010, WRTC will be held just outside Moscow.

WRTC began in 1990 under the auspices of the Goodwill Games, the brainchild of Ted Turner of CNN fame. The first Games were organized in Seattle, Washington, and focused on areas of cultural exchange, arts and other unique subjects — one of these being Amateur Radio and WRTC. Radio amateurs from around the world gathered in an Olympic-style event, joining in competition and camaraderie. In 1996, WRTC moved to San Francisco, then Slovenia in 2000, Finland in 2002 and Brazil in 2006.

Eleven teams will come from North America, 21 teams will come from Europe, six from Asia, one from Africa, one from Central America, two from Oceania and two from South America. Another six teams — the WRTC 2006 Champions, a host team and four sponsored teams — will bring the total to 50 teams. Each Team Leader will also nominate a referee, who, along with volunteers from the radiosport community, will be placed on a referee nomination list. From that list, referees will be selected and assigned to teams. During the competition, the team referee must be from a different country than that of the team and cannot be the one who was nominated by that team.

The 2010 WRTC will be held outside, "Field Day-style." According to organizers, the fields upon which WRTC will take place are located in a flat area about 35 kilometers south of Moscow in the Domodedovo district. Competitors will be located in clusters of 15-20 teams; these clusters will be in an area approximately 40×30 kilometers, with height differences no greater than 40 meters; all competitors' locations will be separated by at least 500 meters. In order to prepare for this style of operation, organizers operated from these fields for the 2009 running of the Russian Radiosport Team Championship.

Each team will have antennas and power monitors supplied, along with a tent, generator (and gasoline), tables, chairs and water. To avoid team members spending time refilling the generator, organizers will have a person dedicated at each location to help keep it up and running during the contest period.

Representing Area 1 of North America (W1, W2, W3 and the VA, NC, SC, FL and GA portions of W4) are Randy Thompson, K5ZD; Jeff Briggs, K1ZM, and Andy Blank, N2NT. Area 2 (the KY, TN and AL portions of W4 and W8 and W9) will be represented by Mike Wetzel, W9RE, and Scott Robbins, W4PA. Steve London, N2IC, and Kevin Stockton, N5DX, will represent Region 3

(W5, WØ). Daniel Craig, N6MJ, and Mitch Mason, K7RL, will represent Area 4 (W6, W7, KL7). Area 5 (VE1, VE2, VE3, VE4, VE9, VY2 and VO2) will be represented by Yuri Onipko, VE3DZ. Area 6 (VE5, VE6, VE7 and VE8) will be represented by Lee Sawkins, VE7CC.

WRTC 2010 is supported by the Moscow Regional Government and the Northern California DX Foundation (NCDXF).

STEVE EWALD, WV1X

Left to right: George Strayline, W2GSS; Tom Brehmer, NØLOH; Dan Pruitt, AE6SX; Mike Lisenco, N2YBB; Gene Clark, W4AYK; J.M. Rowe, N5XFW; Dean Feken, KL7MA; Jay Urish, W5GM; Garth Crowe, N7XKT; Lee Cooper, W5LHC; David Greenhut, N6HD, and Chuck Skolaut, KØBOG.

2009 SECTION MANAGERS WORKSHOP: A LEARNING EXPERIENCE

The Annual Section Manager (SM) Workshop — held September 25-27 — gave 12 newly elected SMs (including three who began their first terms of office on October 1) to visit ARRL Headquarters. During the extended weekend gathering, participants not only got to meet many Headquarters staff members, but also learned some of the ins and outs of how to become effective Section leaders and administrators. The primary purposes of the Workshop sessions were to share ideas and to provide basic administrative, management, leadership and motivational training.

"The Section Manager Workshop is an orientation and training event for new Section Managers that have come on board within the last year," said ARRL Field Organization Team Supervisor Steve Ewald, WV1X. "The ARRL has conducted this training each year at HQ for the past several years, and it was well received once again this year by the participants. The Membership and Volunteer Programs Department Staff and its Field Organization Team were the lead coordinators of the event."

The following Section Managers attended this year's Workshop: J. M. Rowe, N5XFW, Arkansas; Mike Neilsen, W1MPN, Eastern Massachusetts; Tom Brehmer, NØLOH, Iowa; Mike Lisenco, N2YBB, New York City/Long Island; Jay Urish, W5GM, North Texas; Dean Feken, KL7MA, Oklahoma; Dan Pruitt, AE6SX, San Joaquin Valley; George Strayline, W2GSS, Southern New Jersey, and Garth Crowe, N7XKT, Wyoming.

Three new Section Managers who were elected in August were also in attendance: Gene Clark, W4AYK, Georgia; David Greenhut, N6HD, Los Angeles, and Lee Cooper, W5LHC, South Texas. Their terms began October 1.

The Workshop provided an opportunity for those taking part to chat among themselves or within the group, sharing their own views on various issues and exchanging ideas. Through training and orientation sessions conducted by ARRL staff members and by meeting with other SMs, participants were able to explore what works as well, as what does not, and to bring home some fresh ideas and some encouragement.

On the morning of September 25, the Section Managers were given a detailed tour of ARRL Headquarters to meet staff and to visit W1AW, the Hiram Percy Maxim Memorial Station. Several visiting Section Managers enjoyed the chance to operate from W1AW for a little while late on Saturday afternoon.

Several Headquarters staff members led training sessions during the weekend Workshop, allowing these Section Managers an opportunity to learn more about the League's five pillars — Public Service, Advocacy, Education, Technology and Membership and how the position of Section Manager plays an important role.

HQ staff members involved in making session presentations included Emergency Preparedness and Response Manager Dennis Dura, K2DCD; Media and Public Relations Manager Allen Pitts, W1AGP; Education Services Manager Debra Johnson, K1DMJ; Marketing Manager Bob Inderbitzen, NQ1R; Membership Manager Diane Petrilli, KB1RNF; Field and Regulatory Correspondent Chuck Skolaut, KØBOG; Assistant Manager of Membership and Volunteer Programs Norm Fusaro, W3IZ; Laboratory Manager Ed Hare, W1RFI, and Steve Ewald, WV1X. Other workshop speakers included ARRL Chief Operating Officer Harold Kramer, WJ1B, and Membership and Volunteer Programs Manager Dave Patton, NN1N.

In Brief

- ***The ARRL Letter,* Now in HTML, Moves to Thursdays**: ARRL members who subscribe to *The ARRL Letter* — now in HTML — are now getting their issues a day early. Beginning on September 24, *The ARRL Letter* and the *ARRL Audio News* started being delivered on Thursdays instead of Fridays. *The ARRL Letter* is published 50 times each year and offers a weekly summary of essential news of interest to active amateurs. It is available on the ARRL Web site and is sent free of charge to ARRL members via e-mail. The *ARRL Audio News* is compiled and edited from *The ARRL Letter* and is available on the ARRL Web site, via phone at 860-594-0384 and on more than 250 repeater systems around the world.

- **Ham Appointed Chief of Army MARS**: On September 25, veteran Army communicator Jim Griffin, KE7LJA, became Chief of the Army Military Affiliate Radio System (MARS). Major General Susan Lawrence, Commanding General of the 9th Signal Command (Army), named Griffin to succeed Stuart Carter; Carter has held the Chief's post since December 2006. MARS, the Defense Department-sponsored organization of Amateur Radio operators who volunteer for communications support in emergencies, is a component of the 9th SC (A). Before his appointment, Griffin served for two years as Deputy Chief of Army MARS, tasked with the responsibility for construction of its new gateway communications station at Fort Huachuca, Arizona.

- **IRCs — Out with the Old, In with the New**: It is now time to start dumping your old International Reply Coupons (IRCs): The *Beijing Model No 2* must be redeemed before December 31, 2009. According *QST*'s "How's DX" editor Bernie McClenny, W3UR, many QSL managers are now only accepting the new *Nairobi Model IRC*, so he advises that it is now time to start getting rid of the old IRCs and not get stuck with any. The new IRC, available in the US since September 10 costs $2.10 each in the US. For those in the US who will be exchanging the old version of IRCs for new ones, USPS Bulletin #22267 advises postal workers to tell customers "to exchange IRCs that expire on December 31, 2009 for the new IRC version (Item 330800) or for other postage stamps. Retail associates can exchange unused US-issued IRCs for $0.01 less than the value of the IRC. (The amount to exchange is the printed price of the IRC along with any additional postage affixed minus one penny.)" Many DXers use IRCs instead of cash when they send QSL cards. For more information on IRCs, see page 86 in the July 2009 issue of *QST*. QST

National Weather Service/ ARRL SKYWARN Recognition Day

The 11th annual SKYWARN Recognition Day (SRD) will take place on Saturday, December 5, 2009. This is the day that Amateur Radio operates from many National Weather Service (NWS) offices around the United States. The purpose of the event is to recognize Amateur Radio operators for the vital public service they perform during times of severe weather and to strengthen the bond between radio amateurs and their local National Weather Service office. The event is cosponsored by the American Radio Relay League and the National Weather Service.

Traditionally, hams have assisted the National Weather Service during times of severe weather by providing real-time reports of severe events and storm evolution. The assistance that radio amateurs provide to the NWS throughout the year is invaluable.

SKYWARN Recognition Day this year will be held from 0000 UTC to 2400 UTC on Saturday, December 5, 2009. (That means the event officially begins on Friday evening in the United States.) To learn more, check the NOAA Web site at **www.wrh.noaa.gov/mtr/hamradio**.

NOMINATIONS OPEN FOR 2009 INTERNATIONAL HUMANITARIAN AWARD

Nominations are open for the 2009 ARRL International Humanitarian Award. The award is conferred upon an amateur or amateurs who demonstrate devotion to human welfare, peace and international understanding through Amateur Radio. The League established the annual prize to recognize Amateur Radio operators who have used ham radio to provide extraordinary service to others in times of crisis or disaster. Please refer to **www.arrl.org/FandES/field/awards/humanitarian.html** for details, specific information and background on this annual award.

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

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

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

All nominations and supporting materials for the 2009 ARRL International Humanitarian Award must be submitted in writing in English to ARRL International Humanitarian Award, 225 Main St, Newington, CT 06111, USA. Nomination submissions are due by December 31, 2009. In the event that no nominations are received, the committee itself may determine a recipient or decide to make no award.

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

Winners of the 2008 ARRL Humanitarian Award were the amateurs of the Sichuan Radio Sports Association, the Chinese Radio Sports Association (CRSA) and the many Amateur Radio operators in China who assisted with communications support during the aftermath of the May 2008 earthquake in that country.

PUBLIC SERVICE HONOR ROLL CRITERIA EXPLAINED

Each month in *QST's* Field Organization Reports column, the Public Service Honor Roll (PSHR) recognizes the efforts of Amateur Radio operators who are active in many aspects of public service. This includes net operations, traffic handling, emergency operations and public service communication support. There are chances that you're already involved with some aspect of Amateur Radio that would apply to the Public Service Honor Roll (PSHR).

Take a look at these categories and descriptions to see where your Amateur Radio activities fit in. At the end of each calendar month, just add up your qualifying points. If it reaches the 70 point level (or more), you've qualified for the Public Service Honor Roll. Report the good news with your call sign and monthly PSHR point total to your ARRL Section Manager or Section Traffic Manger.

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

The ARRL section leaders, in turn, forward these reports to HQ so that staff members can prepare them for listing in the *QST* Field Organization Reports. The names of Section Managers are on page 16 of *QST* and at **www.arrl.org/sections**.

PSHR Categories

Category 1. Participation in a public service net — 1 point, maximum 40.

One example of a public service net is one that is regularly scheduled and handles Amateur Radio formal messages. There are many such public service nets: local and section nets that are affiliated with the National Traffic System (NTS); NTS region, NTS area and independent nets that handle messages. ARES, RACES or SKYWARN nets that meet on a regular basis would also qualify. Another example is when an NTS Digital Relay Station manually logs onto an automated digital system. This action, too, qualifies under the intent of PSHR Category 1.

Category 2. Handling formal messages (radiograms) via any mode — 1 point for each message handled; maximum 40.

The ARRL's *Public Service Communications Manual* explains how to count your individual messages in Section 2, NTS Chapter 10.2. (You may find the entire manual at **www.arrl.org/FandES/field/pscm**.)

Category 3. Serving in an ARRL-sponsored volunteer position: ARRL Field Organization appointee or Section Manager, NTS Net Manager, Transcontinental Corps (TCC) Director, TCC member, NTS official or appointee above the Section level — 10 points for each position; maximum 30.

ARRL Field Organization appointees (in alphabetical order) include the following: Assistant District Emergency Coordinator, Assistant Section Emergency Coordinator, Assistant Section Manager, Bulletin Manager, District Emergency Coordinator, Emergency Coordinator, Local Government Liaison, Net Manager, Official Bulletin Station, Official Emergency Station, Official Observer, Official Observer Coordinator, Official Relay Station, Public Information Coordinator, Public Information Officer, Section Emergency Coordinator, Section Manager, Section Traffic Manager, State Government Liaison, Technical Coordinator and Technical Specialist.

The Section Manager is the ARRL member-elected League official in the section. An NTS official or appointee above the Section level would include Region and Area Net Managers and TCC Directors who are in charge of organizing TCC membership rosters of operators who comprise the corps. TCC members are those operators who are assigned to relay traffic from one NTS area to another, conducting liaison with NTS nets to do so. NTS Members at Large, NTS Area Staff Chairs, NTS Area Digital Coordinators and Digital Relay Stations would also be included in this category.

GEORGE STONE, WB4CYV, AND DAVID PARRISH, KI4THY

Mike Boyea, KE4KMG (left), is interviewed by Lelan Stratom of News Channel 5 of Nashville. In the spring of 2009, members of Middle Tennessee Amateur Radio Society and the Middle Tennessee SKYWARN helped program weather alert radios for the public.

Category 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 earns the participant 5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies.

Category 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. The participant earns 5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.

This category recognizes an Amateur Radio operator who is directly involved in an actual emergency operation. This includes the operator who is on the scene or out in the field, in the shelter, at the emergency operations center, at the hospital or other served agency's headquarters, or their temporary command center.

If you are an active participant in an unplanned incident —in other words, an emergency operation — you may take credit for this participation even though you may not be physically at the emergency scene.

Category 5 covers all the Amateur Radio operator participants such as net controllers, net liaison stations and other radio amateurs who support communications in unplanned incidents. Even if you are not actually on the emergency scene or at the shelter, etc, but are spending time and efforts for supporting the same emergency communication effort, then this time would count for points in Category 5.

Category 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.

Category 6(a) recognizes the efforts it takes to provide and maintain an automated digital system (like a packet bulletin board or a PACTOR system) that handles ARRL radiogram-formatted messages.

Category 6(b) recognizes that Web pages and e-mail list servers have become popular and effective ways to communicate news and information to the community of radio amateurs who are involved in emergency and public service communication operations and preparedness.

If you are involved in any of these activities, keep track of your efforts and the time involved and report your results accordingly. If you qualify for PSHR twelve (12) consecutive months, or 18 out of a 24 month period, you are eligible for a one-time certificate from ARRL Headquarters. Please write (and include a list of qualifying months) to Steve Ewald, WV1X, in care of ARRL Headquarters. As an additional reference, check **www.arrl.org/FandES/field/pshr**. QST

Team USA at the 2009 World High Speed Telegraphy Championships

Ken Low, KE3X

Team USA at the 8th HST IARU World Championships (left to right): K3ODY, KE3X, W2UP, W5ZL and KE7OPG.

The 2009 World High Speed Telegraphy (HST) Championships were held September 11-15 in Obzor, Bulgaria. While HST has historically been an Eastern European sport, teams from several new countries, such as Mongolia, entered this year; after an absence of several years, the United States returned to the competition. Team USA fielded a five person team led by captain Barry Kutner, W2UP. Ilya Kleyman, KE7OPG; Gary Schmidt, W5ZL; Kody Low, K3ODY, and myself rounded out the team. Barry and Ilya were returning to HST competition for the second time, but for the rest of us it would be our first experience.

An HST competition is divided into three types of events — Transmitting, Receiving and Practicing Tests — held over a two day period. Competitors are divided into five age groups; both the Men's and Women's divisions have Under 16, Under 21, Under 40 and Over 40 divisions, plus an additional Over 50 division on the Men's side. Each country can field up to two competitors per division, for a total of 18 competitors.

Day 1: *MorseRunner* and Transmitting

The competitions began on Saturday morning. Barry and Gary headed off to their Receiving Tests, while Ilya, Kody and I were assigned the same bracket and drew *MorseRunner*, one of the Practicing Tests, as our first event. HST contestants use "HST Mode," where a pileup of four stations is continuously calling. After you log a station, another one immediately arrives to replace it. This would be ideal, of course, if all four were always perfectly spaced out by 150 Hz and had different call sign lengths, but of course it's never that simple.

Perhaps due to our backgrounds in CW contesting, *MorseRunner* turned out to be the best event for Team USA. Barry took the silver medal in Category I while Ilya and I posted the second and fourth best scores in a tight Over 40 class where seven competitors scored in a 150-point range. But all our efforts were dwarfed when Bulgarian Ilya Getzov, LZ4UU, blew away the previous world record with an unbelievable 4330 points. That's 72 QSOs in a 10 minute period at an average of 60 words per minute, or about 8 seconds per QSO at a rate of 430 per hour, all copied through nonstop four-station QRM!

Our next event was Transmitting (TX), at which I thought: "This will be easy, I've been sending CW since I was 12 years old — piece of cake." In Transmitting, the objective is to send as many 5-character "groups" as possible in 60 seconds. You do this three times in a row for Letters, Figures and Mixed Characters, where Mixed means all the letters, figures *and* five punctuation marks. If you make an error — and with three International Class Referees staring at you, you surely will — you have two options: You can either send 6 "dits" and repeat the group, or you can accept a 5 percent score reduction and keep going. But there's a catch: After three uncorrected errors, your run ends, even if the 60 seconds aren't up yet.

I got through my Transmitting Letters and Mixed well enough, but in Figures I ran into a brick wall labeled 97567. Sending at a "conservative" 48 words per minute, I left off a single "dit" on the last 7. Okay, no problem, I'm only 18 seconds into the run, and I don't want to burn a 5 percent penalty too early, so I'll just repeat it. Second try: same error again, last digit! Now it's crunch time: Do I take the 5 percent penalty and keep going? No, stay cool, let's try one last time. Third time: Different error, same digit. Those 10 seconds would cost me a full place in the overall standings. Noting my sheepish expression after the run, one of the referees offered gently but matter-of-factly: "Rookie mistake using the dual-lever paddle, kid: The pros use single-lever for Figures." Thankfully, Ilya captured the third medal for Team USA with scores of 220, 230 and 140 characters.

Day 2: *Rufz* and Receiving

Day 2 of the competition meant the second Practicing Test: *Rufz*. Pronounced "ruffs," it is short for *Rufzeichen-Hören*, which in German means "listening to call signs." At HST, you get two attempts to copy 50 call signs as accurately as possible, and the higher score counts. But here's the trick: If you get a call sign right, the speed increases, so the next call sign becomes harder to copy.

Fabian Kurz, DJ1YFK, from Germany came within 500 points of setting a new *Rufz* world record as he grabbed the gold medal with a score of 194,038. For the rest of us "mortals," that's an average of close to 800 characters per minute (CPM), or almost 200 words per minute across 50 call signs. To me, Morse code at 800 CPM sounds like a 20 millisecond burst of noise.

Finally, it was time for the Receiving (RX) tests. At an HST competition, the speeds start at 50 CPM and keeps rising in 10 character increments until it exceeds 300 CPM and the last competitor throws in the towel. In this event, Ilya won a bronze medal, while Barry got a certificate for 6th Place.

Heading Home

On the final day, we had the final closing ceremonies and awarding of team medals and individual overall medals. Ilya picked up a bronze for the US in the Over 40 overall classification, raising the total Team USA medal count to five. No surprises on the team scores, as Belarus, Russia and Romania took home the gold, silver and bronze medals, respectively. Team USA placed 9th out of 14 teams — a respectable showing for our first real team effort, as we took home the first medals ever for any team outside Europe.

We saw that HST in Eastern Europe is popular for all the right reasons: It's fun, it develops concentration and mental stamina, it tests performance under pressure and it's implemented in a supportive team setting where the top talent can represent their countries on an international stage. All the competitors and referees were generous in their suggestions on how to improve our skill level. My favorite tidbit of advice? Becoming a World Champion is simple: Practice Morse code one hour per day, then repeat for 10 years. QST

This Month in Contesting

Sean Kutzko, KX9X
ARRL Contest Branch Manager, kx9x@arrl.org

WARM EVENTS FOR SOME HOLIDAY CHEER

Ah, December…the days are shorter, the air is colder, and the holidays make all of us harried and happy at the same time. While we all have responsibilities to family and friends during this time of year, there are also several on-air events that keep radio fun and exciting, even if we have limited time. Here's an extended "Sean's Picks" for December, to give you a taste of what you could be doing with your contest time this holiday season.

Of course, no December would be complete without the ARRL 160 Meter and 10 Meter Contests. Though we're still at the bottom of the sunspot cycle, 10 meters has surprises in store for us all the time. On many occasions, 10 is open, but everybody is waiting for somebody else to call CQ; therefore, no signals are heard. The weekend of December 12 is the time to get on 10 and make some noise. Make sure the Technicians in your local club get on and work this one. The 10 Meter Contest has been the impetus for many a license upgrade.

The 160 Meter Contest was what enticed me to get on the Magic Band for the first time. I had an Elmer back in Urbana, Illinois who told me to try this contest. "But I have no 160 antenna," I lamented. All I had was a barefoot rig and a 40 meter dipole up about 50 feet. My Elmer told me to use my tuner and load it up, and I would work people. Sure enough, I made about 300 QSOs in a casual effort. Yes, I had to retune it every few kHz, but I worked a lot of stuff, including New England and numerous stations on the West Coast. I even bagged KH6 and a couple of Caribbean stations with that arrangement. Help get the kids to bed, find something to load up and get on for this great event the weekend of December 5.

There are other events in the last month of the year that are worth investigating as well:

For more 160 meter fun, be sure to try the **Stew Perry Topband Challenge** December 26 and 27. Stew Perry, W1BB (SK) was known as "Mister 160" by many operators. This contest honors his legacy. It has a unique element: scoring is based on the distance of the QSO.

If you enjoy digital modes, or you've been wanting to try them, you have several options available to you in December. The **TARA RTTY Melee**, sponsored by the Troy Amateur Radio Association, is December 6. Everybody works everybody in this one.

The Feld-Hell Club sponsors a monthly Hellschreiber sprint. December's **Feld-Hell Sprint** will be December 17 from 1500Z-1700Z. Turn on your rigs and start printing those QSOs!

PSK was once the "new" digital mode. In fact, it's now been around for over a decade. Naturally, there are competitions for this mode. Perhaps the premier PSK contest is the **PSK DeathMatch**, sponsored by the Michigan DX Association. For 48 hours on December 12 and 13, stations all around the world will get their PCs and interfaces gassed up for the big event. Multipliers are States/Canadian Provinces/Countries per band. This is a fun event and does draw quite a bit of DX. If you've never made a PSK QSO, the DeathMatch is a good "learning" event. The prizes are tough to beat as well; if you do well, you can win a *real* sword! That would be handy for cutting through the QRM.

Finally, more PSK contesting can be had for some end-of-the-year cheer: The Penn-Ohio DX Society's **070 Club DX Scramble** will be on December 27. This QRP event is perfect for PSK, as you simply don't need that much power to run PSK. You will be surprised at what you can work with a mere 5 watts on PSK.

VHFers have the opportunity to test the limits of their stations with two events. The last leg of the **ARRL International EME Competition** takes place on the weekend of December 5-6. In case you haven't heard, you don't need a large, complicated station to work EME these days; using the WSJT software by K1JT, stations with 100 watts and a halfway decent beam can copy other stations off the moon, even without an elevation rotator! For more information, check out EA6VQ's Web site at **www.vhfdx.net/eme.html**.

WSJT can also be used for terrestrial QSOs, often using meteor-scatter propagation. The **North American VHF WSJT Geminids Contest** runs December 12-16, around the same time as the Geminids meteor shower (hence the name). This is an exciting way to make QSOs hundreds of miles away on the VHF bands. Technician class licensees are welcome to try this! Visit the WSJT Group's Web site at **www.ykc.com/wa5ufh/** for complete details.

HF QRPers have lots to do as well. There are no less than five QRP events this month, including the RU QRP club's **Wake Up! Sprint** (December 4 and 5), the Adventure Radio Society's **Spartan Sprint** (December 8),The Colorado QRP Club's **Snowshoe Run** (December 13), the QRP-ARCI's **Holiday Spirits Homebrew Sprint** (December 20) and the Flying Pigs' **Run For The Bacon Sprint** (December 21). These are great little events that don't take up much time and are loads of fun. Try them — especially if you only have a couple of hours to play radio.

Numerous holiday contests exist as well, including the Amateur Radio Lighthouse Radio Society's **Christmas Lights QSO Party** (December 19-January 3), The **RAC Winter Contest** (December 26), and the DARC's **Christmas Contest** (December 26). Lastly, you can ring in the new year with one of the great Amateur Radio traditions, ARRL's **Straight Key Night**.

While I've outlined numerous ways you can play radio during the holiday season, let's not forget the true spirit of the season. Let's all take a moment and be thankful for what we have today. Give back to your community in some fashion this season. An "attitude of gratitude" is especially important during the holiday season.

Wishing you peace, health and pileups.

In the November/December "Contesting 101"

Mistakes. The smart ones learn from their mistakes; the wise ones learn from the mistakes of others. Kirk Pickering, K4RO, gives you the top 10 rookie mistakes in contesting and how to avoid them. Contesting 101 can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Operating Tip of the Month

*"**'Performance Reviews.'** Take some time right after a contest to make notes of what worked well and what didn't. Did you change bands too early? Why? Did that new antenna make a difference? How? Did rearranging your desk make things more comfortable for you in your last effort? Constant, honest examination of your station will result in better performance next time, no matter what your level of competition."*

CONTEST CORRAL

in association with the *National Contest Journal*

DECEMBER 2009

Start and Finish	HF	VHF+	Contest Title	Phone	CW	Digital	Exchange	Sponsor's Web Site
Dec 3, 0000Z - Dec 3, 0600Z	1.8		Top Band Sprint		✘		RST, S/P/C, ARCI number or Power	qrparci.org/contests
Dec 4, 2200Z - Dec 6, 1600Z	1.8		ARRL 160 Meter Contest		✘		RST and ARRL/RAC section if US/VE	www.arrl.org/contests
Dec 5, 0000Z - Dec 6, 2400Z		50-1296	ARRL EME Competition	✘	✘	✘	Both call signs, sig rpt, acknowledgment	www.arrl.org/contests
Dec 5, 1600Z - Dec 6, 1800Z	3.5		Top Operators Activity Contest		✘		RST, serial, and TOPS/PRO number	www.procwclub.yo6ex.ro
Dec 5, 0000Z - Dec 5, 2400Z	1.8-28		TARA RTTY Mêlée			✘	RST and State/Province or serial	www.n2ty.org/seasons/tara_melee_rules.html
Dec 12, 0000Z - Dec 16, 0200Z		50-222	North American VHF WSJT Contest			✘	Both calls, grid square, acknowledgment	www.sportscliche.com/wb2fko/w09/rules_w09.pdf
Dec 12, 0000Z - Dec 13, 2400Z	28		ARRL 10 Meter Contest	✘	✘		RS(T) and State/Prov or serial	www.arrl.org/contests
Dec 12, 0000Z - Dec 13, 2400Z	28		28 MHz SWL Contest	✘	✘		Log ARRL 10 Meter Contest QSOs	swl.veron.nl/swlcontest.htm
Dec 12, 0000Z - Dec 13, 2400Z	1.8-28	50	PSK Death Match			✘	Name and S/P/C	www.mdxa1.org/deathmatch.html
Dec 12, 0000Z - Dec 13, 0200Z	1.8		Russian 160 Meter Contest	✘	✘		RS(T), serial, square ID (see Web site)	www.radio.ru/cq/contest/rule-results/
Dec 12, 1400Z - Dec 13, 1400Z	1.8-28		Croatian CW Contest		✘		RST and serial	www.hamradio.hr
Dec 12, 1700Z - Dec 13 1000Z	1.8-7		UBA Winter Contest	✘	✘	✘	RS(T) and UBA section or serial	users.telenet.be/on6ly
Dec 13, 2100Z - Dec 13, 2259Z	14		Great Colorado Snowshoe Run		✘		RST, S/P/C, class, CQC number or power	www.cqc.org/contests/snow2008.htm
Dec 19, 0000Z - Dec 20, 2400Z	3.5-28		OK DX RTTY Contest			✘	RST and CQ Zone	www.crk.cz/ENG/DXCONTE.HTM
Dec 19, 0000Z - Dec 19, 2359Z	1.8-28	50,144	RAC Winter Contest	✘	✘		RS(T) and province or serial	www.rac.ca
Dec 19, 0001Z - Jan 3, 2359Z	1.8-28	50,144	Lighthouse Christmas Lights QSO Party	✘	✘		Serial or ARLHS number	arlhs.com
Dec 20, 2000Z - Dec 20, 2400Z	1.8-28		Holiday Spirits Homebrew Sprint		✘		RST, S/P/C, ARCI number or Power	qrparci.org/contests
Dec 26, 0200Z - Dec 26, 0959Z	3.5-28		RAEM Contest		✘		Serial and lat/long in degrees	www.srr.ru/CONTEST/cup_raem_engl_07.php
Dec 26, 0830Z - Dec 26, 1100Z	3.5-7		DARC Christmas Contest	✘	✘		RS(T) and DOK or special station code	www.darc.de/referate/dx/fedcx.htm
Dec 26, 1500Z - Dec 27, 1500Z	1.8		Stew Perry Top Band Distance Challenge		✘		Grid square	jzap.com/k7rat/stew.rules.txt
Dec 27, 0000Z - Dec 27, 2400Z	14		070 Club QRP DX Scramble			✘	Call sign, first name, WR 100 entity	www.podxs070.com
Dec 31, 1700Z - Dec 31, 12 Mid	1.8-28		South Dakota QSO Party	✘	✘		RS(T) and SD county or S/P/C	www.w0blk.org
Jan 1, 0000Z - Jan 1, 2359Z	1.8-28	50+	ARRL Straight Key Night		✘		General QSOs	www.arrl.org/contests

All dates refer to UTC and may be different from calendar date in North America. Times given as AM or PM are local times and dates.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
No contest activity occurs on 30, 17, 12 meters. Serial = Sequential number of the contact. S/P/C = State, Province, DXCC Entity.
Publication deadline for Contest Corral listings is the first day of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

DECEMBER 2009 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 10 PM EST Friday, December 4 (0300Z December 5) and 9 AM EST (1400Z) Tuesday, December 15 (10-40 WPM). The West Coast Qualifying Run will be transmitted on 3581.5, 7047.5, 14047.5, 18097.5 and 21067.5 by station K6KPH at 2 PM PST (2200Z) Saturday, December 12 (10-40 WPM). Unless otherwise indicated, code speeds are from 10-35 WPM.

Take 77! Field Day 2009

A cast of thousands (37,592, to be precise) marched onto their FD sets June 27-28. It was no *Lost Weekend* for them.

Dan Henderson, N1ND
ARRL Field Day "Key Grip"

Reminiscing on the blockbuster movies from yesteryear and today, the thought crossed my mind that Field Day was not too different from most Hollywood productions. There are plot lines to follow…Actors to recruit…Deals to make…Locations to scout…Equipment to gather…Stories to tell…With the result being a feature worthy of acclaim within our own ranks as well as within the towns and communities where we reside because, to steal a line from *The Maltese Falcon*, Field Day is ***"The stuff that dreams are made of."***

ANDY VAVRA, KD3RF/VE2DXY

Field Day fun for three young aspiring hams as (from the left) Evan Pepper, Gary Pepper and Martin Kempisty make contacts on 20 meters under the watchful eyes of K3DN Warminster ARC's control operators.

It was almost as if Shoeless Joe in *Field of Dreams* had whispered, ***"If you hold it, they will come."*** Come they did, as Field Day 2009 set an all-time record for both number of entries received (2642) as well as number of participants (37,592). Maybe there was magic in the Iowa cornfields, the mountains of Colorado, the beachfronts in Hawaii, the thawing tundra of Alaska, or the city parks of New York. We should not be surprised, however, because Field Day traditionally has the largest participation of any Amateur Radio activity sponsored by the ARRL.

My favorite movie of all time — *Casablanca* — would well be represented in this script by saying ***"Of all the Field Day sites in all the towns in all the world, they walk into mine"*** when we talk about the online Field Day locator. In only its second year, a total of 1606 clubs, groups and individuals listed their sites, and it has turned out to be a popular tool for extending Amateur Radio's message and invitations to our towns, communities and friends.

After the months of planning and final hours of site work, the moment arrived where we could have "*Dirty Harry*" Callahan make the first QSO saying, ***"Go ahead, make my log."*** And make the logs they did, as participants reported 1,360,401 contacts. It is as if Norma Desmond walked right off *Sunset Boulevard* and said, ***"All right, Mr Maxim, I'm ready for my CQ."*** That's the most total contacts reported since 2002. Phone remains the most popular mode, accounting for 56.3% of all contacts. If Harry asks ***"You've got to ask yourself one question: 'Do you like CW? Well. Do ya, Hiram?'"*** the answer has to be a resounding "Yes" because the 556,525 CW QSOs are the most reported since before 1995, the earliest year for which we have complete QSO breakdowns. The 38,340 digital QSOs are again the most ever reported for Field Day. Leads one to borrow a line from the *Wizard of Oz* "***Hiram, I've got a feeling we're not on AM anymore."***

Mortimer, the well-loved nephew in *Arsenic and Old Lace*, could well have been talking about Field Day when he said, "***Insanity runs in my family. It practically gallops.***" Field Day sites in all 50 states, all 80 ARRL/RAC sections, as well as Mexico, Jamaica, Costa Rica and South Africa, witnessed the frenetic spirit in action. Whether

Top 10 Claimed Scores

Call Sign	Score	Class
W3AO	30,888	20A
K1R	20,562	5A
W6ZE	19,304	9A
W9CA	18,996	3A
W2RDX	18,614	3A
W6YX	17,448	4F
K2NJ	16,790	3F
K2ZR	15,150	2A Battery
K2AA	14,894	6A
W4IY	14,744	6A

Entries by Class

1A	173	20A	1	2E	28
2A	502	1B1	198	3E	18
3A	338	2B1	1	4E	9
4A	149	1B2	64	11E	1
5A	73	2B2	26	1F	36
6A	45	1C	56	2F	78
7A	21	3C	1	3F	50
8A	9	1D	371	4F	16
9A	11	2D	20	5F	13
10A	2	3D	6	6F	1
11A	1	4D	2	7F	2
12A	1	5D	1	10F	2
17A	1	1E	280	11F	1

Participation By ARRL Section

Section	Entries
AB	11
AK	9
AL	29
AR	23
AZ	51
BC	30
CO	56
CT	34
DE	7
DX	4
EB	23
EMA	27
ENY	27
EPA	79
EWA	21
GA	67
IA	29
ID	16
IL	90
IN	65
KS	36
KY	34
LA	21
LAX	36
MAR	11
MB	2
MDC	51
ME	16
MI	88
MN	60
MO	56
MS	18
MT	20
NC	73
ND	10
NE	14
NFL	37
NH	21
NL	3
NLI	27
NM	26
NNJ	41
NNY	7
NT	5
NTX	65
NV	17
OH	126
OK	33
ON	60
OR	52
ORG	45
PAC	7
PR	5
QC	25
RI	13
SB	17
SC	32
SCV	31
SD	10
SDG	27
SF	14
SFL	24
SJV	28
SK	4
SNJ	19
STX	61
SV	31
TN	62
UT	23
VA	75
VI	1
VT	16
WCF	23
WI	46
WMA	13
WNY	44
WPA	51
WTX	14
WV	13
WWA	60
WY	10

hosting local VIPs from government or served agencies, helping the local reporters get the right angles for the news reports, maintaining the generator or setting up for the covered-dish supper, the energy at a well run Field Day site reminds one of Audrey 2, the misbehaving space plant from *Little Shop of Horrors*. One can almost hear the constant refrain of ***"Feed me!"*** You do not need a director to shout "Action!"

The role of Field Day in introducing new operators and curious onlookers to Amateur Radio remains firmly in the grasp of the Get On The Air — GOTA station. A total of 470 groups included a GOTA station in their operation, which gives a completely new perspective to the movie *Look Who's Talking*. Between the GOTA station and youth bonus for young operators, many groups could well be paraphrasing the line from *The Blues Brothers* — ***"We're on a mission from Hiram."***

Similar to a Hollywood premier, Field Day sites across the lands roll out their own versions of the "red carpet" to welcome visitors. Mayors, city council members, members of Congress, state politicians, community leaders, representatives of served agencies…They all visit our sites and become "stars" for the moment. The goals of these visits are to grab their interest and to leave good impressions. To paraphrase Dorothy in *Jerry McGuire*, we want them leaving with the ***"You had me at CQ"*** mindset. The closest we have to paparazzi for Field Day is the ARRL Online Soapbox at **www.arrl.org/contests/soapbox/**. Select "2009 ARRL Field Day" and see the who-what-how's of 230 Field Day sites. It's not too late to add yours — after all, Hollywood is noted for sequels, prequels and remakes of past classics!

We all know Field Day is not a scored, adjudicated contest — it is an on-the-air operating event. As such, we do not declare winners. It works on the philosophy that all who participate end up with an experience that improves their knowledge and skills. Nevertheless, as you can see from the list of top ten claimed scores, it is as if Captain Renault, again from *Casablanca*, uttered his famous quote: ***"Round up the usual suspects."*** Congratulations to all participants and those who met their individual or group's goals.

And so it is time to put the wrap on another outstanding Field Day. However, it is a *Never Ending Story* really. While we are just getting ready for the festive holiday season, many groups have already started the preparations for not a rerun, but another remake of the classic *Same Time, Next Year*. I hope that on the weekend of June 26-27 we will not be recalling the prison captain's line from *Cool Hand Luke* — ***"What we have here is the failure to have sunspots to communicate."*** Instead, let's hope Field Day 2010 lets us see Rick and Captain Renault walking off while saying, ***"Hiram, I think this is the beginning of a beautiful weekend…"***

Scores

Class A stations are clubs or groups operating with three or more operators. Score listings are grouped according to the number of transmitters in simultaneous operation. The listings show club or group name, call sign(s) used, total number of QSOs, number indicating power output used (5 is less than 5 W, 2 is less than 150 W; 1 is more than 150 W), number of participants and total score including bonus points and ARRL section. Scores are listed from highest to lowest in each class. Class B stations are portables manned by one or two operators. When there are two operators, the other operator's call is listed in parentheses, if it is known. Class C stations are mobiles. Class D stations are home stations using commercial power. Class E stations are home stations using emergency power. Class F stations are EOC stations. Checklogs were either submitted as such or were reclassified because of incomplete/missing data.

1A

SPAWAR Team					
K6AM	3070	2	7	9,510	SDG
Gaither Mountain CC					
N5RR	2036	2	4	7,724	AR
WØICT	1784	2	6	7,338	KS
Bonfield Area Radio Fraternity					
K9TP	1715	2	4	7,116	IL
Rocky Mountain Telegraphers					
WØKV	1454	2	3	6,366	CO
Hoosier DX & Contest Club					
KJ9D	1328	2	14	6,112	IN
Tucson Tracon ARC					
WA7NB	2123	2	3	5,526	AZ
Robert F Heytow Memorial RC					
K9YA	1162	2	5	5,298	IL
Lafayette DX Assn					
W9LDX	1464	2	7	5,262	IN
WØGG	1278	2	3	5,262	CO
High Knob Trekers					
N4DD	1220	2	3	5,130	VA
Buckeye DX Club					
W8OS	1102	2	4	4,808	OH
Bozo and the Lids					
W9TG	992	2	4	4,700	IN
Emergency Mobile Communications Club					
W3USA	1236	2	3	4,480	OH
Neurosa's Gopher Munchers					
AE6C	985	2	4	4,410	SV
Big Hill ARC					
KØHP	936	2	3	4,292	SD
Metro DX Club					
W9TY	1077	2	7	4,264	IL
VE2FET	953	2	10	4,230	QC
Assn Radio Amateurs of So New England					
W1AQ	1352	2	22	4,072	RI
Case Western Reserve Univ ARC					
W8EDU	949	2	3	3,862	OH
Greer ARC					
W4IT	1053	2	20	3,774	SC
Fernando Amargura Radio Transmitting Society					
KL2AX	830	2	3	3,772	AK
Loop Group					
K4QXX	1052	2	17	3,508	WCF
Alberta Clippers					
VE6EX	783	2	5	3,448	AB
Albuquerque DX Assn					
W5UR	1168	2	12	3,286	NM
Dr Loomis Memorial Jr Mechanics League					
W3KDR	971	2	11	3,214	MDC
South Georgian Bay ARC					
VE3SGB	1110	2	5	3,170	ON
Garden State ARA					
K2USA	664	2	20	3,070	NNJ
Oconee Fire District 17 FD Group					
W9DC	704	2	5	2,958	SC
SHARK					
K5MV	570	2	35	2,696	STX
Newton ARA					
WØWML	477	2	10	2,678	IA
Murphy's Law					
K5QY	561	2	7	2,642	NTX
K9OM-K4NVZ Alternative Energy Co-op					
K9OM	572	2	3	2,618	IL
Jasper RC					
K4BEH	513	2	20	2,512	GA
Page Valley ARC					
K4PMH	682	2	8	2,444	VA
Athens Co ARA					
W8MHV	450	2	6	2,368	OH
Loudon Co. ARES					
W4FLO	539	2	14	2,358	TN
The 570-V Connection					
W3HGT	744	2	4	2,356	
NTX					
West Island ARC					
VE2CWI	507	2	31	2,348	QC
Central WI Radio Amateurs @ UWSP					
K9UW	801	2	9	2,310	WI
Southwest MS ARC					
W5WQ	642	2	25	2,234	MS
Parma RC					
W8PRC	487	2	16	2,204	OH
Conejo Wireless Society					
K6SB/7	523	2	3	2,174	NV
Benton ARS					
K5NE	528	2	13	2,174	AR
Bass Hill Repeater Group					
W1KX	552	2	6	2,166	ME
Western MI Portable					
W8A	782	2	3	2,134	MI
I Walton Portable Radio Operators Club					
K8JV	522	2	3	2,126	MI
IOOK Family Affair					
KN8J	457	2	3	2,078	WV
Sandia National Laboratories ARC					
W5MPZ	510	2	16	2,070	NM
Verde Valley ARA					
W7EI	892	2	38	2,034	AZ
Greater Lansing DX Group					
N8VYS	362	2	6	1,998	MI
Lanark-North Leeds ARES					
VE3LCA	381	2	11	1,978	ON
Owensboro ARC					
K4HY	397	2	9	1,944	KY
Dick Turrin Memorial RC					
W2IMU	451	2	4	1,906	SNJ
WPPS RADIO CLUB					
W7POE	313	2	3	1,902	MT
Bob Haley Memorial					
WB6CML	809	2	7	1,868	AL
LeFrog					
W9VBQ	615	2	10	1,852	WI
Juneau ARC					
KL7IG	584	2	17	1,828	AK
North East WY Contest Assn					
WY7FD	493	2	3	1,824	WY

SCVRA
KØCD 357 2 18 1,792 WI
North Augusta - Belvedere RC
K4NAB 299 2 15 1,758 SC
Liebert ARC
KJ8G 701 2 6 1,752 OH
Union Metropolitaine des Sans-filistes de Montreal
VE2UMS 306 2 25 1,734 QC
Hot Springs Village ARC
K5ID 326 2 20 1,732 AR
Morris RC
W2YD 347 2 9 1,686 NNJ
Pilgrim Amateur Wireless Assn
KA1GG 536 2 15 1,622 EMA
The Alaskhams
KL7Y 1222 1 3 1,592 AK
W7VNE 469 2 6 1,588 MT
Greenwood ARS
W4GWD 316 2 24 1,586 SC
Marshall Co ARC
WØGCJ 300 2 14 1,554 KS
Team Zone 2
VA2ZM 696 2 3 1,552 QC
Southern Plains Amateur Radio Klub
WØQS 461 2 22 1,546 KS
WO9Z 685 2 3 1,520 IN
Stanly Co ARC
K4OGB 333 2 26 1,472 NC
ARC of the Univ of Arkansas
K5GOE 288 2 24 1,452 AR
Nanaimo ARA
VE7NA (+VE7TUB)
319 2 29 1,410 BC
LOWARS
VE3JJF 370 2 7 1,400 ON
eXtreme DX ARC
VE2XDX 403 2 10 1,390 QC
Monroe ARC
WZ4V 358 2 23 1,370 TN
Bitterroot ARC
W7FTX 281 2 6 1,336 MT
West Nodaway Radio Group
WØWNR 304 2 6 1,278 MO
TERAC
K7AUO 522 2 3 1,246 WWA
Three Manly Men
K3TN 329 2 3 1,198 MDC
Vaca Valley RC
W6VVR 191 2 10 1,192 EB
Naval Research Lab ARC
W3NKF 230 2 7 1,190 MDC
Fort Saskatchewan ARC
VE6CJ 511 1 3 1,172 AB
Flint ARC
KBØVAC 189 2 6 1,164 KS
Amargosa ARC
N7TP 307 2 8 1,164 NV
Ogdensburg ARC
K2RUK 226 2 12 1,162 NNY
York Co Contesters
W4YCC 387 2 5 1,150 OH
Smoky Mountains AR Team
N4GSM 197 2 5 1,144 NC
Mountain ARC
W6BW (+KG6UDT)
174 2 12 1,048 SJV
MIT Radio Society
W1MX 299 2 6 1,048 EMA
K6KR 229 2 3 1,040 WWA
Skyline ARC
W7DHH 450 2 14 1,000 UT
Parkersburg Amateur Radio Klub
N8NBL 343 2 32 936 WV
Manson Field Day
W7CH 209 2 4 926 EWA
Socorro ARA
W5AQA 296 2 8 912 NM
NK5O 228 2 6 904 NTX
Greater Montgomery Beer Chowder & Propagation Soc
W3ZZ 306 2 3 898 MDC
Bawating ARG
VE3LSC 185 2 8 872 ON
N5PJ 150 2 3 870 OK
Military Magazine ARC
W6MIL 356 2 3 862 SV
Anoka Co RACES
WØANA 96 2 15 842 MN
New Kent 4 DStar
NK4DS 115 2 5 820 VA
AE5IC 176 2 5 810 NTX
3 Amigos
N4HGS 265 2 3 780 KY
JJ & V Contesters
WAØVPJ 336 2 3 774 MN
Lubbock ARES
W5LBB 206 2 28 764 WTX
Tidelands ARS
K5BS 139 2 35 748 STX
The Motley Crew ARC
W9EJ 71 2 11 742 IL
W8SWS 80 2 30 740 OH
Lapeer Co ARA
W8LAP 182 2 9 734 MI
VFW Post 3115 ARC
WØVFW 287 2 3 724 CO
Costa Rica DX Group
TI5A 306 2 3 712 DX
Allen Parish ARES
W5ELM 77 2 15 704 LA
Ogle Co. ARES
W9GD 197 2 7 694 IL
Peterborough ARC
VE3RB 209 2 12 668 ON
NCG
AC7FT 196 2 3 666 OR
Williston Basin ARC
KØWSN 45 2 4 640 ND
Texins ARC
K5DM 239 2 11 628 NTX
Schaeffer Academy ARS
WØSAA 122 2 3 604 MN
K.A.R.O. XYL
N3ELI 82 2 8 564 WPA
Hickory Corners Engineering Society
W8JGC 171 2 5 542 MI
Henry Co. Ohio ARC
K8TII 108 2 11 536 OH
MARA Net
AC7R 52 2 34 534 AZ
Brampton Amateur Radio Federation
VE3VDN 85 2 4 518 ON
Foothills ARC
W3LWW 107 2 22 516 WPA
Rockbridge River Ratz
WD8MQN 99 2 12 512 VA
WA1HRE 143 2 4 498 CT
DeForest ARC
K8GE 40 2 9 480 OH
Merriman Ham Radio Group
KD7EHB 192 2 3 454 OR
W7IS 75 2 3 450 EWA
Northern MI ARES
NM8ES 36 2 12 436 MI
Ellicott ARC
KDØCPA 125 2 4 420 CO
Allen Brook Group
N1DIQ 133 2 3 416 VT
Lillian ARG
K4DEY 45 2 8 380 AL
Montgomery Co ARES
K8MCA 42 2 9 374 OH
Crossover Ham Group
KA3UOL 132 2 3 364 WPA
Kluender ARC
W9JFK 57 2 3 336 MI
NKDXE
WA4ZKO 64 2 3 328 KY
Northern Chautauqua ARC, Inc
W2SB 98 2 10 296 WNY
IARC
AB8SI 5 2 3 260 OH
Arid Achers Ranch
K5TRW 61 2 10 242 WTX
Fox Valley Contest Club
NJ9H 45 2 4 240 IL
Mayerthorpe Flying Tigers
VE6FT 34 1 10 234 AB
N2JFS 25 2 3 200 VT
Terrace PREOC
VE7NWZ 18 2 8 186 BC
Lower Yellowstone ARC
W7DXQ 20 1 3 120 MT

1A Battery

HDW QRP Club
W5YA 968 5 6 10,425 NM
Chew's Ridge Gang
K6MI 751 5 6 8,420 SCV
Manti CC
NC7X 619 5 4 7,040 UT
Bear Mountain QRP Group
WA5Y 525 5 10 5,575 NM
Southwest OH DX & QRP Assn
AE8M 552 5 4 4,990 OH
QCWA Fresno Chapter 213
W6GV 387 5 3 4,220 SJV
The Hapless Dinks
K1SWL 290 5 3 3,400 NH
Hawaii QRP Club
KH6AA 223 5 16 2,980 PAC
Minnesota QRP Society
WQØRP 233 5 19 2,955 MN
Hiawatha / Falls City ARC
KØJKS 261 5 22 2,465 KS
Albany ARC
KK4PQ 161 5 4 1,505 GA
ARC Sorel / Tracy
VE2CBS 116 5 10 1,340 QC
Green Mountain Boys
WA1QGC 99 5 3 1,185 VT
Solder Monkeys
W7FC 59 5 8 840 OR
KE2UK 129 5 3 820 NLI
Club Radio Amateur St Hyacinthe
VE2CAM 34 5 5 535 QC

1A Commercial

Callaway ARL
KSØB 350 2 8 1,750 MO
K5PN 452 2 30 1,514 MS
Treaty City ARA
W8UMD 859 1 22 1,447 OH
CRALL
VE2CRL 345 2 18 1,016 QC
Pathfinders ARC
VA4PAR 204 2 15 598 MB
Macon ARC
W4BKM 55 2 15 160 GA
Operators of Portable Radio Equipment
K7RLL 52 2 3 104 VA
NØDLM 26 2 3 102 AZ

2A

W1MOO (+W1ARF)
4211 2 18 14,306 VT
Radio Amateurs of Northern VT
W1NVT (+W1PU)
4411 2 32 13,294 VT
Buckhead Contest Club /Southeastern DX Club
W4TE (+W4KJ)
3616 2 8 12,216 GA
Raytown ARC
KØGQ (+KCØMO)
3211 2 61 11,914 MO
Minnesota Wireless Assn
WØAA (+KL7YL)
2833 2 11 11,230 MN
Batesville ARC / NCAARS
NG5M (+K5UZ)
3454 2 25 10,996 AR
McMinn Co ARC
NA4K (+K4BP)
3168 2 26 10,630 TN
Tilson Contest Group
K5WA (+KD5HHD)
2811 2 8 10,282 STX
W6KB (+W6PZ)
3041 2 21 10,010 SF
EMARC / TAC
K8EPV (+K8FGL)
2240 2 15 9,982 MI
TX AR Rescue Group
K5LFD (+WR5W)
3036 2 38 9,942 NTX
Decatur ARC
W4ATD (+KB4CAY)
3143 2 20 9,922 AL
The Sakonnet 49'ers
W1LY (+K1TZQ)
2944 2 29 9,860 RI
Central VA Contest Club
W4ML (+W4PM)
2635 2 50 9,706 VA
Saratoga ARA
K6SA (+K6NN)
2802 2 41 9,458 SCV
Mother Lode DX/Contest Club
K6NV (+K6BSA)
2302 2 27 8,982 SV
Randallstown ARC
N3IC (+K3MZ)
2612 2 13 8,968 MDC
Canton ARC
W8AL (+N8YB)
2283 2 30 8,956 OH
Falmouth ARA
K1RK (+W1HQH)
2657 2 65 8,924 EMA
The Redneck Riviera Radio Sport Models
K4F 2937 2 8 8,654 NFL
CARS
K4M (+W4PQ)
2449 2 15 8,352 NC
Stones River ARC
K4FUN (+K4CM)
2065 2 42 8,290 TN
MARC
KK5I (+K5ZEP)
2225 2 25 8,154 OK
Boulder ARC
WØDK (+NØTA)
2408 2 25 8,036 CO
Northern OH DX Assn
W8DXA (+NO8DX)
2515 2 31 8,000 OH
Pacific Co ARC
W7R (+K7KID)
2116 2 39 7,986 WWA
Valley and Massanytten ARA
W4XD (+K4MRA)
2343 2 84 7,914 VA
Texas DX Soc
K5DX (+N5UR)
1976 2 38 7,904 STX
Tampa ARS
N4TP (+N4SEX)
2102 2 35 7,700 WCF
Sudbury ARC
VE3ZI (+VE3BLZ)
1781 2 15 7,542 ON
Big Bend ARC
K5FD (+AD5BB)
1992 2 14 7,414 WTX
N9RJV (+KC9NXC)
1890 2 44 7,216 IL
N4PY 1946 2 4 7,214 NC
Ski Country ARC
KØRV (+WWØAL)
2109 2 41 7,126 CO
Santa Barbara ARC
K6TZ 1784 2 28 7,090 SB
Harvard Wireless Club & Friends
W1AF 1794 2 7 7,080 WMA
Indianapolis RC
W9JP (+W9RCA)
2267 2 40 6,798 IN
Oregon High Desert CC
K7AW 1749 2 5 6,798 OR
Lake Co ARC
W9LJ (+W9EMA)
1759 2 32 6,788 IN
W8MRM (+W8GTZ)
1788 2 77 6,770 MI
W/K ARC of Greater Milwaukee
N9AW 1725 2 11 6,758 WI
Lakes Region Repeater Assn
W1UR (+W1BST)
2272 2 7 6,726 NH

NELS, ANDERSON, K1UR

K1UR plus K1NR operated mobile from K1UR's 1963 Land Rover in Maine.

