
QST
Official Journal of
ARRL
The national association for AMATEUR RADIO
December 2004
devoted entirely to
amateur radio
Season's Greetings to All
H. R. Hick
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1914-2004
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Remembering the past
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NEW RECEIVER GIVES +30dBm TOI

Using receiver design techniques introduced in the IC-7800, Icom's engineering team focused on producing a distortion-free, high-dynamic-range. To achieve this goal, Icom used higher-grade components in vital receiver sections of the IC-756PROIII. The result? Outstanding performance, whether the whole band is calling or you're trying to pull a "new one" out of the QRM.

LARGE INDUCTORS = LOWER DISTORTION

The IC-756PROIII uses large inductors instead of small coils in the bandpass filter (BPF) stage, because small coils sometimes cause magnetic saturation in the BPF stage. Large inductors can handle both strong signals and weak signals with lower distortion.

LOW DISTORTION BPF SWITCHING

The BPF switching circuitry is one of the critical points in a receiver where distortion can be produced by strong out-of-band signals. Distortion at this early receiver stage then propagates throughout the remaining stages and cannot be removed by signal processing. The IC-756PROIII uses low distortion diodes with wide frequency characteristics that prevent formation of distortion components in the BPF stage.

NEW IC-756PROIII

A fusion of the great features from the '756PROII with new technology from the '7800!

uldn't get any better!

LOW IMD ROOFING FILTER

The IC-756PROIII uses a fundamental-mode monolithic crystal filter for the roofing filter. Although it's more expensive than overtone-mode filters, this filter has a better shape factor and is less susceptible to intermod distortion under strong signal conditions. This is the same filter used in the IC-7800.

TWO NEWLY DESIGNED PREAMPLIFIERS

To minimize distortion and maximize dynamic range, the IC-756PROIII preamps use the same basic circuit design as those in IC-7800. Preamp-1 is a noiseless feedback design, with push-pull amplifiers. This design has a high intercept point and covers a wide frequency range. Preamp-2 uses bipolar transistors for higher gain, ideal when you use separate low-efficiency receiving antennas such as small loops or Beverages.

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

HAM-IV

HAM-IV
$559.95

The most popular rotator in the world!

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

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

TAILTWISTER SERIES II

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

T-2X
$649.95

T-2XD
$1029.95
with DCU-1

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

CD-45II

CD-45II
$389.95

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

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

HAM-V

HAM-V
$949.95
with DCU-1

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

ROTATOR OPTIONS

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

AR-40

AR-40
$289.95

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

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

HDR-300A

HDR-300A
$1379.95

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

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

Digital Automatic Controller

DCU-1
$649.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1 degree 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
$69.95

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

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

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

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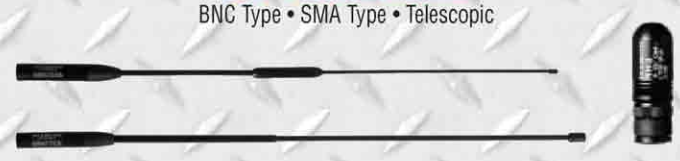

Accessories

Duplexers & Triplexers • Wattmeters • Dummy Loads • Lightning Protection • Adapters • Power Supplies • Coax Switches • Cable Assemblies

Duplexers & Triplexers

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DIAMOND ANTENNA

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News and Features

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QST Workbench

Operating

Departments

Our Cover
Hearty Greetings of the Season from ARRL Officers, Directors, other volunteers and the Headquarters staff! A holiday-themed article begins on page 44. The Santa Claus illustration and type design by Harry R. Hick, 1ESS, originally appeared on the cover of the December 1954 issue.

US & Possessions: Membership in the ARRL, including a one year subscription to *QST*, is available to individuals at $39. Age 65 and over, with proof of age, $36. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of $20. Life Membership, including a subscription to *QST* is available at $975.* Age 65 and over, $900.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

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TCXO DSP 60 m Band

- High Stability TCXO Built In (0.5 ppm @ 77° F/25° C) for rock-solid PSK31, SSTV, or other data modes.
- Improved 1st IF Roofing Filter for enhanced operation in crowded bands.
- Compatibility with optional MH-59A8J Remote Control Microphone.
- Built-in DSP (Digital Bandpass Filter, Digital Noise Reduction, Digital Notch Filter).
- 32-Color Liquid Crystal Display.
- Optional ATAS-120 Auto-Tune and ATAS-25 Manual-Tune Antennas.
- Optional YF-122CN 300 Hz Collins® Mechanical CW Filter.

FT-857D

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

DSP 60 m Band

- Built-in DSP (Digital Bandpass Filter, Digital Noise Reduction, Digital Notch Filter).
- Improved 1st IF Roofing Filter for enhanced operation in crowded bands.
- Optional MH-59A8J Remote Control Microphone.
- 32-Color Liquid Crystal Display.
- Optional ATAS-120 Auto-Tune and ATAS-25 Manual-Tune Antennas.
- Optional YF-122CN 300 Hz Collins® Mechanical CW Filter.