Mesa Marauders
W7UT 2216 2 5 6,670 UT
Cape Fear ARC
K4MN (+KI4WOH)
1853 2 20 6,670 NC
Wayne ARC
W8AV (+N8IW)1895 2 13 6,642 OH
Explorer Post 599
WA2DFI (+W7BSA)
2006 2 22 6,616 AZ
Kanawha ARC
W8GK (+W8SI)
1862 2 36 6,608 WV
Sarasota ACS/FCG
WC4EM (+NE4AA)
1942 2 25 6,292 WCF
Three Guys & A Girl
WN6K 2001 2 4 6,180 SDG
Escondido ARS
N6SD (+N6WB)
1803 2 50 6,170 SDG
JPLARC / CITARC
W6VIO (+W6UE)
1833 2 25 6,156 LAX
Anderson RC
N4AW (+N4SBA)
1514 2 18 6,116 SC
Johnson Co RAC
WØERH (+WAØLKQ)
1719 2 52 6,060 KS
Motorola ARC
K9MOT (+K9QI)
1534 2 25 5,982 IL
Williamsburg Area ARC
K4RC (+NR4C)
1460 2 23 5,726 VA
Meriden ARC
W1NRG (+KB1SIT)
1442 2 25 5,684 CT
KØLIR 1586 2 28 5,630 MO
Madera Co ARC
WF6G (+WD6FF)
1551 2 16 5,628 SJV
Scorpian Ranch Hands
WS4Y 1792 2 7 5,588 KS
Central Oregon DX Club
N7LE 1497 2 12 5,538 OR
Mid-MO ARC
NØSS (+KØETY)
1275 2 40 5,524 MO
Minden ARA
N5RD (+KA5KBP)
1608 2 18 5,428 LA
Philips ARC
W1HP (+KD1NA)
1320 2 15 5,426 EMA
Tennessee Valley DX Assn
W4PL (+WA4AA)
1415 2 54 5,424 TN
Williamson Co ARC
WC5T (+N5TW)
1230 2 32 5,382 STX
C3i AR Group
AC4XQ (+WJ4N)
1425 2 39 5,312 SFL
The Purveyors of Doom
W9UFO (+W9VW)
1752 2 9 5,236 NM
Twin Cities Repeater Club
WØBU (+WBØJMG)
1255 2 35 5,068 MN

Candlewood ARA
W1QI 1442 2 30 5,044 CT
Utah ARC
W7SP (+N7OVG)
1343 2 54 5,014 UT
Harris-Intersil ARC
K4HRS (+KG4KFF)
1129 2 23 4,940 SFL
Montrose ARC
KØIIT (+KCØQXX)
1421 2 49 4,892 CO
MARCA
W7MOT (+WA7ZQK)
1488 2 20 4,884 AZ
Crawford ARS
W3MIE (+N3QQH)
1266 2 45 4,874 WPA
Koolau ARC
KH6J 1271 2 35 4,848 PAC
South Lyon Area ARC
N8SL (+KD8BLR)
1249 2 22 4,806 MI
ARESLAX NW and SW
N6HD 1450 2 35 4,790 LAX
Arkansas River Valley ARF
K5PXP (+KE5EBC)
1178 2 33 4,788 AR
Souris Valley ARC
KØAJW 1323 2 10 4,764 ND
Heart O' Texas ARC
W5ZDN (+W5TSA)
1180 2 35 4,756 NTX
NN5Z 1141 2 7 4,702 OK
VE7RAR (+VA7XP)
985 2 26 4,700 BC
Lynchburg ARC
K4CQ (+KI4MFX)
1091 2 30 4,676 VA
Fresno ARC
W6TO 1313 2 14 4,616 SJV
Stonewall Jackson ARA
K8DF (+K8TPH)
1507 2 29 4,538 WV
Kishwaukee ARC
WA9CJN (+N9RFR)
1056 2 27 4,516 IL
Cedar Valley ARC
WØGQ (+WØMRZ)
1131 2 57 4,472 IA
Delaware ARA
N9N (+W9DUK)
974 2 45 4,470 IN
Eau Claire ARC
W9EAU (+W9E)
1363 2 30 4,442 WI
Ellsworth Amateur Wireless Assn
W1TU (+KB1NEB)
1065 2 17 4,442 ME
Marietta ARC
W8HH 1179 2 12 4,432 OH
South Baldwin ARC
AF4I 1164 2 36 4,342 AL
New Providence ARC
N2XJ 1208 2 27 4,338 NNJ
Mountaineer ARA
W8SP 1191 2 26 4,336 WV
Waltham ARA & Clay Center ARC
W1CLA (+W1MHL)
999 2 24 4,316 EMA
Northwest ARS - Houston
W5NC (+KE5IOV)
1084 2 35 4,308 STX
Bristol Co Repeater Assn
W1ACT (+N1JOY)
1275 2 29 4,308 EMA
Ottawa ARC
VE3RC 1032 2 55 4,304 ON
Tri Co Amateur Radio Club
W9MQB (+WB9TVY)
1095 2 11 4,300 WI
Ashe Co ARC
W4FD (+W4APP)
898 2 29 4,292 NC
Hancock ARC
W9ATG (+N9TT)
1153 2 32 4,248 IN
Des Moines Radio Amateurs Association
WØAK (+WØSCI)
915 2 45 4,204 IA
Hospital Disaster Support Comm System
N6ER (+W6DQ)
1098 2 81 4,192 ORG
Tipton Co ARS
N4ZI (+KJ4GZB)
976 2 12 4,176 TN
Monroe Co Radio Communications Assn
W8PI (+W8DWL)
1129 2 6 4,056 MI
Prime ARA
K9JHQ 1095 2 15 4,002 IL
Palos Verdes ARC
K6JW 1274 2 20 3,930 LAX
Fond Du Lac RC
W9EBV 1007 2 40 3,912 WI
Green River Valley ARS
K9WM 1009 2 22 3,894 IL
Pen Bay ARC
W1PBR 770 2 13 3,834 ME
Hambuds
KA5E 1158 2 21 3,828 STX
WB2QBP (+K2ARC)
1411 2 15 3,792 NLI
OH-KY-IN ARS
K8SCH (+N8YC)
873 2 37 3,774 OH
Johnson City ARA
W4ABR 784 2 30 3,760 TN
San Mateo RC
W6UQ (+W6TUK)
1014 2 15 3,724 SCV
Montgomery ARC
W4AP (+KV4AC)
982 2 65 3,686 AL
Yonkers ARC
W2YRC (+KF2FK)
787 2 68 3,660 ENY
Skyview RS
AB3ER (+N3TIN)
759 2 37 3,654 WPA
East Greenbush ARA
W2EGB (+K2CK)
1229 2 50 3,636 ENY
Kent Co ARC
W3HZW (+AA3ZH)
735 2 58 3,626 DE
8 Rivers ARC
KW8V 1036 2 8 3,584 WV
Know Hill Krew
N5WLA 886 2 8 3,582 NTX
Fort Madison ARC
WFØRT (+NWØX)
761 2 19 3,568 IA
NERC
K3A 1028 2 6 3,518 EPA
SCHUYLKILL
W3SC (+W3EEK)
819 2 17 3,502 EPA
Valencia Co ARA
K5OUR (+KC5OUR)
715 2 107 3,472 NM
Randolph Co ERC
K4RAN (+KI4WIQ)
1093 2 10 3,456 AL
Big Island ARC
KH6EJ 781 2 37 3,430 PAC
Iowa City ARC
WØJV (+WØIO)
994 2 14 3,380 IA
DLARC
W3OK 1295 2 11 3,308 EPA
Hanover Area Hamming Assn
KF3M 1017 2 13 3,304 EPA
Massillon ARC
W8NP (+W8DEF)
765 2 25 3,282 OH
Anchorage ARC
KL7AA 1293 1 42 3,275 AK
Heartland DX Assn
NIØDX 1021 2 10 3,274 NE
East Coast Long Wire Assn
KC2SHB (+KC2DUX)
641 2 17 3,184 SNJ
Tippecanoe ARA
W9REG (+WB9SWD)
559 2 55 3,120 IN
Fox Cities ARC
W9ZL 765 2 35 3,104 WI
Garland ARC
K5QHD 548 2 48 3,096 NTX
South Towns ARS
WB2ELW 732 2 30 3,080 WNY
Jackson Co ARA
N5OS (+K5DXG)
634 2 73 3,072 MS
Long Island Mobile ARC
W2VL (+WV2LI)
666 2 86 3,018 NLI
Franklin Co ARC
AI4RT 671 2 21 3,006 NC
Wilson Creek Special Event
N7T 642 2 5 2,994 EWA
CTRI Contest
WA1RR 922 2 12 2,974 RI
Harrisburg Radio Amateur's Club
W3W 693 2 20 2,954 EPA
Pine State ARC
N1ME 817 2 32 2,938 ME
South Bay ARA
KU6S (+AE6YN)
1355 1 50 2,901 EB
Goddard ARC
WA3NAN (+W3IUI)
855 2 9 2,894 MDC
Univ of Mississippi ARC
W5UMS (+KE5YCM)
642 2 18 2,882 MS
Six Meter Club of Chicago
K9ONA 642 2 17 2,842 IL
Rockingham Co ARC
N4IV (+W4SH)
592 2 16 2,824 NC
Orleans Co ARC
WA2DQL (+KB2BLS)
690 2 33 2,804 WNY
Carbon ARC
W3HA 740 2 10 2,792 EPA
Charlestown ARES
KA1RI (+N1UIL)
527 2 22 2,788 RI
Northeast Tarrant ARC
N5EOC (+KI9U)
490 2 25 2,772 NTX
Tyler ARC
K5TYR (+W5ETX)
622 2 55 2,752 NTX
Peekskill / Cortlandt ARA
W2NYW 694 2 10 2,746 ENY
The Villagees ARC
K4VRC (+KI4DYE)
552 2 43 2,740 NFL
Kingsport ARC
W4TRC 1132 2 25 2,714 TN
Irvine Disaster Emergency Communications
N6IPD (+K6NL)
738 2 32 2,708 ORG
West Allis RAC
W9FK 747 2 21 2,702 WI
Delaware Valley Radio Assn
W2ZQ (+KB2SYB)
498 2 32 2,694 SNJ
N9PS Field Day Group
N9PS 683 2 12 2,692 IL
Bloomington ARC
K9DIY (+K9SOU)
556 2 81 2,678 IN
Newton and Hesston College ARC
NØNK (+NØLQT)
616 2 12 2,658 KS
EPCOM
VE7PCE (+VA7PCE)
801 2 25 2,652 BC
Paso Robles ARC
W6R (+N6KKS)
1130 1 25 2,641 SB
Reno Co ARA
WØWR (+WBØEOC)
573 2 13 2,608 KS
Rowan ARS
N4UH 562 2 22 2,584 NC
NA1RA (+WJ1D)
826 2 10 2,570 CT
Horned Toad Acres Wireless Assn
N7KQ 767 2 12 2,566 AZ
Holy Family School ARC
KØG 1045 2 10 2,510 CO
Muscatine ARC
WØM (+KCØAQS)
812 2 14 2,492 IA
Keowee-Toxaway ARC
K4WD (+KS4YX)
716 2 37 2,484 SC
Azalea Coast ARC
AC4RC 443 2 30 2,468 NC
Sturdy Memorial Hospital ARC
W1SMH 621 2 21 2,452 EMA
Surrey ARC
VE7SAR (+VE7GGD)
448 2 18 2,432 BC
Los Alamos ARC
W5PDO (+WD5JRO)
610 2 20 2,388 NM
Trojan ARC
WØWOB 473 2 5 2,386 KS
Vashon / Maury Island RC
W7VMI 500 2 37 2,376 WWA
Sierra Blanca ARC
KR5NM (+K5RIC)
466 2 12 2,352 NM
Putnam Emergency & Amateur Repeater League
K2PUT (+K2PC)
435 2 42 2,348 ENY
Derangers
N6MI 509 2 6 2,332 SCV
Fidelity ARC
W1MB (+K1NQG)
595 2 25 2,312 RI
SCCARA
W6UW (+W6UU)
567 2 22 2,312 SCV
Clark Co ARC
W9WWI (+N9UGP)
425 2 43 2,308 IN
Half Moon Bay ARES
WR6HMB 669 2 20 2,302 SCV
Yavapai ARC & Yavapai Co ARES / RACES
W7YRC 660 2 135 2,264 AZ
Penn-Mar RC
W3MUM 645 2 20 2,262 EPA
Casper ARC
W7VNJ 613 2 19 2,220 WY
Mich-A-Con ARC
KC8VC (+W8JWN)
469 2 15 2,212 MI
Mt Magazine ARC
W5MAG (+KD5NDJ)
799 2 10 2,208 AR
Grand Rapids ARA
W8DC 529 2 25 2,190 MI
South Kitsap ARC
N7IG (+N7CQ)
601 2 17 2,188 WWA
Mt Diablo ARC
W6CX 723 2 27 2,182 EB
Sonoma Co RA
W6SON (+W6LFJ)
487 2 35 2,174 SF
Brandon ARS
K4TN (+KC4MMR)
420 2 27 2,160 WCF
VE7UT 382 2 29 2,158 BC
Club Radio Amateur de Quebec
VE2CQ (+VE2CDX)
626 2 35 2,158 QC
Black Diamond RG
KX9M 398 2 16 2,112 WI
Shelby ARC / ARES of Cleveland Co
K4KUT (+W4PZH)
554 2 18 2,098 NC
Valley Baptist ARC
KD4HXT 725 2 12 2,090 SJV
Mecklenburg ARS
W4BFB 521 2 65 2,084 NC
VE3SAR 513 2 14 2,084 ON
Radio Operadores Del Este
KP3RE 350 2 30 2,078 PR
Prescott-Russell ARES Group
VE3PRV 509 2 12 2,074 ON
N4MI 429 2 19 2,066 VA
Tri State ARA
K3TSA 502 2 12 2,066 ENY
K7EUG 577 2 3 2,060 OR
Middle TN ARS, Inc.
W4UOT (+AJ4QR)
463 2 41 2,050 TN
Clarksville AR Transmitting Soc
KF4L (+KF4L)
403 2 12 2,034 TN
Mountain ARC
NXØG 528 2 14 2,030 CO
21 Repeater/Kenallville Contesters
N9VI (+K8IAT)
515 2 16 2,030 IN
Hidden Valleys ARC & UW-Platteville ARC
KC9KQ 374 2 29 2,020 WI
Newington ARL
NA1RL (+W1OKY)
654 2 30 1,998 CT
Olive Branch ARC
W5OBM (+N5PYQ)
375 2 22 1,986 MS
Green Valley ARC
WE7GV 369 2 47 1,974 AZ
Playground ARC
W4ZBB (+K4FWB)
401 2 16 1,972 NFL
Blossomland ARA
W8MAI (+W8KIT)
330 2 16 1,970 MI
Seattle Auxiliary Comm Service
W7ACS 271 2 35 1,966 WWA
AR Transmitting Society
W4CN 517 2 20 1,956 KY
Elliot Lake ARC
VA3TOP 326 2 21 1,944 ON
Metuchen RC
K2YNT 459 2 9 1,934 NNJ
KE5VSU (+AD5WA)
392 2 15 1,928 MS
GARS
W5BII (+K5BPA)
475 2 72 1,920 LA
Springhill ARC
N5II 475 2 7 1,918 LA
Starke Co ARC
W9JOZ (+KB9OLZ)
364 2 45 1,918 IN
Copper Counter Radio Amateur Assn
W8CDZ 486 2 3 1,914 MI
Whitley Co ARC
WC9AR 425 2 40 1,912 IN
Kings Co ARC
VE1LD 630 2 9 1,910 MAR
Vancouver Antenna Club
VE7MRP (+VA7PNP)
614 2 9 1,904 BC
W4RAT 724 2 10 1,898 VA
Egyptian RC
W9AIU 307 2 18 1,878 IL
Hiawatha Valley ARC
NØDH 508 2 36 1,878 MN
Englewood ARS
N4EAR 348 2 25 1,876 WCF
Tri-States ARC
W4GTA (+KI4TEY)
460 2 15 1,870 GA
Martin Co ARES / RACES
WX4MC (+K4ZK)
556 2 50 1,862 SFL
Club Radioamateur de Beauce
VE2CRB 377 2 11 1,830 QC
Runestone ARC
WØALX (+KØMHC)
235 2 15 1,826 MN
Ocoee ARS
W4OAR (+K4KFN)
309 2 16 1,822 TN
UCSC Hams
AC6P 634 2 8 1,818 SCV
Eastern Shore ARC
K4BW 351 2 40 1,814 VA
Lake Ozark ARC
NØZS 536 2 37 1,812 MO
Elllijay ARS
K4LDI 420 2 27 1,806 GA
Theodore Roosevelt ARC
KØND 448 2 24 1,786 ND
Northwest OH ARC, Inc.
W8EQ 348 2 11 1,782 OH
Irving ARC
N5BB 297 2 38 1,778 NTX
Muskingum Co ARES
KD8LGV 463 2 20 1,776 OH
Franklin Co ARC
AC1L (+KB1MSU)
319 2 25 1,770 WMA
South AL RC
WC4M 279 2 16 1,750 AL
Tamaqua Wireless Assn
W3CMA 404 2 22 1,750 EPA
Blackstone Valley ARC
W1DDD (+KB1RYT)
382 2 37 1,748 RI
Mooshorn ARC
AL7LE 341 2 26 1,744 AK

Zero Beaters ARC
WAØFYA 609 2 10 1,728 MO
SARES
K6SNY 273 2 44 1,710 SCV
Plattsmouth ARC
KBØSMX 274 2 18 1,708 NE
Yucaipa Valley ARC
K6YRC 385 2 19 1,694 ORG
ARA of Bremerton
W7VE 274 2 8 1,682 WWA
Bonac ARC
K2EC (+K2DQ)
561 2 24 1,674 NLI
Littleton Area Radio Klub
K1EME 241 2 11 1,670 NH
Coastside ARC
WA6TOW 444 2 28 1,664 SCV
NR9F 432 2 4 1,658 IN
Aeronautical Center ARC
W5PAA 262 2 34 1,654 OK
Suffolk Police ARC/HBO RC
WB2HBO 374 2 25 1,652 NLI
W5AUU 550 2 20 1,650 AR
Gallatin Ham RC
W7ED 549 2 23 1,648 MT
KBØTRU 329 2 5 1,640 NE
N4IQ 449 2 3 1,636 SC
Sand Hills ARC
WØMI 293 2 10 1,616 KS
Akron Area Simplex Group
AB8SX 422 2 4 1,612 OH
Huron ARA
WØNOZ (+KDØHJE)
308 2 15 1,596 SD
Arlington ARC
K5SLD (+W5JCK)
231 2 45 1,594 NTX
Borderline ARC
W7BAR 241 2 40 1,584 UT
Hellgate ARC
W7PX 180 2 35 1,580 MT
Iroquois Co ARC
W9RWX (+W9GRS)
172 2 31 1,578 IL
Lowcountry ARC
K4SVL (+KC4PPL)
341 2 12 1,572 SC
Pocatello ARC
N7PI 215 2 21 1,572 ID
Maple Valley ARC / Maple Valley ARES
KC7KEY 296 2 38 1,550 WWA
W6QET 416 2 10 1,540 LAX
W9AH 339 2 50 1,536 IN
Northwest Amateur Radio & Electronics
Assn
WØKE 467 2 23 1,528 MO
Michigan AR Alliance
W8USA 371 2 11 1,518 MI
Moreno Valley ARA
AB6MV (+KI6SOT)
357 2 30 1,514 ORG
Washington Area ARC
KCØSBF (+ABØDX)
266 2 20 1,510 IA
Southern KY ARS
KY4AR 369 2 29 1,508 KY
Ramapo Mountain ARC
WA2SNA 417 2 5 1,492 NNJ
North Country Arc
W2LCA 215 2 11 1,492 NNY
Ogden ARC
W7SU 610 2 10 1,470 UT
Mid-Atlantic ARC
W3NWA 234 2 25 1,464 EPA
Panoramaland ARC
K7JAR 174 2 31 1,454 EWA
Boca Raton ARA / FAU ARC
N4EN (+K4FAU)
270 2 18 1,454 SFL
Three Rivers ARC
WØEND 364 2 10 1,452 ND
NC4ML 178 2 15 1,446 NC
Shiawassee ARA
W8QQQ 272 2 10 1,434 MI
K7CCH 361 2 25 1,430 OR
ARA Bloomington
WCØAAA 287 2 25 1,424 MN
Navarro ARC
N5VO 217 2 27 1,420 NTX
W4RYZ (+AG4PZ)
266 2 32 1,402 NFL
Winona ARC
WØNE 207 2 21 1,382 MN
Santa Clarita ARC
W6JW (+N7TN)
264 2 30 1,378 LAX
Oroville ARS
W6AF 302 2 20 1,378 SV
Lincoln Co Volunteer Communications
NC4LC 255 2 34 1,360 NC
Westcoast ARA
VE7IYOA 252 2 6 1,356 BC
Utica ARC
K2IQ 198 2 5 1,356 WNY
DCS-22 Malibu
K6DCS 348 2 15 1,350 LAX
Alamogordo ARC
K5LRW 332 2 5 1,350 NM
Wattsburg Wireless Assn
K3WWA 202 2 29 1,348 WPA
Rockwall ARC
K5RKW (+K5RXQ)
201 2 41 1,344 NTX
ARC at UCF
K4UCF (+KG4YDW)
94 2 40 1,336 NFL
Indian Hills RC
W8DDD 245 2 7 1,336 OH
Laguna Beach EmComm Team(RACES)
N6L (+KE6GFF)
215 2 40 1,320 ORG
Bryan ARC
W5BCS (+N5SBN)
331 2 30 1,312 STX
No KY ARC / KY Dist 7 AR Emergency Team
K4CO (+KY7ET)
378 2 30 1,306 KY
Pahrump Amateur Radio Repeater Assn
K1NV 367 2 3 1,294 NV
Alger ARC
KC8BAN 311 2 25 1,292 MI
Sunset Empire ARC
W7BU 263 2 9 1,276 OR
K8CAD 334 2 17 1,270 MI
Em Com Assn
WØECA 109 2 5 1,268 MO
K3CAL (+N3IDX)
216 2 6 1,260 MDC
N4DBR 409 2 4 1,260 SC
San Jose State University ARC
W6YL 271 2 10 1,256 SCV
RADOPS of El Jebel Shrine
KØFEZ 293 2 14 1,244 CO
Somerset Co ARC
K3SMT 254 2 13 1,240 WPA
Shuswap ARC & North Okanagan RAC
VE7RAW 113 2 51 1,226 BC
Chautauqua Co Amateur FM Assn
K2HE 229 2 25 1,208 WNY
VE9MSR 260 2 3 1,200 MAR
Amherst U-U Hams
WB2VUO 234 2 7 1,198 WNY
Honeywell-Glendale ARC
K7HON 420 2 8 1,192 AZ
Pine Ridge ARC
WØFLO 236 2 17 1,192 NE
Palouse Hills ARC
W7NGI 370 2 10 1,190 ID
Manhattan Area ARS
KSØMAN 381 2 14 1,188 KS
Kootenai ARS
K7ID (+N7UTK)
247 2 4 1,174 ID
Everglades ARC
W4SVI (+WB4JFA)
210 2 24 1,170 SFL
Laredo Hams ARC
W5LRD 313 2 15 1,170 STX
KI6NSG 179 2 3 1,168 ORG
Discrete Components of 955
KC3AM 374 2 10 1,164 DE
Sooland ARA
KØTFT 225 2 24 1,162 IA
Renfrew Co ARC
VA3NRR 198 2 31 1,158 ON
Toronto ARC
VE3TNC 346 2 12 1,148 ON
The Bedrock Few
WA9JHH 174 2 3 1,142 IN
Wells Co ARC
W9SR 161 2 11 1,138 IN
WV Amateur Radio, Inc.
WV8AR 256 2 25 1,112 WV
Puerto Rico Amateur Radio League
KP4ES 49 2 31 1,110 PR
WØMRM 347 2 3 1,096 MO
Ste Genevieve DX & Contest Club
AJØW 80 2 3 1,072 MO
K8ALM 7 2 3 1,070 OH
WA5HOT 133 2 7 1,068 STX
Mobile Ohm Volunteers
N9OQT 84 2 11 1,066 IL
Central Kansas ARC
WØCY 292 2 20 1,066 KS
Southboro Rod & Gun ARC
W1SRG 323 2 5 1,064 EMA
Bears Seattle
K7NWS 200 2 10 1,060 WWA
Saskatoon ARC
VE5AA 235 2 12 1,050 SK
TARA
K3TAR 349 2 3 1,048 EPA
Woodford Co ARC
KY4WC 138 2 17 1,046 KY
Eastern AZ ARS
K7EAR 243 2 4 1,044 AZ
W5LM 220 2 10 1,038 NTX
ARC of Augusta
W4DV 148 2 18 1,034 GA
Pike Co. ARC
W9UL 164 2 19 1,028 IN
Sierra Radio Assn
K6SRA 169 2 9 1,016 SCV
Jones Co ARC
WØCWP 283 2 7 1,016 IA
Pamlico ARS
N4PRS (+AI4WL)
123 2 27 1,016 NC
Wallowa CO Amateurs
NG7X 124 2 4 1,008 OR
TCARA
KC8CNN 222 2 10 1,004 MI
Okaw Valley ARC
KK9N (+W9KXQ)
301 2 10 994 IL
Clinton ARC
WØCS 219 2 12 964 IA
Lewis-Clark ARC
W7VJD (+NA7EM)
99 2 48 942 EWA
W5JMC 277 2 4 942 VA
Grand Nelson Clan
WB9GNC 338 2 7 938 MT
Wellesley ARS
W1TKZ 82 2 15 936 EMA
Plymouth Historical Museum Team
N8RGF 300 2 4 936 MI
STARS
K9SRC (+KB9RGI)
123 2 8 934 IL
Schuylkill Amateur Repeater Assn
W3EEK (+W3EEK)
81 2 17 932 EPA
Lockheed Employees RC
W4LMA 185 2 18 926 GA
Lanierland ARC
W4E 88 2 20 926 GA
Delaware Co ARES / RACES
W3AEC 217 2 4 916 EPA
Cedar Creek ARS
KC9OYM 168 2 8 906 IL
WEDIXIE ARC
WB4MZO 132 2 6 902 GA
Central MORadio Assn
KØSI 107 2 20 902 MO
ARA of NE
WØWWV 108 2 20 896 NE
Prince George's Co ARES / RACES
W3PGC 121 2 16 894 MDC
Gulf Coast ARC
WA4GDN 108 2 24 894 WCF
Anok Co. RC
WØYFZ 163 2 10 892 MN
Montgomery ARS
NC4MC 219 2 6 888 NC
Roane Co ARC
KE4RX 105 2 24 880 TN
Laurel ARS
AE4QL 187 2 16 874 KY
So Cal Amateur Transmitting Soc
WB6LRU 162 2 9 874 LAX
VE8YK 89 2 12 870 NT
Columbia ARS
NF4CQ 85 2 25 870 NFL
Bayouland Emergency AR Service
KE5EAO 7 2 22 864 LA
Capital City ARC
W7TCK 179 2 29 856 MT
Amador Co ARC
K6ARC (+K6DIK)
52 2 15 856 SV
Owen Co ARA
K9EOH 51 2 8 852 IN
West Coast CW Boys
K6VWL (+KT6L)
162 2 3 848 SDG
Lake Wales Repeater Assn
K4LKW 23 2 27 842 WCF
Salt Lake Peanes ARC
K7CSW 158 2 8 842 UT
Greenwood ARC
VE1ARC 227 2 15 838 MAR
Assn Radio Amateur de Portneuf
VE2CSP 84 2 20 834 QC
ON Science Ctr ARC
VE3OSC 149 2 60 832 ON
Mayes Co ARC
WX5MC 102 2 11 814 OK
Carolina ARES
WX4SC 128 2 16 806 SC
Beaufort Radio Amateur Group
W4BFT 101 2 20 798 SC
Brooksby Radio Amateur Group
W1BBV 71 2 10 792 EMA
Shore Point ARC
W1SPC 94 2 37 788 CT
Tier Ham Group
N2TJ 256 2 7 772 WNY
Pontotoc Co. ARA
N5HY 84 2 19 768 OK
Kentucky Colonels ARC
KY4BG 147 2 12 764 KY
Holiday City ARC
W2HC 181 2 16 756 SNJ
Elkhart ARC
K9HDH 236 2 5 750 IN
Idaho Soc of Radio Amateurs
K7BSE 124 2 12 748 ID
Triangle Repeater Assn
W5APX 146 2 6 742 STX
BARK & UTARC
VO1BRK 75 2 9 738 NL
Foothills RC
W4FAR 90 2 5 730 NC
KA3PMW 88 2 16 726 WPA
Bushmills Net Field Day Group
K4UIE 184 2 5 722 GA
Gadsden ARC
K4JMC 170 2 10 706 AL
MITRE Bedford ARC
W1ON 80 2 11 698 EMA
JVARC
K3DNA 156 2 7 698 WPA
Inuvik ARC
VE8EV 117 1 3 693 NT
Lower Yakima Valley Ham Club
K7VNG 175 2 7 690 EWA
Phillips Co. ARC
WØZXN 140 2 11 680 KS
Mizpah Shrine Radio Unit
W9FEZ 203 2 12 656 IN
Norwesco
N9PHS 76 2 13 650 WI
Ben Rasnick Group
K6VBC 113 2 4 648 SB
Grant ARC
W8STZ 122 2 24 634 OH
W Wa Medical Services Em Com
AD7AW 140 2 3 630 WWA
Jingle Jims
K9VSO 130 2 3 628 WI
Three Physicists and a Salesman
NS7F 154 2 4 622 AZ
Saint Clair Co. ARES
K4SCC 189 2 30 578 AL
Carteret Co. ARS
W4YMI 76 2 10 552 NC
North Star Lake Group
KCØUIU 37 2 5 524 MN
Mohawk Valley ARA
KC2AUO 154 2 4 508 NNY
Kentucky River Emergency ARS
N6BX 19 2 3 508 KY
Conneaut ARC
W8BHZ 104 2 10 464 OH
Russell Co ARC
WR4RC 163 2 5 376 VA
University ARC
N7UW 130 2 9 360 WY
Northeast Iowa AR Assn
WØMG 72 2 10 344 IA
Watertown ARC
N9HR 36 2 27 310 WI
Heritage Harbour ARS
KB3QVO 51 2 10 302 MDC
Nebraska ARC
NEØRC 101 2 6 252 NE
VE7IGQ 14 2 9 106 SD

2A Battery

Buffalo Lighthouse Crew
K2ZR 1411 5 7 15,150 WNY
Colorado QRP Club
WØCQC (+KØFEI)
1420 5 7 14,435 CO
NM Field Day Coalition
K5TQ 1133 5 3 11,505 NM
Tommy Ack Memorial FD Club
W4RRW 481 5 4 5,160 GA
Explorers RC
NA3DX (+NA1DX)
405 5 6 4,105 MDC
Walton RA
W2LZ (+W2CD)
288 5 9 3,215 WNY
Rochester ARC-QRP
WØMXW 231 5 16 3,165 MN
Spaulding ARC
W4TIY 333 5 30 2,935 GA
Barstow ARC
WA6TST 221 5 10 2,760 ORG
Sultans of Sweat
K5AXW (+KD5ZBS)
261 5 8 2,625 STX
Air Mobile Radio Operator Soc
N3D 337 5 6 2,585 DE
Tango ARS
K9TAS (+KA9I)
181 5 4 2,580 IN
N4N Field Day Group
N4N 315 5 3 2,415 GA
Androscoggin ARC
W1NPP 226 5 12 2,405 ME
Portland Amateur Wireless Assn
W1KVI 203 5 41 2,130 ME
Marconi ARC
VO1MRC 103 5 5 1,990 NL
UCLA ARS
W6YRA 190 5 8 1,865 LAX
Ottawa Valley QRP Soc
VA3OVQ 78 5 4 1,585 ON
STOOKS
KW4JS 51 5 3 750 TN
Oglethorpe / Madison Co ARES
KI4MMM 48 5 12 690 GA
N4ZAK 47 5 4 585 NC
Platte River AR Community Assn
KE7JMU 14 5 7 570 WY
Orinda Radio Interest Group
K6ORI 21 5 3 455 EB
Benton Co ARES
K7CVO 15 5 9 445 OR

2A Commercial

Order of Boiled Owls of NY/Radio Central ARC
KW2O 1873 2 19 6,078 NLI
North Franklin ARS
N2NNY (+KC2UPI)
1280 2 6 5,412 NNY
Ottumwa ARC
WAØDX 1347 2 7 4,312 IA
East Pasco ARS
K4EX 849 2 8 3,490 WCF
Pottstown Area ARC
K3ZMC (+N3WXW)
843 2 25 2,966 EPA
Zamora Shrine Ham Radio Unit
W4ZHR (+K4TQR)
812 2 22 2,916 AL

Macon Co ARC
NØPR (+ABØC)
642 2 12 2,786 MO
Fort Pierce ARC
W4AKH 614 2 41 2,714 SFL
Allegheny Valley Radio Assn
W3RA 728 2 3 2,528 WPA
Spartanburg ARC
K4II 705 2 25 2,320 SC
Scioto Co ARES
WW8O 1004 2 11 2,060 OH
Middlesex ARG
K4VY 398 2 13 1,908 VA
Enterprise ARS
WD4ROJ 408 2 17 1,892 AL
Delta Co ARS
K8PL 440 2 14 1,708 MI
Community Service RC
WØP (+KCØYNE)
290 2 11 1,646 MO
Stillwater ARA
WØJH 410 2 20 1,468 MN
Columbia Co ARC
K4KNS (+WE4GW)
279 2 19 1,420 GA
KC7AQZ 330 2 3 1,140 AZ
Sevier Co Hams
KK4TT 378 2 9 1,106 TN
Central Dakota ARC
WØZRT 426 2 30 1,054 ND
Wantagh ARC
W2VA 215 2 18 1,046 NLI
NØBHC 166 2 11 1,042 MN
Sweetwater ARC
WY7U (+WB7NKK)
313 2 10 930 WY
Coon Valley ARC
NØNAF 298 2 3 900 IA
Camas Prairie ARC
KC7MGR 144 2 17 888 ID
Coyote ARC
K5C 158 2 14 880 STX
W4HOD 100 2 10 866 AL
Tri Co Repeater Assn
W9MM 323 2 7 816 WI
West Central MN ARC
NØM 149 2 6 798 MN
Fullerton RC
W6ULI 208 2 45 716 ORG
Lewes ARS
W3LRS 71 2 8 692 DE
Lancaster Radio Transmitting Society
W3AD 260 2 20 520 EPA
Ozarc ARC
K5BAX 65 2 21 480 AR
Tonto ARA
N7TAR 167 2 4 434 AZ
Illinois Valley RA
N9OBB 58 2 9 306 IL
Thunderbolt ARA
KJØT 22 2 5 194 CO

3A

Cortek RA
W9CA (+N9CC)
5085 2 25 18,996 IL
Rochester DX Assn
W2RDX (+W2AN)
4783 2 58 18,614 WNY
North Shore RC
K9OR (+K9RST)
3204 2 75 11,962 IL
Greater Norwalk ARC
N1EV (+W1NLK)
2911 2 50 10,566 CT
Providence Radio Assn
W1OP (+W1PRA)
3550 2 17 10,554 RI
Oakland Co ARS
W8TNO (+K8O)
2993 2 34 10,000 MI
Lake ARA / ARES
K4FC (+N4FBC)
2691 2 42 8,990 NFL
Peoria Area ARC
W9PIA (+K9PEO)
2357 2 60 8,360 IL
Rochester ARC
WØBM 2143 2 56 8,280 MN
Sterling Park ARC
K4NVA (+W4KSN)
2217 2 25 8,210 VA
North Fulton Amateur Radio League
W4QO (+NF4GA)
2253 2 259 8,074 GA
St Paul and Mining RCs
WØMR (+KØAGF)
2339 2 60 8,034 MN
Albany ARA
K2CT (+KM2O)
2368 2 56 7,938 ENY
Twin City FM Club
WØEF 2065 2 50 7,608 MN
Magnolia DX Assn
K5MDX (+W5NO)
2082 2 53 7,604 MS
Sussex Co. Community ARC
W2LV 2020 2 19 7,372 NNJ
South Orange ARA
K6SOA (+K6WO)
1994 2 79 7,216 ORG
Southern Inyo ARA
W6TD 2216 2 4 6,918 ORG
Naval Postgraduate School ARC
K6LY (+K6NPS)
1677 2 26 6,810 SCV
WØGKP 1695 2 41 6,776 MN
Southern VT ARC
K1SV (+WT1B)
2234 2 27 6,750 VT
Jefferson Co. ARC
W7JCR 1597 2 48 6,402 WWA
Scranton Pocono AR Klub
K3CSG (+WX3A)
1736 2 62 6,082 EPA
East Bay ARC
W6CUS (+WS6V)
1479 2 20 5,930 EB
Nixa ARC
NØA (+KCØLUN)
1739 2 50 5,872 MO
Kennehoochee ARC
W4BTI 1415 2 86 5,762 GA
Coquitlam, Burnaby, New-West ARC's
VE7SCC (+VE7BAR)
1521 2 35 5,572 BC
Twin City Ham Club
W5EA (+W5PEM)
1532 2 29 5,542 LA
San Andreas Faultline Survivors
W6SW (+W6K)
1834 2 5 5,518 SJV
Mississippi Valley ARC
W9FCC 1916 2 8 5,486 WI
National Electronics Museum ARC
K3NEM (+W3GR)
1317 2 25 5,442 MDC
Edmond ARS
K5EOK (+KE5TGZ)
1328 2 52 5,442 OK
Dixie AR Klub
W4DAK 1459 2 15 5,438 NFL
Nassau ARC
K2VN (+KC2SBO)
1355 2 44 5,344 NLI
Shreveport ARA
K5SL (+K5JMR)
1369 2 30 5,264 LA
ARES District 24
WØDTF (+KBØLZU)
1277 2 20 5,248 CO
Radio Farm
NØMA (+NØMMA)
1558 2 18 5,202 IA
McKinney ARC
W5MRC (+AE5IT)
1171 2 43 5,184 NTX
Medina 2 Meter Group
W8EOC (+K2RWO)
1351 2 26 5,164 OH
Reelfoot ARC
K4RFT (+N4MJ)
1083 2 18 5,098 TN
Northern AZ DX Assn & Coconino ARC
W7TB (+NF7E)
1222 2 20 5,078 AZ
LARC-FARL
K8UNS 1301 2 81 5,016 MI
Milford ARC
W8MRC 1339 2 21 5,014 OH
Stamford ARA
W1EE (+K1FC)
1584 2 42 4,982 CT
Cumberland Plateau ARC
W4CV (+KT4BW)
1149 2 57 4,942 TN
Nittany ARC
W3YA 3458 1 12 4,940 WPA
Riverland ARC
W9UP 1125 2 25 4,756 WI
Hamfesters RC
W9AA (+AB9MZ)
1154 2 50 4,688 IL
Morrow Co ARES
W8NL 1179 2 10 4,682 OH
Roanoke Valley ARC
W4CA (+AB4A)
1515 2 23 4,674 VA
Bristol ARC
W4UD 1191 2 56 4,644 TN
Northern Berkshire ARC
N1WM 1011 2 15 4,516 WMA
Idaho Potato Contest Group
KØIP 1313 2 8 4,502 ID
TriState ARS
W9OG (+WA9C)
1107 2 33 4,492 IN
QSY Society / Mount Beacon ARC
K2QS (+KC2BMX)
1076 2 97 4,436 ENY
Mississippi State University ARC
W5YD (+AE5LG)
1083 2 9 4,392 MS
Northeast Wyoming ARA
NE7WY (+WY7WST)
919 2 39 4,284 WY
Regina ARA
VE5NN 1243 2 8 4,202 SK
Northeast Wireless RC
NW2C 1102 2 47 4,164 NLI
Xerox ARC
W2XRX (+W2NED)
1084 2 15 4,148 WNY
Mt Vernon ARC
K8EEN (+KC8YLD)
1126 2 25 4,122 OH
JTRG
WY5I (+N4T)
1285 2 65 4,084 SFL
DX SIG of Valley RC of OR
N7MQ 1290 2 10 4,078 OR
Monessen ARC
W3CSL 1063 2 30 4,022 WPA
Central MI ARC
W8MAA 987 2 32 4,004 MI
Bill Gremillion Memorial RC
K4NRC 948 2 44 3,998 GA
Keyston VHF & Hilltoppers Club
W3HZU (+W3ZGD)
1081 2 12 3,990 EPA
Ashtabula Co ARC
K8CY (+N8OHU)
1173 2 18 3,980 OH
Burlington / Oakville ARCs
VE3HB (+VE3CJ)
1059 2 35 3,942 ON
Manny Papandreas Memorial FD
W4SS (+W2CB)
953 2 35 3,876 SFL
Memphis Areas Tri Club Group
W4EM (+W4BS)
1045 2 100 3,868 TN
CRES ARC
W8ZPF 917 2 33 3,854 OH
Goshen ARC
K9WJU (+K9TSM)
828 2 30 3,848 IN
Southern Michigan ARS
W8DF 1012 2 10 3,842 MI
Jackson ARC
W5PFC (+N5DU)
784 2 80 3,832 MS
GNARC
N6FR 1023 2 17 3,830 SV
Rappahannock ARA
K4YM 866 2 13 3,828 VA
W4NJA 921 2 15 3,762 KY
Tallahassee ARS
K4TLH (+W4SKG)
808 2 58 3,710 NFL
Lake Area Radio Klub
WØWTN 834 2 29 3,676 SD
Rockford ARA
W9AXD 945 2 25 3,670 IL
Albemarle ARS
K4WO 1041 2 42 3,652 NC
Alliance ARC
W8LKY 939 2 16 3,646 OH
Stanwood Camano ARC
W7PIG 1133 2 59 3,644 WWA
Radio Club of Tacoma
W7DK (+W7OS)
1079 2 66 3,628 WWA
Howell Co. ARC
WØHCA 827 2 12 3,620 MO
Orange Park ARC
K4BT 776 2 38 3,560 NFL
Antelope Valley ARC
K6OX (+AF6OV)
886 2 82 3,546 LAX
Nature Coast ARC
N4C (+K4BKV)
689 2 19 3,528 NFL
Aero ARC/Baltimore Radio Amateur TV Soc
W3PGA 753 2 25 3,512 MDC
Albert Lea and Austin ARC
NXØC 1022 2 25 3,510 MN
Troy ARA
N2TY (+W2TRY)
931 2 65 3,492 ENY
Barnstable and Pilgrim ARC
K1UI (+N1FI)963 2 12 3,464 EMA
Milwaukee Radio Amateurs' Club
W9RH (+K9FI)
727 2 11 3,436 WI
San Joaquin Valley ARS
WA6SJV (+WA6WTF)
812 2 40 3,398 SJV
Grumman ARC
WA2LQO 892 2 15 3,396 NLI
Western IL ARC
W9AWE 801 2 15 3,394 IL
Albemarle ARC
WA4TFZ 887 2 53 3,386 VA
Florence ARC
W4ULH (+K4UA)
642 2 47 3,340 SC
Hoosier Lakes RC
K9CWD (+K9GV)
874 2 23 3,318 IN
Davis Co. ARC
K7DAV (+N7CN)
841 2 130 3,302 UT
Foothills ARS
K6YA (+KI6QNZ)
1094 2 25 3,296 SCV
San Fernando Valley ARC
W6SD (+K6KLP)
779 2 35 3,294 LAX
Lakeland ARC
K4LKL (+K1DU)
618 2 40 3,272 WCF
St Charles ARC
KOØA (+WBØHSI)
816 2 23 3,246 MO
Corona PD CSV Team
W6CPD 718 2 20 3,224 ORG
Trident ARC
N4EE (+W4ANK)
740 2 13 3,206 SC
Kankakee Area Radio Soc
W9AZ (+N9FD)
718 2 18 3,196 IL
Club Radioamateur Vallee du Richelieu
VE2CVR 710 2 32 3,154 QC
Estes Valley ARC
WØRP (+KCØKBP)
669 2 43 3,138 CO
Central IL RC
W9AML 807 2 50 3,136 IL
San Angelo ARC
W5QX (+W5DLL)
587 2 42 3,134 WTX
Granite State ARA
N1QC 699 2 27 3,122 NH
Peconic ARC
W2AMC 835 2 39 3,030 NLI
Skyline ARC
K2IWR 860 2 30 3,010 WNY
Lone Star ARS
W5C 597 2 25 3,006 STX
Fluvanna ARES Group
WO4R 940 2 17 3,004 VA
W4OVH (+W4PVA)
550 2 31 2,968 VA
Oxford Co ARES
W1OCA (+N1GZB)
559 2 16 2,952 ME
Wyandot Area Ham Operators Organization
KD8BNV (+KD8FLT)
543 2 10 2,952 OH
Shenandoah Valley ARC
W4RKC 703 2 16 2,894 VA
Austin ARC
W5KA (+K5LBJ)
515 2 53 2,864 STX
South Canadian ARSand OU Student ARC
W5NOR 652 2 50 2,858 OK
Society of Newfoundland Radio Amateurs
VO1AA 729 2 22 2,856 NL
Cape Ann ARA
W1GLO (+KB1PGH)
547 2 72 2,842 EMA
High Sierra FD Group
W6PS 961 2 8 2,840 SV
Pasadena RC
W6KA (+NV6C)
896 2 50 2,826 LAX
Valdosta ARC
W4VLD 1036 2 22 2,766 GA
Daytona Beach ARA / Daytona Beach CERT ARC
K4BV (+KI4ZKE)
531 2 36 2,758 NFL
Joplin ARC
WØIN (+KBØSTN)
671 2 15 2,740 MO
Kaw Valley ARC
WØCET 554 2 30 2,706 KS
Palomar ARC
W6NWG (+WD6FWE)
973 2 45 2,686 SDG
WØRX 605 2 4 2,686 MN
FPL Group
K8ESQ 622 2 5 2,642 MI
Rogue Valley ARC
W7OEK 823 2 16 2,642 OR
Gaston Co. AR Operators
W4C 569 2 21 2,632 NC
Eston Co ARC
K8ETN 747 2 20 2,626 MI
Tulsa ARC
W5IAS 675 2 15 2,626 OK
South TX ARC
N5CRP (+KY5V)
437 2 25 2,612 STX
Prince Edward RC / Quinte ARC
VE3RL 637 2 15 2,602 ON
Eaton ARC
K8CHR 747 2 20 2,576 MI
Susquehanna Valley ARC
W3VPJ 574 2 15 2,572 EPA
Genesis ARS
N1ZIZ (+KA1GDQ)
385 2 17 2,490 EMA
Franktown FD Group
WØCBH 773 2 18 2,490 CO
South Bay ARC
W6SBA 451 2 30 2,484 LAX
Convair/220 RC
W6UUS 727 2 14 2,474 SDG
Scottsdale ARC
K7TR 652 2 5 2,416 AZ
Peel ARC
VE3XR 644 2 20 2,406 ON
Northwest Illinois ARC
W9F 514 2 15 2,344 IL
Lunenburg Co ARC
VE1LUN 778 2 17 2,334 MAR
Dog Hollow Contest Group
AK9D (+WGØTA)
661 2 6 2,322 MO
Blue Ridge ARS
W4NYK 509 2 44 2,296 SC
SPARK
W4QR 501 2 57 2,278 VA
New Bern ARC
W4EWN (+K4EAW)
315 2 16 2,266 NC
Rolla Regional ARS
WØGS 468 2 25 2,244 MO
Tri-Co ARA
K6AGF 619 2 32 2,240 ORG