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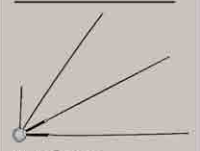

ATAS-120
VHF/UHF Base Radial Kit ATBK-100.

Automatic Matching for FT-897/857 Series Transceivers

NEW

FC-40
Automatic-Matching 200-Memory Antenna Tuner

WATER PROOF

- Compatible with all versions of FT-897/857, and requires only two supplied cables (RF and Control) for interconnection to transceiver!
- Required Drive Power: 4 ~ 60 Watts. Maximum TX Power: 100 Watts.
- Typical Matching Time: Less than 8 seconds.
- During Matching, less than 0.25 Watts will be radiated to reduce QRM.
- 200 Match-Data Memories for instant "refresh" when returning to previously-used frequencies.
- Operational on 1.8 ~ 54 MHz when used with 66' (or longer) wire, or 7~ 54 MHz with standard 8.2' whip antenna (wire/whip antenna not supplied).
- Compact Size (9" x 6.9" x 2.2" WHD) and Light Weight (2.65 lb.).

ATAS MICRO Manually-Tuned High-Performance Portable Antenna ATAS-25

- Slide resonating tube up and down for coarse tuning, then rotate tube for precise matching on your operating frequency.
- Mounts on standard camera tripod screw for quick, sturdy portable installation (tripod not included).
- Breaks down to less than 2' lengths, and weighs 2.1 pounds (plus tripod)-ideal for portable use!
- Attach supplied 144/430 MHz radials and use base section for 144/430 MHz operation.
- Capable of full 100 W operation with FT-857D/FT-897D.

Frequency Range: Amateur Bands 7 – 430 MHz.
Power Capability (50% duty cycle, 1 min. TX/1 min. RX): HF/50 MHz CW/SSB 100 W
AM 50 W
144/430 MHz 50 W

Size: 7.2' (2.2m) maximum, 2' (0.6 m) collapsed for packing.
Weight: 33 oz. (930 g)
Included Accessories; HF wire radials, 144/430 MHz radials, Allen wrench. Not included: coaxial cable, camera tripod, QSL cards!

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"IT SEEMS TO US..."

The FCC's BPL Decision

At its October 14 meeting the Federal Communications Commission adopted new rules for Broadband over Power Line (BPL) systems. In doing so the FCC moved unusually quickly from a Notice of Inquiry (April 2003) to a Notice of Proposed Rule Making (February 2004) and on to the adoption of final rules in ET Docket No. 04-37.

The stated purpose of the new rules is to encourage the deployment of BPL systems as an additional way for consumers to gain access to broadband services while safeguarding licensed radio services against harmful interference. At this writing, just one week after the meeting, the Report and Order containing the details of the new rules has not yet been released. However, it is safe to say that the rules will place new restrictions on BPL systems that are not present in the existing FCC Part 15 rules. Indeed, they are more restrictive than the FCC's proposals contained in the NPRM released earlier this year.

Spokesmen for the nascent BPL industry claim to be happy with the new rules. They will be less happy once they actually see what's in them. In the meantime they must put on a brave face for the benefit of their investors. Certainly they have reason to welcome the end of the period of uncertainty that always marks a pending rulemaking, although the battle is far from over. Yet to come are petitions for reconsideration and judicial review of the Commission's decision, the grounds for which are unusually fertile thanks to the FCC's own procedural errors. And they will come, because the FCC—while it has tightened the rules for BPL—has fallen far short of providing adequate protection for over-the-air radio services, including but not limited to Amateur Radio. We have ample reason to be unhappy.

There is no longer any question but that BPL pollutes the radio spectrum. The technical showings submitted by the ARRL and the National Telecommunications and Information Administration (NTIA) clearly establish that fact. Because so-called Access BPL devices have a significantly greater potential for causing interference than typical unlicensed devices, the FCC will subject them to tighter equipment authorization procedures: in FCC-Speak, "certification" instead of "verification."

Unfortunately, the FCC did not take the logical next step of mandating a lower radiated emission limit for BPL devices. That they should have done so is clear to anyone who objectively reviews the record of the Docket 04-37 proceeding. The ARRL and others have documented harmful interference that is occurring *now* at BPL test sites. Measurements taken at those sites corroborate calculations by the ARRL, NTIA, and others showing that interference to typical radio stations is a certainty if BPL systems operate at the existing Part 15 limit.

On September 13, the NTIA submitted findings to the FCC showing that the probability of harmful interference from a power line carrying a BPL signal at the Part 15 limit is essentially *100%* up to 200 meters from the power line at 4 MHz. The interference distance increases with frequency, to about 400 meters at 20 MHz. Given the virtual certainty that any FCC-licensed station will operate in closer proximity than that to power lines, and given that FCC licensees are entitled to protection from harmful interference from unlicensed emitters, the FCC was and is obligated to mandate a lower limit. That the Commission has chosen not to do so is irresponsible.