Dickson Co ARC
WC4DC 453 2 21 2,216 TN
Kings Co RC
W2RAK 459 2 5 2,194 NLI
HP Boise ARC
AB7HP (+WV7I)
505 2 17 2,152 ID
West Central Ohio ARA
WC8OH (+W8COH)
390 2 25 2,144 OH
Callam Co ARC
W7FEL (+WX7RIK)
364 2 30 2,142 WWA
Burlington Co Radio Club
K2TD (+KC2OGR)
612 2 34 2,134 SNJ
Riverside Co ARA
W6TJ 446 2 34 2,092 ORG
KB7TG (+KD7SZX)
911 1 6 2,088 MT
Lassen ARC
K6LRC 364 2 21 2,088 SV
Olympia ARS
NT7H 459 2 13 2,080 WWA
Chicago Suburban RA
N9BAT 427 2 43 2,066 IL
Brightleaf ARC
W4AMC (+W1VOA)
372 2 35 2,054 NC
Eastern New Mexico ARC
KA5B 406 2 50 2,050 NM
Mountain ARC
W3YMW 364 2 31 2,046 MDC
West Fork ARC / NTWG, Inc
ND5X 627 2 14 2,044 NTX
ARC of Amite Co
W5CCW 340 2 6 2,044 MS
WD5DDH (+K5ASU)
347 2 32 2,028 NTX
Red River Radio Amateurs
WØILO 595 2 20 2,014 ND
Montgomery ARC
KV3B (+W3EXP)
487 2 32 2,002 MDC
Nevada Co. ARC
W6DD 459 2 20 1,996 SV
Snohomish Co Hams Club
WA7LAW (+KD7EJI)
315 2 61 1,978 WWA
Southern Berkshire ARC
W1BAA/2 (+K1LEE/2)
236 2 30 1,978 ENY
Reading RC, Inc.
W3BN 384 2 35 1,976 EPA
Chatham-Kent ARC
VE3CRC 367 2 20 1,968 ON
North Ottawa ARC
W8CSO (+N8RXC)
412 2 19 1,948 MI
San Gorgonio Pass ARC
W6PRC 321 2 17 1,938 ORG
Sask Alta RC
VE6WP 439 2 6 1,926 AB
Charles Co ARC
K3SMD 302 2 18 1,898 MDC
VE9ND 317 2 12 1,876 MAR
New River Wireless Assn
K4NRW 375 2 6 1,866 VA
Aroostook ARA
K1FS 563 2 23 1,856 ME
Sherman Co AR Enthusiasts
KSØGLD 402 2 14 1,854 KS
W2IR (+KC2BYZ)
395 2 12 1,850 ENY
EPARA - PARK
N3IS (+W3PRK)
321 2 125 1,842 EPA
Montachusett ARA
W1GZ 378 2 10 1,832 WMA
Camden Co ARS
KB4CC 316 2 12 1,832 GA
Huntington Co. ARS
K9HC 486 2 15 1,830 IN
Randolph ARC
NC4ZO (+WS4H)
349 2 43 1,828 NC
Deep East Texas ARC
W5IRP 292 2 11 1,820 STX
Portsmouth ARS & PARES
W4POX 407 2 34 1,820 VA
Jayhawk ARS
WØLB (+KDØBZI)
428 2 24 1,818 KS
Lake Erie ARA
WB8CQR (+KD8ACO)
298 2 28 1,796 OH
West River RC
WR1VT 410 2 14 1,794 VT
Nashville ARC
K4CPO 353 2 10 1,788 TN
North Port ARC
W4NPT 249 2 15 1,742 WCF
Meridian ARC
W5FQ 284 2 40 1,738 MS
Ohio District 4 ARES
WC8EMA 255 2 43 1,732 OH
Silvercreek ARA
W8WKY 564 2 5 1,728 OH
Shoreline ACS
W7AUX 316 2 19 1,722 WWA
Dixie ARC
W7DRC 393 2 20 1,718 UT

TERRA SERIGHT, KE5ZRU

Mayor Debra McCartt (with the mic) visited W5WX, Amarillo's Panhandle ARC. Watching Her Honor operate was Assistant Chief of Police Perry Gilmore (standing) and APD's senior dispatcher Becky Lucero (left). Conducting the demo was Henry Janhsen, N5HPJ (right), president of the Panhandle ARC.

Cumberland Valley ARC
W3ACH (+W3SML)
252 2 78 1,712 WPA
Branchburg OEM
N2B 403 2 19 1,704 NNJ
Hendricks Co ARS
N9HC 246 2 44 1,702 IN
Buffalo Amateur Radio Repeater Assn
W2EUP 407 2 17 1,700 WNY
Cherryville Repeater Assn II
W2CRA 337 2 23 1,688 NNJ
ID Field Day Group
W7RNF 641 2 13 1,666 ID
Peace River RA
W4DUX 454 2 33 1,666 WCF
Ocean State ARG, Inc.
K1OS 500 2 8 1,654 RI
Ste Genevieve Co ARC
KØQOD (+KDØFZG)
209 2 20 1,650 MO
Fort Armstrong Wireless Assn
K3TTK 480 2 21 1,648 WPA
Northwest Missouri ARES
WDØSKY 258 2 7 1,634 MO
Dayton ARA
W8BI 395 2 37 1,632 OH
Midwest ARS
W9MAR (+KA9NOO)
281 2 15 1,628 IN
Insurance City Repeater Club
K1DFS (+N1RMF)
366 2 17 1,624 CT
WAFAR
W9FT 435 2 16 1,620 IL
Cascades ARS
W8JXN (+K8JXN)
399 2 31 1,616 MI
Fallbrook ARC
N6FQ 470 2 59 1,616 SDG
Holmesburg ARC
K3FI 347 2 12 1,606 EPA
West Santa Barbara Co ARES
W9EC 302 2 8 1,588 SB
Matanuska ARA
KL7JFU (+KL2FA)
306 1 37 1,587 AK
Navarre CERT ARC
KC4ERT 216 2 25 1,582 NFL
GCARES
KB3SKW 248 2 21 1,558 MDC
Victor Valley ARC
K6QWR 288 2 12 1,538 ORG
Polk Co ARA
N9XH 268 2 25 1,516 WI
Tulare Co ARC
WA6BAI 170 2 19 1,512 SJV
Northside ARC
AAØNC 371 2 12 1,506 MO
North Arkansas ARS
N3QL 156 2 50 1,486 AR
Aksarben ARC
KØUSA 465 2 25 1,480 NE
The South Park Marauders
WVØH 489 2 13 1,472 CO
ARC of Savannah
W4HBB 213 2 32 1,468 GA
NC State University Student ARS
W4ATC 441 2 7 1,462 NC
Rio Hondo ARC
W6GNS 367 2 10 1,454 LAX
Mt Shasta ARC
W6BML 436 2 7 1,448 SV
New River Valley ARC
N4NRV 281 2 13 1,444 VA
McHenry Co Grid Rats
W9VB (+WL7CTA)
354 2 8 1,440 IL
Radio Amateur Society of Norwich
N1NW 236 2 29 1,440 CT
St. Augustine ARS
N4AUG 195 2 10 1,438 NFL
Princeton ARC
W4KBL (+KJ4FAU)
381 2 30 1,432 KY
Wild Horse Desert Hams ARC
K5WHD (+WB5IZD)
130 2 91 1,428 STX
Muhlenberg Co ARS
AA4PL 194 2 15 1,424 KY
Bloomfield ARC
W1CWA 244 2 13 1,424 CT
East Palestine ARC
W8GMM 354 2 17 1,404 OH
ARC of Alameda
K6QLF (+KF6UVB)
105 2 32 1,392 EB
Pioneer ARC
KØJFN 250 2 6 1,392 NE
High Desert ARC
NM5HD 275 2 28 1,380 NM
Wichita ARS
N5WF 202 2 36 1,364 NTX
Metropolitan ARC
K8NOW 319 2 7 1,356 MI
Madison Co DX Club
KKØG 263 2 22 1,326 IA
Valley of the Moon ARC
W6AJF 318 2 10 1,324 SF
Big Rapids Area ARC
N8OE 267 2 31 1,310 MI
Southern IN Mobile Em Comm Team
KB9NEJ 267 2 22 1,284 IN
Tri County CW ARC
W3TCW 269 2 21 1,280 WPA
Chisholm Trail ARC
WD5IYF (+KE5JUP)119 2 12 1,270
OK
Campbell River ARS
VE7CRC 431 2 10 1,224 BC
Thin Air Radio Society
KEØMF 429 2 3 1,214 CO
Vinton Co ARC
KC8YUO 174 2 6 1,198 OH
North Georgia Tri-State ARC
W4NGT (+KC4PC)168 2 19 1,194
GA
Mile High RC
K6GUN 159 2 10 1,188 ORG
Christian Co ARES
WA6JGM 200 2 5 1,188 MO
Hall of Science ARC
WB2JSM 235 2 30 1,174 NLI
Radio Amateurs of Corry
W3YXE 171 2 11 1,146 WPA
Willits ARS
W6MMM 243 2 18 1,136 SF
Fulton Co ARC
K9ILS 167 2 22 1,126 IL
Umpqua Valley ARC
KC7TLY (+KB7WDR)
183 2 60 1,124 OR
LaMoine Emergency ARC
WB9TEA (+N9EWQ)
110 2 11 1,118 IL
USCG Auxiliary Division 10, District 11R
K1EHO 171 2 25 1,112 AZ
Concord ARS
W4AMI 359 1 25 1,109 GA
Old Post ARS
W9EOC 135 2 17 1,108 IN
Wilderness Center ARC
N8TWC 209 2 3 1,104 OH
Oak Forest ARC
KE5TRB (+WB5ANN)
112 2 12 1,100 STX
Valley RC of Oregon
W7PXL 64 2 23 1,094 OR
K8SWD 507 2 5 1,076 MI
Milton ARC
K3FLT 244 2 8 1,046 EPA
Calhoun Co ARA
WB4GNA 155 2 44 1,032 AL
Hams 4 Hammurabi
NI4NI 329 2 3 1,010 EWA
Southwest MO ARC
WØEBE 126 2 10 1,002 MO
Mammoth Cave ARC
KY4X 187 2 15 970 KY
Loose Moose-cateers
N8ATS 304 2 13 950 MI
Hornet ARC
NB6GC 240 2 7 930 EB
Emporia ARS
KCØU (+KBØSSR)
53 2 12 916 KS
Champaign Co. ARES
WB8UCD 201 1 12 915 OH
University of Southern California ARC
W6YV 79 2 3 908 LAX
Delaware Valley Ragchew Club
N2HQX 100 2 12 900 SNJ
Lee DeForest ARC
N6CG 167 2 25 884 ORG
Cass Co Area Radio Amateurs
NØUMP 116 2 4 860 MO
Easton ARS
K3EMD 153 2 14 828 MDC
Northern Lakes ARC
KØGPZ 208 2 50 816 MN
Independent RC
WA6IRC 86 2 44 802 ORG
N7CM 133 2 3 792 OR
Bear Bait RC
W2JST 78 2 3 756 ENY
KØEAR 119 2 3 728 MO
Highland Lakes ARC
K5HLA 59 2 13 704 STX
American Airlines ARC
K5JME 76 2 20 702 OK
Mystic Valley ARG
N1MV 40 2 7 694 EMA
Scotland Co ARES Group
KD4OWS 63 2 6 680 NC
BSA Venturing Crew 80
W3BSA 22 2 7 662 VA
Long Island AR Simplex Club
W2LIS 252 2 20 658 NLI
OFLC Guys
NØTK 118 2 3 442 CO

3A Battery
Baton Rouge ARC
K5DF (+K5LSU)
705 5 47 8,095 LA
Reno QRP Group
W7FST 570 5 16 5,915 NV
Knightlites QRP
WQ4RP 320 5 6 3,795 NC
DeKalb Co ARC
W4GBR 323 5 12 3,785 AL
Wagoner Windtalkers
WI5ND 305 5 11 3,295 OK
Seaside Tsunami ARS
WA7VE (+WA7FIV)
227 5 49 2,470 OR
Colorado QRP Club
ABØCD 197 5 17 2,450 CO
Head Lake Group
VE3LM 257 5 4 2,265 ON
W5MSQ (+WR1TX)
152 5 18 1,950 STX
Pioneers ARC
W9DA 83 5 3 1,245 IL
QCWA Chapter 162
K9AKG 59 5 13 1,095 WI

3A Commercial
Splitrock ARA
K2RF 1026 2 20 2,936 NNJ
New York City Transit ARC
K2IRT 756 2 15 2,412 NLI
Neptune ARC
W2NRC (+N2GT)
476 2 52 2,142 NNJ
K5M Consortium
K5M 422 2 8 1,754 WTX
W7DTV 693 2 16 1,696 OR
Cascade RC
W7EK 402 2 23 1,626 WWA
Douglas Co ARC
WØUK 506 2 89 1,528 KS

Cumberland ARC
K3IEC 393 2 14 1,516 EPA
Stubblefield Repeater Club
K4HJ 258 2 25 1,242 KY
Richmond ARC
W4ZA (+W4FJ)
211 2 42 1,140 VA
Dubois Co ARC
N9NAU 510 2 15 1,134 IN
Octagon Wildlife Sanctuary
W8OWS 201 2 4 1,118 WCF
Suffolk Co RC / Brookhaven National Lab RC
W2DQ 175 2 32 1,114 NLI
Radio Assn of Western NY
W2PE 249 2 16 1,090 WNY
Club de Radio Amateur Outaouais
VE2CRO 410 2 16 972 QC
Tobacco Valley ARC
K7EUR 251 2 15 816 MT
Central Ohio Operators Klub Extra-Novice
W8TNX 231 2 10 792 OH
Cotton Hill VHF Group
WB2UEE 258 2 8 566 NNY
Bluff Country DX Assn
W9IDX 225 2 4 522 WI
Southside ARC
NØHV 198 2 36 500 MO
Palatine RACES
AD9DP 85 2 16 476 IL
Hammin Sams
KØHSC 121 2 11 430 CO

4A

K4BFT (+KI4HBO)
4708 2 34 14,404 AL
Utah DX Assn
K7UM (+K7UT)
4624 2 33 14,080 UT
Palo Alto ARA
W6ARA (+W6OTX)
3480 2 74 11,326 SCV
Old Barney ARC
N2OB (+N2CW)
3311 2 30 11,210 SNJ
Vienna Wireless Society
K4XY (+K4HTA)
3361 2 120 10,958 VA
ARROW/UMARC Field Day Team
W8UM (+W8PGW)
2719 2 48 10,560 MI
Delaware ARA
K8ES (+W8JK)
2581 2 42 9,688 OH
Midland ARC
KD5C (+W5QGG)
2240 2 50 9,652 WTX
Lighthouse Amateur Radio Alliance
K4PB (+W4PB)
2824 2 25 9,374 SFL
Contoocook Valley RC
K1BKE (+K1DFQ)
3587 2 52 8,934 NH
Fauquier ARA
W4VA (+N2VA)
2261 2 29 8,540 VA
Cuyahoga Falls ARC
W8VPV 2255 2 28 8,224 OH
Murgas ARC
K3YTL (+W3MTP)
2457 2 27 7,994 EPA
Boars RC
NG5A (+AD5NR)
2001 2 30 7,690 NTX
Westchester Em Comm Assn
N2SF (+KD2SQ)
1970 2 40 7,686 ENY
Portage Co ARS
KD8CKP (+N8QE)
2349 2 65 7,206 OH
Russell Co RC & Columbus ARC
W4AN (+W4CVY)
1345 2 41 6,446 AL
Lincoln ARC
KØKKV (+KBØDNP)
2106 2 68 6,290 NE
White Mountain ARC
W1MWV 1221 2 23 5,646 NH
Penn Wireless Assn
W3SK 1216 2 21 5,620 EPA
Hazel Park ARC
W8HP 1498 2 79 5,552 MI
Oregon Tualatin Valley ARC
W7OTV 1383 2 144 5,526 OR
Dial ARC/Butler Co VHF
K8PI (+W8BLV)13152 45 5,138 OH
Hannibal ARC
WØKEM 1198 2 19 5,042 MO
Catalina RC
W7SA (+N7FG)
1383 2 79 4,940 AZ
Blue Ridge ARC
W4YK 1016 2 55 4,906 NC
Lockheed Martin ARC & Fort Worth Kilocycle Club
W5IU 1075 2 39 4,900 NTX
OSCAR
NØUW 1526 2 30 4,864 MN
Redmond ARES, MicroHAMS, & Redmond Top Key CC
N7OS (+N7KE)
1148 2 45 4,812 WWA
Guilford Co ARES
NA4GC (+AJ4DV)
1284 2 25 4,750 GA
Green Mountain Wireless Soc
N1VT (+AB1CH)
1237 2 28 4,730 VT
NC4CS 1374 2 20 4,626 NC
Livermore AR Klub
K6TS (+K6CKT)
1457 2 12 4,450 EB
Columbia-Montour ARC
WC3A (+K3BD)917 2 29 4,406 EPA
Washington Amateur Communications
WA3COM (+KC3HW)
1014 2 31 4,350 WPA
Wireless Assn of South Hills
N3SH 1053 2 20 4,220 WPA
Alford Memorial RC
W4BOC (+KJ4NAX)
964 2 83 4,120 GA
Cambridge ARA
W8VP (+N8IMW)
1012 2 22 4,116 OH
Brazos Valley ARC
KK5W (+W5DPA)
901 2 37 3,950 STX
N6NA (+W6FT)
1166 2 80 3,938 SV
All ARC
W7PU 943 2 5 3,866 WWA
AARC/ARCC
N5VA (+KD5RHR)
867 2 47 3,772 NM
Saratoga Co. ARA
K2DLL 1159 2 46 3,760 ENY
Radio Amateurs of Greater Syracuse
W2AE 877 2 68 3,758 WNY
W1BIM 952 2 14 3,714 WMA
Rip Van Winkle ARS
WD2K 951 2 17 3,640 ENY
West Chester ARA
WC8VOA 1652 1 25 3,303 OH
Radio Assn of Erie
W3GV 888 2 7 3,290 WPA
Fort Myers ARC
W4LX 804 2 15 3,252 SFL
Orange Co (NY) ARC
W2HO 802 2 42 3,222 ENY
Wilderness Road ARC
W4CDA (+WQ4Z)
628 2 25 3,160 KY
Middlesex ARS
W1EDH 856 2 12 3,152 CT
Holland ARC
K8DAA 829 2 15 3,080 MI
Montcalm Area ARC
N8MA 633 2 23 3,026 MI
W7W (+WA7UHD)
729 2 30 3,006 WWA
Hamilton ARC
VE3DC 1029 2 35 2,928 ON
Bladen ARS
W4BLA (+KI4SYK)
944 2 37 2,840 NC
Genesee Co RC
W8ACW 734 2 11 2,806 MI
Oakland Radio Communication Assn
K6A (+WW6OR)
499 2 51 2,712 EB
Central NH ARC
W1JY (+W1CNH)
452 2 36 2,680 NH
Greater Vancouver RC
VE7VRG (+VA7OSO)
715 2 9 2,668 BC
Santa Fe Trail ARC
K5OKS 476 2 25 2,656 KS
Island Co ARC
K7A (+W7AVM)619 2 15 2,656 WWA
Santa Fe Trail ARC
KSØKS 476 2 25 2,656 KS
M&M ARC
W8PIF 1314 1 16 2,643 MI
Philmont Mobile RC
W3EM (+W3PSH)
591 2 20 2,530 EPA
Webster Co ARES
NØRT (+KCØOKO)
423 2 27 2,524 MO
Bridgerland ARC
W7IVM 620 2 50 2,508 UT
Hot Springs ARC
KØHS 410 2 36 2,506 SD
Alexandria RC
W4HFH 619 2 20 2,466 VA
WW1IE (+K1BSA)
471 2 18 2,422 ME
Capital Area AR Emergency Response Team
W9SPI 533 2 4 2,388 IL
Cleveland ARC
W4GZX 387 2 43 2,300 TN
Lenoir ARC / Caldwell ARES
KF4WOD (+KR4EOC)
405 2 23 2,246 NC
T-CEP Disaster Radio Team
K6TI (+W6TOP)
465 2 51 2,230 LAX
Maury ARC
W4GGM 514 2 28 2,230 TN
Grayson CO ARC
K5GCC 373 2 15 2,226 NTX
Ozark Mountain ARC
ACØMQ (+KDØHAW)
441 2 39 2,192 MO
Southern Pennsylvania ARC
K3IR 463 2 15 2,188 EPA
Triangle ARC
K8BLP 377 2 19 2,188 OH
Southern PA Com Group
K3AE 510 2 30 2,156 EPA
Triple A ARA
N3TN 651 2 33 2,152 WPA
Charleston ARS
W4HRS 311 2 26 2,146 SC
Bootheal ARC
KBØUFL (+WB4NMG)
297 2 20 2,144 MO
TriCo ARC
WX4TC (+KJ4CZE)
518 2 19 2,086 GA
Wheaton Community Radio Amateurs
W9CCU 634 2 17 2,080 IL
K9DRT 549 2 18 2,066 IN
K9BAR 446 2 19 2,052 IL
North Hills Amateur Club
W3EXW 343 2 43 2,030 WPA
East River ARC
W8MOP (+K8WBS)
392 2 9 1,984 VA
Broken Arrow ARC
W5BBS 296 2 40 1,932 OK
Thunderbird ARC
WG7J 689 2 20 1,930 AZ
Parrottsville Crackers
AG4OA 312 2 14 1,924 TN
Coachella Valley ARC
NR6P 378 2 22 1,838 ORG
Victoria ARC & Coleto Creek ARC
W5DSC 366 2 23 1,830 STX
Lake Oswego ARES
WA7LO (+KD7ZDO)
227 2 64 1,782 OR
ARC of Anderson
NC6I (+KI6WBM)
345 2 20 1,770 SV
Columbia ARC
W4CAE (+N1CKM)
298 2 59 1,758 SC
Palisades ARC
W9IW 363 2 25 1,664 IL
South Bay ARS
K6QM (+KF6ZBF)
210 2 12 1,654 SDG
W6PW 282 2 20 1,648 SF
Sun Country ARS
W4CW (+KJ4MDM)
248 2 9 1,644 NFL
Sierra Foothills ARC
W6EK (+KI6WDV)
231 2 21 1,554 SV
Sky Valley ARC
W7SKY 92 2 20 1,532 WWA
W2ONT 343 2 18 1,516 NNY
Electric City ARC
W7ECR 230 2 12 1,450 MT
Elk Co. ARA
N3NIA 392 2 23 1,444 WPA
Radio Amateurs of the Gorge
W7RAG 118 2 40 1,442 OR
NBC ARC
N2EW 253 2 4 1,400 LAX
Grande Ronde Radio Amateur Assn
W7GRA 172 2 19 1,382 OR
Newark ARA
N8ARA 261 2 30 1,372 OH
Rural Iowa ARES
KCØQNI 154 2 8 1,368 IA
W7ORE 301 2 9 1,366 OR
Hoosier Hills Ham Club
W9QYQ 244 2 23 1,314 IN
Panhandle ARC
W5WX 118 2 40 1,312 WTX
KC8UAV 374 2 5 1,298 MI
Lincoln Co ARC
N7OY 107 2 18 1,290 OR
W4VO 141 2 10 1,216 GA
Southern California Japanese Ham Club
K6JP 180 2 7 1,158 LAX
Bucyrus ARC
W8BRG 212 2 7 1,138 OH
Southern Crescent ARC
KJ4KPX 132 2 12 1,130 GA
North Shore ARC
VE3NSR 138 2 20 1,092 ON
RECWA
WW2FD 220 2 5 1,040 ENY
Ogemaw Arenac ARS
K8OAR 231 2 9 1,036 MI
Spencer Co ARC
KC9FTG 114 2 7 958 IN
Sequoia AR Group
N6KRV 142 2 6 866 SJV
Delaware Valley OMIK
W3DVO 104 2 9 858 SNJ
Club Radioamateur Lanaudiere, Inc
VE2RALI 155 2 4 810 QC
N7QJ 580 1 5 690 OR
Capital City ARS
AA3DC 29 2 10 502 MDC

4A Battery

Friends Of The 045 Repeater
W6V 439 5 11 4,320 EB
Portland ARC
W7LT 292 5 18 3,330 OR
St Louis QRP Soc
NFØR 172 5 9 2,735 MO
Elgin ARS
VE3RSE 186 5 11 2,185 ON
Nova QRP
WA4MM 177 5 9 2,175 VA
Snake River ARC
K7SI 187 5 37 2,000 ID
Rifles & Radios
W9R 181 5 12 1,455 IL
Delta Co ARES
KD5DHD (+WB5HSL)
72 5 3 1,110 NTX

4A Commercial

Birmingham ARC
W4CUE (+W4JY)
812 2 124 2,994 AL
Anthracite Repeater Assn
W3SJI 665 2 15 1,986 EPA
W2GLQ 674 2 18 1,938 NNJ
Hillsdale Co ARC
K8HRC 611 2 18 1,822 MI
Tompkins Co ARC
AF2A 672 1 10 1,487 WNY
CCDX Club
AD1T 447 2 12 1,234 NH
Black River ARC
K8BRC 331 2 12 1,112 MI
Macoupin Co Area RC
K9MCE 299 2 15 768 IL
Mississippi Coast ARA
W5SGL 154 2 15 748 MS
Lakway ARC
W2IQ 163 2 18 476 TN
Jersey Shore ARS
NJ2AR 62 2 30 244 SNJ

5A

Port City ARC
K1R (+W1WQM)
6357 2 50 20,562 NH
North Shore Radio Assn
NS1RA (+KB1PAL)
3883 2 75 13,652 EMA
Carroll Co Contesters
WY3P 4051 2 15 13,158 MDC
Ozaukee RC
W9LO (+AA9W)
3765 2 31 12,490 WI
Loudoun ARG
K4LRG (+AJ4EY)
3106 2 63 11,490 VA
Virginia Beach ARC & Virginia DXCC
W4UG (+K4IX)
3484 2 67 10,992 VA
W5ANR 2323 2 50 8,570 AR
Cherryland ARC
W8TCM (+KC8LTL)
2487 2 40 6,598 MI
St Petersburg ARC
W4TA 1481 2 65 6,316 WCF
10-70 Repeater Assn
N2SE (+W2INS)
1346 2 35 5,386 NNJ
MNARC/DCARA/DELCO DUG/MOBILE 6ERS
N3NZ 1376 2 58 5,254 EPA
RF Hill ARC
W3AI 1416 2 20 4,748 EPA
W4OLB 991 2 25 4,616 TN
South Pickering ARC
VE3SPC 1217 2 14 4,594 ON
Warminster ARC
K3DN 1262 2 31 4,322 EPA
London ARC
VE3LON 1270 2 30 4,040 ON
Highlands Co. ARC
K4W (+AG4ZM)
785 2 25 3,962 WCF
Marion ARC
W8GVB (+WW8MRN)
795 2 20 3,962 OH
Wayne Co ARA
W4GOL 755 2 26 3,770 NC
ARALB
W6RO (+KF6KEE)
786 2 43 3,688 LAX
Maryland Mobileers ARC
W3CU 765 2 25 3,680 MDC
Cambridge ARC
VE3SWA 881 2 5 3,620 ON
Kalamazoo ARC
W8VY 1346 2 15 3,604 MI
Core Group
K4ORE (+W4CHM)
815 2 22 3,502 TN
Intercity ARC
W8WE (+W8WER)
742 2 12 3,336 OH
ARA Southwest FL
W4F (+K2ZEL)
1123 2 38 3,334 SFL
Kitchener Waterloo ARC
VE3IC 1039 2 16 3,332 ON
Schenectady ARA
K2AE (+KC2MER)
599 2 31 3,270 ENY
York Region ARC
VE3YRA 780 2 30 3,200 ON
Wood Co EmComm
WC8EC 568 2 28 3,082 WV
Fort Venango Mike and Key Club
W3ZIC 556 2 16 3,048 WPA
Iredell Co ARS
W4SNC 777 2 49 3,028 NC

Chesapeake ARS
W4CAR (+K4AMG)
680 2 50 2,796 VA
Warrensburg Area ARC
WØAU 735 2 30 2,720 MO
Kendall ARS
KB5TX 589 2 18 2,652 STX
Twin City ARC
K9CU 676 2 40 2,644 IL
Toledo Mobile Radio Assn
W8HHF 456 2 50 2,540 OH
Manotic ARG
VE3AIR 497 2 150 2,500 ON
Alphalpha Repeater Group
W4A 522 2 30 2,392 WCF
Ft Herkimer ARA
W2FHA 385 2 22 2,358 WNY
Barrow ARES Club
WR4BC 555 2 35 2,314 GA
KQ7R 359 2 16 2,310 OR
Upper Valley ARC
K8FBN 337 2 40 2,194 OH
Eastern Connecticut ARA
K1MUJ 511 2 10 2,176 CT
Siskiyou Co ARA
K6SIS 574 2 7 2,106 SV
Bay Area ARC
WB8ICU 407 2 10 2,088 MI
Riverside Radio Amateurs
WA8RRA 511 2 8 2,086 MI
Coastal ARS
W4LHS (+K4S)
348 2 45 2,078 GA
Nortown ARC
VE3NAR 750 2 10 2,064 ON
Sabine Valley ARA
K5GVL 360 2 15 2,064 NTX
Barry ARA
K8BMI 413 2 43 1,920 MI
Tri Co AR
KC9OLF 406 2 15 1,902 IN
Citrus Belt ARC
W6JBT 355 2 25 1,898 ORG
Int'l Radio Consortium of the Mystical Town of Waugh
W9B 445 2 20 1,872 IN
BCARPSG
K3PSG 378 2 10 1,856 WPA
K4D 246 2 60 1,696 NFL
Jonestown Mountain Repeater Assn
N3CSE (+KB3TCF)
385 2 14 1,684 EPA
ARCs of Spokane
N7LC (+K7YY)
206 2 50 1,564 EWA
Cherokee Capital ARS
K4WOC 160 2 18 1,526 GA
Where RC
WT9H 174 2 20 1,498 IL
Beaver Valley ARA
W3SGJ 192 2 59 1,434 WPA
Southeast Texas Amateur Radio
KD5MAM (+KK5TC)
180 2 30 1,178 STX
Sterling - Rockfalls ARS
W9MEP (+K9BWE)
174 2 15 1,178 IL
Monongalia Wireless Assn
W8MWA 314 2 12 1,058 WV
Puerto Rico FD Group
KP4FD 51 2 41 1,056 PR
Zombie Works
WE8U 181 2 8 940 ID

5A Battery
Durham Region QRP Club
VE3QDR 876 5 6 8,920 ON
Zuni Loop Mtn Expeditionary Force
N6GA 781 5 9 8,035 LAX
Forsyth ARC
W4NC (+W4WS)
605 5 55 6,390 NC
David Sarnoff ARC
N2RE 158 5 31 2,335 SNJ
W8PIG 114 5 8 830 OH

5A Commercial
Milledgeville ARC
W4M 505 2 23 2,512 GA
Wisconsin ARC
W9CQ (+KC9PIF)
581 2 17 2,342 WI
West Central Louisiana ARC
N5LX 173 2 13 908 LA

6A
South Jersey Radio Assn
K2AA (+W2EA)
4374 2 59 14,894 SNJ
Woodbridge Wireless
W4IY 4355 2 34 14,744 VA
Mike & Key ARC
KD7IKV (+WA7IVY)
4083 2 80 12,704 WWA
Mike & Key ARC
K7LED (+WA7IVY)
4083 2 80 12,684 WWA
United Radio Amateur Club
K6AA (+K6ZNL)
3708 2 34 11,668 LAX
Santa Cruz Co ARCs
K6WC (+N1WC)
2645 2 70 10,518 SCV
Lake Co ARA
N8BC 2106 2 28 8,112 OH
Big Bear ARC
K6BB (+KC6JTN)
1350 2 20 6,092 ORG
Four Lakes ARC
W9JZ (+KG9NG)
1262 2 22 5,390 WI
N8LC 1599 2 30 5,316 MI
Fountain Valley Amateur Comm Team & & West Coast ARC
WA6FV 1243 2 25 5,160 ORG
Lake Monroe ARS
N4EH (+KJ4IYD)
1560 2 71 4,902 NFL
Orlando ARC
W1SE (+W4PLB)
916 2 40 4,786 NFL
Antietam RA, Inc.
W3CWC (+W3HAM)
1081 2 48 4,782 MDC
Andrew Johnson ARC
W4WC (+KD4RNC)
1118 2 13 4,568 TN
Hoodview ARC
W7Q 1356 2 34 4,506 OR
Starved Rock RC
W9MKS (+K9ZQ)
873 2 57 4,218 IL
Tipp City ARG
K8ZC 781 2 15 3,970 OH
Denver RC
WØTX 1003 2 27 3,682 CO
Saginaw Valley ARA
K8DAC (+N8XPS)
840 2 40 3,572 MI
Fulton Co ARC
K8BXQ 898 2 25 3,554 OH
Crawford Co ARC
W8BAE 1196 2 20 3,390 OH
West Chester Repeater Assn
W8WF 675 2 40 3,214 OH
Sheboygan Co ARC
W9VCL (+AB9FT)
589 2 12 3,154 WI
W9BJ 763 2 12 2,890 WI
Whitman ARC, Inc.
W1N 665 2 31 2,726 EMA
Brantford ARC
VE3BA 936 2 9 2,720 ON
Sangamon Valley RC
W9DUA 726 2 50 2,536 IL
Michigan City / LaPorte & Porter Co
W9SAL 405 2 49 2,360 IN
Conejo Valley ARC
AA6CV 409 2 56 2,304 SB
Waterville Area Wireless Assn
WA1WA 429 2 24 2,296 ME
WC4AR 379 2 14 2,250 TN
Northern Ohio ARS
K8KRG 426 2 36 2,142 OH
Las Vegas Radio Amateur Club
K7V 261 2 40 2,068 NV
Kent ARS
K3ARS (+N3WGC)
287 2 26 1,980 MDC
Northwood ARES
NS9Q 212 2 23 1,744 WI
W6SCE 385 2 7 1,676 LAX
Whitby ARC
VE3WOM 557 2 16 1,384 ON
Turlock ARC
W6BXN 404 2 10 1,328 SJV
Altus Area ARA
AJ5Q 86 2 15 1,248 OK
K5CRA 118 2 20 452 NTX

6A Commercial
LaGrange ARC
AB4GA 794 2 80 2,448 GA
Wisconsin Valley Radio Assn
W9NA 757 2 19 2,366 WI
Haywood Co AR Group
KI4BXI 9 2 19 682 TN

7A
Raleigh ARS
W4DW (+W4RNC)
3637 2 56 11,554 NC
Hampden Co RA
W1NY 3009 2 61 10,352 WMA
Central KY ARS
AA4NJ (+KE4YVD)
2348 2 24 8,308 KY
Fort Wayne RC
W9TE (+KB9WWO)
2177 2 57 7,574 IN
W8ZHO 1681 2 75 6,794 MI
DuPage ARC
W9DUP 1734 2 52 6,456 IL
Salem ARC
W7SAA 1431 2 25 5,980 OR
Delta ARS
VE7SUN (+VE7CDQ)
1604 2 22 5,970 BC
Illiana Radio Club
W9IRC (+KT9E)
1525 2 51 5,580 IL
Sun Parlour & BCRC ARC
VE3OW 2019 2 25 5,546 ON
Bellevue ARC
WØWYV (+WBØCAP)
1097 2 10 5,062 NE
North East GA ARC & Athens RC
W4G (+NE4GA)
878 2 34 4,148 GA
CGARC/MGRA
W4R (+KI4GCA)
1106 2 45 3,924 GA
Calaveras ARS
N6FRG (+KI6OBE)
643 2 17 3,432 SJV
Bexar Co ARES
K5EOC (+W5QS)
540 2 86 3,334 STX
Silverado ARS
W6CO (+KO6FR)
691 2 23 3,316 EB
Short Mountain Repeater Club
W4YXA 521 2 15 2,578 TN
Whitewater Valley ARC
N9JM 584 2 49 2,418 IN
W9WLC (+N9UHF)
464 2 23 2,382 IL
Midland ARC
W8KEA 456 2 26 2,348 MI
Stanislaus ARA
W6ERE 344 2 25 1,020 SJV

8A
Nashua Area RC
N1FD (+KB1RGE)
4445 2 40 14,080 NH
Cuyahoga ARS
W8BM 2640 2 35 10,382 OH
W9NE (+W9CEQ)
2835 2 60 10,136 IL
Two Rivers ARC
W3OC 2054 2 24 8,500 WPA
Gwinnett ARS
W4GR 1698 2 107 6,336 GA
Mahoning Valley ARA
W8QLY (+W8IZC)
1532 2 60 5,218 OH
Niagara Peninsula ARC
VE3VM (+VE3ROW)
1332 2 30 4,568 ON
South East Metro ARC
WØCGM 897 2 18 4,086 MN
Scarborough ARC
VE3WE 473 2 23 2,244 ON

9A
Orange Co ARC
W6ZE (+N1AB)
5925 2 85 19,304 ORG
Gloucester Co ARC
W2MMD 2690 2 45 10,696 SNJ
Wabash Valley ARA
W9UUU 1568 2 54 5,898 IN
South West IA ARC
KØSWI (+KØSWI)
1536 2 55 5,594 IA
ARC of El Cajon
WA6BGS 1263 2 120 4,412 SDG
Silver Springs RC
K4GSO 810 2 20 4,114 NFL
Greater Wichita Field Day / BEARS & WARC
NØW (+KCØYJI)
923 2 80 4,092 KS
Keuka Lake ARA
KV2W 366 2 34 2,348 WNY
El Dorado Co. ARC
AG6AU 472 2 37 2,268 SV

9A Battery
West Valley ARA
W6ZZZ (+AD6RE)
1453 5 30 14,405 SCV
Orange Co Radio Amateurs/Durham FM Assn
W4EZ 1100 5 35 11,115 NC

10A
Mississauga ARC
VE3MIS 1712 2 22 6,144 ON
Anne Arundel RC
W3VPR 1092 2 132 5,028 MDC

11A
Rappahannock Valley ARC
K4TS (+W4IM)
2873 2 32 10,282 VA

12A
Ventura Co ARS, Simi Settlers, Ventura Co ARC
N6R 1474 2 45 6,040 SB

17A Battery
USECA ARC
K8UO 1176 5 117 12,070 MI

20A
Potomac Valley RC & Columbia ARA
W3AO (+KE3Q)
9693 2 60 30,888 MDC

1B-1 Op Battery
N4TY 849 5 1 8,640 KY
K7IA 727 5 1 7,570 NM
W3TS 556 5 1 6,010 EPA
K5WNH 433 5 1 4,680 NTX
N8BB 443 5 1 4,580 MI
KXØR 403 5 1 4,380 WY
KEØG 393 5 1 4,030 MN
VE3RER 357 5 1 3,820 ON
W1ECH 356 5 1 3,245 VT
N7N (AB9CA,op)
294 5 1 3,240 WY
K3ATO 264 5 1 2,790 EPA
WØEA 227 5 1 2,620 IA
VE3LC 245 5 1 2,600 ON
NE3R 193 5 1 2,350 MDC
K8AB 227 5 1 2,270 OH
N3AB 212 5 1 2,270 EPA
W3ANX 200 5 1 2,240 WPA
N3RN 251 5 1 2,195 EPA
WI9WI 190 5 1 2,050 WI
AA1PL 132 5 1 1,955 RI
K1PDY 170 5 1 1,950 NH
W9NJY 168 5 1 1,830 WI
W8VK 173 5 1 1,830 OH
AD7L 164 5 1 1,790 OR
K3TW 133 5 1 1,755 MDC
KIØII 138 5 1 1,730 CO
W7AQK 157 5 1 1,720 AZ
WØYHE 162 5 1 1,720 MN
W6UR 152 5 1 1,670 SJV
VE2GB 144 5 1 1,640 QC
W3WT 121 5 1 1,545 EPA
KU4A 141 5 1 1,540 KY
KB8AP 129 5 1 1,540 OR
K4CHE 134 5 1 1,540 DE
AD5WI 134 5 1 1,515 AR
N3XRV 114 5 1 1,490 EPA
K7HBN 134 5 1 1,490 WWA
WAØKAQ 74 5 1 1,490 CO
N2JR 120 5 1 1,350 VA
K9FOH 98 5 1 1,330 IN
W6GA/7 86 5 1 1,310 MT
KØUU 120 5 1 1,300 MN
K5SI 117 5 1 1,270 STX
VA2SG 121 5 1 1,260 QC
N8XMS 101 5 1 1,260 MI
KD9KC 168 5 1 1,255 WTX
WUØL 100 5 1 1,250 SD
KB7LJP 78 5 1 1,230 WWA
AB4EL 113 5 1 1,220 NC
N7ARE 153 5 1 1,215 UT
KIØG 74 5 1 1,190 CO
W7CD 97 5 1 1,160 WWA
K6AR 101 5 1 1,160 SDG
N3ZP 100 5 1 1,100 EPA
WØCZ 73 5 1 1,065 ND
K6UZB 81 5 1 1,060 SV
KC9ZO 87 5 1 1,020 IL
WD5HNI 122 5 1 990 STX
KE7CDE 147 5 1 985 AZ
KQ6ES 72 5 1 970 ORG
W6SJ 30 5 1 950 ORG
WB5NMZ 57 5 1 920 AL
VE7BQO 64 5 1 875 BC
KKØD 72 5 1 870 CO
KB5FIO 42 5 1 870 STX
WØRSP 80 5 1 850 SD
KE4KE 118 5 1 840 TN
K8ZT/7 61 5 1 815 MT
NR8Z 61 5 1 810 OH
KD7OED 29 5 1 795 AZ
KA1HSP 63 5 1 780 WMA
NG1P 125 5 1 775 ME
KE3HG 62 5 1 760 EPA
N8N 51 5 1 760 OH
WD9EWK 61 5 1 755 AZ
NKØE 59 5 1 740 CO
VE6ZC 61 5 1 725 AB
AB8DF 56 5 1 710 MI
WB3CEG 46 5 1 710 STX
VA2YLB 121 5 1 705 QC
KF7HB 35 5 1 700 OR
W9CJS 46 5 1 635 IL
WG5F 48 5 1 630 OK
WB3AAL 50 5 1 615 EPA
N5KEV 61 5 1 580 NM
N8XA 85 5 1 550 OH
NØDA 39 5 1 540 OR
N7GGJ 48 5 1 530 WWA
KA9VHG 49 5 1 495 WI
W1EH 38 5 1 480 NFL
NI5X 28 5 1 430 OK
W4PJP 54 5 1 420 OK
W7AU 26 5 1 410 OR
KB3GDG/P 29 5 1 395 WPA
N7WY 29 5 1 390 SCV
KØWRZ 46 5 1 380 KS
KB3I 22 5 1 370 MDC
WA7CS 22 5 1 370 EWA
WWØWB 29 5 1 345 CO
N2ESE 23 5 1 330 NNJ
AJ4CG 17 5 1 320 GA
VE2AHH 22 5 1 320 QC
AI4KT 9 5 1 315 VA
WAØNVT 32 5 1 310 MO
WA4GLH 15 5 1 295 TN
W8BS 25 5 1 275 OH
KI4EZC 9 5 1 240 TN
KB1QKB 7 5 1 235 NH
K2KGJ 7 5 1 220 ENY
N1MMY 11 5 1 205 EB
W9AQ 19 5 1 195 IL
KC8JOO 7 5 1 135 OH
AD6QQ 6 5 1 80 SCV

1B-1 Op
W2RA 1232 2 1 5,178 WNY
K7DR 886 2 1 3,304 MI
WB8JUI 600 2 1 2,628 OH
KØZR 699 2 1 2,504 VA
KE7NO 790 2 1 2,194 MT
N4UF 471 2 1 1,954 NFL

COURTESY NKØE

Dave, NKØE, waiting out the t-storms, watches Mother Nature put on her light show while operating at the WGØAT site.

NA5DX	427	2	1	1,710	MS
AI4BJ	365	2	1	1,680	KY
WØXR	375	2	1	1,640	CO
WA9STI	411	2	1	1,412	SJV
WØAAA	294	2	1	1,236	MN
K3HH	342	2	1	1,222	MDC
W3UL	316	2	1	1,094	MDC
N8TD	192	2	1	1,022	OH
W9DKB	189	2	1	1,006	WI
KB3IRR	416	2	1	982	EPA
NGØR	212	2	1	976	MN
WA2CRQ	202	2	1	952	SV
N5VI	200	2	1	950	MS
NØNS	255	2	1	918	IA
AB5I	203	2	1	912	OK
W5EI	167	2	1	902	WTX
K6PDQ	273	2	1	896	SB
N3SW	110	2	1	790	VA
AC7JW	147	2	1	694	UT
KC4WQ	100	2	1	694	EPA
WE6Z	368	1	1	656	SV
AF6ME	138	2	1	626	SF
WD6LL	238	2	1	626	SV
KB8HOC	182	2	1	614	OH
N2DD	129	2	1	608	WNY
KC7O	174	2	1	598	SB
WØRK	203	2	1	556	MN
WB2AXF	82	2	1	528	ENY
VE4XM	130	2	1	510	MB
AB3FX	111	2	1	492	MDC
VA2NU	120	2	1	490	QC
KBØYTO	19	2	1	488	NE
AB6S	210	2	1	470	EB
N7CFO	82	2	1	464	WWA
WA6WPG	81	2	1	456	SB
K3ZT	152	2	1	454	EPA
NØBHT	140	2	1	430	CO
K6JRA	85	2	1	420	EB
W9KHH	54	2	1	416	WI
W9KH	102	2	1	410	IL
WØAEW	64	2	1	400	CO
NØUB	73	2	1	396	MO
K7DNH	122	2	1	394	NV
WT9S	117	2	1	384	AZ
K3ORS	123	2	1	346	TN
WB6MMQ	27	2	1	304	LAX
AC7CJ	25	2	1	300	EWA
N3HCP	72	2	1	294	EPA
N3WTF	70	2	1	290	ORG
N6RZR	70	2	1	290	SV
WØGTR	11	2	1	272	MN
NØOMC	33	2	1	266	KS
AA9NA	78	2	1	256	IL
W5ENG	27	2	1	254	STX
N3QBI	44	2	1	244	WPA
KC2CHN	21	2	1	234	SDG
W9SRB	90	2	1	230	IL
WB8VQU	90	2	1	230	MI
K8SG	63	2	1	226	MI
AB3S	43	2	1	222	EPA
WB3AKD	35	2	1	220	VA
AD4JD	60	2	1	220	TN
K3WQ	71	2	1	192	MDC
W7JAZ	8	2	1	170	OR
N7RAA	27	2	1	154	NV
AE5KT	44	2	1	138	NTX
K7JHW	19	2	1	138	WWA
KØVG	7	2	1	124	MN
KDØHWX	11	2	1	122	MN
KB3OUK	25	2	1	120	WPA
WB5CCO	31	2	1	112	LA
KF4JQP	15	2	1	80	AL
KB7RJF	15	2	1	80	SJV

1B-1 Op

W5RMB	305	2	1	610	AL
N4UOH	149	2	1	596	NC
KD5BBR	91	2	1	182	OK
KE8E	166	1	2	166	OH
ABØDK/2	42	2	1	108	WNY
K3ESS	42	2	1	84	NFL

2B-1 Op

NJ2X	25	2	1	248	NNJ

1B-2 Op Battery

VA3DF	400	5	2	4,155	ON
NØEVH (+K0WEW)	321	5	2	3,410	MO
W7EL (+K7PJT)	310	5	2	3,400	OR
VA3YV	322	5	2	3,165	ON
W4MJT	255	5	2	2,800	NC
K2WNY (K2SH)	265	5	2	2,790	WNY
K3WGR	205	5	2	2,340	EPA
KC7H	247	5	2	2,100	EWA
K4RDU	171	5	2	1,910	VA
AD4GP	167	5	2	1,865	GA
N3CU	120	5	2	1,550	EPA
N7JI	131	5	2	1,525	OR
K2QR	88	5	2	1,230	WNY
VA7RMM	129	5	2	1,065	BC
AI2T	55	5	2	850	WNY
AE6JB	40	5	2	690	SV
W7RIN	60	5	2	685	AZ
K4RET (+N4MJM)	37	5	2	395	VA

1B-2 Op

W8TK	1578	2	2	7,062	OH
WB9COY	1239	2	2	4,990	SDG
KA1VHF	1020	2	2	4,430	OH
KEØUI	912	2	2	3,650	CO
VE6KZ	753	2	2	3,262	AB
N5JB	771	2	2	3,228	NTX
K7GGG	1024	2	2	3,224	AZ
N5JB (+W5ONL)	771	2	2	3,178	NTX
K7RE	673	2	2	2,842	WY
N9EZ	650	2	2	2,750	MI
K9ZA (+W9GKA)	739	2	2	2,468	IL
VE6AID	471	2	2	2,170	AB
K5T	1009	1	2	2,018	NTX
K3TM/4	432	2	2	1,968	VA
N6JF	427	2	2	1,700	LAX
VE3UK	695	2	2	1,580	ON
WT7B	562	2	2	1,474	ID
W5WHN	158	2	2	1,100	NM
N9NM	227	2	2	958	STX
VE7GDS	191	2	2	790	BC
W1UJ	125	2	2	730	NH
K3VIN	283	2	2	716	KY
K7DU	185	2	2	684	WWA
KBØYH	251	2	2	652	CO
KV6O	203	2	2	556	CO
W3RP (+K8ARY)	218	2	2	550	WPA
K4XF	108	2	2	502	SFL
KU4UV	121	2	2	492	KY
K2OAK	167	2	2	486	NNJ
WBØSMX	115	2	2	480	AZ
KE7HLR	82	2	2	478	NV
WB2AZE	52	2	2	454	NNJ
W6OFM	109	2	2	392	SF
NA9Q/VY1 (+NB9Q)	54	2	2	358	NT
K4RVH	54	2	2	358	AL
KTØR	52	2	2	330	MN
K7OVW (+KC7WEU)	103	2	2	306	OR
K5NLX (+KD5SQT)	50	2	2	300	AR
KE9SA	47	2	2	246	WI
N2MEE	67	2	2	234	ENY
AA2GS	27	2	2	224	KY
WW6CW	11	2	2	194	SDG
K5PA	70	2	2	190	STX
KD8LBS	58	2	2	166	OH
KCØMJY	7	2	2	64	CO

2B-2 Op Battery

NØUR	1078	5	2	10,830	MN
K3ZZ	1030	5	2	7,575	MDC
N8EFO	373	5	2	3,920	OH
WØFBI	251	5	2	2,960	IA
WA8WPI	161	5	2	1,870	MI
KA6SGT/9	103	5	2	1,030	IN
K7NS	60	5	2	950	UT
KE5LSU	13	5	2	325	NM

2B-2 Op

KGØGY	800	2	2	3,438	NE
NE7D	571	2	2	2,334	OR
KC5JFO	480	2	2	1,690	NTX
AB9SJ	665	2	2	1,580	NM
W5JMW	266	2	2	1,570	WTX
WS4C	347	2	2	1,384	SC
KCØUXC	217	2	2	1,356	SD
NE3H	221	2	2	1,204	EPA
K4JKA	233	2	2	1,082	VA
NB3T	271	2	2	1,008	VA
AE6FD	238	2	2	826	SJV
KA2KGP	151	2	2	644	WNY
WE7H	142	2	2	634	AZ
KS6A	55	2	2	460	SV
KD8ITX	97	2	2	452	WPA
KCØPIK	60	2	2	370	KS
N4UPX (+KF5BJN)	101	2	2	346	MS
WA2YCJ	36	2	2	282	NNJ

1C

N6BK (+WX7G)	506	5	2	5,160	LAX
AA6DP	735	2	4	2,990	LAX
K7VO	482	2	1	1,164	WWA
K2NV/VE3	250	2	1	1,150	ON
W2ET	240	2	1	1,096	MDC
WA2WDT	233	2	1	904	MDC
W3AG	163	2	1	902	WPA
WO8L	166	2	1	886	NC
W9XS	172	2	1	808	IL
W3BC	188	2	2	788	WPA
WA7ZZB	151	2	1	752	WWA
KI4FW/M	50	5	1	625	VA
N7DLV	113	2	1	576	WWA
K1UR	111	2	2	572	ME
ABØYM	137	2	1	568	CO
W7CGA	71	2	1	534	EWA
K8TL	108	2	2	528	OH
KCØVFO	173	2	1	496	CO
N5XTR	347	1	1	447	WTX
KK6GJ	148	2	1	446	SB
K2HVN	85	2	1	434	NH
K2NV	62	2	1	398	WNY
K2NV/2	62	2	1	398	WNY
VE6AB	65	2	1	380	AB
W4ZPR	43	2	1	372	VA
K6LMN/Ø	31	2	1	362	MN
AF6AV/M	152	2	1	354	SDG
N7TM	47	2	1	338	WWA
WØOGH	90	2	1	322	AZ
K6BBQ	28	2	1	306	SF
N5YEE	43	2	2	286	LA
NE9T	37	2	1	278	IN
N3TG/M	59	2	1	268	VA
AA5TI	79	2	1	258	NM
VA7ANI/MM	79	2	1	258	BC
KA3KSP	63	2	1	226	WPA
K5VHH	60	2	1	220	STX
WØIE	44	2	1	188	KS
KA1KNW	43	2	1	186	CT
AG6RF	38	2	1	176	EB
KIØP	31	2	1	162	CO
WU1B	6	2	1	162	ME
KC4YBO/M	29	2	1	158	IA
W9BNO	3	2	1	156	CO
W4EJY	51	2	2	152	TN
KA5FQA	20	2	1	140	OR
KCØJQO	16	2	1	132	MN
WA5ICA	16	2	1	132	NTX
N7VLN	40	2	1	130	MO
K9PNP	14	2	1	128	IN
W9CNF/4	9	2	1	118	NFL
KF6IIU	16	2	1	82	EB
WB6PWD	9	1	1	59	LAX
WØRDE	4	2	2	58	KS
VE7CX	3	2	1	56	BC
AD7RZ	3	2	2	56	AZ

3C

KB7EOC	89	2	5	778	OR

1D

W4IX	1068	2	1	3,746	SC
VE3TA	1140	2	1	3,722	ON
W3GS	728	2	3	2,758	EPA
W9SN	629	2	1	2,566	IN
K9UQN	607	2	1	2,362	IL
WI2E	663	2	2	2,290	EPA
VE2JCW	555	2	1	2,220	QC
VE3GSI	534	2	1	2,186	ON
WA1ENO	1041	2	2	2,082	EMA
K5ENS	1007	2	1	2,064	LA
VE3MGY	530	2	1	2,062	ON
W8TM	515	2	1	1,892	OH
WIØS	387	2	2	1,698	MN
KØGAS	900	1	4	1,660	CO
KEØFJ	787	2	1	1,624	MN
N7RVD	363	2	1	1,566	ME
W6AEA	751	1	1	1,552	EWA
WA2JQK	546	2	1	1,470	ENY
AE5PW	356	2	1	1,394	AR
W6AFA	1329	1	1	1,379	LAX
KB3LIX	360	2	1	1,374	WPA
KO7X	657	1	1	1,313	WY
VA7ST	312	2	1	1,298	BC
NØLY	305	2	1	1,270	MO
NIØR	262	2	1	1,198	MO
W7GVE	296	2	1	1,184	AZ
KØMPH	279	2	1	1,160	MN
KA2OUO	292	2	1	1,148	NC
KG4W	344	2	1	1,140	VA
NS2X	342	2	1	1,062	TN
KC4YOT	223	2	3	956	NC
W6VM	299	2	1	944	SB
VE6AO	886	1	1	936	AB
WØQQG	224	2	1	914	VA
W6SX	428	1	1	906	SJV
WØRAA	208	2	1	882	CO
VA3ATT	219	2	1	876	ON
N2YO	223	2	1	860	VA
W2DXE	200	2	1	840	WNY
N8XPQ	212	2	2	812	MI
N4V	194	2	1	788	VA
ND3R	223	2	1	776	WPA
W7QN	196	2	1	764	WWA
KC5GNB	178	2	1	762	NTX
KØLWV	186	2	1	744	MO
WA8SDF	366	2	1	732	OH
K4O	80	2	12	730	AL
N1WQ	173	2	1	724	MN
W9KB	358	1	1	721	MI
VE2FFE	138	2	1	702	QC
NV9X	174	2	1	694	IL
K4SV	161	2	1	694	NC
KEØRR	242	2	3	676	MN
KA2FHN	186	2	1	674	WNY
N8KC	169	2	1	672	MI
W6ABR	332	2	9	664	SF
N8CPA	165	2	1	660	OH
K2MK	304	1	1	658	SNJ
VE3FJ	150	2	1	650	ON
KB9YGD	257	2	1	632	IN
KAØZPP	263	2	2	626	MN
NX7F	159	2	1	612	NV
K9MMS	140	2	1	610	IL
KI4EGT	150	2	1	600	GA
N7XW	122	2	2	590	WWA
VA3HUN	132	2	1	578	ON
W2BEE	132	2	1	578	ENY
WB2L	154	2	1	576	IN
K2GN	158	2	1	576	SNJ
KA3TKV	101	2	1	572	EPA
W3KS	255	2	1	560	DE
W5QLF	123	2	1	542	STX
K6LRN	135	2	1	540	SV
W3SW	190	2	4	530	WNY
K5VRC	120	2	1	530	AR
N6RO	326	1	1	518	EB
N3GGT	117	2	1	518	EPA
WO2N	117	2	1	518	NLI
NØKBD	125	2	1	508	MN
WB9GHD	89	2	1	506	SDG
KE7YF	197	2	1	502	AZ
K1KO	223	1	1	496	VA
WA3AAN	220	1	1	490	EPA
W5SQA	110	2	1	490	NTX
K2BC	157	2	3	470	NNJ
N8EW	105	2	1	468	OH
N3CZ	103	2	1	462	NC
KH7T	211	2	10	460	PAC
KC7GNM	105	2	1	460	AZ
KI4TZU	201	2	1	452	SC
K8SSJ	37	2	2	450	OH
WØZA	101	2	1	450	CO
KJ4WD	106	2	1	446	NC
VE2CLM	115	2	11	424	QC
KB6A	92	2	1	418	ORG
WØBH	247	1	1	418	KS
VE1ARG	204	2	1	408	MAR
N1DBS	89	2	1	406	CT
N8NOE	93	2	1	406	MI
NØBUI	135	2	1	404	MN
WA7YNU	122	2	1	394	MT
N4TZY	88	2	1	390	KY
KS4S	85	2	1	390	NC
N1NN	84	2	1	386	EMA
N4NC	96	2	1	384	NC
N6KW	191	1	1	382	WWA
KB9OFM	160	2	1	370	WI
AG4FK	185	2	1	370	TN
N7WH	95	2	1	370	ID
KG4WNA	67	2	1	368	KY
N3BM	168	1	1	363	VA
KG2NI	176	2	1	354	WNY
WØVX	109	2	1	344	NTX
N4RS	72	2	1	338	MO
AK4DW	70	2	1	330	TN
WB5A	165	2	1	330	NM
WE6EZ	114	2	1	328	NV
WG5J	276	1	1	326	NTX
WA9ZES	81	2	1	324	IN

KT4U	171	1	1	324	VA
N5LH	81	2	1	324	AR
AD5LU	87	2	1	324	NTX
WB3O	134	2	1	318	VA
N2BZP	94	2	1	318	NV
KØPK	67	2	1	318	MN
KD3SB	133	2	1	316	WPA
NQ5Z	82	2	1	316	OK
VE7KS	157	1	1	314	BC
KI6CG	263	1	1	313	MT
AB1BW	85	2	1	312	CT
KO6OP	131	2	1	312	SJV
K6CSL	86	2	1	310	SJV
W1WSN	77	2	1	308	SFL
KC9DKQ	153	2	1	306	WI
K9GPC	128	2	2	306	IL
N6WK	255	1	1	305	ORG
AE6IC	127	2	1	304	SDG
W4HEW	76	2	1	304	GA
K9DVB	126	2	1	302	WI
KH6GMP	63	2	1	302	PAC
W9WXN	25	2	1	300	IN
VA2WDQ	148	1	1	296	QC
KD4YDC	123	2	1	296	GA
WS2E	241	1	1	296	EPA
KD2HE	157	1	1	294	NLI
N9YLZ	118	2	1	286	IL
W9JD	58	2	1	282	NE
KE5ZZN	32	2	1	278	STX
K8OUX	57	2	1	278	MS
VE6RI	114	1	1	278	AB
K4XD	124	1	1	277	NC
W3KM	69	2	1	276	EPA
W4NRV	138	2	8	276	VA
K3VED	136	2	1	272	WPA
W5PEH	55	2	1	270	STX
VE3TAZ	30	2	1	270	ON
VE2WNF	109	2	1	268	QC
AA6AC	67	2	1	268	SB
W4HAY	67	2	1	268	TN
K2FEO	108	2	1	266	WNY
KB7HDX	108	2	1	266	EWA
WB9FJO	57	2	1	264	MI
W5GAI	80	2	1	262	STX
KI4CZR	55	2	1	260	GA
KG8BB	104	2	3	258	OH
KA5VZG	103	2	1	256	TN
AAØA	252	1	2	256	MO
KF6PQT	62	2	1	256	LAX
AB8AG	128	2	1	256	OH
WB4MNK	51	2	1	254	NFL
AI4CO	102	2	1	254	NFL
N9LYY	50	2	1	250	IN
N6AD	125	1	1	250	SF
KK1X	50	2	1	250	EMA
AA5VU	51	2	1	248	STX
N6QQ	186	1	1	241	LAX
N1VMJ	118	2	1	236	WMA
VA7IR	118	2	1	236	BC
N1YDU	107	2	3	234	OH
N4DLR	66	2	1	232	OH
N1BCL	180	1	1	231	VT
K4GHS	134	1	1	231	NC
WR5RR	45	2	1	230	OK
N2J	177	1	1	227	SNJ
W8KGR	112	2	1	224	MI
KL7IWF	87	2	1	224	NC
WA2LXE	35	2	1	220	NNJ
W8DUQ	35	2	1	220	WV
K9MIE	109	2	1	218	IL
K3DJ	164	1	1	214	SFL
AA7IH	52	2	1	208	OR
W8CQK	79	2	2	208	OH
KV5WS	28	2	1	206	STX
N9GG	39	2	1	206	EPA
KC4TVZ	154	1	1	205	GA
WS2N	35	2	1	204	NLI
AD7MQ	77	2	1	204	MT
AF4TF	77	2	1	204	TN
N5RAG	61	2	1	202	STX
AB2TC	99	2	1	198	WNY
W9RAM	97	2	1	194	IN
NP3CW	96	2	1	194	PR
VE3EMB	10	2	1	188	ON
N7LQT	69	2	1	188	AZ
W7YKN	66	2	1	182	NV
KD5RSS	33	2	1	182	OK
N1AOK	65	2	1	180	CO
KG8WI	47	2	1	180	MI
KS7U	65	2	1	180	AZ
N5LXI	64	2	1	178	NTX
NE1H	87	2	1	174	NH
KF7VG	48	2	2	172	WWA
KO8S	30	2	1	170	MI
W7IX	60	2	1	170	WWA
KF6JQC	58	2	1	166	SJV
KC5YWN	58	2	1	166	AR
AF6NI	57	2	1	164	SDG
W5DLP	66	2	1	164	NTX
WA4HWT	80	2	1	160	GA
W1WIU	150	1	1	160	RI
WB7NIL	54	2	1	158	WWA
K9KLO	53	2	1	156	GA
AA8DN	53	2	1	156	OH
KO6CR	51	2	1	152	ORG
KØUAS	50	2	1	150	KS
KD4QMY	100	1	1	150	GA
KA1PPV	25	2	1	150	CT
AB8RX	50	2	1	150	MI
N3ZEL	75	2	2	150	WPA
W4JHU	50	2	1	150	VA
WB9LRK	73	2	1	146	IN
W6IFA	48	2	1	146	SV
K2JX	89	1	1	139	NLI
KA8PTT	53	1	1	138	OH
KC9JXD	43	2	2	136	IL
AC7LC	21	2	1	134	WWA
KJ4ND	48	2	2	132	KY
N2YHQ	33	2	1	132	WNY
KZ2G	66	2	1	132	NLI
WB8ENE	27	2	1	130	OH
W1WMJ	80	1	1	130	OH
N7HIT	40	2	1	130	UT
KØRRP	38	2	1	126	NC
W3WOT	38	2	1	126	NC
WB9GKM	37	2	1	124	IL
KD5JFE	37	2	1	124	LA
W9KVR	18	2	1	122	IL
KU1Q	61	2	2	122	CT
KF6IMG	35	2	1	120	ORG
KCØEWG	34	2	1	118	KS
VA3RNJ	21	2	1	116	ON
WB9MII	29	2	1	116	IL
W3NWS	16	2	1	114	MDC
KF4IRC	25	2	1	114	AL
WB4IXU	32	2	1	114	TN
W3JM	56	2	1	112	EPA
WA6GFR	20	2	1	112	ORG
KB3SPH	31	2	1	112	MDC
NS4DX	47	2	1	112	VA
KD6GJU	30	2	1	110	SB
KJ4LBZ	30	2	1	110	VA
KA6GDT	20	2	1	110	SJV
4C5ØC	15	2	1	110	DX
W6NF	30	2	1	110	NV
WN2A	15	2	1	110	NNJ
K7EIQ	54	1	1	108	EWA
KK7CG	29	2	1	108	OR
K6GEP	40	2	1	108	ORG
W8ONE	27	2	1	108	OH
NØPOH	28	2	1	106	CO
K7AWB	28	2	1	106	EWA
N1IMW	30	2	1	104	NH
K4AAL	27	2	1	104	TN
WQ2Q	26	2	1	102	SNJ
KB1HCD	51	2	1	102	CT
KB1OIS	26	2	2	102	NH
W5KI	29	1	1	99	AR
KT7F	27	2	1	98	ORG
N8KOJ	24	2	1	98	OH
W4LSC	24	2	1	98	AZ
KE7TMB	23	2	1	96	OR
W8KNO	23	2	1	96	OH
W4DSR	11	2	1	94	NFL
KJ4BKD	22	2	1	94	NC
K1RDX	22	2	1	94	NH
N3GWR	93	1	1	93	EPA
N4EOC	43	1	1	93	MDC
K4IJK	21	2	1	92	RI
KD8GRG	21	2	1	92	MI
N7PXD	21	2	1	92	AZ
N8XAY	21	2	1	92	OH
KB5DRJ	21	2	1	92	NTX
W9TQV	20	2	1	90	WI
ABØUO	32	2	1	90	KS
KT4RH	45	2	1	90	TN
KA6FBB	20	2	1	90	ORG
KCØJPO	19	2	1	88	ND
WA5KSC	18	2	1	86	SC
KJ6VX	17	2	1	84	SDG
N8TMB	16	2	1	82	MI
KA4WWN	16	2	1	82	SC
KC2TEL	26	2	1	82	NNJ
K4GOP	40	2	1	80	NFL
KA1RWY	15	2	1	80	CT
AI5G	15	2	1	80	NTX
WA9KRL	39	2	1	78	IL
KC7RK	7	2	1	78	WWA
VE5DLM	39	2	1	78	SK
WBØGAG	7	2	1	78	IA
VA7LT	14	2	1	78	BC
WØKLV	12	2	1	74	MN
WA2BKN	37	2	1	74	SFL
N9NUZ	12	2	1	74	WI
N3MQL	12	2	1	74	EPA
K7BBR	6	2	1	74	UT
N3PCE	11	2	1	72	WPA
KB1MEK	10	2	1	70	CT
N9WAY	5	2	1	70	WI
K5FYI	10	2	1	70	WTX
VE7JRX	9	2	1	68	BC
W3ELW	9	2	1	68	WPA
KB1RDL	68	1	1	68	CT
KB7QAG	9	2	1	68	WWA
KG4LNG	9	2	1	68	MT
KD8CHN	8	2	1	66	MI
KC9KIO	8	2	1	66	WI
KB3NRL	8	2	1	66	EPA
N9RG	18	2	1	64	SFL
W7SST	6	2	1	64	OR
K4AWC	31	1	1	62	GA
KBØLQJ	5	2	1	60	UT
KA2IBN	30	2	1	60	ENY
KS4FE	4	2	1	58	KY
WØKIE	4	2	1	58	OK
WA3LGG	2	2	1	58	EPA
NB4F	29	2	1	58	GA
WA2ZNC	57	1	1	57	WNY
AD7XV	3	2	1	56	WWA
KC2AEI	3	2	1	56	MDC
KC2MBN	3	2	1	56	NLI
ZS1JY	1	2	1	54	DX
NK4I	1	2	1	52	SC
WA8RUM	1	2	1	52	OH
W5FIO	16	2	1	50	NTX
K1NPT	25	2	1	50	RI
N2KF	15	2	1	48	WNY
KE6PPE	22	2	1	44	SCV
K9EFY	22	2	1	44	IN
WØXP	41	1	1	41	MO
WA5YNE	40	1	1	40	OK
WB7QFO	20	2	1	40	CO
WBØJD	19	2	1	38	SD
K4DXU	24	1	1	37	TN
N4SG	16	2	1	32	TN
N9WK	29	1	1	30	WI
WZ6P	14	2	1	28	SB
KA2TAM	27	1	1	27	EPA
K3MAF	13	2	1	26	VA
K4FX	25	1	1	25	NC
WB6KDH	12	2	1	24	SB
KH6HME	11	2	1	22	PAC
N5OA	21	1	1	21	LA
N9FNK	10	2	1	20	IN
KB6NN	4	2	1	16	SF
KBØERS	7	2	1	14	STX
W7HSA	5	2	1	10	WWA
K3BRJ	3	2	1	6	VT
W4RRH	5	1	1	5	VA
VE3AJ	2	2	1	4	ON
KF3BN	2	2	1	4	MDC
WA6VCN	2	1	1	2	ORG

2D

W6PT	1298	2	5	3,960	SDG
VE3YAA	901	2	3	3,648	DX
K2TTT	1134	2	3	3,648	NNJ
K7SDX	626	2	10	2,334	EWA
W5GAD	613	2	25	2,274	LA
K6SYU	376	2	11	1,274	ORG
W4NUN	320	2	2	924	GA
W4BPH	94	2	16	638	WCF
KK6I	282	2	3	568	SDG
K2VK	148	2	4	492	NNJ
K4YTZ	161	2	4	492	SC
KB3LVX	148	2	2	382	MDC
N5GAR	56	2	1	364	NTX
N6OYV	94	2	2	258	SV
AC5DI	85	1	3	225	STX
WX1J	86	2	4	192	MI
KB3LMC	29	2	1	142	MDC
W8WFQ	29	2	1	108	OH
N2RHL	51	2	2	102	WNY
W5RKN	14	2	1	28	STX

3D

NØGF	1175	2	15	4,004	ND
K1TTT	1712	2	3	3,638	WMA
W4V	1287	2	16	2,624	AL
W2LI	274	2	25	1,058	NNJ
K7DLX	165	2	5	466	UT
N7TCO	349	1	3	353	EWA

4D

VE3URF	916	2	4	2,170	ON
WB1GOF	375	2	47	1,746	EMA

5D

W5KFT	3577	2	13	10,326	STX

1E

N4BP	1014	5	2	10,190	SFL
AA3B	1980	2	1	8,170	EPA
W6JTI	752	5	1	7,770	SF
W2BC	1761	2	6	7,494	WNY
K3WW	1515	2	1	6,302	EPA
WØUA	3056	1	3	4,857	CO
WB8RTJ	457	5	1	4,720	OH
K8RG	435	5	1	4,700	WV
W9TS	395	5	1	4,200	IL
NØTT	1009	2	1	4,186	MO
K1EEE	395	5	3	3,805	NH
N5AW	1099	2	1	3,720	STX
WA2EQF	781	2	5	3,608	NNJ
N1URA	275	5	3	3,570	ME
W3MF	304	5	2	3,350	EPA
N4PN	1260	2	1	3,326	GA
WA9S	718	2	1	3,022	IN
NY1P	274	5	1	2,990	CT
W6AQ	305	5	1	2,920	LAX
N3HBX	1375	2	1	2,900	MDC
N1SV	1261	2	1	2,672	EMA
W7NNN	1133	2	1	2,656	WWA
K9DMV	263	5	1	2,610	IL
W1TJL	1205	2	1	2,560	CT
W9LHG	625	2	1	2,550	WI
AA1O	244	5	1	2,535	EMA
VE7NI	192	5	1	2,500	BC
WA8KAN	243	5	1	2,480	WV
K6ZH	663	2	2	2,446	SDG
W4ZW	561	2	1	2,394	WCF
K4WW	650	2	1	2,390	KY
N7WS	1075	2	1	2,314	AZ
AC3V	216	5	1	2,230	EPA
WA1VKO	755	2	1	2,160	NH
K6RB	463	2	1	2,102	SCV
VE7NH	500	2	1	2,100	BC
KB3FJJ	182	5	1	2,070	EPA
NI7R	168	5	1	1,930	AZ
W7GB	388	2	1	1,852	EWA
W5USJ	170	5	1	1,850	NTX
W5ODS	148	5	1	1,830	OK
AE5GT	747	2	1	1,814	STX
K8AJS	381	2	1	1,806	OH
VE9CEH	713	2	1	1,776	MAR
N6RK	406	2	1	1,774	SV
VE2AWR	446	2	1	1,736	QC
WNØG	505	2	2	1,730	IA
KD7MSC	199	5	1	1,725	OR
AI7H	366	2	1	1,714	ID
K1MBF	150	5	1	1,700	TN
NØXT	784	2	1	1,668	MN
K4WOP	374	2	2	1,646	VA
WB1HJS	156	5	1	1,605	WMA
N4TCP	642	2	1	1,580	NC
AE1P	637	2	1	1,576	NH
K6EMI	437	2	3	1,566	ORG
AAØCL	328	2	1	1,562	MO
KB3X	672	2	1	1,494	NC
WR2G	293	2	1	1,482	SJV
KØLMD	549	2	1	1,428	CO
W4LLY	530	2	3	1,410	KS
N1CC	426	2	1	1,406	NTX
N7NB	114	5	1	1,390	WWA
VE3CX	496	2	3	1,384	ON
K4EU	403	2	1	1,302	VA
K6KQV	308	2	1	1,298	SCV
N7GTE	619	2	1	1,290	UT
KØRFD	325	2	1	1,278	CO
W8AWE	384	2	8	1,276	MI
K6UF	342	2	1	1,276	SCV
WA4FOM	93	5	1	1,265	NNJ
KB8UHN	552	2	1	1,254	OH
N4HAI	109	5	1	1,240	OH
NXØI	302	2	1	1,236	MO
WU9Z	102	5	2	1,220	IN
K4DZR	98	5	1	1,210	TN
AI4FR	353	2	1	1,210	WCF
NQ5X	384	2	2	1,198	NTX
K4OD	127	5	1	1,195	GA
NQ2W	104	5	1	1,190	ENY
KCØVEP	94	5	1	1,190	NE
KC9CDW	526	2	1	1,152	WI
WB2TFM	523	2	1	1,146	NFL
KU4WD	400	2	1	1,146	TN
N6ZFO	99	5	1	1,140	SF
N6KP	506	2	1	1,112	SJV
W4ZKE	240	2	1	1,110	KY
WØIS	105	5	1	1,110	MN
W3LL	466	2	1	1,082	MDC
W4EA	205	2	1	1,052	GA
N7UVH	253	2	1	1,044	ID
AE5B	239	2	2	1,020	WTX
WA7PRC	221	2	1	1,000	WWA
W6GMT	85	5	1	1,000	MN
W7FD	450	2	4	1,000	SJV
VA3OC	942	1	2	992	ON
KN4QD	251	2	1	982	SC
WA5RML	87	5	1	970	NTX
KD3FG	307	2	1	970	MDC
WD9FTZ	95	5	2	965	OH
W2FAM	126	2	1	954	WNY
KJ5ZT	320	2	20	930	AR
KK6TV	93	5	2	925	SDG
NY6J	227	2	1	920	IN
KØGEO	160	2	1	890	STX
K5EEE	309	2	1	868	SFL
K6TY	100	2	4	850	LAX
W7HD	173	2	1	842	AZ
KC9IMR	49	5	1	840	IL
NCØO	205	2	1	836	IA
K2NCC	165	2	1	830	OR
K3NCO	145	2	1	830	MDC
WS1J	198	2	1	828	VT
W7YSB	65	5	1	800	AZ
WA6L	64	5	1	790	SDG
K4CX	220	2	1	790	TN
K4KSR	52	5	1	770	VA
KI4MUG	121	5	1	755	KY
WB8EJN	126	2	1	754	MO
N3DUE	300	2	1	750	MDC
N6VCW	40	5	1	750	ORG
WB9HFK	65	5	1	750	IL
ACØLP	49	5	1	740	MO
K7NAL	284	2	2	738	UT
W5UGD	240	2	1	730	SC
K6TD	135	2	1	726	SCV
N2MTG	280	2	1	710	ENY
KC3Q	150	2	1	700	EPA
AC4YD	270	2	1	692	KY
KL7NC	135	2	1	690	AK
N7EIE	57	2	4	668	WWA
AA6BS	51	5	1	660	SCV
WA7LK	81	5	1	655	WWA
VE3OZ	199	2	1	648	ON
WA8UMT	134	2	3	644	MI
KB7TBT	262	2	1	630	NNJ
K6RJP	240	1	1	630	EB
N4MUH	171	2	1	628	NFL
K7VGF	101	2	1	624	WWA
K2XC	126	2	1	622	NNY
AJ4MJ	27	5	1	620	NC
KA3PCX	235	2	1	620	EPA
N7BK	235	2	1	620	WWA
K1KAV	52	5	1	620	VA
KG6S	170	2	2	616	SV
N5PU	148	2	1	616	MS
WØLPD	122	2	1	614	STX
NN9X	102	2	2	606	IN
WØRIC	227	2	1	604	CO
AE4EC	121	2	1	596	NC
N8EN	96	2	1	592	MI
KT7AZ	170	2	1	590	AZ
KAØLDG	47	5	1	585	ND
WBØTEV	206	2	1	576	NTX
N5GMJ	113	2	8	574	NTX
W3GQJ	65	2	1	570	NFL
KE4UKX	102	2	2	558	VA
WN9M	131	2	1	550	GA
KR1ST	150	2	2	550	SC
NF7T	121	2	1	540	ID
K8MSQ	110	2	1	540	MDC
K3IZ	96	2	1	534	VA
WA3SWJ	48	2	1	530	MDC
KI6CQ	34	5	1	525	LAX
AB5TQ	91	2	4	510	AR
W4JO	185	2	1	484	GA

K7PSU	139	2	3	482	AZ
KCØLOE	212	2	2	474	SD
KC9QQ	176	2	1	470	IN
NT4OM	159	2	1	468	GA
K1KEY	156	2	1	462	WCF
K5RWP	87	2	1	456	NTX
K6BSR	72	5	1	450	OR
AB5JR	98	2	1	446	NM
WB6FDY	68	2	1	444	IL
KA3TGV	171	2	2	442	WPA
NC4MI	139	2	1	438	NC
KD5MFY	93	2	1	436	OK
W8AG	34	5	1	420	IN
KB2UUL	7	5	1	420	NC
WS5K	38	5	1	420	NM
W2JTM	134	2	1	418	ENY
K6OTT	33	2	1	416	SCV
N4DXI	221	1	1	412	NFL
VY1EI	101	2	1	410	NT
KCØDWX	79	2	2	408	KS
N9DIX	126	2	1	402	TN
KBØMPY	100	2	1	400	CO
N4LEC	74	2	1	400	GA
KE3D	150	1	1	395	STX
N1NRA	96	2	2	392	VT
WBØOEW	24	5	1	390	AZ
N8HC	144	2	1	388	OH
W4XK	59	2	1	386	TN
KBØHLF	142	2	1	384	IA
ND2E	81	2	1	374	TN
W2LHL	22	5	1	370	NNJ
VE7TI	109	2	1	368	BC
NU3Q	109	2	1	368	WPA
WBØIWG	63	5	1	365	WPA
NW1V	131	2	1	362	VT
N6QZS	64	2	1	356	SV
N1ILZ	101	2	1	352	SJV
AC6N	51	2	1	352	NV
W9UIH	123	2	2	346	IL
VA3WPV	39	5	1	345	ON
W5EPW	19	5	1	340	SFL
N8PA	95	2	1	340	OH
NØTRQ	143	2	1	336	LA
ND6S	46	2	1	334	SV
KF6ROE	41	2	1	332	SDG
KC4ONA	91	2	1	332	NFL
KG4BYN	18	5	1	330	TN
W4BFL	39	2	1	328	SFL
KCØRPS	87	2	2	324	CO
VA3RJ	40	2	1	310	ON
WØJEC	80	2	1	310	MN
KC2OBN	102	2	1	304	NLI
KAØEIC	64	2	1	304	KS
NAØBR	50	2	1	300	CO
WO3X	73	2	1	296	OH
K4JWM	27	5	1	285	AL
K4KJM	135	1	1	285	SC
WE5T	65	2	1	280	NTX
W4PAH	25	5	1	275	NC
AB8HK	11	2	1	272	MI
NØBK	43	2	1	272	MN
WA3ZBJ	23	5	1	270	WPA
KD7ZVI	27	5	1	270	OR
NO6X	101	1	1	264	EB
KG6LJO	80	2	1	260	NV
KC8JJT	2	5	1	260	MI
KC2LRC	52	2	1	254	WNY
KB3LGO	50	2	1	252	WPA
KS6M	44	2	1	238	EB
W7GHD	21	2	1	234	WWA
AD7DD	40	2	1	230	EWA
K5BDM	89	2	1	228	OK
W7KI	37	2	1	228	LAX
AE6ST	19	2	1	226	ORG
N8PQ	35	2	2	220	MI
W1WAB	26	2	1	208	WCF
KI4NBE	71	2	1	192	WCF
KCØVFP	21	2	1	192	MN
WØAAW	8	5	1	190	MO
KC7PVD	18	2	1	186	UT
KB1LIE	7	2	1	184	VT
VA7HZ	59	2	1	184	BC
KB7UM	41	2	1	182	IL
KD5DLZ	40	2	1	180	OK
K7RQN	39	2	1	178	AZ
WD4NIT	14	2	1	178	GA
KI6BVW	12	2	1	174	ORG
AC7VL	10	2	1	170	WWA
KB8YGA	9	2	1	168	MI
K2HVE	18	1	1	168	NNJ
KF4ZNL	68	1	1	168	GA
AH6JD	7	2	1	164	PAC
N3UYI	38	2	1	162	MDC
KB3DVS	4	2	1	158	NTX
K3DI	44	1	1	158	MDC
KK5CT	28	2	3	156	NTX
KO6YG	11	5	1	155	SCV
KW7I	52	1	1	152	OR
WBØVYH	25	2	1	150	AZ
W4DGJ	11	2	1	144	NC
VY2OM	35	2	1	140	MAR
KC4MYV	18	2	1	136	NFL
W6KYF	22	2	1	134	SCV
KI4ASK	38	2	2	126	GA
W4AMP	13	2	1	126	GA
W1SRB	12	1	1	112	WMA
KJ4BQS	11	2	4	112	AZ
N5WSS	31	2	1	112	AR
W8RU	25	2	1	108	MI
AK6QJ	25	2	1	100	SDG
K2HSV	13	2	1	76	SF
KC2JRQ	4	5	1	70	NLI
WB5EXI	2	5	1	60	STX
KD5YPH	5	2	2	60	CO

2E

W2WHP	1203	5	40	6,065	NLI
W8VM	547	5	11	6,020	OH
W5ZZ	3098	1	2	5,742	LA
N5LCC	1184	2	4	2,886	LA
NVØU	159	5	8	2,480	MO
W5TB	242	5	4	2,345	NTX
VE6FI	1874	1	3	1,974	AB
AB2DE	822	2	11	1,928	NNJ
N5BL	695	2	16	1,914	NM
KC9CCQ	1211	1	7	1,741	MN
VA7MM	367	2	2	1,646	BC
K7SEL	427	2	6	1,404	ID
WB5LVI	350	2	6	1,286	STX
KU4V	370	2	2	1,196	NC
KNØBS	244	2	12	938	IA
NT3Y	256	2	9	936	EPA
AA9UF	163	2	3	930	IL
N7PR	600	1	4	856	SV
KC9FQD	223	2	3	796	WI
KF4KJT	226	2	2	722	SC
K2LDC	70	2	15	712	NLI
N8PVC	111	2	2	472	OH
KP2D	56	2	12	466	VI
K4UOL	170	2	2	438	KY
N9QID	88	2	2	426	IN
K7WXO	74	2	2	398	EWA
KL7R	36	2	2	362	AK
KG4IVD	14	2	1	292	NC

3E

W4DXA	2601	2	17	8,876	NC
KK7PR	2287	2	9	6,210	OR
K3MJW	1814	2	40	5,410	WPA
KØKU	1082	2	68	4,164	KS
W7FLY	927	2	13	3,796	WWA
W5ROK	933	2	10	3,474	NTX
W3KWH	940	2	10	3,224	WPA
N2MO	604	2	26	3,024	NNJ
KB8O	605	2	3	2,354	OH
NN6MI	503	2	30	2,328	EB
W5ROS	177	5	4	2,275	STX
WØAR	55	5	25	1,425	KS
W5SSV	269	2	6	1,406	STX
K3TI	255	2	9	1,084	EPA
W5STR	310	2	15	1,012	AR
NR3I	81	2	3	756	DE
W6AMG	151	2	5	672	SB
WI7J	92	2	5	560	UT

4E

N2BJ	2777	2	4	8,360	IL
W8WZZ	942	2	7	3,166	OH
KL2R	397	2	7	2,476	AK
W8BAP	533	2	18	2,130	OH
K5WPH	677	2	23	2,122	WTX
W8DYY	729	1	15	1,756	OH
AE5EP	90	2	10	976	STX
KC2NXO	189	2	4	878	WNY
KØTDD	114	2	4	724	MN

11E

WØNT	3716	2	29	12,742	CO

1F

Platinum Coast ARS					
W4MLB	1170	2	11	4,504	SFL
Wildcat Creek Contesters					
W9PC	914	2	6	4,234	IN
West Essex ARC					
W2EF	674	2	10	3,218	NNJ
New Providence ARC					
K2MUN	562	2	15	2,794	NNJ
Benicia ARC					
KB6EOC	533	2	23	2,066	EB
Charlotte ARC					
W4CQ	483	2	13	1,974	NC
W9WIL	289	2	6	1,960	IL
Colorado ARES D-10, Loveland EOC					
WØFT	452	2	12	1,894	CO
Fayette ARA					
K8FAY	540	2	11	1,830	OH
Shelby Co ARES					
K8EMA	501	2	17	1,532	OH
Thibodaux ARC					
W5YL	300	2	9	1,250	LA
Marshall Co ARA					
KI4HUS	242	2	10	1,178	KY
Berkeley Co ARES / RACES					
W4BRK	177	2	4	1,104	SC
Rim Country ARC					
W7RIM	287	2	33	1,024	AZ
Metro ARC					
W9FO	303	2	7	946	IL
Seal Beach / Los Alamitos RACES					
K6ZT	150	2	14	870	ORG
Warren Co RACES / ARES					
K2FN	500	1	12	870	NNJ
BRHC					
KAØTTY	115	2	1	844	MO
Butte ARC					
W7ROE	794	1	6	844	MT
Mansfield Emergency Mgt Agcy					
KB1JJE	100	2	3	750	EMA
Spring Area Baptists					
K5VFD	363	1	8	653	STX
Athens ARC					
K5EPH	214	2	9	604	NTX
Oklahoma City Emergency Management					
WX5EOC	14	2	20	578	OK
Red River Valley ARC					
WB5RDD	37	2	12	524	NTX
Sequatchie Co ACS					
W4HP	175	2	11	500	TN
Westcumb ARC					
VE1WRC	111	2	12	472	MAR
Newport Co ARC					
W1SYE	157	2	12	464	RI
Mountain View ARES					
K6MTV	54	2	23	464	SCV
James City Co EOC					
KC4CMR	64	2	3	378	VA
New Britain CERT					
W1VJA	48	2	5	346	CT
San Diego/Imperial Co Chapter, American Red Cross					
W6RDX	90	2	17	330	SDG
Santa Cruz Co AEC					
W6TUW	36	1	2	286	SCV
WØYC	86	2	2	222	MN
K2GQ	73	1	6	155	NNJ
JARA / Jamaica Red Cross EOC					
6Y5RA	18	2	1	86	DX

2F

Halifax ARC					
VE1FO (+VE1QD)					
	2110	2	50	8,390	MAR
Alamance ARC					
K4EG (+W4JPL)					
	2062	2	25	7,188	NC
Montgomery Co ARES / RACES					
AA3E (+WM3L)					
	2127	2	13	6,424	EPA
Story Co ARC & Cyclone ARC					
WØYI (+WØISU)					
	1151	2	27	5,328	IA
Lake Co RACES / ARES					
K9IQP (+W9QL)					
	1352	2	33	5,076	IL
Neshoba Valley ARC					
N1NC (+N8VIM)					
	1115	2	25	4,842	EMA
Merry meeting ARA					
KS1R (+N1TRC)					
	915	2	56	4,754	ME
York RC					
W9PCS (+NN9L)					
	1333	2	38	4,484	IL
Houston ECHO Soc					
W5ECO	792	2	19	3,844	STX
Bullitt ARS					
KY4KY (+W4KBR)					
	872	2	25	3,724	KY
Boeing Employees ARS - STL					
WØMA	1160	2	10	3,654	MO
Imperial Co ARES/RACES					
W6ICR	1003	2	20	3,514	SDG
Johnson AR Service					
WA5JRS	1457	2	8	3,404	NTX
Heart of America RC					
WØRR (+WØOEM)					
	637	2	15	3,138	MO
Great Falls Area ARC					
W7ECA (+N7NBB)					
	791	2	30	3,064	MT
Turkey Heaven Man Repeater Assn					
N4THM (+WX4WG)					
	723	2	25	2,938	AL
Geauga ARA					
W8DES	875	2	14	2,716	OH
Tupelo ARC					
KK5K	1171	2	5	2,532	MS
Cowichan Valley ARS					
VE7CVA	908	2	15	2,508	BC
Dickson Signal Corps					
NO4Q	666	2	4	2,462	TN
Coffee Co ARES					
WM4CC	471	2	14	2,406	TN
Central LA ARC					
W5LD (+AC5PW)					
	464	2	20	2,364	LA
OCARS / RACES					
W4EEE	652	2	6	2,288	GA
Cass Co ARC					
W9VMW (+KV9N)					
	663	2	50	2,282	IN
AB8I	540	2	8	2,086	MI
Waterbury ARC					
W1LAS	768	2	7	1,986	CT
Lincoln Co EOC					
AD7OY	449	2	2	1,868	NV
Central Carolina AR Comm Team					
NC4CC (+AE4AA)					
	373	2	38	1,848	NC
North Shore ARC					
VE7NSR (+VE7EMR)					
	359	2	16	1,832	BC
Hays/Caldwell ARC					
KE5LOT (+WA5AU)					
	251	2	20	1,786	STX
Oklahoma City Autopatch Assn					
W5MEL	493	2	28	1,784	OK
DeSoto ARC					
W4MIN	275	2	12	1,540	WCF
Nacogdoches ARC					
W5NAC	258	2	18	1,536	NTX
Corona Norco ARC					
W6PWT	449	2	8	1,480	ORG
BCARES					
W3FTP	473	2	6	1,448	EPA
Fair Lawn RES					
W2NPT	157	2	25	1,440	NNJ
Manteca ARC					
K6MAN (+K6EMS)					
	329	2	30	1,426	SJV
Robeson Co ARS					
W4LBT (+K4TH)					
	129	2	11	1,424	NC
Columbiana Co ARC					
WX8EMA	193	2	6	1,398	OH
Marshall ARC					
KB5MAR	195	2	15	1,376	NTX
Tri City ARC					
W1QV	388	2	20	1,342	CT
Macon-Bibb EMA RG					
WX4EMA	207	2	8	1,324	GA
Cupertino ARES					
K6KP	113	2	21	1,314	SCV
Picorams					
K9IYP	278	2	7	1,306	IL
Tech ARA					
KC5ORO	263	2	12	1,290	NM
Fresno Co ARES/ RACES/SATERN					
N6S	179	2	11	1,288	SJV
Central Iowa RAS					
KØMIW	312	2	11	1,286	IA
Westminster RACES					
AF6II	122	2	8	1,274	ORG
Tri-Lakes Monument Fire RA					
WØTLM (+AFØS)					
	237	2	18	1,196	CO
Tar River ARC					
NA4SH	318	2	10	1,194	NC
Massasoit ARS					
W1MV	60	2	21	1,176	EMA
El Paso Co ARES					
NØUX	253	2	16	1,096	CO
Shoreline ARC					
W7BCG	148	2	6	1,096	CT
Southeast LA ARC					
WM5T (+WB5NET)					
	266	2	12	1,084	LA
Deming ARC					
W5DAR	265	2	15	1,044	NM
Treasure Valley RA					
K7OJI (+KE7WSX)					
	144	2	10	1,000	OR
Burlington ARC					
W1KOO	231	2	14	990	VT
NWS Ft Worth SKYWARN					
WX5FWD	204	2	7	970	NTX
Evanston Amateur Radio Community					
KC9OAS	88	2	30	952	IL
Laguna Woods ARC					
W6LY	184	2	6	840	ORG
Tri-County RC					
NC4AR	108	2	5	816	NC
Citrus Co ARES					
KD4FG	245	2	4	784	NFL
Chester Co ARES/RACES-CCAR					
W3EOC	290	2	8	754	EPA
NF1Y	141	2	4	732	CT
Hennepin Co Mobile AR Corps					
WØPZT	90	2	13	730	MN
Quad-Co ARC					
N3QC	63	2	6	696	WPA
FARCE (Friends & Amateur Radio Communications Enthusiasts)					
KF6NNM	149	2	5	650	SV
Oakland Co ARPSC					
W8OAK	270	2	7	648	MI
Madison Co ARC					
W9VCF	281	2	7	620	IN
Keokuk Co Emergency Management					
WØXOB	57	1	10	557	IA
Cabarrus ARS					
K4WC	197	2	18	544	NC
Loyalist ARC					
VE9EOC	245	2	15	540	MAR
Alameda Co OES					
W6VOM	195	2	5	530	EB
Central Florida CAP Radio Assn					
W4AFV	63	2	14	492	WCF
Brazoria Co AR Service					
KF5ADC	86	2	9	456	STX
Baytown Area ARC					
K5BAY	188	2	16	426	STX
Maricopa Co Sheriff's Posse					
K7MCS	161	2	6	372	AZ
Samaritano Radio Group					
WP4NPO	36	2	16	344	PR