If anyone doubts the legitimacy of the interference issue, consider this. To protect aeronautical communications, the new rules establish numerous frequency bands that BPL must *entirely* avoid. If the interference isn't real, why did the NTIA insist that the FCC take this step? Why do the new rules establish exclusion zones and consultation requirements to protect federal government, public safety, and certain other stations? We're looking forward to reading the Report and Order to find out whether the FCC will require coordination around its own field offices, as the NTIA thoughtfully proposed on their behalf.

As for the rest of us who are licensed to use the radio spectrum, the FCC's plan is to saddle us with the burden of identifying BPL as the source of the harmful interference we will inevitably encounter and tracking down the responsible party. To provide a starting point, the FCC will require the BPL industry to maintain a publicly available database. The new rules will require that any BPL devices that are deployed must have the capability to be adjusted and shut down remotely, presumably to give BPL system operators the ability to resolve interference in real time. Whether or not they will actually be required to do so remains to be seen.

Throughout the entire proceeding, the ARRL has been the principal voice of reason arguing against the headlong rush to pollute the radio spectrum for short-term gain. An unfortunate side effect of our activism on the issue is that to some, this is a battle between "old" Amateur Radio technology and "new" broadband technology. It is not. It is a battle over a unique and priceless natural resource: the narrow slice of the radio spectrum that supports long-distance communication without the need for any infrastructure whatsoever.

There is nothing new about sending radio signals over power lines; it's been done for decades, within rational limits that until now have kept radio interference from being an issue. There is nothing old about Amateur Radio technology; we are on the leading edge in introducing digital applications to the HF environment.

It is sad beyond measure that the FCC is willing to squander a unique natural resource in order to provide a short-range broadband connection that can easily be provided by several other, non-polluting means.
—David Sumner, K1ZZ

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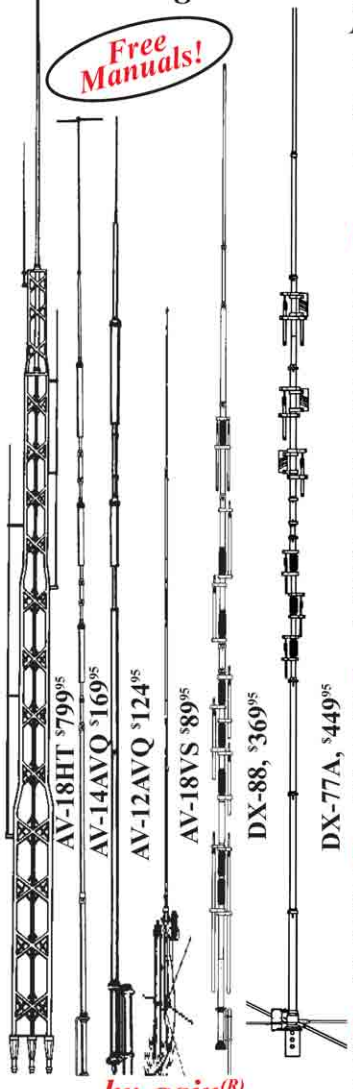

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All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic band-switching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators. Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage. Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low. Two year limited warranty.

AV-18HT, $799.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

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

AV-14AVQ, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $124.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

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

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

All bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $189.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

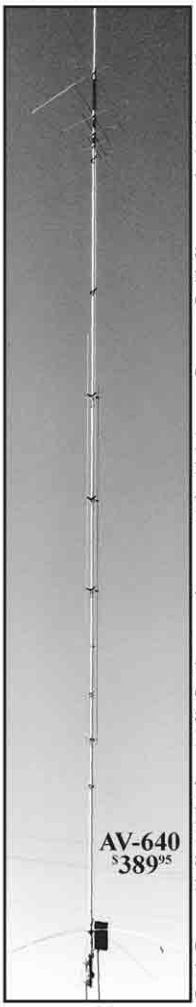
DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs.

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

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$799.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

hy-gain(R) PATRIOT

Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



No ground or radials needed

Effective counterpoise replaces radials and ground.

Automatic bandswitching

Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

Sleek and low-profile

Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

Full legal limit

Handles 1500 Watts key down continuous for two minutes.

Built-to-last

High wind survival of 80 mph. Broadband matching unit made from all *Teflon*® insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain® warranty

Two year limited warranty. All replacement parts in stock.

AV-640, $359.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $289.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

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Extreme Radio Activity!!!

Put the X in Xcitement

and take your on-air radio activity to new levels with these mobile transceivers from Alinco. Whether you choose a single band, dual band or "all mode" HF + 6m radio, Alinco delivers superb audio quality and low noise.

Single Band Commandos

Choose DR-135T MKII VHF, DR-235T 222MHz, or DR-435T MKII UHF FM *Mobile/Base Transceiver*

Whichever band you choose, these rugged single band mobile transceivers are ready for serious use in demanding conditions. You'll enjoy the large illuminated mic and easy-to-read alphanumeric display. The well-designed functions are user-friendly and include 100 memories, high stability TCXO, ignition key on/off feature, theft alarm, autodial memories, alphanumeric channel labels, CTCSS encode+decode, DCS, tone bursts, theft alarm, direct frequency input, optional internal TNC or optional internal digital voice module.

Double Duty Dynamos

DR-620T VHF/UHF *Wide Band Receive Mobile/Base FM Transceiver*

This Xciting VHF/UHF dual band radio will actually change to meet your needs! The removable remote-mount head allows you to invert the transceiver for optimum speaker placement and extra flexibility when installing in a vehicle. Plus, the large alphanumeric display lets you change display colors so you can select the color that works best for you. Enjoy wide band broadcast FM signals, AM Airband, weather and other public safety frequencies in addition to VHF and UHF operations. Add the optional internal TNC for packet or APRS operations or be among the first to engage in digital voice communications with the optional digital module. Other features include a large illuminated mic, internal duplexer, CTCSS encode+decode, DCS and more.

DR-605TQ VHF+UHF *Dual Band Mobile/Base FM Transceiver*

Alinco's Xcellent value in a dual band, dual watch transceiver with crossband repeat at a price that's amazingly low. This popular dual band features CTCSS encode+decode, 50 memories per band, internal duplexer, large easy-to-use controls and a massive heat sink for quiet fan-free operation. Xtreme value in a VHF+UHF transceiver!

All Mode Action

DX-70TH HF+6M *Mobile/Base Transceiver*

Rugged and reliable, this radio is a proven performer with 100 watts output and all mode performance on all bands including the 6M "magic band". The removable remote mount control head makes mobile installation easier and the big display with a wide choice of operator parameters and full QSK CW operation makes getting on the air easy. Whether you enjoy HF action or the challenge of 6M, the DX-70TH is ready to deliver on-air Xcitement!

For more details on feature-rich, value-packed transceivers for your favorite bands, call or stop by your favorite Alinco dealer or visit Alinco on the web.

www.ALINCO.com

Distributed in North America by Ham Distribution, Inc., 15 South Trade Center Pkwy, #B5, Conroe, Texas, 77385. Phone: 936-271-3366. Fax: 936-271-3398.

ARRL in ACTION

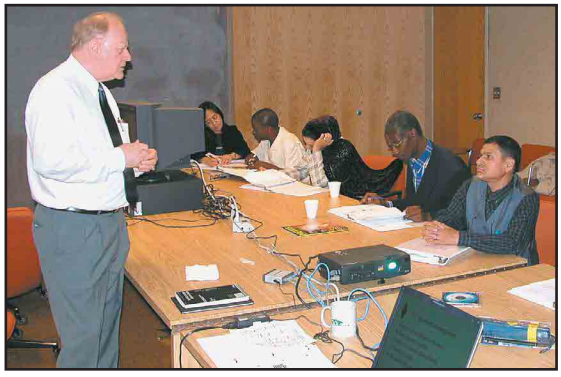
***YOUR* membership at work**

By Steve Ford, WB8IMY, sford@arrl.org

ARRL Hosts International Training Conference

Students from seven nations attended the 2004 United States Telecommunications Training Institute (USTTI) course on Amateur Radio administration. Sessions took place October 18-22 at ARRL Headquarters. Coordinated by USTTI and presented by ARRL Headquarters staff, the program covers—among other topics—the International Telecommunication Union and ITU regulations, the International Amateur Radio Union, spectrum management, emergency communication, digital communication, amateur satellites, electromagnetic interference, international licensing and Amateur Radio testing and licensing in the US.

Teaching the majority of the Amateur Radio Administration Course were ARRL Chief Technology Officer Paul Rinaldo, W4RI, and Technical Relations Specialist Walt Ireland, WB7CSL, of the ARRL Technical Relations Office in Washington, DC, with assistance from other ARRL staff.



Walt Ireland, WB7CSL, conducts a USTTI class session at ARRL Headquarters.

An Enthusiastic Turnout for ARRL New Mexico Section Convention

"The 2004 Duke City Hamfest and ARRL New Mexico Section convention was very successful this year," declared Linda Scott, KC7QXO, president of New Mexico Hamvention, Inc. On August 20-21, more than 900 people gathered at the University of New Mexico Continuing Education building, in Albuquerque. "We take over the whole building with four main areas for vendors inside, a tailgate area and RV parking in the back parking lot, and three classrooms for 12 forums and VE testing."

"What the heck is this?" ARRL Sales and Marketing Manager Dennis Motschenbacher, K7BV (right), asks Bill Wageman, K5MAT, at the New Mexico Section convention. It turned out to be a lamp that can be worn on the head to make emergency antenna repairs in the dark. "Being a plug and play kind of guy, I couldn't turn it off!" Motschenbacher said.

Thirty-six vendors, clubs and organizations from three states filled the four inside areas. On Saturday, along with the free tailgate section, there was a static display area featuring three communications vehicles from Search and Rescue, National Guard and Sandoval County ARES. The event was topped off with a banquet with Dennis Motschenbacher, K7BV, ARRL Sales and Marketing Manager as the featured speaker.