3F

West Jersey DX Group					
K2NJ (+W2EN)					
	4898	2	43	16,790	NNJ
Smith Chart ARS					
K4OO (+K4JRA)					
	3009	2	26	11,146	NC
Williamson Co ARES					
N4FR (+W4SQD)					
	1981	2	150	6,552	TN
East Alabama ARC					
W4LEE	1800	2	27	6,422	AL
Thomasville ARC					
W4UCJ (+KI4RGD)					
	1188	2	74	5,106	GA
Southwest Dallas Co ARC					
W5AUY (+N5UV)					
	1043	2	45	4,958	NTX
Oak Ridge ARC					
K4PJ	1160	2	50	4,538	TN
Cochise ARA					
K7RDG	1057	2	16	4,354	AZ
McHenry Co RACES / ARES					
K9ESV	993	2	20	4,228	IL
Adams Co ARS					
W3KGN	967	2	14	3,858	EPA
Algonquin ARC					
N1EM	836	2	18	3,748	EMA
Maxim Memorial Station - ARRL HQ					
W1AW (+W1HQ)					
	2347	1	20	3,637	CT

Carroll Co ARC
K3PZN (+WO3L)
956 2 16 3,550 MDC
Glynn ARA
N4S 648 2 24 2,880 GA
WMA RACES/ARES
WC1SW 745 2 19 2,668 WMA
Okaloosa ARC
W4AAZ (+KI5FR)
584 2 17 2,666 NFL
Mulebarn Club
WØS/KCØYLT
659 2 7 2,648 MO
Raritan Bay Radio Amateurs
K2GE 572 2 20 2,480 NNJ
North Wildwood OEM RC
NW2NJ 497 2 8 2,322 SNJ
EOAWA/NPARC
W8TPY 437 2 20 2,222 OH
Santa Maria Ham Radio ARES
K6SMX 590 2 14 2,182 SB
Mankato Area RC
WØWCL 461 2 20 1,998 MN
Sierra ARC
WA6YBN (+W6EFB)
375 2 30 1,900 SJV
Western Tidewater Radio Assn
WT4RA 453 2 18 1,850 VA
MICON NWS DTX
K8DTX 540 2 15 1,818 MI
South Mountain Repeater Assn
N3TWT 677 2 7 1,758 EPA
Cherokee Co ARES / ARS
AI4GL 386 2 12 1,714 GA
Carousel RC
K2OQ 276 2 6 1,652 WNY
Manitowoc Co RC
W9DK 295 2 15 1,610 WI
Southington ARA
W1ECV 464 2 15 1,472 CT
Cocoa ARS
N4LEM 695 1 10 1,464 SFL
Lawton Fort Sill ARC
K5USA (+W5KS)
264 2 7 1,438 OK

Grand Strand ARC
W4GS (+AF4UZ)
203 2 25 1,426 SC
Headwaters ARC
N3PC 326 2 12 1,422 WPA
Tri-City ARA
W7GDY 429 2 4 1,410 AZ
Harney Co ARES
W7HRN 108 2 13 1,366 OR
DMAT OK-1 ARC
ND5MS 246 2 14 1,356 OK
Garden City ARC
K8GC (+K8KV)
200 2 32 1,334 MI
K3ZX 216 2 5 1,282 SC
CCARA
KD4NH 281 2 39 1,242 TN
ARA of the Southern Tier
W2ZJ 193 2 35 1,228 WNY
Blount Co ARC
W4BLT 249 2 21 1,216 AL
Virginia Mountain ARC
W4COV 378 2 5 1,120 VA
Manalapan RACES/ARES
W2TIN 102 2 16 1,104 NNJ
Canadian Forces Com Squadron #734
VE5XZ 184 2 10 1,092 SK
Gloucester City ARC
NJ2GC 160 2 9 1,090 SNJ
KØRGT 121 2 20 1,044 MO
Enid ARC
W5HTK 109 2 28 832 OK
W6TOI 127 2 7 826 LAX
Burbank Emergency AR Service
N6CDJ 76 2 35 652 LAX

4F
Stanford ARC
W6YX (+K6SU)
5499 2 30 17,448 SCV
Bergen ARA
K2BAR (+KC2SGF)
2548 2 43 7,972 NNJ
W8FY 1851 2 16 5,678 OH
W4SHL (+WN4AT)
1079 2 15 3,900 AL

Tri-Town Radio Amateur Club
W9VT (+N9DWG)
1094 2 11 3,266 IL
National Trail ARC
K9UXZ (+KB9RSK)
951 2 14 2,902 IL
Middle East Emergency Radio Service, Inc
KC4EM (+K4DNG)
572 2 54 2,824 TN
N8IHI 735 2 7 2,372 OH
Flagler Palm Coast ARC
W4FPC 280 2 23 2,208 NFL
ARA Tonawandas
W2SEX 533 2 23 2,176 WNY
TriCo ARC of North TX
WC5C (+N5ZKA)
423 2 22 2,164 NTX
Golden Spike ARC
K7UB 539 2 24 1,894 UT
CQ Radio Club
K1BCI 334 2 19 1,868 CT
Indian River ARC
W4NLX (+W2SDB)
338 2 20 1,508 SFL
S Nye Co ARES
W7NYE 149 2 12 1,056 NV
Valley Camp
K7S 351 2 8 1,042 WWA

5F
Forsyth Co ARES
N4AC 2701 2 86 9,158 GA
Tri-State ARA
W8VA 1249 2 46 4,834 WV
Southern Counties ARS / Cape May Co ARC
K2BR (+N2CMC)
1092 2 42 4,612 SNJ
Ham Assn of Mesquite
WJ5J 1015 2 10 3,424 NTX
Flagler Em Com Assn
AF2C 367 2 28 2,728 NFL
Worcester EmComm Team
WE1CT 512 2 40 2,670 WMA
Metroplex ARC
W2MPX 339 2 34 2,044 NNJ

Metropolitan Detroit SATERN
N8SE 278 2 16 1,924 MN
Cross Co ARC
WA5CC 253 2 36 1,852 AR
Sammamish ARES/RACES Group
W7S 360 2 28 1,764 WWA
Lower Columbia ARA
W7DG 1289 1 14 1,552 WWA
Endless Mts ARC
N3EP 294 2 21 1,408 EPA
Wabash Emergency Management Agency
KC9MAK 88 2 5 1,298 IL

6F
Queen City Emergency Net
W8VND 1567 2 17 4,528 OH

7F
W2GSB 983 2 55 4,888 NLI
Greater Bridgeport ARC / Derby OEM
W1DBY (+W1EFM)
993 2 67 3,764 CT

10F
Bears of Manchester
W1BRS (+K2KKH)
1043 2 30 4,398 CT
Arlington ARC
W4WVP 349 2 33 2,824 VA

11F
SATERN of San Bernardino & Riverside Co
W1SAT 51 5 25 2,520 ORG

Logs either submitted or reclassified as Checklogs: AD1L, G6CSY, K5BWD, K5RQ, K6UW, K9HD, K9PMV, KAØLL, KB8M, KB9WWQ, KI6VX, N1SWK, N5UWY, N6AS, NE3I, NJ9Z, NV8N, VA3AEC, VA3GML, VE1ACU, VE2FK, VE2HOT, VE3NQM, VE3YXO, VE6CNU, VE7AOV, VK4TT, W1AR, W2IRT, W2RJ, W3MJ, WB7NKK, WG7X, WS8H

June 2009 VHF QSO Party

Anticipation, Determination, Perspiration — June 13-15, 2009

Rick Rosen, K1DS
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It just wouldn't be an ARRL contest if those three factors weren't present. For some, the buildup is a multi-year project — anticipating that their station, conditions and operating experience will bring them the reward of distinction in *QST*, the winners and leaders listings, a plaque or a certificate: *anticipation*. Others figure they are just in the right geography and the correct operating category with just the right amount of gear and gumption to press on to a chance for an award: *determination*. Then there is the Pareto Rule — with 80 percent of the stations providing the basic communications activity for the joy of VHF on-the-air activity and operating under field conditions, no matter what the temperature or weather may be in their locale: *perspiration*. For the other 20 percent of the stations that got the top scoring listings and certificates, there were plenty of all three ingredients that affected their success.

Much of the feedback from the participants was extremely positive. The newcomers to VHF contesting were absolutely amazed at the 6 meter propagation and levels of activity. Guests and visitors to rovers and portable stations were impressed with the contesting efforts and enthusiasm of the participants.

Make no mistake about it — when it comes to the excitement of contesting and the growth of scores over the past two decades, rovers of every category have been the most controversial and contributory group. The joy of contesting from several coastal or mountaintop locations in the same weekend is enjoyed by a large contingent of score-submitting rovers, as well as the somewhat lesser-documented activities of the "captive" rovers that support a single station.

Many of the perennially high-scoring single- and multi-op multiband stations would not have been able to achieve their score totals without the additional QSO points and grid-band-multipliers rovers provide.

The first thing I notice when looking at the scores after ARRL computer checking is the number of logs submitted, in order to gauge the participation compared to previous years. This year saw 1135 logs, which included 47 entries from Canada, 4 from Mexico, 7 DX logs from the Caribbean, Venezuela and Brazil, and a 1-contact log from Kenya. This represents a total increase of 61 logs over last year for a gain of 5 percent. As always, the number of logs submitted seriously underestimates the participation, as we find that K5QE has 1225 QSOs in the log just on 6 meters.

My next gander is at the number of rovers and their category distribution. These categories have experienced the most significant recent rule changes. Classic Rover logs numbered 60, Limited Rover included 37 entries and Unlimited Rovers submitted 5 logs, for a total of 102. Last year we had 95 rover logs, with 61 Classic Rovers, 26 Limited and 8 Unlimited. This may be a limited sampling over only 2 years, but the change in the rules apparently did not discourage rovers and the rules change for participating on the bottom four bands in the Limited Rover category did not have a negative impact on this type of activity.

Single-Operator Low Power entries numbered 693, up 33 from last year. Single-Operator High Power entrants numbered 206, up a notch from 200 last June. Single-Operator QRP entries remained about the same with 33 logs entered versus 35 last year. The Limited Multi-operator category had 56 logs entered, an increase of a whopping 500 percent over 2008's 11 entries in this category. In the Multi-operator category we saw a drop from 72 entrants to only 44 this year.

Single Operator, Low Power

K2DRH	401,544
W5SXD	267,029
K9MU	247,248
N3LL	204,156
K5RQ	169,540
WB1GQR (W1SJ, op)	158,588
AF1T	151,380
KC9BQA	143,412
K2EK	132,848
NØLL	132,240

Single Operator, High Power

K1RZ	455,590
K1TEO	373,464
WB9Z	288,864
K9CT	286,080
K8EB	250,160
WDØT	193,060
W4WA	192,000
WA2FGK (K2LNS, op)	179,520
K4QI	178,308
K4SN	177,885

Single Operator Portable

KA1LMR	53,361
K6VCR	29,160
KM7W (KL9A, op)	27,734
K9AKS	24,511
KF4VTT/VP9	18,825
W9SZ	12,400
K9QVB/9	12,231
WB2AMU	8,906
N2YTF	7,200
N6FD	5,964

Limited Multi-operator

K9NS	666,551
K5TR	502,128
K8GP	425,754
W3SO	335,070
AA4ZZ	312,018
W5ZN	271,183
KA2LIM	218,892
W4IY	176,600
W1QK	175,680
KB1DFB	165,540

Multi-operator

W2SZ	1,768,746
K5QE	1,324,182
W3CCX	713,507
K3YTL	409,738
W4NH	341,217
WØAUS	323,180
WØEEA	259,845
KBØHH	249,780
WØKVA	154,000
N6VI	139,568

Rover

VE3NPB/R	130,548
W1RT/R	128,790
W6TE/R	101,277
VE3SMA/R	97,240
N5AIU/R	75,720
N2CEI/R	64,538
KC3WD/R	62,504
WA2IID/R	56,250
AE5P/R	51,948
K2QO/R	50,958

Limited Rover

W6YLZ/R	104,580
KO4MA/R	58,112
WAØVPJ/R	48,037
AG4V/R	27,927
AF6AV/R	25,275
W3DHJ/R	23,760
K6EU/R	22,800
N4JDB/R	15,312
KC2QZF/R	13,184
KCØPON/R	12,782

Unlimited Rover

K5RNT/R	30,750
KRØVER/R	24,003
N1LF/R	24,000
K4GUN/R	13,065
N3XUD/R	10,200

Expanded results are now online! Visit **www.arrl.org/contests** for more June VHF results!

Conditions

VHF contest participants usually look forward to some 6 meter E_s and they were not disappointed. Although the total 6 meter band QSO count was down by almost 12,000 or 9 percent, there were still a respectable total of 125,000 6 meter contacts in the submitted logs. Eleven stations had 6 meter grid counts over 200, with K5QE netting 251. Another 30 stations spread over a wide path of the Southeast, Central and Southwestern states submitted 6 meter grid multipliers of over 150.

Two meter numbers were up by 2800 or 10 percent. 222 MHz activity increased by

DAVE ALL, N3XUD

The Three Generation Rover Team of N3XUD/R. From left: Angel All, KB3STA; Dave All, N3XUD, and Bill All, N3KKM, operating from a mountaintop site in Western Pennsylvania. This was Angel's first contest since getting her license in April and she helped her family team to a 5th place finish in the Unlimited Rover category.

800 contacts or 13 percent. 432 MHz contacts rose by 1000 or 9 percent. Microwave contact numbers were significantly lower this year. A 25 percent decrease, from 8100 to 6100, is almost entirely attributable to the lack of team or group rover entries that were microwave-equipped.

Many stations reported 2 meter EME QSOs and the top two Multi-operator stations found the multipliers very valuable. The moon was workable for North American stations from 0430 UTC until 1900 UTC Sunday. There was also decent 2 meter E_s in the early hours of Sunday morning from the southwest toward the east and northeast into KY, TN, SC, NC and GA.

Single-Operator Categories

Maintaining his top spot in Single-Op Low Power (SO-LP) for yet another year, Bob, K2DRH, in IL topped his previous performance with a score of 401,500 and came close to the score of the top entry in Single-Operator High Power. His score is attributable to excellent QSO totals on 6 meters with 200 grid multipliers on that band and a bevy of contacts on the next three bands with rather thin totals on the microwaves through 3 GHz. In 2nd place, Rich, W5SXD, with a six band setup from NTX section, scored 267,000 points. Rich reported, "Great contest and shakedown cruise for rebuilt station." Third place went to Justin, K9MU, in WI, also with a six band station, netting 247,000 points. N3LL and K5RQ, both from WCF, were in 4th and 5th places respectively, both having substantial luck with the 6 meter conditions. Stations placing 2nd through 5th were not in last year's Top Ten for this category.

In the Single-Operator High Power (SO-HP) category, Dave, K1RZ, made it to the top, moving up from 3rd place last year, scoring 455,600 with his 10 band station from the MDC section. Taking advantage of the 6 meter activity combined with the density of East Coast stations and rovers, he snapped the winning streak of Jeff, K1TEO, from CT who was in 2nd place this time with 373,500. Our 3rd place winner was Jerry, WB9Z, with a score of 288,800, edging out the 4th place scorer, Craig, K9CT, whose total was 286,000, both from IL. Erwin, K8EB, in WI was in 5th place with a 10 band entry from MI. Neither K9CT nor K8EB were in the Top Ten SO-HP standings last year.

The Single-Operator QRP (SO-QRP) entrants are a small but dedicated group of amateurs who make special efforts to get to rarer grids or higher locations with limited power on one to eight bands. Although his score was 53,300, down from the 78,000 of 2008, Chris, KA1LMR, was first in this group as he has been for many years, with an eight band effort from NH. Tom, K6VCR, was 2nd from SDG, also using eight bands, with a score of 29,000. Chris, KL9A, operating under the call KM7W, claimed 3rd place from MT with 27,700 from 283 QSOs on 6 meters and 98 grid multipliers. Our 4th place winner was Curt, K9AKS, with a score of 24,500 and a five band station in SD. Doug, KF4VTT/VP9, made it into the 5th spot with 251 QSOs in 75 grids from Bermuda, while spending less than 3 hours operating!

Multi-operator Categories

K9NS, with their 666,500 score, won the Limited Multi-operator (LM) category; they had a good balance of contacts and grid multipliers across the bottom four bands. Their eight operators started off with a bang and logged 164 contacts in the first hour. Over 1000 6 meter QSOs in 231 grids propelled their great score. That effort bumped K5TR into 2nd place this year, as his four band team of two ops totaled 402,000, down 30 percent from their 2008 score. The 11 person K8GP crew operating from VA slid back into the LM category this year with a score of 425,700. The effort and cost for the trek to Spruce Knob, WV was a limiting factor. The Wopsonock Mountain seven person team at W3SO captured the 4th spot with 335,000 points, while the AA4ZZ crew of nine was 5th with 312,000.

The Unlimited Multi-operator (UM) category saw W2SZ again as top scorer, with almost 1.77 million points. Their totals were 2141 QSOs and a multiplier total of 483 grids of which microwaves contributed 432 contacts and 183 grids. Continuing to press them for the 2nd year in a row was 2nd place K5QE, with their nine operators amassing 1.324 million points with remarkable 6 meter numbers. They had a total of 2002 QSOs and 498 grid multipliers, but their microwave contribution was limited to 177 QSOs and 70 multipliers.

Affiliated Club Competition

	Entities	*Score*
Unlimited Club		
Society of Midwest Contesters	57	1,687,500
Medium Club		
Potomac Valley Radio Club	36	1,823,783
Nacogdoches ARC	7	1,465,974
North East Weak Signal Group	24	1,387,075
Mt Airy VHF Radio Club	11	947,154
Northern Lights Radio Society	22	939,327
Florida Contest Group	19	832,953
Mt Frank Contesters	4	697,990
Central Texas DX and Contest Club	6	657,094
Florida Weak Signal Society	12	485,129
Grand Mesa Contesters of Colorado	9	458,483
Badger Contesters	17	455,913
Contest Club Ontario	13	441,966
Carolina DX Assn	8	358,348
Rochester VHF Group	10	353,142
Pacific Northwest VHF Society	20	332,530
Northern California Contest Club	22	250,034
Yankee Clipper Contest Club	14	171,143
Tennessee Contest Group	14	152,875
Southern California Contest Club	4	144,061
Rochester (NY) DX Assn	3	135,025
Alabama Contest Group	9	103,137
Arizona Outlaws Contest Club	11	97,666
Frankford Radio Club	6	79,652
Central Arizona DX Assn	3	57,443
Utah DX Assn	3	39,644
Mad River Radio Club	5	39,402
North Texas Microwave Society	5	21,197
South East Contest Club	4	20,287
CTRI Contest Group	3	19,125
Maritime Contest Club	3	10,003
Minnesota Wireless Assn	6	9,153
Local Club		
Murgas ARC	4	595,634
Chippewa Valley VHF Contesters	4	427,949
Eastern Connecticut ARA	4	177,618
10-70 Repeater Assn	3	55,109
Schenectady Museum ARA	4	28,470
Burlington County Radio Club	5	19,171
Raritan Bay Radio Amateurs	7	17,195
Ventura County Amateur Radio Society	4	13,815
Spokane DX Association	3	11,058
Dauberville DX Assn	3	10,996
Portage County Amateur Radio Service	6	10,274
Meriden ARC	3	6,710
Low Country Contest Club	4	2,629

In 3rd place again, the W3CCX Packrats scored 713,500 with a 12 band effort, complete with a visit from Murphy who wrought havoc with the transmit amplifiers for 6 meters, 2 meters, 70 centimeters and 23 centimeters. The 12 hams at K3YTL were next in line with a 4th place finish and 405,000 points using six bands from their usual FN11 perch. W4NK came in 5th, a newcomer to this year's Top Ten in the UM category.

Rover Categories

The Limited Rover (RL) category was modified this year to include only the lowest four VHF bands. Of the 37 stations in this category, 17 used those four bands and 15 used bands A, B and D (6 meters, 2 meters and 70 cm). The winner in this category was a hustling Mike, W6YLZ, accompanied by John, N6MU, scoring 104,500 while covering 11 grids. Andy, KO4MA, with Dave, AJ4LU, also a four bander, was 2nd with 58,000, covering an aggressive 22 grids across 1300 miles in three states. John, WAØVPJ, took 3rd place with another four band swing through eight grids, amassing 48,000. Steve, AG4V, copped the 4th spot with a 28,000 effort that also included eight

Northeast Region
(New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)

WB1GQR	158,588	A
(W1SJ, op)		
AF1T	151,380	A
K1KG	116,382	A
WB2SIH	97,812	A
W3PAW	88,954	A
K1RZ	455,590	B
K1TEO	373,464	B
WA2FGK	179,520	B
(K2LNS, op)		
N3HBX	127,600	B
WA1T	120,805	B
KA1LMR	53,361	Q
WB2AMU	8,906	Q
N2YTF	7,200	Q
VA2NU	2,432	Q
W3MEO	150	Q
W3SO	335,070	L
KA2LIM	218,892	L
W1QK	175,680	L
KB1DFB	165,540	L
K2BAR	154,198	L
W2SZ	1,768,746	M
W3CCX	713,507	M
K3YTL	409,738	M
W2FU	131,596	M
W3KWH	27,750	M
W1RT/R	128,790	R
WA2IID/R	56,250	R
K2QO/R	50,958	R
WA3PTV/R	28,288	R
KB1EKZ/R	26,240	R
KC2QZF/R	13,184	RL
W3HMS/R	11,520	RL
N3XUD/R	10,200	RU

Southeastern Region
(Delta, Roanoke and Southeastern Divisions)

N3LL	204,156	A
K5RQ	169,540	A
K2EK	132,848	A
N4QWZ	127,470	A
NJ2F	123,546	A
W4WA	192,000	B
K4QI	178,308	B
K4SN	177,885	B
WB4SLM	159,384	B
KB5AAB	129,990	B
KB5YZG	2,352	Q
KC8KSK	522	Q
K8GP	425,754	L
AA4ZZ	312,018	L
W5ZN	271,183	L
W4IY	176,600	L
W4TP	104,650	L
W4NH	341,217	M
N4JQQ	64,253	M
K4AC	58,344	M
W4YCC	30,849	M
K4RSV	5,977	M
N2CEI/R	64,538	R
KC3WD/R	62,504	R
WA5KBH/R	462	R
KO4MA/R	58,112	RL
AG4V/R	27,927	RL
N4JDB/R	15,312	RL
KD5IKG/R	8,001	RL
AI4GR/R	3,838	RL
N1LF/R	24,000	RU
K4GUN/R	13,065	RU

Central Region
(Central and Great Lakes Divisions; Ontario Section)

K2DRH	401,544	A
K9MU	247,248	A
KC9BQA	143,412	A
WO9S	70,468	A
W9GKA	60,750	A
WB9Z	288,864	B
K9CT	286,080	B
K8EB	250,160	B
W9GA	138,866	B
K8MD	129,920	B
W9SZ	12,400	Q
K9QVB/9	12,231	Q
K9OM	1,650	Q
AI9I	1	Q
K9NS	666,551	L
N8ZM	148,526	L
N9TF	48,498	L
W9VW	31,527	L
NG9R	23,205	L
VE3WCC	134,816	M
N8KOL	110,580	M
N9UHF	95,160	M
KB8O	39,552	M
N2BJ	38,822	M
VE3NPB/R	130,548	R
VE3SMA/R	97,240	R
KF8QL/R	29,646	R
W9FZ/R	26,433	R
NE8I/R	21,513	R
W9YOY/R	8,436	RL
K8DOG/R	6,862	RL
N8OC/R	5,452	RL
N9UX/R	4,838	RL
K9GY/R	1,829	RL

Midwestern Region
(Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)

W5SXD	267,029	A
NØLL	132,240	A
KØSIX	107,168	A
W5ROK	98,212	A
(WA8ZBT, op)		
KAØPQW	86,784	A
WDØT	193,060	B
K5LLL	156,136	B
WD5K	148,938	B
W6OAL	141,168	B
K5AM	132,880	B
K9AKS	24,511	Q
KCØATQ	3,552	Q
KC8CUI	2,009	Q
WØSJE	1,911	Q
N7QF	490	Q
K5TR	502,128	L
WØVB	84,488	L
WØLSD	72,691	L
NØEO	66,165	L
W5KFT	57,658	L
K5QE	1,324,182	M
WØAUS	323,180	M
WØEEA	259,845	M
KBØHH	249,780	M
WØKVA	154,000	M
N5AIU/R	75,720	R
AE5P/R	51,948	R
WØZQ/R	45,428	R
WRØI/R	10,812	R
KAØKCI/R	10,428	R
WAØVPJ/R	48,037	RL
W3DHJ/R	23,760	RL
KCØPON/R	12,782	RL
N5TIT/R	8,479	RL
AAØKW/R	8,316	RL
K5RNT/R	30,750	RU
KRØVER/R	24,003	RU

West Coast Region
(Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)

KG6IYN	84,056	A
VA6AN	65,798	A
NU6S	56,924	A
K6XN	32,928	A
WJØF	22,256	A
W7CE	106,505	B
N6EQ	82,615	B
N6KN	82,416	B
K7CW	79,344	B
W7EW	51,072	B
K6VCR	29,160	Q
KM7W	27,734	Q
(KL9A, op)		
N6FD	5,964	Q
KC6MIE	935	Q
K7TOP	779	Q
WA7JTM	82,810	L
AD6IJ	29,681	L
VE6AO	25,415	L
W7JLC	20,806	L
K7WA	11,178	L
N6VI	139,568	M
VA7ISL	91,504	M
W6TV	61,920	M
N6TEB	51,900	M
W6AB	26,695	M
W6TE/R	101,277	R
KE6QR/R	12,200	R
K6LMN/R	10,653	R
K7MDL/R	2,530	R
KH7Y/R	320	R
W6YLZ/R	104,580	RL
AF6AV/R	25,275	RL
K6EU/R	22,800	RL
N6ORB/R	11,679	RL
K6JRA/R	8,514	RL

grids on four bands. Bob, AF6V, operated in only two grids but managed to capture 5th place with 25,000, operating four bands in southern CA.

In the Classic Rover (RC) group, top dog was Murray, VE3NPB, who with Russ, VE3OIL, as his rover partner, covered nine grids using 12 bands and added 381 QSOs with a phenomenal 172 grid multipliers for 130,500. This is the first time they have topped a Rover category in the June contest. Just 1800 points behind, John, W1RT, and Christophe, ON4IY, were in 2nd place with 128,800. In 3rd place, another "regular" in the rover ranks, Dave, W6TE, and John, K6MI, had a 101,200 point log with their 11 band effort. Our 4th place scorer was another Ontario, Canada based rover, Steve, VE3SMA, also manning a 12 band station through seven grids for 97,200. Johnny, N5AIU, and Lon, AE5BN, captured 5th place with their eight band activity through 10 grids of the southwest.

The top Unlimited Rover (RU) score was reported by Dustin, K5RNT, and his spouse, Amanda, K5AMW, who chose this category to avoid competition with other Texas rovers in the Classic Rover group. Their six bands, coupled with a 14 grid rove earned them 30,700 for 1st place. Second place in this category was Eric, KRØVER (don't you think he has one of the cleverest vanity calls?) who with nine bands across seven CO grids scored 24,003 points. I emphasize Eric's score down to the last digit as Les, N1LF, from AL had 24,000 points for 3rd place, only three points behind! Les covered four grids with 10 bands, making a lot of use of the feedback he got from his questions on the VHF Contesting reflector.

Steve, K4GUN, with his roving partner, now his spouse, K4LIG, placed 4th in RU with 13,000 using four bands across six grids. His soapbox included this note, "If you haven't been fortunate enough to have yours [spouse] along on a roving adventure, you're really missing out. It made a so-so rove into another great memory."

In 5th place was the three generation team of Dave, N3XUD, his dad Billy, N3KKM, and his 11 year old daughter Angel, KB3STA. They garnered 10,200 while traversing four grids. They reported, "Angel pretty much settled on 6 meters as that is where most of the action was. Her dad taught her well and she handled the pileups like she had been doing it for a long time."

So where was the group of California based multiband team rovers? Some participated on a limited basis, but did not submit logs. Their calls appeared in the logs of others who did submit for scoring. Duffey, KK6MC, editorialized in a post on the VHF Contesting reflector (**lists.contesting.com/mailman/listinfo/VHFcontesting**), "The new rules appeared to curtail the coordinated roving activity from California, as only one

Holding the Channel

You may recall that the VHF QSO Party started on the same day that all television stations in the US changed to digital signals. For a year prior to the change over, W7DTV, the Skyline Tower Amateur Radio Club, a group composed primarily of broadcast engineers involved in the Skyline Tower master broadcast site in Portland, had planned to operate a 6 meter station using the now-surplus broadcast antennas with a fantastic signal from the six bay Super Turnstile antenna at 1570 feet Height Above Average Terrain. As reported by Ev, W7EEH, with only a short window of time between the changeover and contest start, the group didn't expect such a high receive noise level, limiting the site's effectiveness, but it was a memorable experience just the same.

Sponsored Plaque Winners

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

Category	Plaque Sponsor	Winner
Overall Single Operator High Power	Southeastern VHF Society	K1RZ
Overall Single Operator Low Power	Mike Coogan, KB7ME	K2DRH
Overall Single Operator QRP Portable	Mount Frank Contesters, K9NS	KA1LMR
Overall Multi-operator	Randy Stegemeyer, W7HR	W2SZ
Overall Limited Multi-operator	K1TEO, W2GKR, W2GKO, KA1FVG	K9NS
Overall Rover	Southeastern VHF Society	VE3NPB/R
Atlantic Division Rover	Potomac Valley Radio Club	K2QO/R
Midwest Division Limited Multi-operator	Gene Gabry, N9TF	KDØHGA
Northwestern Division Single Operator QRP Portable	Mike Coogan, KB7ME	KM7W (KL9A, op)
Northwestern Division Multi-operator	Randy Stegemeyer, W7HR	K7AWB
Pacific Division Multi-operator	Jim Davis, NN6EE	W6TV
Roanoke Division Rover	Potomac Valley Radio Club	KC3WD/R
Southeastern Division Single Operator High Power	Southeastern VHF Society	W4WA
Southeastern Division Rover	Southeastern VHF Society	N2CEI/R
Southwestern Division Single Operator High Power	W5UWB — In Memory of John Chambers, W6NLZ	N6EQ
West Gulf Division Single Operator High Power	North Texas Microwave Society	K5LLL
West Gulf Division Rover	North Texas Microwave Society	N5AIU/R

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

call from the 15 or so that have participated in that activity over the past few years appears in the logs submitted. It is a shame that there were eight 10 band VHF/UHF stations that appeared to be dormant in this year's contest. I think that this is a bad sign. With that activity, rover activity would have been at a new high. I hope that some of these stations found their way into fixed, portable, or other rovers."

New Records

Thirteen section records were set in SO-LP, two of them division records. Rich, W5SXD, in the NTX section now holds the West Gulf Division high score with 267,000, while Rob, N3LL, in WCF with 204,000, set a Southeastern Division record. Four additional section records in SO-HP were set this June by K9EA in IN, K1RZ from MDC, KB5AAB in MS and WDØT in SD.

Surprise of surprises, W5ZN set a record for AR and the Delta Division in the LM category with a score of 271,000. Our own ARRL President Joel, W5ZN, together with our Contest Manager Sean, KX9X, and Membership and Volunteer Programs Manager Dave, NN1N, made this happen. In the Unlimited Multi-operator category, K5QE pushed the envelope in STX with a West Gulf Division record-setting 1.324 million points. Another Unlimited Multi-operator entry, K4AC, set a new NFL record with 58,000.

There are still several ARRL Section records unclaimed in the SO-QRP Category. This year we have three section records, two of them also division records. Curt, K9AKS, set the SD SO-QRP record with 24,500 from a five band setup. Curt is also the "keeper of the records" and has edited the list of section and division winners posted on the ARRL Contest Branch Web site (**www.arrl.org/contests**). Chris, KL9A, operating as KM7W, posted 27,700 points in MT to claim the Northwestern Division SO-QRP record. Doug, KF4VTT/VP9, set the "International" SO-QRP Portable record with a single band 6 meter effort from Bermuda, logging an 18,000 total.

Club Participation

There were 45 clubs represented, three more than last year. The Society of Midwest Contesters (**www.w9smc.com**) was the top and only entrant in the Unlimited Club category with 57 entries and a 1.69 million aggregate score. The three main contributors were stations K2DRH, WB9Z and K9CT, whose combined scores made up one million of the total.

Topping the Medium Club listings was the Potomac Valley Radio Club (**www.pvrc.org**) with 36 entries and 1.82 million total score. Their main contributors included K1RZ, K8GP and W3SO. It is no surprise that the Nacogdoches ARC (**www.w5nac.com**) with eight entrants scored almost 1.5 million points on the strength of the K5QE Multi-operator station that contributed 88 percent of the total. The Northeast Weak Signal Group (**www.newsvhf.com**) placed 3rd with 1.38 million points and 24 entries, with K1TEO, W1QK and W1RT/R as their leading scorers.

In the Local Club class, The Murgas ARC (**www.qsl.net/k3ytl**) was the leader with 595,000, including the scores of four stations; two of them, WA2FGK and K3YTL, made up 99 percent of that total. The 2nd place club was the Chippewa Valley VHF Contesters (**www.cvvhf.org**) with four logs and a 428,000 aggregate; K9MU contributed more than half of that total. Chippewa Valley moved up two places from last year's 4th spot in this category. In 3rd place is the Eastern Connecticut ARA (**www.qsl.net/k1muj**) with their four log sum of 176k, on the strength of the KB1DFB Limited-Multi score of 165k.

Fun for Everyone

While many of us find amusement assembling and operating a technically demanding radio station, taking lots of gear and antennas on the road or just grabbing a few QSOs when the bands are hopping, VHF, UHF and microwave communications have continued to challenge and inspire. Surplus cell phone base station amplifiers have become more readily available and power for many microwave-equipped stations has increased, allowing for longer distance contacts and more grid multipliers.

We are beginning to see analog TV gear showing up as surplus — a boon to builders and experimenters. It is certainly rewarding to see increasing participation in all divisions of the contest with more youth entering the ranks. The rovers and portable stations have increased the public awareness of the communications capability of Amateur Radio and its significant place in emergency communications. Let's continue to build the enthusiasm and momentum by stimulating more operators to use those neglected bands often considered too dull or too challenging. Share this article and ask your buddies and club members to join in the fun and participate. An extended contest article with more charts and pictures is available at **www.arrl.org/contests**.

Next year's ARRL June VHF QSO Party is scheduled for June 12-14, 2010 and the bands should continue to be hopping. C U there. 73, Rick

JOHN D'AUSILIO, W1RT

Inside the very clean rover of John, W1RT. John's vehicle is QRV from 6 meters all the way up to the microwave bands. John, along with partner ON4IY, used this vehicle to cover 10 grids and earned 2nd place in the "classic" Rover category.

2010 Kids Day Announcement

Mark Beckwith, N5OT, and David Hodge, N6AN

The first Sunday of 2010 is the time to get a youngster on the air and share the joys and fun that Amateur Radio can provide. Kids Day returns **January 3 from 1800 to 2400 UTC**.

Sponsored by the Boring (Oregon) Amateur Radio Club (**jzap.com/k7rat**), this event helps bring the excitement of Amateur Radio to a younger audience. The exchange is simple: first name, age, location and favorite color. After that, the contact can be as long or as short as each participant likes.

Suggested frequencies for Kids Day are 28.350 to 28.400 MHz, 24.960 to 24.980 MHz, 21.360 to 21.400 MHz, 18.140 to 18.145 MHz, 14.270 to 14.300 MHz, 7.270 to 7.290 MHz and 3.740 to 3.940 MHz, as well as your favorite 2 meter repeater (with permission of the repeater's sponsor, of course). You can work DX, but be sure to remember any third party traffic restrictions that may exist when a nonlicensed operator is working a DX station.

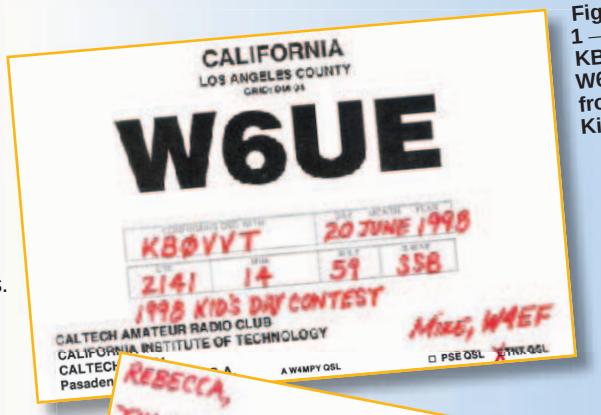


Figure 1 — Rebecca, KBØVVT's, W6UE QSL from the 1998 Kids Day.

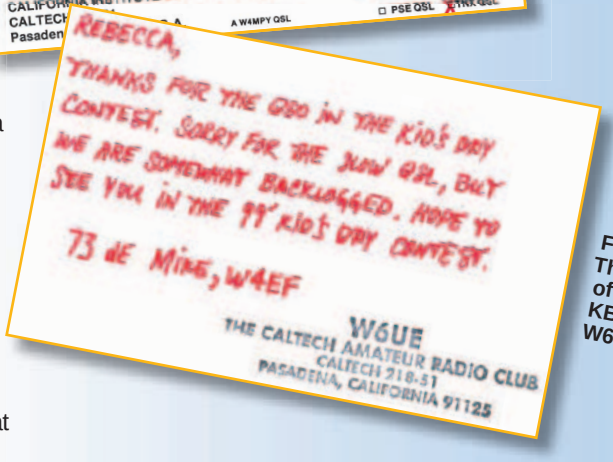


Figure 2 — The back of the KBØVVT-W6UE QSL.

From Kids Day to Caltech

Kids Day has prompted many to get their first license. Other times, it has had a more lasting impact. Back in 1998 Rebecca, KBØVVT, of Raytown, Missouri had a Kids Day contact with Mike, W4EF, at the California Institute of Technology (Caltech) club station W6UE. Mike works at the Jet Propulsion Laboratory in Pasadena, which is the leading US center for robotic exploration of the solar system, and conducts major programs in space based Earth sciences. During the contact Rebecca mentioned to Mike that she was interested in going to Caltech. Mike sent her a QSL card (see Figures 1 and 2) and accompanying Caltech prank postcard (see Figure 3), which she framed and displayed in her shack.

Jump forward to summer 2009. Rebecca is a student at MIT and comes to Pasadena for the summer to participate in a summer internship at JPL. Her home away from home was the Caltech campus. Mike was able to present her a key to the W6UE club station to use for the duration of her internship. She even participated in the North American CW QSO Party from the W6UE station in early August.

Figure 3 — The famous prank Caltech postcard.

A Soapbox and Certificate

Everybody has a story to tell about Kids Day. Whether yours resulted in a career path or just an afternoon of pizza and laughter, share your experiences. The Kids Day soapbox is available to all; post your stories and share your photos with thousands of other participants around the globe. Be sure to read what others share; you might find a new way to enjoy Kids Day — like making contact on a dipole they built themselves, building a simple electronic kit or doing research on the places contacted.

Once Kids Day is over, be sure to log on to **www.arrl.org/kidsday**, fill out the online survey and print a certificate for each of the kids who participated at your station. These certificates are suitable for framing and will help maintain their interest in Amateur Radio for some time to come.

Kids Day opens doors and opens minds. Open your shack doors and invite the youngsters over to learn and enjoy themselves. Let's all work to get some fresh, young voices on the air on January 3.

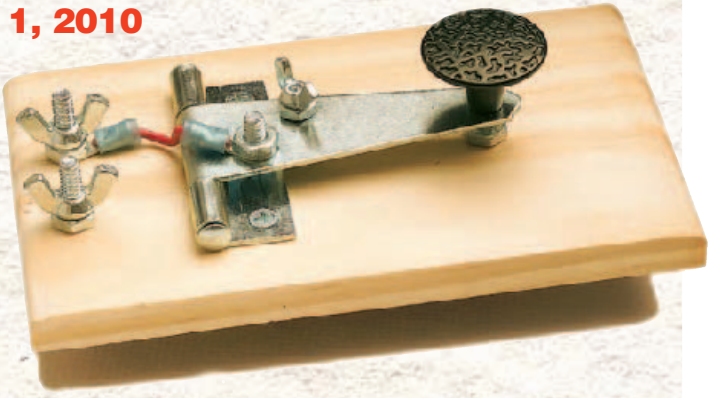
All images courtesy David Rich, KGØUS.

Figure 4 — Did Rebecca's Kids Day contact with W6UE spark a career path?

kidsday@arrl.org

2010 ARRL Straight Key Night

0000 – 2359 UTC January 1, 2010



From the very beginning of Amateur Radio, there was Morse code. Straight Key Night takes us back to our heritage. Break out that old key or bug, maybe use some vintage gear and make some QSOs that call back to a simpler time. No fast exchanges, no sequential serial numbers — just get on the air and send CW for the fun and joy of it.

"And code is music,
from sounders and speakers it dances
in the shack to each sender's inner clock,
and comes butter-smooth, deliciously swinging,
or choppy staccato from a 'fist' praising definition,
or perfectly metered, flowing exquisitely
from the gentle hand of an artist."

— © Troy Weidenheimer, WØROF
(used with permission)

E-mail your summary of stations worked, along with your stories, high resolution photos and your vote for "Best Fist" and "Most Memorable QSO" to **straightkey@arrl.org** or send in your paper logs to Straight Key Night, ARRL, 225 Main St, Newington, CT 06111. All logs must be submitted no later than 0000 UTC Monday, February 1, 2010.

THE 2010 ARRL RTTY ROUNDUP

1800 UTC Saturday, January 2 –
2359 UTC Sunday, January 3, 2010

WAYNE KING, N2WK

WA2TMC (front) and N2WK

- **Submit Cabrillo-formatted electronic logs by e-mail to rttyru@arrl.org**
- **All logs must be submitted by 0000 UTC Wednesday, February 3, 2010.**
- **The ARRL RTTY Roundup is the fastest-growing contest the League offers. More and more amateurs are getting bitten by the digital bug every year. Make QSOs with RTTY, PSK and more! W/VEs send a signal report and their State or Province; DX stations send a signal report and serial number, starting with 001. Everybody works everybody! Get your computer interfaced to your rig and work the world in this long-standing RTTY event.**

Complete rules can be found at **www.arrl.org/contests**

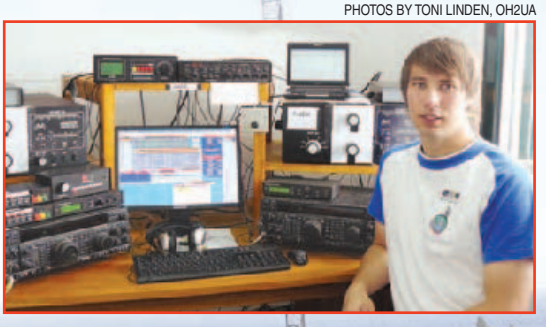
2010 ARRL DX Contest

CW: **0000 UTC Saturday, February 20 – 2359 UTC Sunday, February 21**
Phone: **0000 UTC Saturday, March 6 – 2359 UTC Sunday, March 7**

- CW log submission deadline: 0000 UTC Tuesday, March 23, 2010
- Phone submission deadline: 0000 UTC Tuesday, April 6, 2010
- E-mail Cabrillo-formatted logs to **dxcw@arrl.org** or **dxphone@arrl.org**. Paper logs to ARRL, 225 Main St, Newington, CT 06111 USA
- Complete rules can be found at **www.arrl.org/contests**
- The thrill of competition and the hunt for DX will be the focus in late February and early March! W/VE stations work only DX and DX stations work only W/VE. Exchange a signal report and your W/VE state or province; DX stations send a signal report and transmitter power.

Work your share of the DX, then tell us how you did! Post your stories and photos to the contest soapbox at www.arrl.org/contests/soapbox

PHOTOS BY TONI LINDEN, OH2UA



2010 ARRL January VHF Sweepstakes

“Out in my Rover, antennas are raised
Good signals tonight — so strong, I’m amazed
Fingers are frozen, my lips are blue
It’s the VHF Sweeps — CQ, CQ!”

1900 UTC Saturday, January 23 — 0359 UTC Monday, January 25

Complete rules can be found at **www.arrl.org/contests**

- An excellent event for some January VHF+ fun. Stations exchange four-digit grid square. Collect as many QSOs and different grids as you can. Technician class licensees are encouraged to participate!
- Logs must be submitted by 0400 UTC Thursday, February 25, 2010
- E-mail Cabrillo-formatted logs to **januaryvhf@arrl.org**. Paper logs to ARRL January VHF Sweepstakes, 225 Main St, Newington, CT 06111.

BRUCE RICHARDSON, W9FZ, AND WENDELL SMITH, N9REP

Bruce Richardson, W9FZ (left) and Wendell Smith, N9REP, out roving with a few antennas.

W3UR

HOW'S DX?

DX News from Around the Globe

3V — TUNISIA

A German team who will be operating with special call 3V3S from November 23-December 2 will be QRV from the club station 3V8SS in Sousse, Tunisia. This will include a multisingle effort in the CQ World Wide CW DX Contest. Team members will include DJ7IK, DJ8NK, DJ9CB, DL9USA and DF1LON. They will be using a Spiderbeam and verticals, which will then be donated to the club station. The team will have a Web site, soon, at **www.3V3S.tk**. QSL via DL9USA.

3W — VIETNAM

An international team will be operating from Con Co Island (AS-185) as 3W6C in April. Plans are to run four stations 24/7 for 2 weeks with a goal of 60,000 QSOs. The international team is being led by Swiss operators with approximately 20 operators from Vietnam, Germany, America and Japan. Activity is expected on all bands. The team is looking for sponsors. They have a Web site at **www.3w6c.qrv.ch**.

5R — MADAGASCAR

Sam, G4OHX, plans to be in Madagascar from December 28 - January 3. He hopes to be QRV as 5R8HX. Afterwards he'll be in South Africa and operating as ZS5/G4OHX from January 4-17.

8Q — MALDIVES

8Q7QQ will be a 6 meter EME DXpedition March 24-31. Pierre, HB9QQ, "has been very busy optimizing the 6 meter EME station he will be taking next spring for his JT65A operation," says W7GJ on *Make More Miles on VHF* (**www.mmmonvhf.de**). Pierre "will be using a low-noise external preamp, 500 W Falcon amplifier and a 7-element Yagi overlooking the ocean." W7GJ says there are "some great horizon-only windows for NA stations — while he has ground gain on the horizon at the same time." Lance says EME conditions are optimum during that time of the year. In addition to HB9QQ, HB9CRQ also plans to be on the trip and possibly other members of the HB9Q Team. They will concentrate on 144 MHz but will also do some 6 meter and 23 centimeter. Flights and bungalows are already booked but it may not be too late to go along, if you're looking for adventure. Contact HB9CRQ.

A2 — BOTSWANA

Mike, K9NW, tells us he will be active from Botswana as A25NW from November 23-December 1, including a Single-op All-band entry in the CQ World Wide CW DX Contest. Mike will be QRV on all bands. QSL via K9NW.

C5 — GAMBIA

Eric, SM1TDE, will be in The Gambia from December 10-January 3. He has applied for a license and supposes it will be issued upon his arrival. This will be a family vacation and so radio will come second. Activity is planned for CW only on 1.8 through 28 MHz using 100 W and simple wire antennas. Eric prefers QSLs go via the bureau, although direct is okay too. He does not have plans to use LoTW or eQSL.

C9 — MOZAMBIQUE

Derek, ZS5Y, is planning a 6 meter EME operation from Mozambique this month. Plans are to start on December 4 for a week of activity.

CE — CHILE

Pedro, HK3JJH, confirms he is indeed looking into Wollaston Islands (SA-031) and Diego Ramirez Islands (SA-094), Chile in the December 2009-January 2010 time frame. Keep an eye on your favorite DX pub for details on this one.

FO — FRENCH POLYNESIA

Phil, F5PHW, has been in Tahiti, French Polynesia since August and will be QRV as FO8RZ until August 2011. He is running 100 W mostly on CW with some RTTY. Phil has a Yagi for 10, 15 and 20 meters up about 6 meters high. He also has an inverted V for 40 and 80 meters as well as an HF6V, which can be used on 30, 17 and 12 meters. Phil also has a 160 meter kit for the HF6V he plans to install. QSL via LoTW or via F8BPN, either direct or via the French REF-Union bureau.