The highlights of the Duke City Hamfest included an ARRL forum paneled by Rocky Mountain Division Director Walt Stinson, WØCP, Vice Director Rev Morton, WS7W, New Mexico Section Manager Bill Weatherford, KM5FT, and Dennis Motschenbacher, K7BV.

East Meets West at Hamfair 2004

Thanks to the generosity of the Japan Amateur Radio League (JARL), ARRL DXCC Manager Bill Moore, NC1L, represented the League at Hamfair 2004 in Tokyo. With an attendance of 27,000 amateurs, Hamfair rivals the Dayton Hamvention in size.

"The opening ceremony was quite lively with music, a talk by JARL President Shozo Hara, JA1AN, and introductions of many VIPs from around the world," Moore said. "DXCC card checking was busy. We checked more than 200 applications over three days."

The trip provided an opportunity to discuss the future of Amateur Radio from Japanese and American perspectives. "I toured JARL Headquarters, JARD (Japanese Amateur Radio Development Association) and *CQ Japan* (the Japanese counterpart to *QST*)," Moore explained. "We share many of the same challenges. They, too, are exploring ways to attract more people into Amateur Radio.

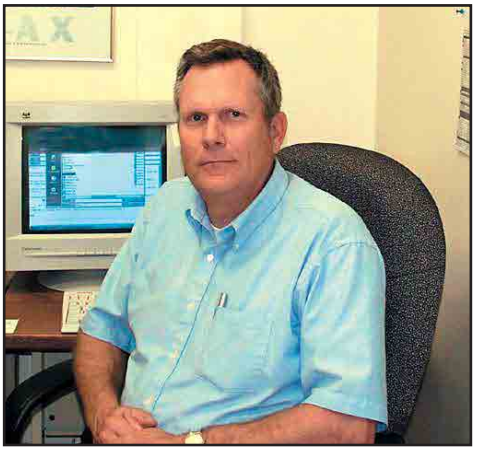
ARRL's Bill Moore, NC1L, with JARL President Shozo Hara, JA1AN, at Hamfair 2004 in Tokyo.

WA8SME Goes to Heaven...Almost

The late John Denver described West Virginia as "almost heaven" in his famous song "Country Roads." ARRL's coordinator of the Amateur Radio Education and Technology program, Mark Spencer, WA8SME, journeyed there for the 46th Annual West Virginia ARRL Section Convention and Hamfest, August 28 and 29 at Jackson's Mill.

Mark didn't meet St Peter, but he did offer two presentations to the enthusiastic attendees. According to Mark, "First was an overview of the program and how to approach local schools to get them involved. The major theme here is that hams need to 'walk the walk as well as talk the talk.' Hams know and articulate the need to get youth involved in Amateur Radio, but few take the initiative to actually do more than talk about it. Second was a concept I have been promoting that involves 'bringing space into the classroom at little or no cost,' using redundant school computers, free software and simple radio equipment to receive weather satellite imagery in the classroom.

"The comments after the talk were very positive and there appeared to be a number of hams who were going to get engaged in their local schools. Most knew of a teacher they were going to approach, and that is exactly what I had hoped would happen. I have found that despite all the things we are trying to do to get wireless technology literacy into our schools, it all comes down to a jazzed teacher and the local club or ham who provides the suggestion, encouragement, and support to make it a reality."

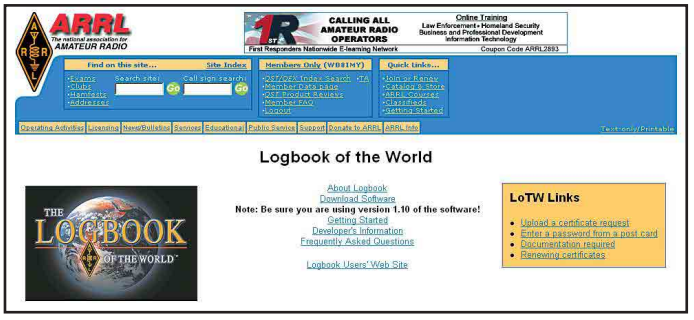


ARRL Amateur Radio Education and Technology Program Coordinator Mark Spencer, WA8SME.

ARRL Logbook of The World Tops 8000 Participants

According to ARRL Membership Services Manager Wayne Mills, N7NG, Logbook of The World has amassed more than 8000 participants. "We're delighted with the response," Mills said. "The Logbook database now holds over *50 million* QSO records. After each contest and major DXpedition, the total takes another big bounce."

Not only are hams uploading their logs to Logbook of The World, they are beginning to redeem their confirmed QSO credits for DXCC awards and endorsements. "We have people who've accumulated quite a few credits and now they're putting them to use," Mills stated. "With hundreds of hams joining Logbook each month, that trend can only go upward." See Logbook of The World on the Web at **www.arrl.org/lotw/**.



The Logbook of The World Web site at **www.arrl.org/lotw/**.

Putting More Fresh Ideas to Paper

"Many members aren't aware that we publish conference proceedings," says ARRL Production Assistant Maty Weinberg, KB1EIB. "It is a service we provide to clubs and organizations. The conference organizers send me the articles and I assemble the books. The League only charges for the printing, and a little extra for my time. For larger conferences, it is an economical way to create an attractive proceedings book to give to the attendees."