INTERNATIONAL TEAM HEADS TO SEVERAL PACIFIC ISLANDS

By the time you read this, an international team will have just finished operating from Samoa (5WØMR, etc). Their next stop will be Tonga where they will be QRV from November 19 through December 1. They are expected to be some of the first operators to use the new A31 prefix, which is now reserved for visitors. The team includes:

Call	*Home Call*
A31MR	IK1PMR
A31LEO	PA3LEO/K2LEO
A31WL	PAØBWL
A31NN	AA4NN
A31SN	OE2SNL
A31IW	DJ5IW
A31JC	DJ7JC

Plans are to participate in the CQ World Wide CW DX Contest with special call A31A. Activity before and after the contest will be with each operator's own A31 call on all bands and modes. They will be focusing on Europe, the low bands, 12, 17 and 30

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

meters and RTTY. Plans are to have four stations, three with amplifiers. The team has a Web page at **www.ik1pmr.com**. They will also be operating on the 60 meter band. Plans are to have small amplifiers.

The international team will next go to New Zealand from December 2-6, where they probably will operate from Waiheke Island (OC-201). The ops for this one include IK1PMR, PA3LEO, PAØBWL, AA4NN, OE2SNL, DJ5IW, OZ1IKY and DJ7JC. This one will be a "holiday style operation" with ZL/home calls being used.

After New Zealand the international team heads to Rarotonga (OC-013), South Cooks for their December 6-13 DXpedition. Their calls are:

Call	*Operator*
E51PMR	IK1PMR
E51LEO	PA3LEO/K2LEO
E51BWL	PAØBWL
E51EEE	AA4NN
E51SNL	OE2SNL
E51XIW	DJ5IW
E51NAA	DJ7JC

And finally some of the international team will close down from Singapore between December 14 and 17, this time using 9V/home calls. The ops will be IK1PMR, PA3LEO and PAØBWL. This one will be a "holiday style operation" on CW and the digital modes.

JD/O — OGASAWARA ISLANDS

JI5RPT's Web site (**www.ji5rpt.com**) reports that he and Harry, JG7PSJ, are heading back to JD1 — Chichijima (AS-031), Ogasawara Islands for an operation between December 27-January 1. They will be operating as JD1BLY (QSL via JI5RPT) and JD1BMH (QSL via JG7PSJ).

KG4 – GUANTANAMO BAY

Keith, KJ5YU, recently obtained the call sign KG4YU to be QRV from Guantanamo Bay. Look for him to be active, mostly on 20 meters, on various HF frequencies as his time and work schedule allows. He will be operating from the Club Gitmo station, which includes a Kenwood TW-570D running 100 W. Keith's expected operating schedule will be mostly on weekends through approximately February 1. QSL via Keith's home call KJ5YU.

V3 — BELIZE

Pete, K8PT, is heading to Ambergris Cay (NA-073), Belize for a holiday style operation from November 24-December 6. He'll be operating as V31PT on 7 through 28 MHz on SSB, CW and RTTY. QSL via K8PT.

VK — AUSTRALIA

The Wireless Institute of Australia (WIA) turns 100 next month, which it believes makes it the world's oldest national radio

society (**www.wia.org.au**). VK100WIA will be on the air next May to celebrate from the WIA. Affiliated clubs may borrow the call sign for further operations after that. There will be a commemorative QSL card for the operations between May and October 2010 and a "limited edition" operating award, the WIA Centenary Award, for making two contacts with VK100WIA. There will be a program of events at the WIA annual meeting in Canberra in May, with other special events being planned by radio clubs. The WIA began with a meeting of "wireless pioneers" in Sydney in 1910, to "protect their interests and rights against — harsh treatment by authorities and a high licence fee."

VK9X — CHRISTMAS ISLAND

VK9X/G6AY with operators G3SWH and G3RTE will be active from Christmas Island February 20-27. It's OC-002 for IOTA and is #66 on *DX Magazine's* 2008 most wanted survey, worldwide. Phil and Jim will be CW only, all bands 80-10, going with the best propagation with two stations on the air as many hours a day as possible. They hope to work as many North American, European and "Rest of the World" (ROTW) stations on as many bands as possible. QSL via G3SWH, direct with SAE and return postage or via Phil's Web site, **www.g3swh.org.uk** for a bureau reply, or the regular way with a bureau card. **www.g3swh.org.uk/christmas-island.html** for more information.

VP2V — BRITISH VIRGIN ISLANDS

Kurt, W3HQ, is planning a trip to the British Virgin Islands where he will be QRV as VP2V/W3HQ from December 4-16. Activity is expected on 1.8 through 28 MHz on CW only. QSL via W3HQ.

XU — CAMBODIA

XU7UFT is the Cambodian call sign for Norbert, F6AXX, and Alain, F6HBR, from Sihanoukville, December 3-8. They plan to be CW only. QSL via F6AXX at the French REF-Union Bureau or direct to his published address with an SAE and postage cost. They have a goal of answering all the QSL requests by January 15.

YV and YVØ — VENEZUELA and AVES ISLAND

Alex, YV5SSB, updates us on some upcoming activities of the 4M5DX Group. A January 2010 operation from Aves Island (YWØA) is in the works for three or four weeks. They still need to negotiate the length of stay with the Venezuelan Navy. They 4M5DX Group is also working on a number of IOTAs with the first one expected in November to December of this year on Orchila Island (SA-054) as YW5O. In February they will try YW7IOTA from Coche Island (SA-012) and in March from Patos Island (SA-048) as YW5P.

Z2 — ZIMBABWE

Mikhail, RW3AJX, has been in Zimbabwe for 1 year. He received his Z23MS license in April of this year. Mikhail will be working there for about 2 to 3 more years. He expects to be QRV on SSB on 80 through 10 meters and PSK31 a little bit later. There is no Z2 QSL bureau and cards should go via UA3DX.

ZL — NEW ZEALAND

Paul, ZL4PW, and Ray, VK4HDX, are going to a rare one, OC-203, Stewart Island. Put this on your calendar for March 9-30, 2010. The last time it was on was just for 48 hours, back in 2004. Most past operations have been CW. These two boys plan to be on 160-15, all modes, plus maybe the CQ WPX SSB Contest. They are getting their gear ready and have their travel costs covered but still need a phasing device for phased arrays for 40 and 30 and a solid state amplifier. To help with those, you can reach them at **zl4pw@orcon.net.nz**. Their Web site is "under construction."

WRAP UP

That is all for this month. A special thanks to AA1MI/HB9DST, FO8RZ, HK3JJH, IK1PMR, KE3Q, RW3AJX and *The Daily DX* for this month's news. Don't forget to send your club newsletters, photos and DX news to your editor at **bernie@dailydx.com**. Until next month, see you in the pileups! — *Bernie, W3UR* QST

W3ZZ

THE WORLD ABOVE 50 MHz

New Blood

Every once in a while the discussion on the VHF Contesting Reflector turns from rover rules, new ways to use nonradio means to manufacture contacts before and during contests and other perennial favorites to important and fixable issues. One such issue is finding ways to improve VHF+ activity and discussing where to find the operators to fuel this improvement. Since a version of this discussion just ended on the reflector and because I believe that the latter topics are important functions of this column, I would like to revisit specifically where we might find some new blood.

The Ideal Road to DXing on VHF+

We all know the ideal approach to developing new VHF+ operators. We need a source of operators who are interested in using the VHF+ frequencies. Then we need someone(s) to mentor them, to answer their questions and to help them get started. Most of all there must be someone to explain the challenges and the fascination with these frequencies and tell them why they should persevere. It also helps to have local activity nets so they will have someplace to listen and talk when they get on the VHF+ bands. Lacking this help and feedback you will get very few new VHF operators. But first, where are we going to find new blood to mentor?

Previous Attempts

Let's first look at the sources for new operators in Amateur Radio over the last half century. Originally the amateur ranks were populated by experimenters and SWL DXers seeking to work people in the far off countries they heard on their shortwave radios. I started primarily as a ham radio SWL and my original interest in working DX, whether day-by-day or in competitions, has never waned in over 50 years. Of course this is a very limited source of new amateurs but it sufficed for many years. The Novice license provided many their first experience with VHF and a few stayed on the VHF bands after they upgraded. In fact, the golden years of VHF activity were probably in the 1960s fueled by Novices and Technicians and the ready availability of emergency communications equipment provided by localities. There was activity every night on 2 meters and lots of local and not so local nets.

Often overlooked are CBers. Starting later in the 1960s many CBers were fascinated by both the F2 and E layer DX available on 11 meters and yearned to be free of the crowding they found there. Many became amateurs. Some conquered the code and became mainstream HF hams. Some could not exceed the 5 WPM code requirement and became Technicians, joined the VHF+ ranks and stayed there even after they upgraded.

Any discussion of new VHF DX blood automatically has gravitated to converting FMers. Indeed, starting around 1970 there was a massive increase in the number of people using FM. In great part this was because of the longtime desire for reliable local communications, something that FM readily delivered. From that time on, current VHF DXers have tried and tried and tried to make VHF DXers out of FM operators with only limited success. There are good reasons why this is so.

By the mid 1970s FM may have become the most popular mode of amateur communication. FM radios and handheld transceivers were selling like hot cakes and repeaters were springing up everywhere like mushrooms. This high level of FM activity was maintained for the rest of the 20th century and provided an obvious source of potential VHF DX operators. But in many ways this was deceiving. The vast majority of FM-only operators were interested in reliable local communication. Their mindset was based on discrete channels, and tuning as we know it on VHF or HF DXing was an alien concept to many. The majority of operations took place on repeaters where the repeater did the heavy lifting and little more than a handheld transceiver was needed.

In fact most FM operators strongly doubted that communications could be maintained over distances beyond that supplied by the local repeater. Those FMers who came from the HF world returned there when they were not on FM. VHF+ meant line of sight for almost all FM users.

Then came the cell phone revolution beginning around the year 2000. The ideal form of local communication — reliable and relatively cheap. The repeaters emptied out. Large repeater clubs went from hundreds of members to tens of members. Today many repeaters remain lightly used. If you don't believe this, listen sometime even in large metro areas.

There are a few exceptions to the failure to make real VHF operators out of FMers. The first is the special case of the entry class operators in Thailand who are limited to 10 W simplex 2 meter FM. Many of these operators would like to contest and indeed do so in the CQ WW VHF contest. This contest attracts well over 1000 operators and scores approaching 1000 contacts and about 20 grids all with 10 W. In fact this VHF contest is the biggest yearly contest in Thailand.

The other exception is the well-known Rochester VHF Group, which has in the past consisted of hundreds of FM operators along with a large core of experienced, technically competent VHF DXers. Here there are no problems finding many Elmers and plenty of help getting started and going as high in frequency as you might be interested in going. Although a significant number of FMers have gone to SSB/CW in this club, based on my ability to work FN12/FN13 over a 250-300 mile path, many of them do not run much power.

This Month

*December 6	*Excellent* EME conditions
December 12-16	2009 WSJT Geminids Test
December 14	Geminids meteor shower peaks 0510Z

*Moon data from W5LUU

Where Else Can We Try?

If previous organized attempts to find new VHF activity have failed, what is left? There is an additional variant of converting FMers whose results are not yet known because it is relatively new. National events like 9/11 and Katrina have reemphasized the importance of disaster communications. Federal efforts and, to a growing extent,

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local and regional disaster communications have come to be based on highly complex and expensive trunking systems whose reliability is in question under disaster conditions. Thus cell phones routinely fail during a disaster not usually because the cell phone hardware is damaged but because the cell phone networks are not designed, nor could they economically be designed, to handle the communications volumes that are produced during a disaster.

Complex emergency communications networks sometimes work and sometimes do not. Many involved in communications for first responders understand and would like to apply the KISS principle (Keep It Simple Stupid). Unfortunately, many of the modern digital radios and digital communications modes are anything but simple. In trying to accomplish everything through the highest technology, many of these modern digital communications devices become part of the problem instead of part of the solution.

Simple handheld transceivers and analog communication voice repeaters are still very valuable in emergencies and many nonamateurs interested in disaster response have been urged to get amateur licenses. The vast majority of these people are interested only in disaster communications. But might some of them go on to become mainstream amateurs with broader interests or even become interested in communicating over greater distances on the VHF bands they already use on FM? For instance John Lindholm, W1XX, sponsors a statewide FM contest in Rhode Island coinciding with the CQ WW VHF Contest. He is getting a few dozen entries, about half of whom are willing to submit their logs for the CQ VHF contest. This is a long reach but we won't know how it works unless we try it.

Starting in the 1990s ICOM and Yaesu in particular produced a series of competitively priced, compact portable/mobile radios that covered 160 meters to 70 cm. It is said that the ICOM IC-706 series is the single most popular radio ever made. Everybody has some variant of this type of radio (an FT-100 resides in my car). I was sure that these radios were the savior of VHF activity. Yet I was entirely wrong. When I asked a few years ago at the Visalia DX convention how many in the contesting forum owned such radios, around 80 percent of the more than the 100 present raised their hands. Yet when asked how many had ever made a DX contact on VHF fewer than 10 hands went up. The reason was lack of interest, lack of activity ("those bands are always dead") and the requirement for a decent antenna ("a wire out the window won't do").

Now there appears to have been a change with the advent of high end HF+6 meter radios ranging from the K3, FT-2000, IC-7600 and even less expensive but still main station radios like the FT-450 and TS-480, and the slow but steady penetration of the pure SDR radios like the Flex 5000/1000. With these radios the DX Challenge includes 6 meters, and that has attracted the HF DX/contest crowd (for instance, locally in a very short time W3UR has over 100 countries and W3LPL is in the 90s on 6 meters).

Now we are seeing some very familiar HF faces on the VHF bands, particularly 6 meters. Not a month goes by that I don't get at least one e-mail from a longtime HFer, most not from anyone I know, telling me how he tried his new HF+6 meter radio on some kind of low band antenna and found that he could work lots of stations and that 6 meter propagation was fascinating. Thus we have another convert to the Magic Band and the possibility that some of these folks will go on to explore other VHF bands.

So where is the new VHF blood? It is under our noses — the large number of HF operators who have previously not been willing to try 6 meters. When presented with an easy route to try 6 meters they find that an E_s opening sounds like 10 meters on a good day.

What can the VHF community do? We can encourage our friends with these radios to try 6. We can explain that the time to try is April through July and why this is so (they will understand time limitations — 160 meters is really decent in a typical year only from October through April). We can be their VHF Elmers. We can answer their questions and help them technically. If they need someone to listen for their VHF signals, be there to help them. If you belong to VHF club, seek these HFers out, answer their questions and emphasize 6 meters. A certain number of them will go on to try other VHF bands — remember they have to walk before they can run.

How does this work in practice? Let me give you one personal example. Fifteen years ago my local club, the Potomac Valley Radio Club, an HF contest club, had only a handful of VHF operators. Amongst others I kept telling them how great VHF was and in the meantime a few dozen nonVHF members now have obtained VHF capability. Some of the local VHFers who are also interested in HF contesting have joined the PVRC and many of the operators of the Grid Pirates, K8GP, and VHF contest stations, W3SO and W4IY, have become PVRC members. Some were previously members but others are new.

The Pirates have provided technical assistance to help a significant number of local rovers and local fixed stations get on the air. In many cases these operators have become technically competent on VHF+ in their own right and now are capable of maintaining their own stations to a great extent. So, this is a win-win situation but it doesn't happen without help from the VHF community. What we have done in the Washington, DC area can be readily duplicated elsewhere.

ON THE BANDS

September produced a lot of microwave activity and a couple of decent coastal tropo openings but ones not nearly as nice as last month's east/west duct. Let's look.

Tropospheric Ducting. On the 3rd Vic, WB2SLM (EM82) caught a coastal duct up to K1TEO (FN31rh) 832 mi on 1296 and 2304 and to WA2LTM (FN20rh) 734 mi on 1296. The same time Jon, NØJK, notes KS was working into WI and MI. Following the 2 meter Sprint Dave, K1WHS (FN43) worked K4SME (EM80) and W4VC (EM81) on 432 and K4QI (FM06) on 1296. The next morning he worked K4LY (EM85) on 1296 and W4VHH (EM95) on 1296 and 2304. The best were contacts with Mark, K1MAP, in (FM14/FM15) on 10 GHz. Mark was as loud on 3 cm as on 2 meters. On September 22-23 Bob, K6QXY, heard the KH6HME beacons weakly on 144, 432 and 1296 via the transpacific duct.

Contests. In brief the September VHF contest had little interesting propagation but Al, K7ICW (DM62oh) reported a near miss (calls but no report) with Don, KE7NR (DM33um) on 1296 over an occluded mountain path. Todd, N4QWZ (EM66) worked approximately 500 miles to Chicago area stations including K2DRH (EN41) on 1296. Jon, NØJK, noted E_s between KS and FL. Kudos to Bruce, W9FZ, who organized Midwest Mania (**w9fz.com/midwestmania09**) to encourage both increased fixed station and rover activity in the Midwest region. In response Lloyd, NE8I/R, drove 885 miles through 9 grids. The contest write-up should tell us how many more answered the call. Conditions in the 222 Sprint were also flat. Top scores I have heard: W8ZN 47/23, WZ1V 45/20, K1TEO 43/18, KC9BQA 32/18, K1WHS 38/15, K1RZ 30/18, K1TR 28/14, K4QI 24/18, W3ZZ 23/14. Totals were low outside the northeast but Todd, KC9BQA, said he benefited from rover activity, which was absent here in the East.

The other contests fared much better. This month's highlight was an Atlantic coastal duct coinciding with the Fall 2 meter Sprint on September 7. Stations from Nova Scotia FN73 (VE1WLC) to northern FL were in the duct. Top scores from the early results were W8ZN 160/42, K1WHS 170/36, K1TEO 150/36, WZ1V 117/28, W3ZZ 94/29, K1RZ 90/29 and K3TUF 90/24. Dave, K1WHS, observed a classical coastal ducting event with one elevated segment from New England to FL bypassing lowland stations in between and a solid low altitude duct from VE1 down the coast to the Carolinas. He worked 70 Qs in the first hour. His longest contacts were Steve, N2CEI, and Sandra, K4SME (EM80) in FL. Steve says they were about to quit when they heard K1OR (FN42). As the duct broadened they eventually worked Dave, K1TR (FN42), WZ1V (FN31) and K1GX (FN31) but heard no one else.

The 10 GHz and Up contest also had enhanced conditions. Steve, KB8VAO, operating from Blue Knob (FN00rg) worked W1FNF on Mt Equinox (FN33kd) 343 mi and KT1J (FN34bi)

RUSSELL PILLSBURY, K2TXB

Figure 1 — Mickie, N1MKY (left), and Dale, AF1T, look for some DX at sunset from Block Island in the 10 GHz contest.

369 mi. Wally, WØPHD, from EN18gg worked both VE4MA (EN19lu) and NTØV (EN08oc) with enhanced signals. Most interesting was the modulation of the signals by the nearby wind turbines. Mark, K1MAP, details operation from FN30ap, FM28kt, FM27hv, FM27ap, FM26aq and FM14ux the following 2 days. Conditions were ordinary until the last two grids when Mark worked to Martha's Vineyard (FN41ql) 437 mi, Block Island (FN41ee and FN31) from FM26 and Block Island and K1WHS (FN43mj) 648 mi from FM14. Dale, AF1T; Mickie, N1MKY, and Russ, K2TXB, activated Block Island during and after the contest (Figure 1).

6 meters. Pickings were pretty slim. Jon, NØJK (EM28) was into GA/FL on the 7th. The same day Bill, KØHA (EN10) found long single hop to EL95, FL16 and DL82 (XE2YW) as well as TX, LA and all of FL. NØJK notes that even with no sunspots TEP was worked on the 23rd from HK-CE/LU and PY-9Y.

Microwaves. In addition to the activity in the 10 GHz and Up contest John, WØUN, sent me a YouTube link (**www.youtube.com/watch?v=rYxz9Nf1yuI**) to a video of regular rain scatter (RS) contacts between K5LLL (EM10kf) and KM5PO (EM12ko) and W5LUA (EM13qc), the latter a 200 mile path. Al, W5LUA, notes that given enough power and antenna it is possible to work RS down to 902 MHz though this low frequency does not support RS well.

HERE AND THERE

Geminids Meteor Shower. The Geminids are an active group of rather slow (35 km/hr) meteors that produce short bursts that are ideal for digital MS (see below). This year the Geminids peaks at 0510Z ±2 hours, December 14. In spite of their slow speed, long contacts can be made; I have heard and been heard on SSB in KP4 (approximately 1550 miles).

North American VHF WSJT 2009 Geminids Test. Sponsored by the WSJT Group at **groups.yahoo.com/group/wsjtgroup**, this digital (FSK441/JT6M/JT65) contest runs from 0000Z December 12 to 0200Z December 16 on 50-222 MHz to coincide with the Geminids meteor shower. Classes are Fixed/Portable Random, Assisted and Rover Random, and Assisted. Distance scoring (miles) is used. Self-spotting and schedules before and during the contest are allowed in the assisted classes but no information may be passed during a contact by any means but MS. Make sure to read the full details at **www.sportscliche.com/wb2fko/w09/rules_w09.pdf**.

I again wish my readers the very best of the Holiday Season and a New Year in 2010 filled with VHF+ DX. QST

432 MHz Standings

Published 432 MHz standings include call area leaders as of Sep 1. For a complete listing, check the "Records and Standings" pages on "The World Above 50 MHz" Web pages at **www.arrl.org/qst/worldabove**. To ensure that the "Records and Standings" pages reflect current activity, submit reports at least every 2 years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call Sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
W3EP/1	CT	20	2	61	1,760
W1AIM	VT	18	2	56	1,725
K1VU	MA	11	1	16	814
K1WVX	CT	10	1	14	691
WA1FVJ	CT	10	1	14	400
2					
K1JT	NJ	17	2	52	757
K2OVS*	NY	16	4	44	720
WB2AMU	NY	12	1	19	830
W2MPK	NY	9	2	—	—
3					
W3ZZ	MD	26	2	93	1,526
AE3T	PA	23	2	—	1,363
WA2FGK	PA	22	2	81	1,596
N3JNX	PA	11	1	25	786
4					
W4TJ*	VA	43	40	190	—
K4QI*	NC	39	51	261	—
AA4ZZ	NC	32	2	102	1,255
N4QWZ	TN	31	1	110	1,601
K4RF	GA	28	2	96	1,742
W4WA	GA	25	2	88	1,506
K4CSO	GA	25	1	114	1,582
AA4H	TN	21	1	57	1,737
K4RTS	VA	20	2	68	1,078
N4MM	VA	19	3	58	—
K4ETC	TN	14	2	40	908
N4HN	NC	14	1	41	—
KØVXM	FL	10	3	64	2,164
W4SW	VA	9	2	22	521
K4MM	FL	8	2	34	1,691
K4MSG	VA	8	1	19	492
N9HF	FL	7	1	7	608
KE4WBO	FL	3	1	11	1,013
5					
W5LUA*	TX	50	—	—	—
WD5AGO*	OK	40	23	150	1,740
W5ZN*	AR	36	15	155	1,850
K5UR	AR	31	2	220	--
K5SW	OK	31	2	144	1,273
K5YY	AR	30	2	161	1,780
K5QE*	TX	25	2	77	—
WA5VJB	TX	23	—	—	2,108
W5HNK*	TX	20	1	—	1,651
K5LLL	TX	16	2	98	1,673
W5UWB*	TX	14	3	39	2,167
W3UUM	TX	14	2	68	1,619
AA5AM	TX	9	1	52	1,728
AA5JG	OK	6	1	32	1,855
6					
KC6ZWT*	CA	4	3	51	3,934
K6QXY	CA	4	3	36	3,794
KR7O	CA	2	1	39	582
N6ZE	CA	1	2	18	1,265
7					
W7MEM*	ID	19	12	59	—
KI7JA	OR	4	2	21	683
WA7GSK	ID	3	1	12	—
8					
K2YAZ	MI	28	2	108	2,167
WA8RJF*	OH	22	3	80	1,287
K8ROX	OH	17	2	51	1,104
N8PUM	MI	11	2	44	1,368
KB8O	OH	11	2	27	707
9					
N9LR	IL	34	3	136	1,562
K3SIW/9	IL	32	2	134	1,469
KA9UVY	IL	27	2	84	1,409
AA9MY*	IL	25	3	68	1,567
W9RPM	WI	12	2	82	983
KB9TLV	WI	7	2	30	782
Ø					
WØSD*	SD	50	25	138	—
KØRZ*	CO	46	50	275	1,083
KØALL*	ND	42	13	—	—
WØRT	KS	30	2	105	1,940
NØPB	MO	27	1	115	1,936
NØLL	KS	21	1	113	1,690
KØFF	MO	20	1	74	1,189
KBØPE	MO	17	1	61	1,148
KØAWU	MN	15	2	67	1,474
NWØW	MO	9	2	—	890
Canada					
VE3KH	ON	18	—	54	1,174
VE2PIJ	PQ	9	2	37	694

*Includes EME contacts
— Not given

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

The ARRL VUCC numbered certificate is earned by 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 indicate total grid locators claimed. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from August 1, 2009 to September 30, 2009.

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. Send questions relating to VUCC to **vucc@arrl.org**.

50 MHz
100

1691	W8GJ
1692	KQ4KX
1693	WA2KBZ
1694	K4UQC
1695	W9DQ
1696	N2YBB
KQ4KX	125
WA3YGQ	125
K6UM (CN85)	150
KC8TMU	150
KC9FQD	200
N6ORB	250
WAØGUD	250
K1ACL	275
K6RG	275
K9MU	400
W5WP	400
W9VA	500
K4LVV	525
WX7M	550
KN4SM	575
KR7O	575
KØAZ	625
K4CKS	675
KAØJGH	675
NG4C	700
WD5K	1,150

144 MHz
100

697	W5MRB
KØAZ	175
WA3BZT	225

222 MHz
50

140	W9GKA
141	W9RVG
142	NG4C
N4QWZ	60
W9RVG	60

432 MHz
50

326	W9RVG
327	NG4C
328	KØAZ
329	W5MRB
N4QWZ	80

902 MHz
25

43	KØVXM

Satellite
100

183	KD8ILL
WA8SME	225
K8ZZU	275
KD8CAO	325
K8YSE	350
WA4NVM	375
N5AFV	675

QST

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Nov 22-Dec 6, 0000Z-0000Z, Berwyn, IL. Chicago Suburban Radio Association, W9C. 85 years since the founding meeting of CSRA. 145.555 21.331 14.255 7.190. QSL. Ed Schumacher, 3011 Becket Ave, Westchester, IL 60154. **www.csraham.com**

Dec 1-Dec 16, 1800Z-0400Z, Sevierville, TN. Sevier County Emergency Radio Service, W4W. Sevier County Emergency Radio Christmas QSO Party. 28.350 14.260 7.250 3.840. QSL. QSL direct to amateur operating the W4W special event station. **n4jtq@live.com** *or* **www.freewebs.com/aresradio/index.htm**

Dec 4-Dec 7, 1400Z-1100Z, Fredericksburg, TX. Hill Country Amateur Radio Club and the amateurs of Fredericksburg and Gillespie County, TX. N5P. Opening of the George H. W. Bush Gallery at the National Museum of the Pacific War, and commemorating the hams who served in WWII. 14.255 21.275 7.275 3.940. QSL. Nimitz Foundation, 328 E Austin St, Fredericksburg, TX 78624. **info@NimitzFoundation.org** *or* **www.kerrhams.org**

Dec 5, 1400Z-2300Z, Granite City, IL. The Egyptian Radio Club, Inc, W9AIU. 80th Anniversary of the Egyptian Radio Club. 14.275 14.035. QSL. Egyptian Radio Club, PO Box 562, Granite City, IL 62040-0562. *Operating from our mobile van.* **www.w9aiu.org**

Dec 5, 1700Z-2359Z, San Diego, CA. USS *Midway* (CV 41) Museum Radio Operations Room, NI6IW. Pearl Harbor Remembrance Day. SSB 14.320 7.050 PSK-31 7.070 CW 14.060 7.055 D-STAR 2m/70cm SOCAL rep. QSL. USS *Midway* Museum Radio Station, 910 N Harbor Dr, San Diego, CA 92101. **kk6fz@arrl.net**

Dec 5-Dec 6, 1400Z-2200Z, Baltimore, MD. Amateur Radio Club of the National Electronics Museum, W2W. Pearl Harbor Remembrance Day. 14.241 14.041 7.187 7.041. Certificate and QSL. ARCNEM, Box 1693 MS 4015, Baltimore, MD 21230. **k3nem.org**

Dec 7, 0000Z-2359Z, Wilmington, NC. Azalea Coast Amateur Radio Club, NI4BK. Pearl Harbor Day from Battleship *North Carolina*. 14.255 14.030 7.255 7.030. QSL. Azalea Coast ARC, PO Box 4044, Wilmington, NC 28406. *Will be using restored original WWII equipment for CW operations.* **www.ac4rc.org**

Dec 7, 1500Z-2245Z, Baton Rouge, LA. Baton Rouge and USS *Kidd* Amateur Radio Clubs, W5KID. Pearl Harbor Day. SSB: 15 20 40 m Gen and above RTTY subband CW: QRP sub bands. QSL. W5KID, 305 S River Rd, Baton Rouge, LA 70802. *Primary band is 20 meters.* **www.lsu.edu/brarc/uss_kidd.htm**

Dec 12-Dec 13, 1400Z-0200Z daily, Nazareth-Bethlehem, PA. Christmas City and Delaware-Lehigh Amateur Radio Clubs, WX3MAS. Annual Christmas greetings from the Twin Christmas Cities. 28.465 21.365 14.265 7.270 3.970. Certificate. CCARC/DLARC WX3MAS, Greystone Building Gracedale Complex, RR 8, Nazareth, PA 18064. **www.dlarc.org**

Dec 16-Dec 26, 1300Z-0500Z, Granite Peak, MT. Beartooth Climbers, W7G. Radio and Science at the Summit of Montana. 146.52 14.280 3.920 20 m and 80 m weather permitting. QSL. Coordinator, 20 Tai Ln, Apt 5, Bozeman, MT 59715.

Dec 19, 1400Z-2100Z, Belen, NM. Valencia County Amateur Radio Association, KC5OUR. Christmas from Bethlehem (Belen, New Mexico). 28.373 21.370 14.273 7.273. QSL. VCARA, PO Box 268, Peralta, NM 87042. **www.qsl.net/kc5our**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9 ×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. *Note: Some clubs may ask for a nominal fee to cover the cost of the certificate or QSL. Request will be made on air during the event or on the club's Web site.

Special Events Announcements: For items to be listed in this column, use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**. A plain text version of the form is also available at that site. You can also request a copy by e-mail or send a self-addressed stamped envelope (SASE) (Special Requests, ARRL, 225 Main St, Newington, CT 06111; write "Special Events Form" in the lower left-hand corner). Off-line completed forms can be mailed, faxed (Attn: Special Events) or e-mailed.

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **Feb** *QST* would have to be received by **Dec 1**. In addition to being listed in *QST*, your event will be listed on the *ARRLWeb* Special Events page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us.

Special Events listed in this issue include current events received through Sep 10. You can view all received Special Events at **www.arrl.org/contests/spev.html**.

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

ARRL VEC Volunteer Examiner Honor Roll

The ARRL VEC Honor Roll recognizes the top 25 Volunteer Examiners according to the total number of exam sessions they have participated in since their accreditation. Since each session requires an average time commitment of 2-4 hours or more, the thousands of hours these VEs have invested is extraordinary! Whether you are one of our VE Teams that test once a week, once a month or once a year, we want to express our warmest appreciation to all volunteers for their generous contributions to the ARRL VEC program.

If you are an ARRL VE, you can see your session stats online at **www.arrl.org/arrlvec/veparti.php**.

If you are not a VE, become one! See **www.arrl.org/arrlvec/become-a-ve.html**.

Examiner	*Sessions*	*Accreditation Date*
Sammy Neal, N5AF	491	20-Nov-1984
Harry Nordman, ABØSX	371	9-Jan-2002
Royal Metzger, K6VIP	368	29-Apr-1985
Karen Schultz, KAØCDN	342	6-Sep-1984
Glenn Schultz, WØIJR	332	28-Sep-1984
Franz Laugermann, K3FL	316	1-Dec-1991
Kevin Naumann, NØWDG	309	17-Nov-2002
Paul Maytan, AC2T	305	6-Sep-1984
John Mackey Jr, KSØF	301	1-Oct-1990
John Moore III, KK5NU	294	21-May-1995
Victor Madera, KP4PQ	289	1-Mar-1992
David Laurel, KA6RHF	287	22-Apr-1985
David Bartholomew, ABØTO	286	22-Mar-2002

Examiner	*Sessions*	*Accreditation Date*
John Hauner, KØIH	275	11-Jan-1985
Gerald Grant, WB5R	271	4-Jan-1985
Daniel Calabrese, AA2HX	270	1-Nov-1991
David Fanelli, KB5PGY	270	1-Oct-1991
Scott Swanson, K6PYP	263	1-Dec-1992
Gary Mangels, AD6CD	261	30-Jul-1997
Roy Johnson, N1IKM	260	24-Jul-1995
Ralph Schutte, N6NAD	260	22-Aug-1997
Michael Faucheaux, N5KBW	259	15-Jul-1996
Leslie Dale, NI5S	258	6-Sep-1984
Robert Hamilton, NØRN	257	19-May-1987
Frankie Mangels, AD6DC	257	14-Oct-1997

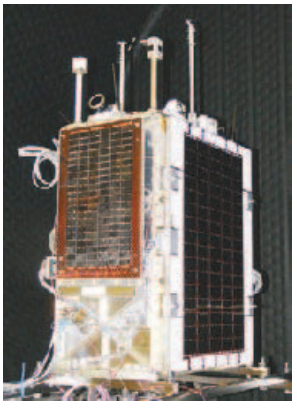
WB8IMY

ECLECTIC TECHNOLOGY

SumbandilaSat in Orbit!

After what seemed like endless delays, South Africa's SumbandilaSat blasted to orbit from the Baikonur Cosmodrome in Kazakstan on September 17. As this column was going to press, the satellite was undergoing initial checkout and all seemed well. Once the main payload, a multi-spectral imager, is put into service, the control team will schedule the activation of other experiments.

Of greatest interest to hams is SumbandilaSat's Amateur Radio module built by South Africa AMSAT. The module consists of a 2 meter/70 cm FM repeater with an uplink at 145.880 MHz and a downlink will be at 435.350 MHz. There will also be a voice beacon at 435.300 MHz. The transponder mode will be controlled by a CTCSS tone on the uplink. At press time the CTCSS tone frequencies had not been announced.



SUNSPACE

SumbandilaSat undergoing pre-launch tests.

The CubeSat Fleet Grows

A week after the launch of SumbandilaSat, an Indian PSLV-C14 rocket carried a cluster of four tiny CubeSats to orbit. CubeSats are very small satellites, typically only a few inches on each side. As relatively inexpensive research spacecraft, they've become increasingly popular with university science programs. A number of CubeSats use Amateur Radio frequencies to downlink telemetry, as is the case with this latest group. See Table 1 and listen for the downlinks!

Future Sats

AMSAT-UK has announced a new amateur satellite project known as the FUNcube. FUNcube is an educational single CubeSat project with the goal of educating young people about radio, space, physics and electronics.

It is anticipated FUNcube will be launched into a sun-synchronous low Earth orbit. The satellite should provide several passes each day, perhaps allowing the morning passes to be used for educational purposes and the evening passes for Amateur Radio communications with its VHF/UHF linear transponder. You'll find more information online at **www.FUNcube.org.uk/**.

WINMOR Update

On-air testing of WINMOR, a sound-card-based alternative to PACTOR for Winlink access on HF frequencies, began in late September. I've been using the beta version of *RMS Express* (the software package that includes WINMOR) and the results have been impressive. On the first day of testing I exchanged messages with KK8G and NØIA on 40 meters. It was surprisingly easy, which is the point of the *RMS Express* design. I composed messages in the *RMS Express* mail module, clicked SEND/RECEIVE and watched as my transceiver began blasting out connect requests.

If you've been hearing odd signals around 7.080 and 14.112 MHz, chances are it is WINMOR testing. There has been much anticipation of WINMOR since it would allow Winlink users to access the network on HF without the use of expensive PACTOR controllers. All you'd need is a computer with a sound device of some kind and, of course, an HF transceiver.

To learn more, see the WINMOR Yahoo group at **http://groups.yahoo.com/group/WINMOR/**.

Developing Electronic Circuits . . . in a "Flash"

A Northwestern University professor and his students have found a novel way of creating graphene, a conductive material that promises to revolutionize the electronics industry.

One method of making graphene involves subjecting graphite oxide powder to toxic chemicals and high temperatures. Their idea for an easier process came in a burst of inspiration: Could a camera flash instantly heat up the graphite oxide and turn it into graphene?

The process, invented by Jiaxing Huang, assistant professor of materials science and engineering at Northwestern's McCormick School of Engineering and Applied Science, and his graduate students, Laura Cote and postdoctoral fellow Rodolfo Cruz-Silva, was published in the August 12 issue of the *Journal of the American Chemical Society*.

Sometimes the simplest ways are best, and this is simple indeed! In Huang's flash process, researchers simply held a consumer camera flash over the graphite oxide and, a flash later, the material transformed into a piece of fluffy graphene.

"The light pulse offers very efficient heating through the photothermal process, which is rapid, energy efficient and chemical-free," Huang says.

When using a light pulse, photothermal heating not only reduces the graphite oxide, it also fuses the insulating polymer with the graphene sheets, resulting in a welded conducting composite.

Using patterns printed on a simple overhead transparency film as a photo-mask, flash reduction creates patterned graphene films — essentially flexible circuits.

The research group hopes to next create smaller circuits on a single graphite-oxide sheet at the single-atom layer level. (The current process has been performed only on thicker films.) QST

Table 1
Four New CubeSats

CubeSat	*Country*	*Beacon Frequency (MHz)*	*Data Downlink (MHz)*
BEESAT	Germany	436.000 — CW	436.000 — 4800/9600 bps GMSK
UWE-2	Germany	n/a	437.385 — 1200/9600 bps AFSK/FSK
ITUpSAT1	Turkey	437.385 — CW	437.325 — 19,200 bps GFSK
SwissCube	Switzerland	437.505 — CW	437.505 — 1200 bps FSK

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

K2TQN

VINTAGE RADIO

The MARS Program

Many of us were MARS (Military Affiliate Radio System) operators during the 1960s and '70s, either from home or while serving in the military. Some of us were both, myself included.

I'll write about my experiences, which I'm sure were like many others. This will give you a view of Air Force MARS activities. I'm sure the other services operated similarly.

I first became interested when I listened to a local 6 meter Air Force MARS net. So I asked someone I knew there if I could join. I heard surplus military equipment was available through the program and that was some of my motivation for joining. During my first couple of years there was very little to do.

Then after building a Heathkit SB-101 transceiver I decided to get on an HF MARS net. I bought a new mixing crystal and retuned the 80 meter coils for, if memory serves, 4595 kHz. After a number of training sessions I became certified to operate on the net. I loved the HF net and became very active there, relaying messages out on 6 meters and on RTTY. I was also in the Air National Guard. I became the training person for the other ground radio operators at our one weekend a month meetings.

Then the North Koreans took the USS *Pueblo* in 1968. Within days I was on active duty. And shortly after that, the Air Force moved our F-100 fighters to South Korea and left the non-plane support personnel at the Atlantic City airport. With nothing to do, I suggested we set up the MARS station, AG2AC, and start handling phone patches, which we did.

Langley AFB MARS station, a ham's dream antenna farm. From left: Log periodic, dipole mast, VHF antennas and a triband beam.

Langley AFB MARS Station

It wasn't long before the Air Force started moving us from Atlantic City to other locations where we were needed. I received orders for Langley AFB in Virginia and was assigned to the Tactical Air Command air-to-ground station. I looked forward to it.

Reporting in at Langley, the Non-Commissioned Officer in Charge (NCOIC) at the air-to-ground station asked me what experience I had. Of course I mentioned my MARS training and told him about my ham radio background. Thinking for a moment, he asked me if I would rather be assigned to the base MARS station as they needed an experienced operator. I jumped at the chance.

He took me to meet the NCOIC at the MARS station. This turned out to be a great opportunity for me and it was also good for the station. When I arrived they only had one Collins station working, running phone patches on the Gateway Europe circuit. They were also the backup station for AIR, the Pentagon headquarters Air Force MARS station. The other three Collins stations were inoperative as were the two RTTY transmitters. This put them into a bind. I volunteered to work on the other Collins stations for them and was told hands-off, that it wasn't my job and that the base had radio repair personnel. I was also told we were so far down the priority list that the repair people never came over to work on the radios.

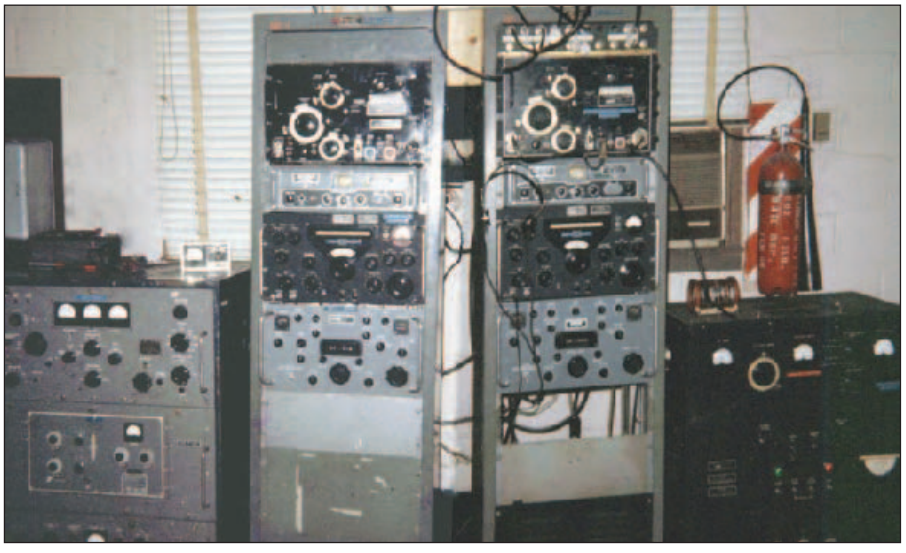
Langley AFB MARS station NCOIC Sgt Farmer.

One of the station consoles, built by the base carpenter shop with K2TQN at the controls.

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

K2TQN's RTTY station in his Hampton, Virginia home. From left: BC-610-I, FRR23 receiver, CV-89 RTTY converter and miscellaneous equipment.

Glenn Snyder, WB4LMX, with his Collins station.



Langley AFB MARS station RTTY equipment.

After a couple of weeks of this, one day the NCOIC and the other senior sergeant went to lunch together and I was told to cover for them if anyone called, that they would be a while. I saw this as an opportunity and took a look at the other Collins transceivers. In about an hour I had all three working. When they came back I was running phone patches from the other console so they would notice. Of course when asked, I denied working on them and said, "I just turned them on and they started working."

The next day I was visited by the NCOIC of the radio repair shop. He had a lot of stripes on his arm. He took me outside to talk and told me he knew I had worked on the radios. I thought I was in big trouble. He wanted to know my background so I filled him in. At the end of our conversation he handed me his business card and told me if any of the radios have problems and I can't resolve them to call him directly. He thanked me and said to be careful and don't get caught.

After that I was given the green light to set up the RTTY stations and put the transmitters online. We started taking hundreds of messages every day and what we couldn't relay I would take home and send them out on the civilian evening nets.

My reward was being assigned a BC-610-I transmitter right out of the box, with all the accessories and spare parts. I picked it up at Andrews AFB and took it to my rented home near Langley. I had to disassemble it to get it to the second floor where I had my shack. So now, according to my wife, I played radio all day at the MARS station and all night at home.

Glenn Snyder, WB4LMX

The base station also had civilian MARS members assigned there. I was told one day that "Mr Snyder" was coming to visit and eat his lunch; that he was a very important man and to treat him with the utmost respect. Mr Snyder arrived just before noon and everyone scurried around straightening up before he entered. We were introduced to each other. He asked me the usual questions such as where I was from, etc. When we got around to radio he told me he was a ham and I said me too. We exchanged call signs and I was immediately told to call him Glenn. This bothered both of the senior sergeants who still had to call him Mr Snyder.

Mr Snyder told me he worked for Rockwell at NASA on the other side of Langley AFB. I told him I had worked for Western Electric before I was called up. He asked me what I did there and we exchanged technical information about the telephone company. Somehow from that conversation I got the wrong impression that he was a high level tech doing work similar to what I did.

We became good friends and I considered him a mentor, as he could answer any technical or ham radio question I had during the next couple of years. We had many enjoyable lunches together. But it wasn't until I visited his large beautiful home one weekend, located on the James River, that I learned what he actually did at Rockwell. It was when he mentioned to me during that visit that he had recently taken King Hussein of Jordan on a tour of NASA at the Kennedy Space Center. I asked, "Just what do you do at Rockwell?"

His answer was that he was the manager of the Apollo Capsule Program. Later he managed the space shuttle program.

After I went back to civilian life and was working again for Western Electric, we kept in touch and I visited him several times over the next few years. Later he retired and several years after that I lost touch with his family.

Knowing Glenn Snyder, WB4LMX, meant a lot to me. You meet the greatest people through ham radio. — *K2TQN*

All photos by John Dilks, K2TQN

CONVENTION AND HAMFEST CALENDAR

Abbreviations
Spr = Sponsor
TI = Talk-in frequency
Adm = Admission

Alabama (Summit) — Jan 2
D F H R T V
8 AM-4 PM. *Spr:* Blount County ARC. Summit High School (Old Rock School), 79150 US Hwy 231 N (Blountsville). *TI:* 146.7 (203.5 Hz). *Adm:* Free. Bill Pond, AE4IE, 150 Smoke Rise Ln, Warrior, AL 35180; 205-647-5705 (phone and fax); **ae4ie@juno.com**; **freezefest.com**.

Arizona (Glendale) — Jan 9
F H R V
8 AM-noon. *Spr:* ThunderBird ARC. Thunderbird School of Global Management-The Activity Center, 15249 N 59th Ave (59th Ave and Greenway Rd). *TI:* 146.7 (162.2 Hz). *Adm:* $2. Tables: $5 (extra table $2.50). Jack Lunsford, KD7RCJ, 6646 N 30th Dr, Phoenix, AZ 85017; 602-242-2411; **j.lunsford@cox.net**; **www.w7tbc.org**.

Florida (Ocala) — Dec 12
D F R T V
8 AM. *Spr:* Silver Springs RC. Green Clover Hall, 319 SE 26th Terr. *TI:* 146.61 (123 Hz). *Adm:* advance $4, door $5. Tables: $10. Earl Sweeney, K4LSB, 5995 NE 63rd St, Silver Springs, FL 34488; 352-236-0180 (phone and fax); **k4lsb@aol.com**; **k4gso.com**.

Georgia (Lawrenceville) — Jan 9
S V
10 AM-2 PM. *Spr:* Gwinnett ARS. St Marguerite Church, 85 Gloster Rd NW. 12th Annual TechFest. *TI:* 147.075 (82.5 Hz). *Adm:* Free. Norman Schklar, WA4ZXV, 480 N Peachtree St, Norcross, GA 30071; 770-313-9410; fax 770-755-5411; **wa4zxv@arrl.net**; **www.gars.org**.

Illinois (Carthage) — Dec 12
D H R V
8 AM. *Spr:* Big Bend ARC. University of Illinois Extension Center, 600 N Madison. 6th Annual Hamfest. *TI:* 147.105 (103.5 Hz). *Adm:* $4. Tables: advance $10 (by Nov 30), door $15 (or after Nov 30). Kathy Dougherty, KB9WBD, 740 Miller St, Carthage, IL 62321; 309-333-8200; **kdough@adams.net**.

Louisiana (Minden) — Dec 19
D F H R S V
Set up Friday 3 PM, Saturday 6 AM; public 8 AM-3 PM. *Spr:* Minden ARA. Minden Civic Center, 501 Broadway. *TI:* 147.3. *Adm:* $5. Tables: $5/$10. Dusty Collins, N5COL, 231 Garrett Dr, Dubberly, LA 71024; 318-371-0636 or 318-422-3159 (cell); **dusty@bellsouth.net**; **www.n5rd.org**.

Mississippi (Poplarville) — Dec 12
D F R T V
8 AM-2 PM. *Spr:* Pearl River County ARC. Old National Guard Armory, intersection of Hwys 26 and 11. *TI:* 145.21 (136.5 Hz). *Adm:* $5. Tables: $10. Larry Wagoner, N5WLW, 40 Pinetucky Rd, Carriere, MS 39426; 601-590-0553; **n5wlw@arrl.net**; **www.prcarc.com**.

New York (Marathon) — Jan 9
D F H R V
7 AM-noon. *Spr:* Skyline ARC. Marathon Civic Center at Lovell Field, Peck Ave and Brink St. *TI:* 147.18. *Adm:* $3. Tables: $5. Patrick Dunn, KC2BQZ, 1302 Rams Gulch Rd, Jamesville, NY 13078; 315-488-3499; fax 315-696-6567; **kc2bqz@gmail.com**; **www.skylineradioclub.org**.