In 2004, the ARRL printed books for seven conferences, primarily for VHF/UHF and microwave groups. The average print run is 300 books per conference. "We print extras for the League to sell after the conferences," Weinberg said, "but the authors retain the copyrights to their articles. This means they can send them to other publications, if they wish."

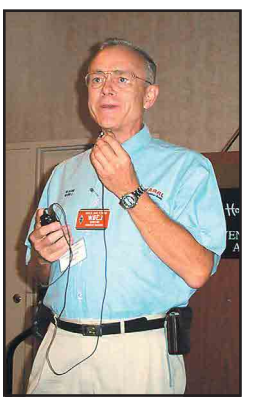
Maty Weinberg, KB1EIB, prepares the 2004 Microwave Update conference proceedings.

Digital Communications Conference a Success

The 2004 Digital Communications Conference, co-sponsored by ARRL and Tucson Amateur Packet Radio (TAPR), drew more than 120 attendees to Des Moines, Iowa in September. Guests were treated to forums on topics as diverse as software-defined radio, the Automatic Position Reporting System and spread spectrum. *QST* Editor Steve Ford, WB8IMY, hosted an introductory session on Voice Over Internet Protocol (VoIP), discussing the popular Echolink and IRLP networks.

TAPR president John Ackerman, N8UR, inaugurated the conference by predicting that "The ideas we discuss this weekend will end up in amateur transceivers a few years from now." ARRL Midwest Division Director Wade Walstrom, WØEJ, took his turn at the microphone to welcome everyone to the conference on behalf of the ARRL.

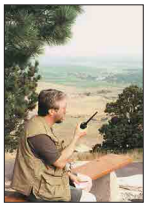
The published 2004 Digital Communications Conference proceedings are available from the ARRL. Go to the ARRLWeb at **www.arrl.org/shop/?item=9329**.



ARRL Midwest Division Director Wade Walstrom, WØEJ, speaks at the 2004 TAPR/ARRL Digital Communications Conference in Des Moines, Iowa.

Guide to ARRL Member Services

ARRL, 225 Main Street, Newington, CT 06111-1494



www.arrl.org/services.html/ **860-594-0200**

Technical and Regulatory Information Services

A wealth of problem-solving information is available to you on the ARRLWeb at **www.arrl.org/tis/**. Can't find the answer there? Call the Technical Information Service at 860-594-0214 from 9 AM to 4 PM Eastern Time, or e-mail **tis@arrl.org**.

Do you have a question about FCC Rules or local antenna restrictions? See the Regulatory Information Branch on the Web, call 860-594-0236 or e-mail **reginfo@arrl.org**.

ARRLWeb www.arrl.org

Log on for news, information and ARRL services. Members have access to special ARRL Web site features. Place free classified ads. Download and view *QST* product reviews and search the on-line periodicals index.

ARRL E-mail Forwarding

Life in cyberspace is easier when you have your own **arrl.net** e-mail address. When you switch Internet Service Providers, all you have to do is let us know and we'll change your e-mail forwarding automatically. You're spared the hassle of having to tell everyone that you've changed addresses! Sign up on the Web at **www.arrl.org/members-only/emailfwd.html**.

ARRL News

The ARRL News service is the most credible source of news for the amateur community. Breaking stories are available on the ARRLWeb. You can also listen to ARRL Audio News on the Web, or by telephone at 860-594-0384. Have a news tip? E-mail **n1rl@arrl.org**.

QSL Service

The most economical way to send and receive QSL cards throughout the world is through the ARRL QSL Service.

Insurance

The ARRL "All Risk" Ham Radio Equipment Insurance Plan provides protection from loss or damage to your amateur station and mobile equipment by theft, accident, fire, flood, tornado and other natural disasters. Antennas, rotators and towers can be insured too. Call 860-594-0211.

Books, Software and Operating Resources

You can rely on ARRL for the very best publications and products: license manuals, circuit design and project resources, antenna construction ideas, and more. Shop online or locate a dealer near you at **www.arrl.org/shop**. What's the secret for making great publications even better?**—We listen to you!** E-mail your publications feedback, suggestions and product ideas to **pubsfdbk@arrl.org**.

DXCC/VUCC

The DX Century Club and VHF/UHF Century Club award programs are among the most popular Amateur Radio awards in the world.

Volunteer Examiner Coordinator (VEC)

Are you looking for a place to take your license exam? Do you have questions about the examination process? The ARRL VEC network is the largest in the nation.

FCC License Renewal/Modifications Service

At just over 90 days before license expiration, ARRL sends FCC-license renewal notices to ARRL members reminding them to renew. ARRL will also handle duplicate license requests, as well as address or other license changes (upon receipt of a completed and signed Form 605) as a free members-only service.

Educational Materials

A complete line of educational materials are available to schools, clubs and individuals.

Trust in Advertising

ARRL's advertising acceptance process is a unique and respected service provided to both members and advertisers. The ARRL Lab regularly evaluates products for acceptable construction quality, safety, compliance with FCC requirements and performance claims. Members rely on *QST* and other ARRL publications to locate reputable suppliers of Amateur Radio equipment and services.

ARRL Foundation

This is your source for scholarships and other financial grant programs to support Amateur Radio. See **www.arrl.org/arrlf/** on the Web or call 860-594-0397.

Write for *QST*

We're always looking for articles of interest to amateurs. See our Author's Guide at **www.arrl.org/qst/aguide/**. If you have questions, or wish to submit an article for consideration, send an e-mail to **qst@arrl.org** or simply mail your article to *QST* c/o ARRL Hq.

Interested in Becoming a Ham?

Phone toll free 1-800-326-3942, or e-mail **newham@arrl.org**. We'll provide helpful advice on obtaining an Amateur Radio license. See **www.arrl.org/hamradio.html**.

We're at *your* Service

ARRL Headquarters is open from 8 AM to 5 PM Eastern Time, Monday through Friday, except holidays. Call **toll free** to join the ARRL or order ARRL products: **1-888-277-5289** (US), Monday-Friday only, 8 AM to 8 PM Eastern Time. From outside the US, call 860-594-0355. The fax number is 860-594-0303 (24 hours a day, 7 days a week).

If you're in Connecticut, stop by ARRL Headquarters for a visit and tour. Located at 225 Main St, Newington, CT 06111, HQ offers tours at 9, 10 and 11 AM, and 1, 2 and 3 PM Monday through Friday, except holidays. Bring your license and operate W1AW anytime between 10 AM and noon, and 1 to 3:45 PM.

If you have a question, try one of these ARRL Headquarters departments . . .

	Contact	*Telephone*	*Electronic Mail*
Joining ARRL	Membership Desk	860-594-0338	**membership@arrl.org**
***QST* Delivery**	Circulation Desk	860-594-0338	**circulation@arrl.org**
Permission Requests	Maty Weinberg	860-594-0229	**permission@arrl.org**
Publication Orders	Sales Desk	860-594-0355	**pubsales@arrl.org**
Amateur Radio News	Rick Lindquist	860-594-0222	**n1rl@arrl.org**
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Hamfests	Gail Iannone	860-594-0262	**hamfests@arrl.org**
Write for QST	Joel Kleinman	860-594-0273	**qst@arrl.org**

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send mail to Martin Cook, QSL Service Manager, use **n1foc@arrl.org** or **mcook@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

ARRL Division Directors

As an ARRL member, you elect the directors and vice directors 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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(405-483-5632); **n5ok@arrl.org**

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(956-425-3128); **k5rav@arrl.org**

ARRL Section Managers

The 15 divisions of ARRL are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists).Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. Visit your section page on the Web at **www.arrl.org/sections/**.

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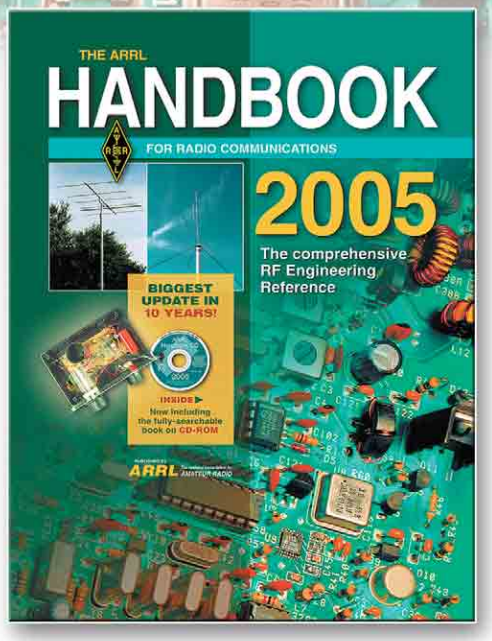

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COURTESY KØNNN

While many of us in northern latitudes would choose to stay close to the fireplace (and the oven) on Christmas Day, Zed Freeman, KØNNN, operating as KØAAA, enjoyed a recent December 25 on Lake Movil near Bemidji, Minnesota. Zed managed to test a brand new fish house and auger, catch his limit of walleye—and make more than 50 contacts on 10 meter SSB (with 20 W to a Yo-Yo-Tenna).