North Carolina (Winston-Salem) — Jan 9
D F R
7-11 AM. *Spr:* Forsyth ARC. Summit School, 2100 Reynolda Rd. "Winston-Salem FirstFest." *TI:* 146.64 (100 Hz), 145.47 (100 Hz). *Adm:* $5. Tables: Bring your own. Ray D'Eau, c/o Forsyth ARC, Box 11361, Winston-Salem, NC 27116-1361; 336-245-5740; **hamfest@w4nc.com**; **www.w4nc.com**.

Tennessee (White Pine) — Jan 2
D H R S V
8 AM-3 PM. *Spr:* Lakeway ARC. Smoky Mountains Expo Center, 1615 Pavilion Dr. 19th Annual Morristown Hamfest. *TI:* 147.03. *Adm:* $6. Tables: $15. June McClary, AI4SO, 2105 Tobes Creek Rd, Cosby, TN 37722; 865-322-0683; **june.ai4so@gmail.com**; **www.lakewayarc.org**.

Wisconsin (Waukesha) — Jan 9
D F H R S V
8 AM-2 PM. *Spr:* West Allis RAC. Waukesha County Expo Center Forum, 1000 Northview Rd (County Trunk FT). 38th Annual Midwinter Ham Radio, Computer, and Electronics Swapfest. *Adm:* advance $4, door $5. Tables: 8-ft, advance $19, door $22 (if available); electrical outlet $20 (advance only). Send #10 business size SASE for advance reservation by Dec 30 to WARAC Swapfest, Box 1072, Milwaukee, WI 53201. Phil Gural, W9NAW, 414-425-3649; **janphil68@att.net**; **www.warac.org**.

Coming ARRL Conventions

November 14
Alabama State, Montgomery*

November 14-15
Indiana State, Fort Wayne*

December 5-6
Florida State, Palmetto*

January 29-30
Delta Division, Jackson, MS

February 6
South Carolina State, Ladson
Virginia State, Richmond

*See November *QST* for details.

D = DEALERS / VENDORS
F = FLEA MARKET
H = HANDICAP ACCESS
Q = FIELD CHECKING OF QSL CARDS
R = REFRESHMENTS
S = SEMINARS / PRESENTATIONS
T = TAILGATING
V = VE SESSIONS

To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database (**www.arrl.org/hamfests.html**) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See **www.arrl.org/FandES/field/hamfests/regform.html** for an online registration form. Dates may be recorded up to two years in advance.

Events that are sanctioned by the ARRL receive special benefits, including an announcement in these listings and online, and gift certificates to the ARRL Bookstore.

For hamfests: Once the form has been submitted, your ARRL director will decide whether to approve the date and provide ARRL sanction. *For conventions*: Approval must come from your director and the ARRL executive committee.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **December 1** to be listed in the **February** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's Web site for possible late changes, for driving directions and for other event details. Please note that postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRLWeb* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**. QST

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

75, 50 AND 25 YEARS AGO

December 1934

- The cover photo shows the schooner *Morrisey* in the polar ice, with radio (W10XDA) on board
- The editorial addresses a member's complaint that all of current *QST*s are devoted to the ultra-high frequencies: (1) It isn't true, and (2) the ultra-highs, in fact, deserve our attention.
- Ross Hull presents "Notes on the Ultra-High-Frequency DX Work," reporting that contact has been made between New York and Hartford!
- Robert Moe announces "W10XDA back from the North," and provides details on the radio equipment aboard the schooner *Morrisey* during its Arctic exploration.
- Clinton B. DeSoto, W1CBD, describes "A Transportable 10-Watt Public Address Sysem," noting that the circuits can also be used in speech amplifiers.
- Joseph Pitzer, W8AXV, reports on "Amateur Radio at the 1934 National Air Races" commenting that it "has come through a hundred percent" at that highly visible public-service task.
- Rinaldo De Cola tell us how to get "Increased Sensitivity with the Regenerative Detector."
- In "Band Switxhing for the Transmitter," D. A. Griffin, W2AOE, tells us how to get away from plug-in coils.
- John Hogen, W3BRX, presents an idea for clubs and hamfests: "Staging a 56-Mc. Hidden Transmitter Hunt."

December 1959

- The cover photo shows a winter scene in New England, noting that "DX is rolling in nicely on all bands." Those are two good reasons for us to stay indoors....
- The editorial discusses a "Rogue's Gallery" of hams who flout the rules, making the bands less pleasant for the rest of us.
- R. G. Cracknell, ZE2JV, reports on "Transequatorial Propagation of V.H.F. Signals" between Southern Rhodesia and Europe.
- C. E. Scheidler, W2AZL, describes "A Two-Meter Converter with a Noise Figure under 2 Db" that can easily be duplicated by the average ham.
- Francis McDonough, W3PMV, presents a "Two-Element Three-Band Beam and Mast for the Lean Purse."
- In "Transistorized V.F.O. fo Mobile S.S.B./D.S.B.", Harry Dunlap, W6ZNM, describes his stable oscillator.
- B. B. Blackburn, W4DWU, uses four 811A's in his new final, "The Medium Power' Kilowatt."
- Lew McCoy, W1ICP, discusses "Choosing a Transmission Line," Part I of a two-part article.
- Pat Miller, W2AIS, tells the hilarious tale of Willy, W1IIN, a CW traffic man on Block Island (in Rhode Island). It seems that the FCC decided Block Island should be a separate country and gave Willy a new call sign — WB1IIN. You'll have to read "First, You Make a Country..." to learn the gory details of what happened to poor Willy after that.

December 1984

- The cover photo shows a moutain-topping pair of Field Day operators, with a small tent for shelter underneath an ARRL flag.
- The editorial explains the latest threat to 160 meters, which originates from "an ill-conceived move to expand the AM Broadcasting band."
- George Isely, WD9GIG, and William Smith, W9LRG, describe "A Helical Antenna for Space-Shuttle Communication."
- In "Try This Versatile CW Shaper," Eric Nichols, KL7AJ, tells us how to adjust the waveform of our transmitted signals, to make them sound better.
- Doug DeMaw, W1FB, tells us about "Practical RF Filtering," which can be used to improve reception and clean up the transmitter output.
- "Optimizing Coaxial-Cable Traps," by Robert Sommer, N4UU, describes how to build effective high-reactance antenna traps.
- "Happenings" reports that "FCC Proposes New Amateur Bands" at 10, 18, and 24 MHz.
- "The New Frontier," by columnist Bob Atkins, KA1GT, announces "World Record Set at 24 GHz," by IØSNY and a group of Italian hams — 331 km.

Al Brogdon, W1AB ♦ Contributing Editor

LIFE MEMBERS ELECTED OCTOBER 24, 2009

Paul G. Adams, W9EEU; Frank H. Alden, K4GXG; Angel L. Arce Torres, WP4IFO; Mike Aretsky, N6MQL; Sheryl K. Atterberg, KAØTTW; Sarahelizabeth Baguhn, WA9SE; Mark E. Bailey, KD4D; Randy E. Barger, N8KJ; Deborah L. Barrow, K3IWH; Harry L. Bartel, NØHQG; Steven R. Bergstrom, KC9KAH; Timothy C. Boan, AE4TB; Benton S. Bonney, W4PE; James J. Bookter, N5NVP; Michael J. Bragg, K1VI; Paul J. Brewer, KI6CQ; Charles H. Bridges, AK6DV; Angie Brooks, W4ARB; William B. Brooks, W4WBB; John R. Bucher, KB3HVQ; Christian Buenger, DL6KAC; Stephen R. Bunker, W6NC; John R. Burns, KY5OAO; Robert W. Bush-Kaufer, KF4RID; Robert K. Carpenter, NE8R; Jeff Cater, K3DEI; George W. Clark, KO4QR; Eric W. Clegg, KU3I; Amie Collins, N9OXO; John T. Crago, KB8DAN; Robert F. Crifasi, KC2RFC; Augustus T. Crocker, KK1R; Tim Cunningham, N8DEU; Harold R. Damron, N9SAM; Wayne A. Davis, WA2WD; James O. Delong, KB6MER; Harry E. Deneweth, N8QPG; Gregory S. Deuhs, KØPJ; Tom Dolezal, W5YDW; Douglas E. Dornier, KD5USF; Kenneth Douglass, AB2WC; Richard E. Dowty, W7EET; William Driscoll, KB1JSV; Jake M. Driver, KC5WXA; Joseph F. Dunphy, K9MBA; John S. Dvorack, KD8BIN; Fred L. Eicholtz, N3IF; Jeffrey R. Ekstrom, K9BQL; Matthew H. Filiput, KDØENE; Andrew M. Fletcher, W9AF; Tully B. Foote, N1XGN; Matthew S. Ford, AB9UF; Lee F. Foster, KC2LDP; James E. Fredrickson, AG4IR; Richard F. Ganter, WD8KYW; Danny W. Garris, KJ4FH; Frederick E. Gooding; Gary M. Goudelock, KF4YKX; Jamie K. Gravelle, KD7YRD; Michael T. Green, N1RNS; Gary A. Guckel, K6ZG; Carlyle Harper, W4CWH; Ann M. Heimann, KB9YVT; Robert H. Henrichs, KB2YZK; Ulrich Herbst, KC9QCX; Katherine L. Hevener, WB8TDA; Sallie M. Howard, AE5OM; John F. Howe, KE4UP; Christopher J. Hubbard, K1HU; Neil A. Hughes, KD5YGD; Stephen R. Hutchins, KN6G; Wesley C. Hyatt, W3EDW; Voje Johansen, LA9DAA; Richard Johnson, WA5EOD; George R. Joyner, KD4QMY; Phil Karn, KA9Q; Christian D. Kennedy, AF6AP; Thomas B. Kernes, KDØDOH; David L. Kleinatland, KE5BMS; Andrew V. Koch, KC9GXN; Walter J. Kreis, KD8HWG; Howard M. Lang, KB6NN; Robert A. Lapointe, N1OGB; David B. Latter, WB2FUE; William Leslie, KC2FYY; George P. Linehan, WA6YCA; Owen Lloyd, KD8JPU; Carl H. Lopez, AJ4DW; Dorothy F. Lowell, KB7WSO; Thomas L. Mainland, AB9BF; Martin J. Marbach, N4MJM; Lori J. Marx, KBØTFN; Dirk A. Matuska, W9OSI; John R. Maxwell, NØWBW; Ronald A. May, WD8INF; Brian K. Maynard, K1NW; Joseph A. Maynard, K6JMA; Ernest E. Mc Clellan, WL7SR; David I. McAnally, WD5M; Scott K. McCarron, N7LRA; John F. Mergen, WA1QLG; Gregory J. Michels, KC2GXV; Joseph P. Millard, K4KJM; Michael L. Mitchell, N3QLZ; George J. Molnar, KF2T; James W. Montag, WV4U; Robert W. Morrell, AH8M; Tip J. Moses, KE7GYO; Michael J. Newman, KB2WCH; Charles D. Neyman, KE5FTA; Michael W. Oliver, KT2T; Daniel A. Olsen, KD7GSW; Barbara L. Osterman, WB6PIH; Patrick Padgett, NG7I; Richard A. Painter, ABØVO; Edmund R. Pajewski, N3KYA; John B. Patrick, WK7K; Steven Q. Paulson, WAØOAT; Terry L. Pendergrass, W5NRA; Michael D. Perez, AA5KT; George H. Petrides, K8WHG; Clarence M. Phillips, KD5WYI; David E. Phillips, W6GBC; Gerald A. Pitner, W9GAP; Bryan H. Quackenbush, KC2PRZ; Michael L. Rains, KØRFI; Drew S. Ratliff, KB4BLI; Kim T. Rawlinson, WNØV; Helen L. Reed, KD7GPX; Joshua M. Regan, K2JMR; Bill O. Rester, KD5SZY; Kenny Richards, KU7M; Gail Richardson, KI4JVM; Lyndell Risenhoover, WØHQ; George Roberts, N9GMR; Dennis N. Rosas, ACØIV; Thomas S. Rum, W5RUM; Michael S. Russo, N9BUH; Joel M. Ruths, K3SUN; Gerald W. Saboe, NØGS; Sam Samaha, K6UA; Andreas Schmid-Zartner, OE1AZS; Jason J. Schwarz, N4JJS; Ryan P. Scott, N7QJ; Joseph E. Seibert, AL1F; Daniel G. Seright, KC6BIF; Bradley Sexton, K5BBS; Dale J. Shafer, N2QBX; Paul W. Sharry, WB2YZB; Barbara J. Shaw, KI6STY; James E. Shaw, AL7BA; Jeremy Shaw, KI6SUA; Warren Shayler, KE5ALK; Sean M. Sheehan, KD7CWE; James L. Shroyer, WB9AQA; Ralph R. Simmons, K5ECX; Keith A. Simonsen, WØCHV; Pamela A. Simonsen, NØVLW; Mark Simpson, AI5G; Timothy B. Slay, N4IB; Tina M. Smith, KI6OLZ; Walter J. Smola, N4WJS; Matthew Sousley, W7JRK; Terry M. Stader, KA8SCP; John O. Stewart, WØCID; T Richmond Stewart, NØMCL; Gary D. Strohm, WBØTOB; Scott A. Sybert, KB1FXY; Gary D. Tillinghast, KB2YAA; Joseph J. Tiritilli, N4ZUW; Stephen S. Toumi, W6ONV; Byron S. Tucci, K9MBS; Wasa Ueda, JI5QNS; William D. Unghire, N1CNV; Gerald G. Unruh, W6GU; Peter N. Varounis, NL7XM; Brian K. Walker, KC4FIE; Donald A. Watne, KJ7DW; Phil Webber, G8KLC; Brian E. Webster, N2KGC; Adam J. Westlund, W8AJW; Robert R. White, WB2BYL; Daniel K. Woodie, KC8ZUM; James E. Woodson, KE4INM; Avery J. Wright, KD4GBA; Zachary A. Yarashus, KJ4BXT

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

W1AUT **Thibault**, Normand R., Blackstone, MA
♦K1WLX **Parker**, Andrea T., Jeffersonville, VT
WA1EEU **Piescik**, Walter P., Wethersfield, CT
K1EXE **White**, James W. Jr, Hudson, NH
W1GHU **Holcomb**, Wade Gladstone, Temple City, CA
W1GPE **Underwood**, George T., Cranston, RI
W1IME **Cardullo**, Francis R., Cambridge, MA
W1JSH **Grant**, Morton L., Windham, ME
W1KUQ **Policastri**, Egidio "Eddie" J., Seekonk, MA
W1PXL **Rose**, Arthur R., St Petersburg, FL
NN1Q **MacIsaac**, John R., Falmouth, MA
K1SZK **Marshall**, Fred L., Albuquerque, NM
K1UM **Manuelian**, Kenneth, Spring Hill, FL
KD1X **Benedetti**, James A., Fairfield, CT
W1ZGW **Flint**, George W. Jr, West Roxbury, MA
WB2AAP **Mattera**, Vincent G., Brooklyn, NY
W2CRJ **Horowitz**, Jerome, Fair Lawn, NJ
N2EQJ **Murano**, Joseph A., Rochester, NY
WA2FAW **Thompson**, Kenneth D., Pompton Plains, NJ
WA2GMU **Blauvelt**, Joan R., Webster, NY
WA2HLA **Kilinski**, Martin "Marty" L., Brockport, NY
N2HWB **Porter**, Carle "Butch" D., Brighton, NY
♦W2MSM **Mullaney**, Michael S., Brewster, NY
WA2LAH **Paulus**, James R., Kendall Park, NJ
WA2LSO **Usevage**, Victor, Rochester, NY
♦W2MQB **Miller**, Donald A., The Springs, NY
KA2NBK **O'Neil**, Robert J., Rochester, NY
♦KD2S **Connors**, Den, Pepperell, MA
K2TFJ **Westdyke**, Charles R. Jr, Sussex, NJ
KW2X **DeBlieck**, Albert G. Sr, Ontario, NY
WA2ZYP **Lehr**, Stephen H., Bergenfield, NJ
WB3DKD **Kelso**, Joe E. Sr, Chambersburg, PA
WA3FLE **Stevens**, Roger W., Norristown, PA
K3LJP **Uber**, Fred P., Wampum, PA
WA3KAI **Manross**, Dale "Chuck" E., Erie, PA
KC3LP **Cockey**, Robert W. Jr, Baltimore, MD
K3PEO **Busch**, William J., Morgantown, PA
W3SI **Hayden**, Charles G., Hollywood, MD
N3ZFM **Hudson**, George W., Millsboro, DE
KG4DAE **Washam**, Kenneth M., Whitley City, KY
W4ELA **Acree**, Edwin L., Crestwood, KY
♦K4FF **McFadden**, Robert W. Sr, Tampa, FL
K4FQI **Allen**, Glenn L. Jr, Springfield, VA
WA4GDO **Atkins**, Elwood "Tommy" L., Chattanooga, TN
AF4UR **DeBaker**, John R., Katy, TX
AE4XV **Schmitt**, William F., Raleigh, NC
W4JAK **Kennemore**, James Allen, Greenwood, SC
KD4KUE **Rogers**, Randall, Greensburg, KY
KI4NJH **Rogers**, Thomas Edward, Savannah, TN
W4PFC **Bair**, Marion James, Albany, GA
K4SCF **Cole**, Newbern V., Martin, TN
KB4S **Baglioni**, Frank A., Phenix City, AL
KF4SP **Jones**, Lawrence S., Longwood, FL
KB4ST **Grubbs**, Oliver L., Orlando, FL
WB4TFF **Parnel**, Elmer R., Maxton, NC
W4UI **Harvey**, George L., Tarboro, NC
KB4WBY **Beach**, Fordyce A., Plantation, FL
KI4YZL **Handley**, James F., Decatur, AL
KC4ZIY **Blackie**, Robert A., Winter Garden, FL
W5CXP **Pipkin**, Sidney "Sid," Clovis, NM
W5FYW **Unger**, Julian H., Houston, TX
WM5H **Kiser**, William N., Russellville, AR
K5KRJ **Crumplar**, Milford "Weeks" Jr, Alexandria, LA
W5MIR **Lester**, Luther M., Tulsa, OK
WA5PUP **Crockett**, George "Tom" Jr, Waco, TX
KB5QDH **Jaskula**, Ronnie M., Kaufman, TX
KE5RFB **Nicholas**, Barry S., Port Arthur, TX
WA5VPA **Cremeen**, Bob D., Springtown, TX
KB5VVN **Thomas**, Estelle M., Amarillo, TX
AC5WG **Robbins**, Lanny S., Hot Springs, AR
K6AF **Gulliver**, Robert "Bud" W., Hawthorne, CA
N6AZN **Nigh**, James D., Lompoc, CA
K6BRP **Ryan**, Luther Eldon, Torrance, CA
♦W6CCL **LaFrentz**, Cheryl "Cheri" C., Hesperia, CA
KD6DRY **Lamont**, Amand "Monte" L., Clovis, CA
W6FU **Johnson**, A. Kenneth, Arcadia, CA
W6GBG **Bacon**, Allan R. Jr, Huntsville, AL
♦WB6QFQ **Larsen**, Guy, Hayward, CA
N6QQF **Rath**, Norman H., Oceanside, CA
exW6RDG **Banker**, Walter E., Fresno, CA
WA6SEK **De Lasaux**, Thomas G., Lodi, CA
KC6TJR **Stephens**, John Frank, Los Angeles, CA
W6RAM **Mays**, Randall "Randy" A., Idaho Falls, ID
KV6W **Henson**, Kenneth S., Hanford, CA
W6ZNO **Charlap-Hyman**, Arthur, Tarzana, CA
♦W7ADM **Bergum**, Gordon B., Lynnwood, WA
N7DAS **Morse**, Jim M., Deer Park, WA
♦W7GSP **Robinson**, Vernon Ray, Renton, WA
W7AYH **Thrapp**, Charles R. "Bob," Casper, WY
♦WA7LZH **Arnold**, James, Leavenworth, WA
N7UAG **Knutson**, Charles "Chuck" K., LaVergne, TN
exW7UX **Miller**, Robert E., Everett, WA
KC8BFQ **Pardo**, Winston O., Fremont, OH
K8CHS **Twite**, Thomas D., Coldwater, MI
W8EV **Hoisington**, Keith A., Arcanum, OH
♦W8FAZ **Zelle**, Joseph, Euclid, OH
K8GEV **Virden**, Gary E., Cuyahoga Falls, OH
NJ8G **Koon**, Thomas E., Greenville, OH
WW8HB **Brock**, Henry "Hank" V., Shelby, OH
AB8IL **Hager**, Thomas F., Salome, AZ
WD8KPQ **Reffeor**, Bruce D., Coopersville, MI
K8KYU **Larson**, Hugh W., Sparta, MI
K8LQM **Amico**, Vincent, Steubenville, OH
K8MID **Burdick**, Harry R., Cincinnati, OH
W8PBX **Haller**, Albert R., Maineville, OH
K8UKV **Katzmann**, Roy J., Ashtabula, OH
N8UYF **Pierce**, Virgil R., Helena, OH
♦KB8ZM **Pace**, William T., South Charleston, WV
WA9BFV **Tenikat**, John P. Sr, Des Moines, IA
W9CNE **Graham**, Robert M., Kokomo, IN
NB9D **Roth**, John L., Huntsville, AL
AA9BJ **Hetzel**, Thomas R., Sheboygan, WI
♦WA9HCZ **Grokowsky**, Jerome "Jerry" C., Onalaska, WI
WB9JAM **Strand**, Warren L., Hinckley, IL
W9KMH **Baker**, David P., Carpentersville, IL
♦W9NMO **McLeod**, Fenwick R. Jr, Prospect Heights, IL
W9OCK **King**, Howard E., Mishawaka, IN
W9UE **Roff**, John G., Sturgeon Bay, WI
W9WBL **Hails**, Stanley W. Jr, Indianapolis, IN
KØAMR **Howard**, Poley R., Independence, MO
WØEAN **Joy**, Robert D., Marion, IA
AAØGN **Grimshaw**, Richard Lee, Alcester, SD
NØTTY **Veith**, Clarence C., Saint Peter, MN
WØJDH **Ficek**, Vitres "Vic" P., Valley City, ND
WØJM **Marshall**, John G., Kansas City, KS
WØLUP **Olson**, Stanley J., Fergus Falls, MN
KEØDK **Stewart**, Chester A., Manhattan, KS
WBØTGG **Hartig**, Albert Lee, Kansas City, MO
exNØTZ **Browning**, Harold L. "Larry," Indianapolis, IN
AFØU **Tetzlaff**, Archibald O., Kansas City, MO
WØURC **Herron**, John A., Chadron, NE
WAØYGP **Beach**, Herbert L., Cambridge, MN
WBØYQR **Van Haaften**, David A., Pella, IA
VE3IIB **Brechun**, Donald, Windsor, ON, Canada
VE3UUM **Davidson**, Paul A., Marmora, ON, Canada

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Gail Iannone ♦ Silent Keys Administrator ♦ sk@arrl.org

Field Organization Reports

SEPTEMBER 2009

Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/FandES/field/pshr/.**

815
W7TVA
620
WB7WOW
504
W4CAC
482
KØIBS
335
N2LTC
308
W2MTA
306
KA2ZNZ
262
KI4KWR
255
WB2KNS
232
KB2BAA
230
K2HJ
214
K4DND
209
NC4VA
207
KB2ETO
205
AK2Z
202
AC6C
201
KØLQB
194
KK1X
190
KB2RTZ
185
KE5HYW
183
K2ABX
182
W7ELI
KI4GEM
180
KK7DEB
K7BFL
177
K7OAH

175
W5DY
WB9FHP
172
K7BC
170
W9AL
160
WD9FLJ
KGØGG
158
KC7ZZ
155
N2GJ
K2BRG
151
W2DWR
150
N1UMJ
147
W2LIE
146
N2RDB
140
W5PY
KK3F
135
K7EAJ
W3YVQ
W4DNA
KBØDTI
130
NN7H
K6JT
N5NVP
WØLAW
WB2FTX
N3RB
K9LGU
KA5EXI
KC4PZA
K4IWW
W4FAL
128
N4HUB
125
W7EKB
WA4UJC
WF2T
120
W8UL
KA4FZI
W1GMF
N1LKJ
AG9G
K2UL
W2KFV

KI4ZJI
119
KK5NU
118
W9WXN
116
K2GW
114
KF7GC
W7JSW
110
W7QM
N7BEC
KC5OZT
K5KV
N8IO
N8OD
N1IQI
K1YCQ
K4GK
N7XG
N7YSS
K1HEJ
W6DOB
KB2EV
WB4GHU
W2EAG
W7GB
108
N7EIE
N4ABM
105
KE7DVV
AD4BL
KE4CB
KD1LE
NA9L
KC2CHA
104
W8ILF
103
KB1NMO
KA2EJD
KJ7NO
102
K9EOH
K2YYD
W8CPG
100
W7GHT
K4SCL
K2AN
K3RC
N9AUG
N5OUJ
W5GKH
N1JX
N2GS
NX9K
WØCLS
NØMEA
KØRXC

W3TWV
K4BG
NX1Q
WA2NDA
AA3SB
WB4FDT
KI4PRX
N9MN
NR2F
W1SGC
KE4PAP
K2TV
KB2KLH
KI4YV
W4TTO
99
K5MC
K4BEH
N2VGA
98
W3CB
96
W2DSX
95
WG8Z
94
KE5YTA
W2CC
K2UPS
93
KC5MMH
90
WB8SIQ
N8DD
WD8Q
N9VC
N3KB
WB4BIK
N3KB
KA1GWE
WB6UZX
K3IN
KB3LNM
N3ZOC
K1JPG
NU8K
W3GJQ
W8IM
K4MSG
N7IE
89
KB9KEG
WB8OIF
88
WA2CUW
87
K2RRM
86
AE5NS
KK7TN
NY3H

W2NYJ
85
WA2WKV
KØBXF
84
KI6RUW
82
N8NMA
KB8NDS
81
WB2HPI
NA7G
80
K7MQF
N2DW
KE5PWL
WØCGB
WØADZ
KCØZDA
WA9WNE
KB3MXM
KA1EHR
KJ4JAT
KA3NZR
79
KS3Z
W7VSE
78
W5ESE
N2VQA
NS7K
77
WDØGUF
WB2WAK
74
WC5M
72
W5XX
71
KB3LFG
WB2ZEX
70
KØDEU
NØDUW
NØDUX
NUØF
KAØFUI
KIØI
KBØJKO
NØMHJ
N3NTV
KØPTK
KØOR
WAØVKC
KD7ZUP
N3SW
K2JAN
N2RLD

The following stations qualified for PSHR in previous months, but were not recognized in this column: (Aug) KK5GY 110, W4KLB 100, KAØDBK 98, N4MEH 90.

Section Traffic Manager Reports

The following Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, EB, EPA, EWA, GA, ID, IL, IN, KS, LA, MN, MS, NC, NFL, NLI, NNJ, NTX, OH, OR, ORG, SD, SFL, SNJ, STX, TN, UT, VA, WI, WNY, WPA, WV, WY.

Section Emergency Coordinator Reports

The following ARRL Section Emergency Coordinators reported: AZ, IN, EWA, GA, KS, MDC, ME, MO, NC, NLI, NTX, OH, SD, SFL, SV, WTX, WNY, WV.

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

KK3F 1805, W1GMF 1328, KA9EKG 1303, N1IQI 1194, K7BDU 1072, W8UL 967, N1UMJ 661, K4IWW 524, NR2F 523.

The following station qualified for BPL by achieving100 or more points by originations plus deliveries: KI4YV 181, K8PJ 105.

The following stations qualified for BPL in previous months, but were not recognized in this column: (Aug) WB5NKD 1011, WB5NKC 607. QST

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**.

160 and 80 Meter Matching Network for your 43 Foot Vertical — *Part 1*

Antenna analyzer — Test instrument designed to measure the impedance and standing wave ratio (SWR) of an antenna or an antenna and feed line combination as a function of frequency. See **www2.arrl.org/members-only/prodrev/pdf/pr0505.pdf**.

Electrically short antenna — Dipole with a length less than an electrical *half* wavelength or vertical monopole with a length less than an electrical *quarter* wavelength.

Ground losses — Portion of transmitter power intended to be delivered to an antenna system that instead is lost due to various resistances in the antenna ground system. This is often particularly significant in short monopoles because the ground connection handles the full antenna current.

NEMA — National Electrical Manufacturers Association, a US industry trade group of corporations involved in the manufacture of electrical equipment. They also establish standards for common electrical parts used in the US.

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

Resonant — The frequency at which a circuit of a resistor, capacitor and inductor has an impedance that is only resistive. The inductive and capacitive reactances are equal and opposite.

Toroidal inductor — Inductor formed by winding wire on a circular donut shaped structure made from metal oxides in a ceramic material. It is used as the basis for inductors that have the property that they are self shielding in that the magnetic fields stay within the core.

The Collins 30L-1 Linear Amplifier — Nearing 50, Still Going Strong

Automatic level control (ALC) — Transmitter system that adjusts the gain of a stage or stages in order to maintain the output at or below a safe level.

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

[1]*The ARRL Handbook for Radio Communications,* 2010 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1462 (Hardcover 1448). Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

DXpeditions — Trip by one or more amateurs with radio equipment intended to put a rare DX entity on the air.

Electrolytic capacitors — Polarized capacitor in which the dielectric is formed from a liquid or semi-liquid material. Generally found in capacitance values above 1 µF and used in power supply and other dc filtering applications.

Grid bias — Voltage that is applied to the control grid, the vacuum-tube element that controls the electron flow from cathode to plate. This is used to set the operating point of the stage.

IOTA — Islands on the Air, a program of the Radio Society of Great Britain, the UK national Amateur Radio society. The purpose is to promote operation from islands. Awards are made based on the number of islands contacted. See **www.rsgbiota.org** for more information.

Linear amplifier — An amplifier that provides an output that is a larger copy of the input signal. This may be used to amplify any type of signal. In contrast, a "class C" amplifier is a *non-linear* amplifier that can only properly amplify CW or FM signals. See **www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=4304**.

MOV (metal oxide varistor) — Surge suppression device that provides a high resistance until a specific threshold voltage is reached upon which the device resistance becomes very low, thus protecting connected circuitry. MOVs are available with different threshold voltages for different applications.

Plate input power — Until the 1980s, FCC amateur regulations specified the maximum allowed transmitter power in terms of *plate input power* — the product of the output amplifier tubes' plate voltage times the key-down plate current. While this was an easy measurement to make with dc instruments and provided a good characterization of AM, CW and FM transmitters, it did not adequately define the characteristics of SSB. Thus the rules were changed to define transmitter power in terms of PEP *output* power.

Safety interlock — A system by which high voltage is automatically removed or shorted when the cover of a potentially dangerous piece of equipment is opened or removed.

Solder pad — Area of printed circuit board consisting of exposed copper designed to allow wires or parts to be placed and soldered.

The Doctor is IN

APRS — Automatic position reporting system. System that accepts global positioning system (GPS) position data from a GPS satellite receiver and processer, formats it into an AX-25 packet for transmission via Amateur Radio, usually on 144.39 MHz. Position data is available via radio or over the Internet. See **www.arrl.org/tis/info/HTML/aprs/pos-reporting.html** for more information.

Attenuator — Device used to reduce the level of a signal. Attenuators are available as both fixed and variable devices with calibration usually in decibels (dB). See **www.arrl.org/tis/info/pdf/9506033.pdf** for an example of a homemade step attenuator.

Harmonics — Signals at exact integral multiples of the operating (or *fundamental*) frequency.

Repeater — Radio station designed to relay transmissions, often from a high remote location. It receives signals on one frequency and simultaneously transmits on another. See **www.arrl.org/tis/info/repeater.html**.

S-meter — Signal strength meter for a receiver. The basic calibration is in "S-units" from S-1 (faint, barely perceptible signal) to S-9 (extremely strong signal), the "S" of the RST (readability, signal strength, tone) reporting system. The nominal, but rarely followed, standard calibration is 50 µV at the antenna terminals for an S-9 and a reduction of 1 S-unit for every 6 dB (¼ power) reduction in input signal. Many receiver S-meters have S-9 at mid range and show DECIBELS ABOVE S-9 in the upper half.

Sawtooth waveform — Complex waveform in which a sharp rise is followed by a linear decline, or a linear rise is followed by a sharp decline.

SSB — Radiotelephone transmission using a suppressed carrier and a single sideband. This method of transmission requires more stable and somewhat more complex equipment than earlier AM. It is more power efficient, uses less than half the bandwidth and avoids the carrier to carrier heterodynes of AM.

Terminal node controller (TNC) — Dedicated hardware device under firmware control that translates packet digital communication to and from a computer type terminal.

VOX — Voice operated transmit. Transceiver subsystem that switches the unit from receive to transmit mode automatically in the presence of a signal at the microphone. See J. Hallas, W1ZR, "Getting to Know Your Radio: Over to You — Transmit/Receive Switching" *QST*, Feb 2006, pp 65-66 for more information.

A Universal Frequency Calibrator

12AX7 — Specific type of miniature vacuum tube from the 1950s. This tube is a dual triode; that is, two independent tube functions in a single envelope.

Dead bug — Term for an electronic circuit construction technique in which components are placed on a circuit board with their leads up and then wired with point-to-point wiring. The name comes from the appearance of multilead integrated circuits, which look like expired insects with their legs up.

FT-243 crystal — WWII-era vintage holder type for piezoelectric quartz radio frequency crystals. Unlike current holders in which crystals are permanently fixed to the holder, these were fixed between two removable plates, making it feasible to grind the crystal to a new frequency and return it to the holder.

Harmonics — Signals at exact integral multiples of the operating (or *fundamental*) frequency.

Microprocessor — Miniature computer system, usually on a single large integrated circuit.

TTL — Transistor-transistor logic. Family of solid state logic circuit elements in which the active gates are comprised of both single and multiple-emitter transistors.

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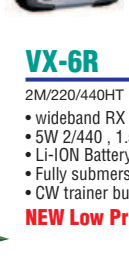

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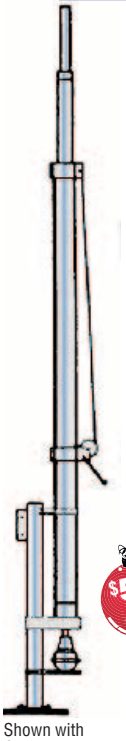

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- Self supporting—will withstand steady-state winds in excess of 50 mph without guying (guying required under extreme wind speed conditions)
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- Massive fiberglass channel insulator

DXE-VRW-1

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DXE-7580-THK	CW Optimizer Capacity Hat	**$59.95**

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- Extremely high strength, heavy wall tubing made to DX Engineering specs

New!

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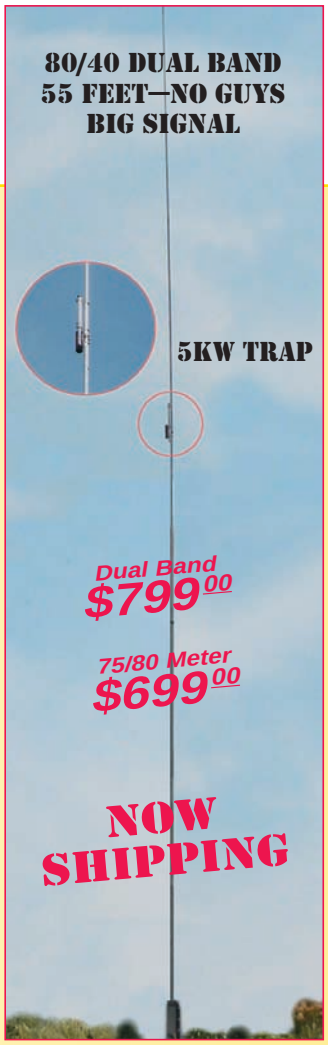
Add-On Tuner

DXE-MBV-ATU-1



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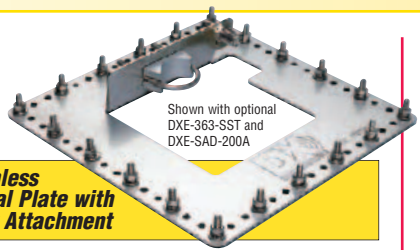

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DXE-AT1243	0.750", slit at 1 end	$3.90	$1.30
DXE-AT1244	0.875", slit at 1 end	$4.20	$1.40
DXE-AT1245	1.000", slit at 1 end	$4.50	$1.50
DXE-AT1246	1.125", slit at 1 end	$4.95	$1.65
DXE-AT1247	1.250", slit at 1 end	$5.55	$1.85
DXE-AT1248	1.375", slit at 1 end	$6.15	$2.05
DXE-AT1249	1.500", slit at 1 end	$6.75	$2.25
DXE-AT1250	1.625", slit at 1 end	$7.65	$2.55
DXE-AT1251	1.750", slit at 1 end	$8.40	$2.80
DXE-AT1252	1.875", slit at 1 end	$9.15	$3.05
DXE-AT1253	2.000", slit at 1 end	$9.90	$3.30
DXE-AT1254	2.125", slit at 1 end	$11.40	$3.80
Aluminum Tubing, 6 Foot Lengths, 0.058" Wall			**Cost/Foot**
DXE-AT1189	0.375", no slit	$5.40	$0.90
DXE-AT1205	0.500", slit at 1 end	$6.60	$1.10
DXE-AT1206	0.625", slit at 1 end	$7.20	$1.20
DXE-AT1207	0.750", slit at 1 end	$7.80	$1.30
DXE-AT1208	0.875", slit at 1 end	$8.40	$1.40
DXE-AT1209	1.000", slit at 1 end	$9.00	$1.50
DXE-AT1210	1.125", slit at 1 end	$9.90	$1.65
DXE-AT1211	1.250", slit at 1 end	$11.10	$1.85
DXE-AT1212	1.375", slit at 1 end	$12.30	$2.05
DXE-AT1213	1.500", slit at 1 end	$13.50	$2.25
DXE-AT1214	1.625" slit at 1 end	$15.30	$2.55
DXE-AT1215	1.750", slit at 1 end	$16.80	$2.80
DXE-AT1216	1.875", slit at 1 end	$18.30	$3.05
DXE-AT1217	2.000", slit at 1 end	$19.80	$3.30
DXE-AT1218	2.125", slit at 1 end	$22.80	$3.80
6061-T8 Aluminum Tubing, 0.120" Heavy Wall Telescoping			
DXE-AT1311	1.500" O.D. x 6 ft. no slit		$23.85
DXE-AT1312	1.750" O.D. x 6 ft. no slit		$28.20
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DXE-AT1314	2.250" O.D. x 6 ft. no slit		$37.45
DXE-AT1315	2.500" O.D. x 6 ft. no slit		$42.50
DXE-AT1316	2.750" O.D. x 6 ft. no slit		$46.95
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DXE-AT1325	3.000" O.D. x 12 ft. no slit		$103.95
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Standard Base

- Tilt Base optional
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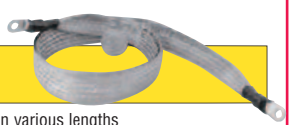

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HEI-BM-10-IC	Boom Mic/Headset/Adapter, ICOM Electret	**$99.00**
HEI-PROSET-4	Boom Mic/Headset, HC4;	**$125.00**
HEI-PROSET-5	Boom Mic/Headset, HC5;	**$125.00**
HEI-PROSETIC	Boom Mic/Headset/Adapter, ICOM Electret	**$139.00**
HEI-PROSETPLUS	Boom Mic/Headset, HC4 and HC5	**$189.00**
HEI-PROSETPLUSIC	Boom Mic/Headset, HC4 for ICOM	**$199.00**
HEI-HTSS	Singleside TRAVELER Headset	**$75.00**
HEI-HTDS	Dual Side TRAVELER Headset	**$89.00**
HEI-HQPP	Quietphone Noise Canceling Headset	**$170.00**

Accessories

HEI-SB-2	Small Adjustable Mic Boom	**$42.00**
HEI-PL2T	Topless PROLINE Boom	**$105.00**
HEI-SM-1	Shock Mount, GM/PR20	**$59.00**
HEI-SM-2B	Shock Mount, PR40	**$95.00**
HEI-TM-1	Tri-Mount Mic Adapter	**$14.00**
HEI-FS-2	Dual Switch Foot Switch	**$38.00**
HEI-HS-2	Ergonomic Pistol Grip Hand Switch	**$29.00**
HEI-BAG1	Leatherette Bag for PROSET	**$25.00**
HEI-BAG2	Leatherette Bag for QPP/BM/TRAV	**$20.00**

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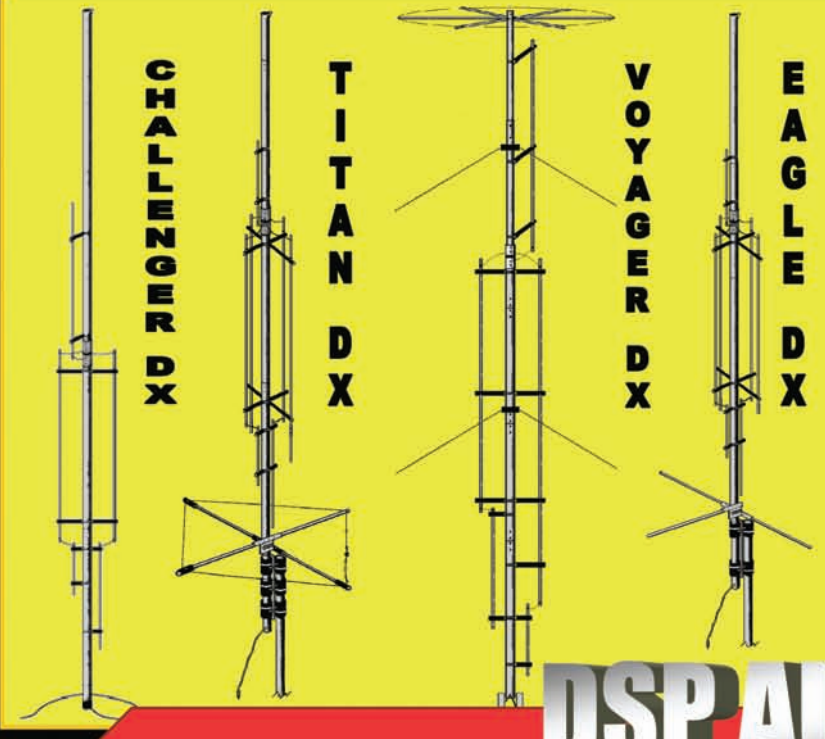
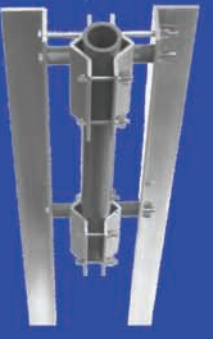


ACCESSORIES

QUICK TILT LADDER MOUNT



QUICK TILT GROUND MOUNT

GUY KITS

DSP AUDIO

HEAR IT IN LINE MODULE

HEAR IT ANEM

HEAR IT SPEAKER

A GAP ANTENNA HAS NO TRAPS, COILS, OR ELECTROMECHANICAL DEVICES, WHICH CAN INCREASE LOSS AND DECREASE RELIABILITY. SIMPLICITY IN DESIGN AND OVER 20 YEARS OF EXPERIENCE IN THE AMATEUR COMMUNITY RESULTS IN USER FRIENDLY ASSEMBLY, INSTALLATION AND OPERATION. SIMPLY LINE UP THE BIG PREDRILLED HOLES IN 6063 ALUMINUM OVER THE LITTLE HOLES AND INSERT A SCREW. A GAP IS PRETUNED AND DESIGNED TO HANDLE 1.5 KW PEP WITH A VSWR UNDER 2:1 ACROSS THE ENTIRE BAND*.

See GAP in the Price Guide

BANDS OF OPERATION	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m
GAP CHALLENGER DX	X	X	X	X	X		X		X	X	
31.5' TALL WEIGHS 21LBS SUPPLIED W/DROP IN GROUND MOUNT REQUIRES 3 WIRE COUNTERPOISE @ 25'											
GAP TITAN DX			X	X	X	X	X	X	X	X	
25' TALL WEIGHS 25LBS MOUNTS ON 11/4" MAST NO RADIALS REQUIRED											
GAP VOYAGER DX							X		X	X	X
45' TALL WEIGHS 39 LBS SUPPLIED W/ HINGED BASE REQUIRES 3 WIRE COUNTERPOISE @ 57'											
GAP EAGLE DX			X	X	X	X	X		X		
21' TALL WEIGHS 19LBS MOUNTS ON 11/4" MAST NO RADIALS REQUIRED											

MONO GAP

Simple, easy to assemble, mono band antenna. Ideal for very limited space. Perfect for those who operate on a particular band and great for school demos and field days.

CONTINUOUS COVERAGE UNDER 2:1 ACROSS THE SPECIFIED BAND.

EACH SUPPLIED WITH:
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PVC GROUND MOUNT
1/2 WAVE FEEDLINE

20m MONO GAP
16' Tall
7 lbs

40m MONO GAP
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12.5 lbs

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THE PERFECT GO - BETWEEN YOUR EARS & YOUR RADIO. DESIGNED TO ELIMINATE NOISE & INCREASE YOUR LISTENING PLEASURE. PLUGS INTO THE EXTERNAL SPEAKER OUTPUT ON YOUR RADIO. ALL UNITS REQUIRE A 12-24 VDC POWER SUPPLY.

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FT-897D TCXO DSP 60 m Band

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

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

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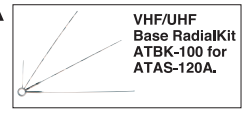
Automatic Matching for FT-897/857 Series Transceivers

FC-40
Automatic-Matching 200-Memory Antenna Tuner (160 m ~ 6 m Band)

WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

ATAS-120A
Active Tuning Antenna System (no separate tuner required)



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FT-817ND
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5 W All Mode Transceiver (AM 1.5 W)

60 m Band

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

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

HF/50 MHz 100 W Transceiver
FT-950

"The Best of the Best Just Got Better"
Introducing the new FT-950 Series with PEP-950 (Performance Enhancement Program)

COMPACT HF/50 MHz TRANSCEIVER WITH IF DSP
HF/50 MHz 100 W All Mode Transceiver
FT-450 Automatic Antenna Tuner ATU-450 optional
FT-450AT With Built-in ATU-450 Automatic Antenna Tuner
Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

HF/VHF/UHF Portable Operation
Just Got a Lot More Powerful!
FT-897D TCXO DSP 60 m Band
HF/50/144/430 MHz 100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver,
now Including Built-in DSP
FT-857D DSP 60 m Band
HF/50/144/430 MHz 100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

Automatic Matching for FT-897/857/450 Series Transceivers

FC-40
Automatic-Matching
200-Memory Antenna Tuner
(160 m ~ 6 m Band) WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857/450 Series Transceivers

ATAS-120A
Active Tuning
Antenna System
(no separate tuner
required)

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Base RadialKit
ATBK-100 for
ATAS-120A.

ATAS MICRO
ATAS-25
Manually-Tuned
Portable Antenna

Real Performance, Really Portable
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HF/50/144/430 MHz
5 W All Mode Transceiver (AM 1.5 W)

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- Icom & Bonito Software Included
- Very Compact Design

IC-R2500

2 WIDE BAND RX IN 1

- 0.01 - 3299.99 MHz*
- AM, FM, WFM, SSB, CW (Main)
- AM, FM and WFM (Sub)
- 1000 Memory Channels
- Optional D-STAR (UT-118)
- Optional P25 (UT-122)
- Optional DSP (UT-106)

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IC-R75 WIDE BAND RECEIVER

- 0.03 - 60.0 MHz*
- Triple Conversion
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*Frequency coverage may vary. Refer to owner's manual for exact specifications.

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In this fast paced economy, you want the best deals you can get and Yaesu's commitment is to our loyal customers. Contact the Hampros for the latest Yaesu coupons and remember to ask about the new Yaesu Performance Enhancement Program for your FT-9000, FT-2000 or FT-950. Coupons expire January 31, 2010.

FTDX Series

FTDX-9000MP
400 watts, dual analog meter sets, LCD display, memory card installed, main and sub receiver VRF, full dual rx, external power supply with twin speaker enclosure.

FTDX-9000D
200 watts, large TFT, built-in memory board, main & sub receiver VRF, full dual rx, internal power supply.

FTDX-9000C
200 watts, dual meters & LCD, VRF installed in main receiver, extra key & headphone jacks, internal power supply.

$80 Coupon

FT-2000
Provides a full 100 Watts of power output (AM: 25 W) on the 160-6 Meter Amateur bands.

$80 Coupon

FT-2000D
An all mode HF/6m transceiver offering 200 Watts of output power.

$80 Coupon

FT-950
Provides up to 100 Watts of power output on SSB, CW, and FM (25 Watts AM carrier).

$80 Coupon

FT-450 & 450AT
160-10 Meters
50 MHz.
100 watts HF-6M

VL-1000
High performance linear amplifier covers 160 to 15 and the 6 meter amateur bands

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NEW!

FT-2900R
200 Alpha-numeric Memories
75 Watts Output

INCLUDED WITH YOUR PURCHASE YSK-7800
NEW!

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Five One Touch Hyper Memories 1000 Memories
50 Watts Output

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FT-8900R
10M/6M/2M/440MHz Quad Band, Dual Receive
50/50/50/35 watts

INCLUDED WITH YOUR PURCHASE YSK-8900
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FT-8800R
2M/440MHz Dual Band, Dual RX,
50/35 watts

$10 Coupon
NEW!

FT-250R
5 Watts RF Output,
Backlit Keypad
700mW Audio Output
Smart Search

$10 Coupon
NEW!

FT-270R
5 watts
RF Output
200 Memories
DTMF Keypad
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Enhanced Paging

VR-5000
2000 Memories 100 kHz to 2600 MHz (2.6 GHz) less cellular

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FT-817ND
HF/6/2/440
all mode
5W QRP all bands

$30 Coupon

FT-2800M
144-148 MHz
65 watts
mobile

NEW!
$10 Coupon

FT-1900R
200 Memories
8 Memory Banks
55 Watts Output
APO

Package Includes: Ni-Cad Battery and Wall Charger

VR-120D
Wide Frequency Coverage
100 kHz to 1299.995 MHz

FT-60R
Dual band 2 meter, 440 MHz
5 watts output on both bands

$15 Coupon

VX-3R
2M/440MHz Micro-mini 1.5W 2M 1.0W 440MHz extensive RX coverage

VX-177
440 MHz, 5W, Rugged/ Submersible, DTMF Keypad, Backlit LCD

$10 Coupon

VX-6R
Triple band 2M, 222, 440, 5W (1.5W on 222) Wideband RX

$20 Coupon
Super Value!

VX-7R – Silver
VX-7RB – Black
Triple band (6M, 2M & 440 MHz) HT with extensive receive coverage

Package Includes: Ni-Cad Battery and Wall Charger

VR-500
100 kHz to 1300 MHz less cellular, in AM, FM-N, FM-W, LSB, USB and CW

VX-8R
Full 5 watts FM on 50/144/430 MHz plus 1.5 watts on 222 MHz. Supports Blue Tooth hands-free

$50 Coupon

FT-897D
HF/6/2/440 all mode Portable 100W HF/6, 50W 2M, 20W, 440MHz

INCLUDED WITH YOUR PURCHASE YSK-857
$20 Coupon

FT-857D
HF/6/2/440 all mode Mobile 100W HF/6, 50W 2M, 20W 440MHz

$60 Coupon

µ-Tuning Kit w/MTU
Base Kit Required

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DMU-2000
Informative and useful displays for the FT-2000 series. require a computer display and keyboard

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FTM-10R/10SR
(144/430 MHz 50/40W) and the lower power FTM-10SR

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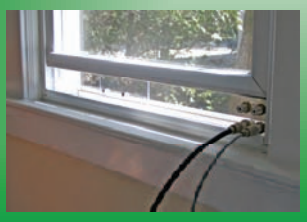
Time to upgrade your station? Our quality feedline and accessories put your power where it belongs. High grade baluns, 300Ω and 450Ω ladder line, coax, feed through panels, premium grade connectors and adapters, and more.

Hot tip: Replacing old lossy coax will boost performance on both transmit and receive.



DC Power Solutions!

Power Cables and Connectors for ICOM, Yaesu, Kenwood, Alinco, and others. Most HF, FM Mobile, and Handheld rigs. Red/Black Zip Cord in many sizes. Hard to find plugs and cables for older radios like the Kenwood TS-520/TS-820 and Yaesu FT-747/FT-757.

Connectors and cables for many air, marine, commercial and public service radios, too!

6-Pin to 4-Pin Power Adapter

Many new HF radios, including the IC-7000, FT-450, and TS-480, are using a new 4-pin plug for DC Power. If your shack is already wired up with the "standard" 6-pin plug, this is the adapter you need. Other configurations are also available.

Extension Cables for ICOM Tuners

Antenna Solutions!

To build the right wire antenna, you need the right antenna wire. We have a wide variety of styles and lengths. Plus insulators, UV-proof rope, marine-grade pulleys, and handy gadgets.

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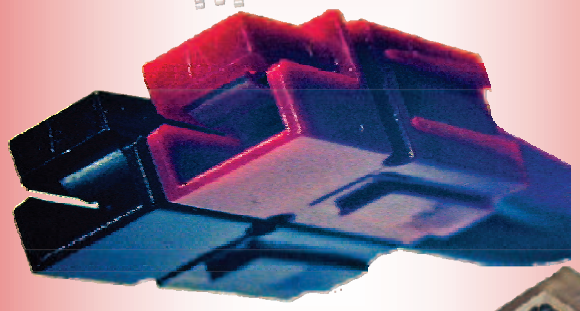
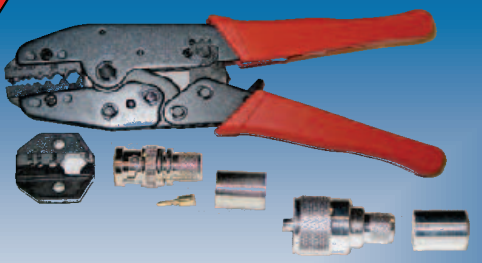


New! Exclusively from Quicksilver Radio, these handy Powerpole splitters are great in the shack, in the field, or in your go-kit. Compact heavy duty units, built to last.

New! 'Andy-Crimp Ratcheting tool for 15, 30, 50 and 75A Anderson Powerpoles.
That's right, ours does the 50 & 75A too!
Special Sale Price $35.
Regular price $50

Limited Time Sale!
West Mountain Radio Crimper for 15, 30, and 45A Powerpoles.
Regular Price $60
Special Sale Price $45



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Crimps LMR-400, 9913, RG-213, RG-8X, RG-58, RG-174, etc. High Quality PL-259 and BNC Connectors in stock!.

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UHF M/F connectors, panel or in-line mount.
Protect your home and equipment.

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LDG ELECTRONICS

The #1 Line of Autotuners

NEW! Z-100Plus

LDG's popular Z-100 economy tuner is now the Z-100Plus. Still small and simple to use, the Z-100Plus sports 2000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds.

Suggested Price $159.99

NEW! Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). Tuning is simple; one button push on the tuner is all that is needed - the Z-817 takes care of the rest. It will switch to PKT mode, transmit a carrier, tune the tuner, then restore the radio to the previous mode! 2000 memories cover 160 through 6 meters. The Z-817 will also function as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the tune button on the tuner. Powered by four AA internal Alkaline batteries (not included), so there are no additional cables required. A coax jumper cable is also induced for fast hook up. ***Suggested Price $129.99.***

NEW! KT-100

LDG's first dedicated autotuner for Kenwood Amateur transceivers. Easy to use - just right for an AT-300 compatible Kenwood transceiver. The KT-100 actually allows you to use the Tune button on the radio. The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. Has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies. If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199.99***

AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included. ***Suggested Price $249***

NEW! Z-11ProII

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. The Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

FREE Balun with purchase any new LDG tuner with a suggested retail value of over $150!

*Purchase any new LDG tuner with a suggested retail value of over $150 between Oct 15, 2009 and March 15, 2010 and receive a Free balun from LDG Electronics. Simply fill out form (available at www.ldgelectronics.com or via mail - write to 1445 Parran Rd., St. Leonard, MD 20685) and send to LDG along with a copy of your dated sales receipt and LDG will send you a Free RBA-1:1 or RBA-4:1. All forms must be received before March 31, 2010. Limit one free balun per household. Not Transferable.

Free Balun with Autotuner Purchase!*

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

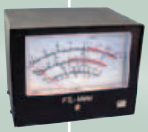
radio not included

NEW! AT-897Plus for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment and takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

radio not included

FTL Meter 2.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
Still Only $49



NEW FTL Meter For Yaesu FT-857(D) and FT-897(D). 4.5" face with calibrated scales for signal strength, discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit, all selectable from the radio's menu.
Suggested Price $79.99

NEW! M-7700 For IC-7700. It will display S-meter on receive, or power out, SWR, ALC level or supply voltages, all selectable from the radio's menu. What's more, the M-7700 and the virtual meter on your radio can work together.
Suggested Price $79.99

See AT-1000Pro Review in Nov. '08 CQ

AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. Tunes from 1.8 to 54.0 MHz (inc. 6 meters), with tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. 2000 memories. 2 Antenna connections. All cables included. ***Suggested Price $599***

NEW! YT-100

An autotuner for several popular Yaesu Radios. An included cable interfaces with your FT-857, FT-897 and FT-100 (and all D models) making it an integrated tuner, powered by the interface. Just press the tune button on the tuner, and everything else happens automatically: mode and power are set, a tune cycle runs, and the radio is returned to its original settings. It's the perfect complement to your Yaesu radio.
Suggested Price $199.99

NEW! IT-100

Matched in size to the IC-7000 and IC-706, the new IT-100 sports a front panel push-button for either manual or automatic tunes, and status LEDs so you'll know what's going on inside. You can control the IT-100 and its 2000 memories from either its own button or the Tune button on your IC-7000 or other Icom rigs. It's the perfect complement to your Icom radio that is AH3 or AH-4 compatible.
Suggested Price $179.99

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Phone 410-586-2177
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IC-92AD

RX-7-05

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IC-92AD 2M/440 D-Star & FM HT

- TX: 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
- Power: 5/2.5/0.5/0.1W
- Optional HM-175GPS Speaker Mic adds GPS capabilities

RX-7-05 Wideband Receiver

- RX: 150 kHz - 1300 MHz (cell blkd)
- AM, FM Narrow & Wide Mode • Memories: 1650
- Scans 100 Channels per second

$199.99 after instant coupon

IC-V8000 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 75/25/10/5W • Memories: 207

ID-880H 2M/440 FM Analog & D-Star Digital Dual Bander

- TX: 144-148, 430-450 • RX: 118-173.995, 230-549.995, 810-999.99 MHz (cell blkd) • Power: 50/15/5W
- Memories: 1052 • D-Star Digital Ready
- Improved User Interface

PW-1 HF/6M 1KW Linear Amplifier

- TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Two input & Four output connectors
- Easily connects to any current Icom HF transceiver

Remote Kit Included!

IC-7000 HF/VHF/UHF Multimode Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 35W (440 MHz)
- Memories: 503 • 41 band-widths with sharp or soft filter shape • RMK-7000 included!

IC-7200 HF/6M Portable/Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 2-100W
- Memories: 201
- 32-bit IF-DSPs + 24-bit AD/DA Converters
- USB Port for CI-V Format PC Control and Audio In/Out

Power Supply Included!

IC-746PRO Multimode HF/VHF Base

- TX: HF/6M/2M • RX: 0.03-60, 108-174 MHz
- Power: 5-100W • Memories: 102
- 32-bit floating DSP & 24-bit AD/DA converter
- Automatic HF/6M antenna tuner • PS-125 included!

LAST CHANCE!

Power Supply Included!

IC-756PROIII HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-100W
- Memories: 101 • 5 inch color screen • 32-bit floating DSP
- Real time spectrum scope • Automatic antenna tuner
- Improved 3rd order intercept point • PS-125 included!

In Stock at all Stores!

IC-7800 Multimode HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7" color screen • Two receivers
- Four 32-bit floating DSPs • Three roofing filters
- External VGA connector • Automatic antenna tuner

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HL-2.5KFX
Legal Limit 1.5kW HF Amplifier

The HL-2.5KFX is the lightest and most compact self-contained 1.5kW output HF LINEAR amplifier in its class. The amplifier's decoder changes bands automatically with most modern radios including the new K3, Orion II.

HL-1.5KFX
HF/50MHz Linear

This 1kW output auto band change 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. It also covers 6 meters.

HL-1.1KFX
Lightweight HF Linear

This world-class compact HF amplifier has built-in switch mode power supply to save the weight. It is compatible with wide AC line of 100 to 250V, and is best suited for DX-peditioners.

HL-1.2KFX
750W PEP HF Desktop Linear

This Solid State, world-class compact 750W HF amplifier is the easiest to handle and operate. The amplifier's broadband characteristics require no further tuning once the operating band is selected.

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TM-271A 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 60/25W • Memories: 200

TM-V71A Dualband FM Mobile

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Cross-band repeat • EchoLink® ready

TM-D710A

Dualband FM Mobile w/TNC

- TX: 144-148, 430-450 MHz
- RX: 118-524, 800-1300 MHz (cell blkd)
- Power: 50/10/5W • Dual receive (V+V) (U+U)
- Built-in TNC for APRS (needs GPS)
- Cross-band repeat • AvMap G5 & EchoLink® ready

AvMap G5 APRS GPS Navigator

- Bright non-glare 5 inch color touchscreen
- Preloaded Tele Atlas street maps of N. America
- AV input; enjoy films, video games & pictures
- Import extra POI's with no extra costs
- Kenwood ready APRS cable included

TH-K2AT

TH-F6A

TH-K2AT 2M FM HT

- TX: 144-148 • RX: 136-174
- Power: 5/1.5/0.5W • Memories: 100

TH-F6A Triband FM HT

- TX: 144-148, 222-225, 438-450 MHz
- RX: 0.1-1300 MHz (cell blkd) • Dual band RX
- FM Wide/Narrow, AM, SSB and CW receive modes
- Power: 5/0.5/0.05W • Memories: 435

TS-480HX

200W HF/6M Mobile/Base

- TX: HF/6M • RX: 0.5-60 MHz
- Power: 10-200W (with two optional 22A PS's)
- Memories: 99 • IF/stage DSP on main band, AF/stage DSP on sub-band

TS-480SAT

100W version with built-in auto antenna tuner.

TS-2000 100W HF/VHF/UHF Base

- TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz • Power: 10-100W (10-50W on 440 MHz) • Memories: 99 • HF/6M Auto Antenna Tuner
- IF/stage DSP on main band, AF/stage DSP on sub-band

TS-B2000

Same as the TS-2000 with high-tech "silver box" look & no front panel controls. Includes PC control software.

TS-2000X

The TS-2000 with 1.2 GHz @ 10W.

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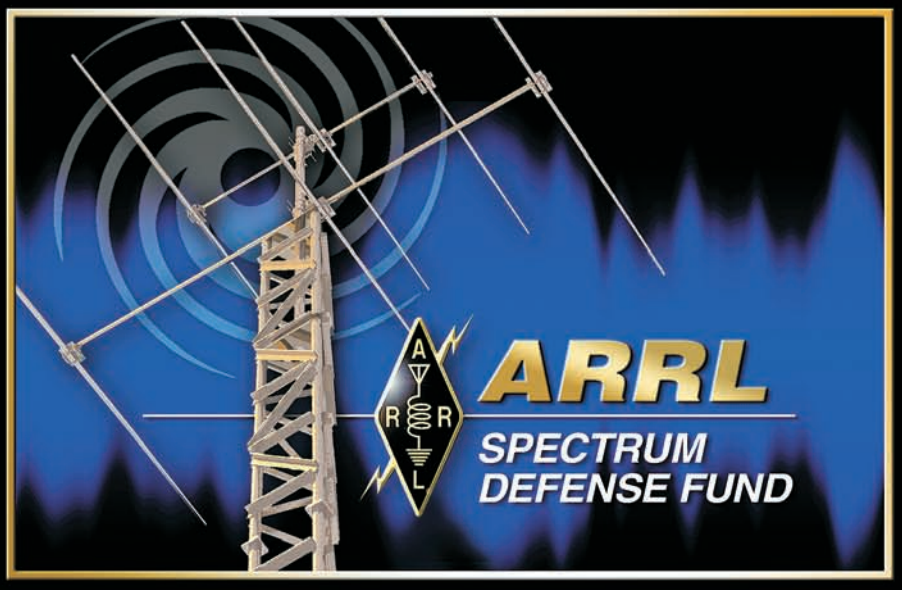

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Email: **mhobart@arrl.org**

FT-60R

FT-270R

FT-60R 2M/440 FM HT

• TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 (cell blkd) • Power: 5/2/0.5W • Memories: 1000

FT-270R 2M FM HT

• TX: 144-148 • RX: 136-174
• Power: 5/2/0.5W • Memories: 200
• Extra large LCD display & speaker
• Increased AF output & added "Memory Only" mode

VX-7R

VX-8R

VX-7R Quad-band FM HT Silver Case

• TX: 50-54, 144-148, 222-225, 430-450 MHz
• RX: 0.5-999 MHz (cell blkd)
• Power: 5/2.5/1/0.05W (0.3/0.05W on 220 MHz)
• Memories: 900 • Submersible 3 feet for 30 minutes

VX-7RB Quad-band FM HT Black Case

VX-8R Quad-band FM HT

• TX: 50-54, 144-148, 222-225, 430-450 MHz
• RX: 0.5-999 MHz (cell blkd) • Memories: 1200+
• Power: 5/2.5/1/0.05W (1.5W on 220)
• Optional GPS Antenna Unit FGPS-2 provides you with real time APRS® data.

FT-2800M 2M FM Mobile

• TX: 144-148 • RX: 137-174
• Power: 65/25/10/5W • Memories: 221

FT-8800R 2M/440 FM Mobile

• TX: 144-148, 430-450 MHz
• RX: 108-520, 700-999 MHz (cell blkd)
• Power: 50/20/10/5W (2M), 35/20/10/5W (440 MHz)
• Memories: 1000 • Crossband repeat
• YSK-8900 included!

FT-8900R Quad-Band FM Mobile

• Same as FT-8800R but TX: 28-29.7, 50-54, 144-148, 430-450 MHz and RX: 28-29.7, 50-54, 108-180, 320-480, 700-985 MHz (cell blkd) • YSK-8900 included!

FT-897D 100W HF/VHF/UHF Portable

• TX: HF/VHF/UHF • RX: 0.1-56, 76-108, 118-164, 420-470 MHz • Power: 5-100W (HF/6M), 5-50W (2M), 5-20W (440 MHz) • Memories: 200

Quadra System VL-1000

HF/6M 1KW Linear Amplifier

• TX: 160-15M/6M • Power: 1000W on 160-15M & 500W on 6M (220 VAC), 500W (110 VAC)
• Automatic band change & antenna tuner
• Two input & Four output connectors
• Easily connects to any current Yaesu HF transceiver

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50W 2M FM Desktop Repeater

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FT2000/D

The FT-2000 (100 watts) and FT-2000D (200 watts) are the 2nd Generation in the proud lineage of the FTdx9000 Series! Featuring extensive DSP filtering, factory installed antenna tuner and power supply and a host of outstanding ergonomic and performance features, the FT-2000 series radios are destined to be the centerpiece of your HF/50 MHz station!

DMU2000 Data Management Unit ..... **Call**
FH2 Remote Keypad **84.95**
SP2000 External Speaker **175.95**
UTUNINGKIT A, B, or C model **479.95**
YF122C 500 hz CW filter **159.95**
YF122CN 300 hz CW filter **164.95**

FT950

The FT-950 has been developed to fit the needs of both the casual and serious DX enthusiasts as well as new licensees desiring a top notch first radio to discover the magic of the HF and 50MHz bands. This superb radio features DSP filtering, 100 Watts of power output, factory installed antenna tuner and many of the outstanding ergonomic and performance features first introduced in our FTdx-9000 and FT-2000 flagship radios.

DMU2000 Data Management Unit ..... **Call**
FH2 Remote Keypad **84.95**
MD100A8X Desk top mic **129.95**
MD200A8X Desk top mic **379.95**
SP2000 External Speaker **175.95**
UTUNINGKIT A, B, or C model **479.95**

FT450/AT

The FT-450(AT) is an amazing compact radio that bundles the most desirable IF DSP features of the FT-2000 and FT-950 into a convenient sized lightweight package. Suitable for home, portable, or mobile use, the economical FT-450(AT) is a rugged 100 watt HF/50MHz radio unequalled in its price class. Available with or without factory installed antenna tuner.

ATAS120 Auto tuning antenna **299.95**
ATU450 Auto antenna tuner **149.95**
FC40 Auto antenna tuner **249.95**
MD100A8X Desk top mic **129.95**
MMB90 Mobile mount **33.95**

FT897D

The FT-897D is a rugged, innovative, multiband, multimode portable transceiver for the amateur radio MF/HF/VHF/UHF bands. Providing coverage of the 160-10 meter bands plus the 6 m, 2 m, and 70 cm bands and it's capable of 20-Watt portable operation using internal batteries, or up to 100 Watts when using an external 13.8-volt DC power source.

ADMS4B Programming software/cable **51.95**
ATAS120 Auto tuning antenna **299.95**
CT39 Packet Cable **9.95**
CT62 Computer Interface Cable **32.95**
FC30 Bolt on auto antenna tuner **189.95**
FNB78 NiMH Internal Battery **115.95**
FP30 Internal Power Supply **209.95**
MD100A8X Desk top mic **129.95**
MH59A8J Remote Control Mic **64.95**
YF122S 2.3 kHz SSB Filter **164.95**

FT857D

The FT-857D, the world's smallest HF/VHF/UHF mobile transceiver, provides base station-type performance from an ultra-compact package that's ideal for mobile or external battery portable work. Wide frequency coverage, outstanding receiver performance, and the convenience of optional remote-head operation make the FT-857D the expert's choice for high-performance mobile operation!

ADMS4B Programming software/cable **51.95**
ATAS120 Auto tuning antenna **299.95**
CT39 Packet Cable **9.95**
CT62 Computer Interface Cable **32.95**
FC30 Auto antenna tuner **189.95**
JTPS28 Jetstream Power Supply **84.95**
MH59A8J Remote Control Mic **64.95**
YF122S 2.3 kHz SSB Filter **164.95**
YSK857 Separation Kit **39.95**

FT817ND

The world's first self-contained, battery-powered, Multi-mode Portable Transceiver covering the HF, VHF, and UHF bands! Providing up to five watts of power output, designed for operation on the 160-10m HF bands, plus the 6m, 2m, and 70 cm bands.

CSC83 Soft Case **23.95**
CT39 Packet Cable **9.95**
CT62 Computer Interface Cable **32.95**
EDC5B Lighter Cable **23.95**
FNB72 Ni-Cd Battery Pack **59.95**
MH36E8J DTMF Mic **56.95**
YF122S 2.3 kHz SSB Filter **164.95**

FT2900R

Massive heatsink guarantees 75 watts of solid RF power, Loud 3 watts of audio output, 200 memory channels, CTCSS and DCS encode/decode built in.

JTPS14M Jetstream Power Supply **49.95**
MLS100 External Speaker **46.95**
MX2 Hustler 2m Mag Mount **32.95**

FT1900R

The ruggedly built yet compact new FT1900R 2m transceiver brings you Yaesu's legendary mechanical toughness along with outstanding receiver performance and 55 watts with crisp, clean audio that will get your message through!

JTPS14M Jetstream Power Supply **49.95**
MLS100 External Speaker **46.95**
MX2 Hustler 2m Mag Mount **32.95**

FT250R

Compact yet incredibly rugged, the FT250R 2-meter handheld is derived to perform under the most difficult operating conditions. It is packed with the leading-edge features you've come to expect from a Yaesu product. The FT250R's die-cast aluminum case houses a large, high-output speaker and the illuminated keypad provides easy viewing during night time operation.

SMAUHF SMA-UHF Adapter **3.50**
SMABNC SMA-BNC Adapter **3.50**
ADMS1F Software and cable **38.95**
EDC5B Cigarette Lighter Cable **23.95**
FBA25A AA Battery case **21.95**
MH34B4B Speaker Mic **33.95**
VC25 Vox Headset **62.95**

FT270R

The FT270R is a compact, high performance submersible FM hand held providing up to 5 watts of RF power, along with loud audio output (800 mW) for the 2m or 70cm amateur bands. Submersible up to 3ft for 30 minutes. Long operating times thanks to the supplied 1400 mAh Ni-MH battery pack.

ADMSVX170 Software and cable **43.95**
EDC5B Cigarette Lighter Cable **23.95**
FBA25A AA Battery case **21.95**
MH57A4B Speaker Mic **27.95**
VC27 Earpiece Microphone **27.95**

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Band Coverage: 160, 80, 40, 20, 17, 15, 12, and 10. High speed electronic bias switching. True step-start control circuitry. Opto-isolated keying interface. SSB, FM, CW, AM, RTTY, SSTV. Driving Power Required: 20 to 60W nominal at rated continuous carrier output. Maximum Output Power: 1500W Continuous Carrier. Duty Cycle: 100% in Amateur service at 1500W output power, SWR 2:1 or less. Harmonic Suppression: Exceeds all FCC requirements Metering (continuous): Relative power, grid current, plate voltage & plate current. Tubes two 3CPX800A7 200/234 VAC, 50/60 Hz, 20 Amperes.

$3695.95

1500 Watt 6m RF Amplifier

Frequency Range: 50 to 54 MHz. High speed electronic bias switching. True step-start control circuitry. Opto-isolated keying interface. Modes: USB, LSB, RTTY, FM, & CW Power Requirements: 200/234VAC 50/60 Hz. RF Drive Power: 15-25 W Nominal; 35-40 Watts Max. For Full Output RF Output: 1500 Watts PEP SSB; 1500 Watts FM or RTTY. Antenna Load (VSWR): 2:1 maximum. Harmonic Suppression: better than 60db down at rated output. Tube Compliment: two 3CPX800A7 pulse-rated ceramic metal triodes. Cooling: pressurized chassis forced air.

VX8R

Bluetooth Hands-Free Operation with GPS/APRS and Real RF-Dual Wideband Receive… The next generation Amateur Handheld transceiver from Yaesu, who has been introducing Leading -Edge Transceiver Technology for years.

CSC93	Softcase	14.95
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FGPS2	GPS Unit	79.95
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MH74A7A	Speaker Mic	43.95

FT60R

The FT-60R includes wide receiver coverage, outstanding audio quality, the most CTCSS/DCS flexibility in the industry, and a new Emergency Automatic Identification (EAI) feature for search-and-rescue work.

ADMS1J	Software/Cable	39.95
EDC5B	DC Cable w/Noise Filter	23.95
EDC6	DC Cable	7.95
FBA25A	AA Battery Case	21.95
FNB83	7.2V 1400mAh Ni-MH	39.95
MH34B4B	Speaker Mic	33.95
VAC370B	Rapid Charger	62.95

FT8800R

If you're ready for the best in a Dual-Band FM Mobile Transceiver, the FT-8800R is ready for you! With easy operation, outstanding receiver performance, and cross-band repeat capability, the FT-8800R is the new standard of comparison!!

ADMS2I	Software and cable	39.95
JTPS14M	Jetstream Power Supply	49.95
MLS100	External Speaker	46.95
MMB60	Quick Release Mobile Bracket	29.95
YSK8900	Separation Kit	49.95

FT7900R

Yaesu's economically priced One-Touch Operation FT-7900R Dual band FM mobile. Back-lit push button controls ensure extraordinarily easy and safe operation while driving at night. The exceptionally wide receiver coverage provides all sorts of additional uses!

ADMS2K	Programming software and cable	39.95
MEK2	Microphone Extension Kit	42.95
JTPS14M	Jetstream Power Supply	49.95
MLS100	External Speaker	46.95
MMB60	Quick Release Mobile Bracket	29.95
YSK7800	Separation Kit	29.95

Customer Appreciation Day

Saturday December 12, 2009 10AM – 4PM

Events:

Prizes, Talk to Manufacturers Representatives, Presentations, Special Pricing on most items, Refreshments, Extended Hours

Manufactures scheduled to attend this year:

Ameritron, Comet, Cushcraft, Daiwa, Gordon West, Heil, Hustler, Hygain, Icom, Jetstream, Kenwood, Maldol, MFJ, Mirage, Vectronics and Yaesu.

Presentations:

11 am – Noon:
It All Starts At The Microphone
By Bob Heil

Noon – 1 pm:
PASS THE HAM , *a fun look at ham antics over the airwaves. By Gordon West*

1 pm – 2 pm:
5J0BV San Andres Island 2009 6M DXpedition By K7BV.

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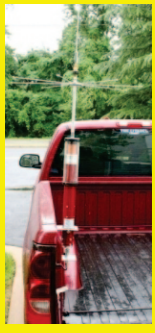

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Note: Mounts are not included.

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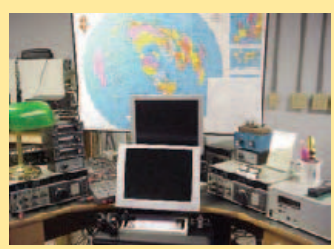

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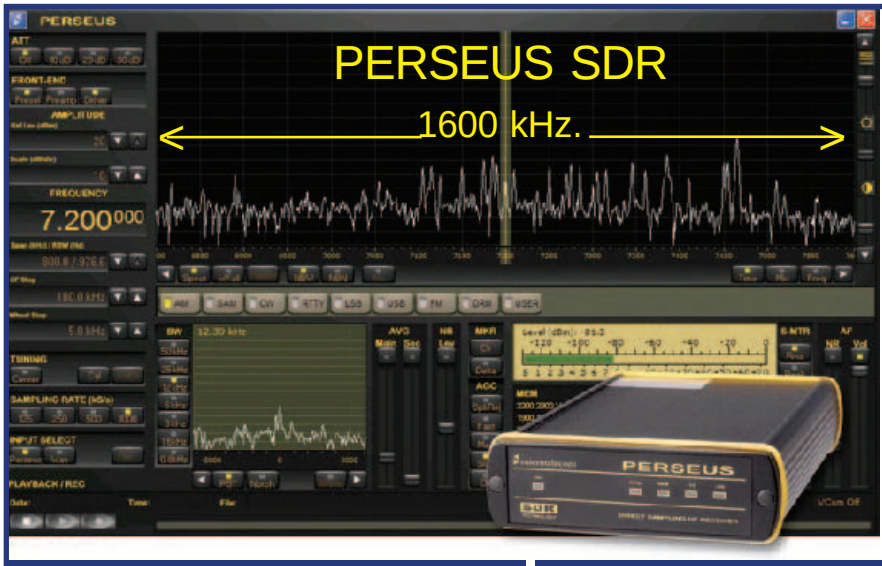

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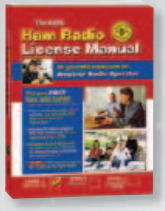

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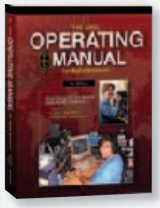

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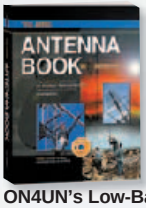

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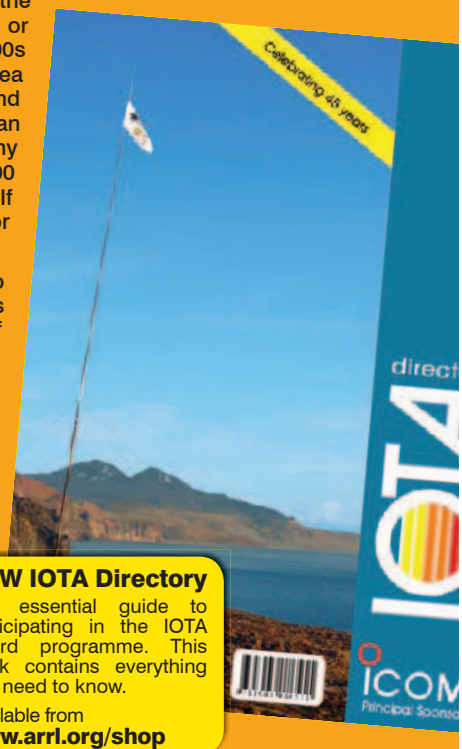

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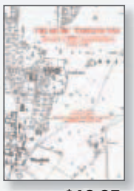

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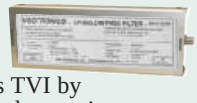

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B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

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Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

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www.RadioReference.com gives you frequencies for both conventional and trunked systems. There may be hundreds of interesting frequencies for your local area. They are all organized complete with descriptions. It couldn't be easier to select what you want to listen to.

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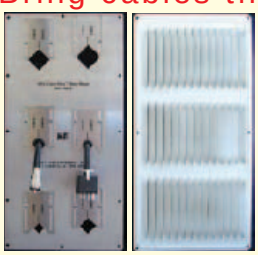

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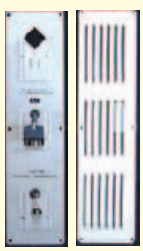
shown with standard half-size vent (not included) it replaces. For *3 Cables*
$14.95



Replace your standard air vents on the eave/sofitt of your house with these *MFJ AdaptiveCable*™ *Air Vent Plates* and…

Bring in coax, rotator, antenna switch, power cables, etc. *with connectors* up to 1¼x1⅝ inches!

Sliding plates and rubber grommets adjust for virtually any cable size to seal out adverse weather, insects and varmints. Use existing vent hole, mounting screws and screw holes.

AdaptiveCable™ *Wall Plates*

MFJ-4614
For 4 Cables
$34.95

Bring nearly any cable -- rotator, antenna switch, coax, DC/ AC power, etc. -- through walls *without removing connectors* (up to 1¼x1⅝ inches). Sliding plates and rubber grommets adjust hole size to weather-seal virtually any size cable.

Includes *stainless steel* plates for each side of wall, sliding plates, rubber grommets, weather stripping and screws.

MFJ-4612
For 2 Cables
$24.95

MFJ-4611
For 1 Cable
$14.95

Free MFJ Catalog
Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

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300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
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http://www.mfjenterprises.com for more info, catalog, manuals, dealers

MFJ high-accuracy *Digital* SWR/Wattmeter

MFJ's high-accuracy digital SWR/Wattmeter gives you three 10-bit frequency compensated power ranges!

MFJ-826B
$179.95

New!

An optimum power range is automatically selected. Each range has full 10-bit resolution. A low range (25 Watt full scale), a mid-range (250 Watt full scale) and a high-range (1500 Watts full scale) covers the entire amateur power spectrum with high accuracy.

A built-in frequency counter selects the appropriate frequency compensated data set to insure highest accuracy for each band. It also displays your transmitted frequency and provides digital frequency readout for older rigs and QRP rigs such as MFJ-9420/9040/9340.

True peak or average forward and reflected power, SWR and frequency are *simultaneously* displayed.

Bargraphs makes tuning antenna tuners, amplifiers and transmitters easy. You can select bargraphs to display forward and reflected power *or* forward power and SWR *or* SWR only.

MFJ's PeakHold™ freezes high-est forward power displayed (bar segment also) for 1, 2 or 3 seconds.

MFJ's *TrueActive*™ peak reading circuit gives you *true* peak or average power.

When SWR is greater than 1.5 to 3 (selectable) an alarm LED lights and buzzer sounds.

Has large high-contrast *backlit* LCD display.

Use 12 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2⅝Hx6D inches.

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 reading the scale.

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

MFJ-868
$149.95

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5½Hx5D in. SO-239 connectors.

New!

Giant 144/220/440 MHz SWR/Wattmeter

MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but covers 144/220/440 MHz.

www.mfjenterprises.com . . . World's largest selection of HF/VHF/UHF SWR Wattmeters!

MFJ-822
$59.95

Lighted 3" Cross-Needle Meter, SWR/Watts, 1.8-200 MHz, Fwd/Ref pwr, 30/300W. Compact.

MFJ-862
$59.95

Lighted Cross-Needle Meter, SWR/Watts, 144/220/440 MHz, 30/300 Watts Fwd, 60/6 W Ref.

MFJ-864
$99.95

Lighted Cross-Needle,SWR/Watts, 1.8-60/144/440 MHz, 30/300W Fwd, 6/60W Ref. Hook up HF&VHF/UHF rigs.

MFJ-815C
$109.95

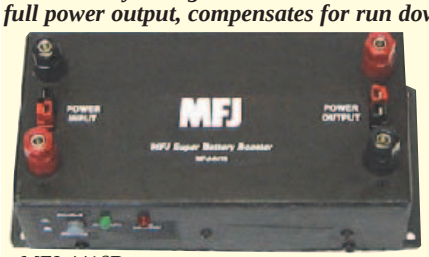
Lighted 3" C/N Meter, SWR/Watts, 1.8 -30 MHz, 300/3000W Fwd, 60/600W Ref. True Peak.

MFJ-812B
$39.95

VHF SWR Wattmeter, 2M/220 MHz, built-in field strength meter, Fwd/Ref, Pwr in 2 30/300W ranges.

MFJ-4416B *Super* Battery Booster

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, compensates for run down battery, wiring voltage drop, car off . . .



MFJ-4416B
$149.95

Boost battery voltage as low as 9 Volts back up to 13.8 VDC! Keeps your transceiver at full power output, provides full performance/efficiency, prevents output signal distortion and transceiver shutdown. Compensates for run-down battery, wiring voltage drop or when car is off. Provides up to 25 Amps peak with 90% efficiency. Selectable 9/10/11 Volts minimum input voltage prevents battery damage from over-discharging. RF sense turns MFJ-4416B off during receive to save power and increase efficiency. Adjustable 12 to 13.8 VDC output pass-through voltage improves efficiency and lets transceiver run cooler. Has output over-voltage crowbar protection. *Anderson PowerPoles*® and high-current 5-way binding posts for DC input, regulated output. 7¾Wx4Hx2⅛D inches.

100 Watts SSB from *cigarette lighter socket!*

MFJ-4403
$119.95

4-Farad capacitors supply 25 Amps needed for 100 Watts SSB peaks and replenished by 10 Amps average from cigarette lighter socket. Protects against reverse/over voltage, voltage transients, short circuits. Provides super noise/ripple filtering.

MFJ AC Line RFI Filter

Eliminate obnoxious power line and computer hash and noise by 6 S-units!

MFJ-1164B
$79.95

Filters and reduces AC power line RFI, hash, noise, transients, surges generated by computers, motors, RF transmitters, static/lightning by 30 db and up to 60-80 dB with a good earth ground. Super fast, *nano-second* overvoltage protection. Four 3-wire 15A, 120VAC outlets.

Transceiver Surge Protector

MFJ-1163, $69.95. Protects your expensive transceiver from damaging power surges. Capacitive decoupling and *ultra-fast* MOVs protection. 4 AC outlets.

MFJ all-in-one *Transmit Audio Console*

MFJ-655B
$219.95

MFJ all-in-one *Transmit Audio Console* gives you an *8-Band Equalizer* for full quality ragchewing audio *or* powerful, pileup penetrating speech . . . Adjustable *Noise Gate* gives you transparent, back-ground noise reduction . . . Clean low-distortion *Compressor* gives you more powerful, richer, fuller sounding speech and higher average power SSB . . . Smooth *Limiter* keeps audio peaks from over-driving your transmitter, prevents SSB distortion and splatter. *Universal Mic-Interface* lets you use any microphone with any transceiver. Has low-noise preamp, mic voltages, PTT jack, impedance matching, level controls, RF/audio isolation, VU meter, headphone monitor, auxiliary input.

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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 . . .

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

MFJ-269
$389.95

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*
$419.95

MFJ-259B HF/VHF Antenna *SWRAnalyzer*™

MFJ-259B
$289.95

The world's most popular antenna analyzer gives you a complete picture of your antenna performance 1.8 to 170 MHz.

It's Super easy-to-use -- makes tuning your antennas quick, painless and easy.

Read antenna SWR, complex impedance, return loss, reflection coefficient. Determine velocity factor, coax cable loss in dB, length of coax and distance to short or open in feet. Read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information. Built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

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KENWOOD
Listen to the Future

All-Terrain Performance

On or off the road, Kenwood's new TM-271A delivers powerful mobile performance with 60W maximum output and other welcome features such as multiple scan functions and memory names. Yet this tough, MIL-STD compliant transceiver goes easy on you, providing high-quality audio, illuminated keys and a large LCD with adjustable green backlighting for simple operation, day or night.

144MHz FM TRANSCEIVER

TM-271A

▮ 200 memory channels (100 when used with memory names) ▮ Frequency stability better than ±2.5ppm (-20~+60°C) ▮ Wide/Narrow deviation with switchable receive filters ▮ DTMF microphone supplied ▮ NOAA Weather Band reception with warning alert tone ▮ CTCSS (42 subtone frequencies), DCS (104 codes) ▮ 1750Hz tone burst ▮ VFO scan, MHz scan, Program scan, Memory scan, Group scan, Call scan, Priority scan, Tone scan, CTCSS scan, DCS scan ▮ Memory channel lockout ▮ Scan resume (time-operated, carrier-operated, seek scan) ▮ Automatic repeater offset ▮ Automatic simplex checker ▮ Power-on message ▮ Key lock & key beep ▮ Automatic power off ▮ Compliant with MIL-STD 810 C/D/E/F standards for resistance to vibration and shock ▮ Memory Control Program (available free for downloading from the Kenwood Website: ***www.kenwoodusa.com***)

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Customer Support/Distribution
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ISO9001 certification

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"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
$199.95

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
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ ***tunable*** Super DSP filter

MFJ-784B
$279.95

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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MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English! Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . . More!

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW. Digs out weak signals. Phase-Lock-Loop even tracks slightly drifting signals.

MFJ-461 $89.95

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable. A battery saving feature puts the MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery. Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 inches. 5½ ounces.

Super easy-to-use! Just turn it on -- it starts copying instantly!

MFJ-26B, $9.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $16.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $7.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ-5163, $10.95. Cable lets you use external speaker when MFJ-461 is plugged into radio speaker jack. 3.5 mm.

MFJ Morse Code *Reader and Keyer* Combination

Plug MFJ's CW Reader with Keyer into your transceiver's phone jack and key jack.

Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you're still learning the code!* Sends and reads 5-99 WPM.

Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard.

MFJ-464 $199.95 *(Keyboard, paddle not included.)*

Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

MFJ-551, $39.95. RFI suppressed keyboard, a must to avoid RFI problems.

MFJ Iambic Paddles

MFJ-564 Chrome
MFJ-564B Black
$69.95

MFJ *Deluxe Iambic Paddles*™ feature a full range of adjustments in tension and contact spacing. Self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. Works with all MFJ and other electronic keyers.

***Miniature* Travel Iambic Paddle**

MFJ-561, $24.95. 1¾Wx1¾D x¾H inches. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

MFJ Code Oscillator

MFJ-557 $39.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312D, $15.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

MFJ-550, $14.95. Telegraph Key Only with adjustable contacts. Handsome black.

MFJ Deluxe CW Keyer

Deluxe MFJ Keyer has all controls on front panel for easy access -- speed, weight, tone, volume knobs, and tune, semi/auto, on/off push-buttons. You get all keyer modes, dot-dash memories, self completing dots/dashes, jam- proof spacing, sidetone, built-in speaker, type A /B keying. RF proof. Solid state keying. 7x2x6 inches.

MFJ-407D $79.95

MFJ-401D, $69.95. Econo Keyer II has front-panel volume/speed controls (8-50 wpm), tune switch. Internal adjust weight, tone. Solid state keying. Tiny 4x2x3½ inches.

Keyer/Paddle Combo

MFJ-422D $189.95

Best of all CW worlds -- a *deluxe MFJ Curtis*™ *keyer* that fits right on *Bencher paddle*! Adjustable weight and tone, front panel volume and speed controls (8-50 WPM), built-in dot-dash memories, speaker, sidetone, semi-automatic/tune or automatic modes. Use 9V battery or 110 VAC with MFJ-1312D, $15.95. 4⅛x2⅝x5¼ in.

MFJ-422DX, $99.95.

MFJ *Curtis*™ Keyer only, fits on your Bencher paddle or MFJ-564 (chrome) or MFJ-564B (black) paddles above.

MFJ*Pocket* Morse Tutor

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

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MFJ-998 1500 Watt *Legal Limit IntelliTuner*™

Only the MFJ-998 gives you fully automatic antenna tuning for your legal limit full 1500 Watts SSB/CW linear amplifier!

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Instantly match impedances from 12-1600 ohms using MFJ's exclusive *IntelliTune*™, *Adaptive Search*™ and *InstantRecall*™ algorithms with over 20,000 *VirtualAntenna*™ Memories.

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A *backlit* LCD meter displays SWR, forward/reflected power, frequency, antenna selected, an auto-ranging bargraph power indication, and much more.

Has quick-glance auto-ranging Cross-Needle SWR/Wattmeter.

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MFJ new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 switchable antenna coax connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total. Has binding post for end-fed long wire antennas.

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Download from internet and upgrade your MFJ-998 firmware as new features are introduced.

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Built-in radio interface controls most transceivers.

Automatically bypasses with excessive tuning power.

Use balanced line antennas with external **MFJ-912, $59.95**, 1.5 kW 4:1 balun.

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Matches IC-706, FT-857D, TS-50S

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200W...Weather-sealed

for Remote/Outdoor/Marine

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Custom designed inductor switch, 1000 volt tuning capacitors, *Teflon*® insulating washers and proper L/C ratio gives you *arc-free* no worries operation

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up to 300 Watts PEP transceiver input power.

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8-Position Antenna switch

Antenna switch lets you select two coax fed antennas, random wire/balanced line or dummy load through your MFJ-949E or direct to your transceiver.

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Full *size* 3-inch lighted Cross-Needle Meter. Lets you easily read SWR, *peak* or average forward and reflected power simultaneously. Has 300 Watt or 30 Watt ranges.

QRM-Free PreTune™

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Plus Much More!

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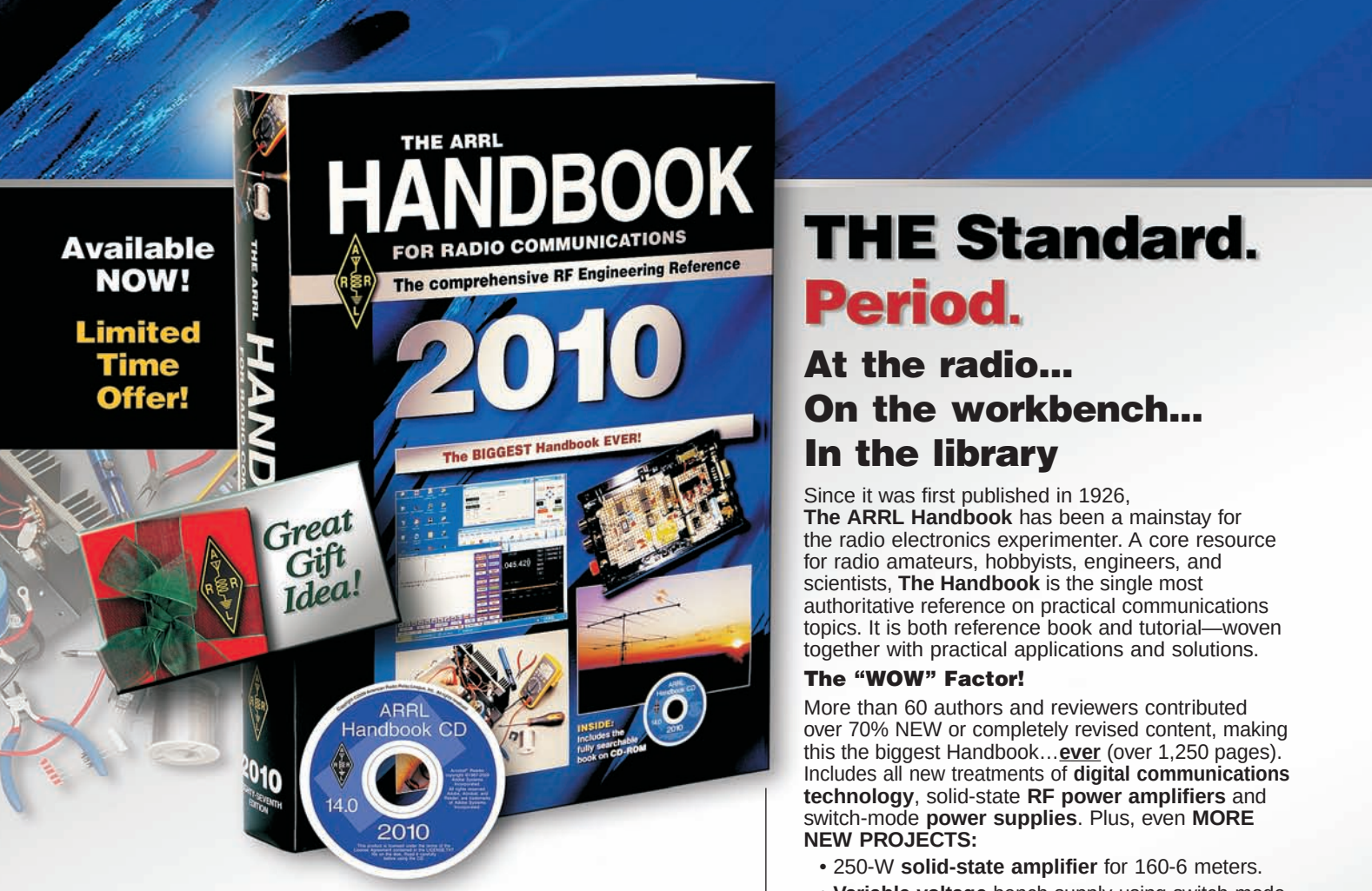

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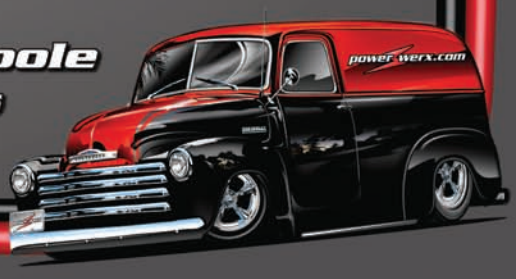

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