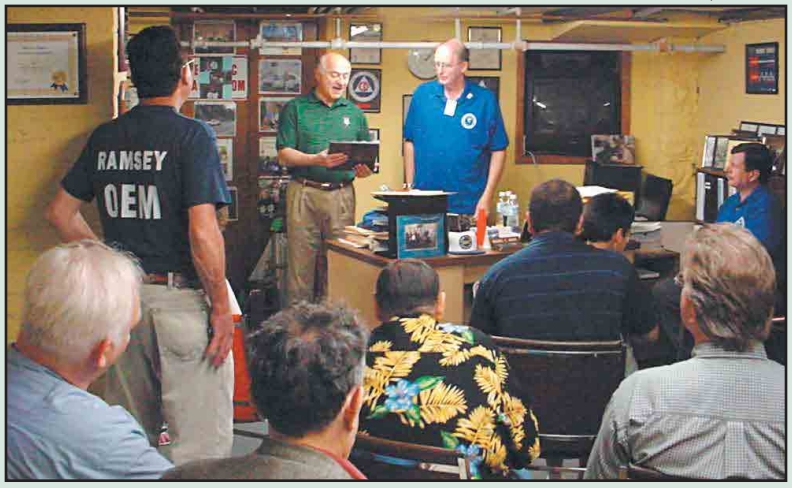
BILL MAYERS, KG2DI

When Sgt Mark Saikkonen, KB2RNA, of the 170th Military Police Company, left for Iraq last year, his mother and stepdad didn't have an oak tree, so they tied a yellow ribbon around the next best thing. The photo shows Mark with his wife Angi and mom Carol Mayers, KB2RMZ, upon his return home to Lakeport, New York, this past spring. Sgt Saikkonen is now deployed in Japan.

Field Day 2004

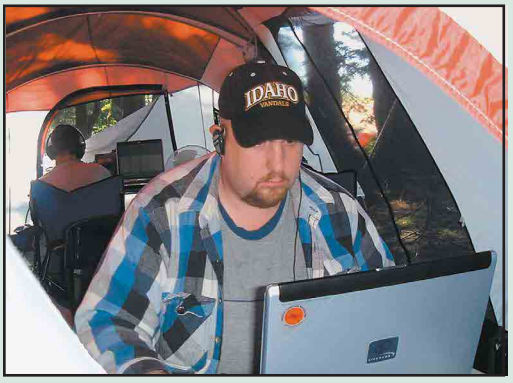
The antennas have been stored, the logs uploaded—and the numbers crunched. You can find the results of another smashing Field Day in the article that begins on page 88. An expanded Soapbox with lots of photos is on the ARRLWeb, **www.arrl.org/contests/soapbox/**.

COURTESY MICHAEL ADAMS, WA2MWT



Ramsey, New Jersey, Mayor Richard Muti proclaimed June 26-27 "ARRL Annual Field Day Weekend" in the Borough of Ramsey at the Emergency Operations Center, where the Metroplex ARC operated a 4F station in cooperation with the Ramsey Office of Emergency Management. In the photo, Mayor Muti reads the proclamation and then hands it to OEM Coordinator Michael Adams, WA2MWT. Wearing an OEM T-shirt to the left is John Acovino, KB2VVO, MARC vice president. Seated with an OEM shirt to the right is Bruce Greenwood, KB2UJN, deputy OEM coordinator.—*Michael Adams, WA2MWT*

COURTESY GREGORY CLIFFORD, KO7C



Aaron Parker, KC7RSO, operating HF from Moscow Mountain for University of Idaho's club station W7UQ during Field Day 2004.

COURTESY JOHN A. GARCIA, K6ZQN

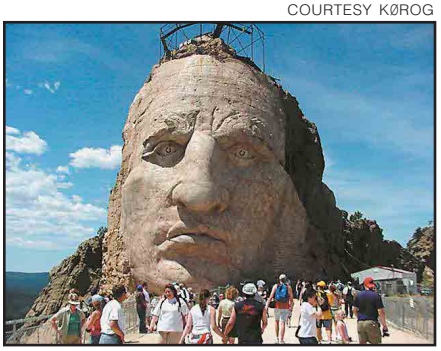
At the Tri-County ARA's site in Frank Bonelli Regional Park in San Dimas, California, Cliff Guice, KG6MIG, and his son Kevin, KG6MIH, conduct a Boy Scout Net on 2 meters during FD Saturday as John Montanaro, N6JSM takes notes.

GALEN SHUBERT, KØKS

Bit bucket aids HSMM experiment: **Unlike most of us, Galen Shubert, KØKS, of Olathe, Kansas, enjoys experimenting with high speed multimedia communications. He writes: "The 'Bit-Bucket' is a 3 gallon plastic bucket with half the interior covered with aluminum foil and the D-Link DI-514 ($20) wireless router mounted at the focus. This is mounted with duct tape at 70 feet on my tower with ac power and Ethernet feed (see photos). The mobile unit is a D-Link DWL-120+ USB adapter mounted at the focus of a parabola made from flashing aluminum stapled to a plywood base. USB has severe limits for cable length, which makes it impractical to mount the adapter at any height. This is a cheap experiment, since the wireless LAN was in use around the house anyway."**

Up Crazy Horse Mountain: To take part in a Volksmarch, a family-oriented and noncompetitive event that originated in Europe, you simply join other walkers on a 10 km jaunt. One of the best known takes place in South Dakota up Crazy Horse Mountain—to the immense carving of Oglala leader Crazy Horse and out on the unfinished arm. The 6.2 mile round trip hike is held annually at this location—the only time during the year when the general public is allowed on the mountain. This year, just over 10,000 made the trek during the two-day event and claimed their medallions for the effort.—*Roger Kehm, KØROG, SD Public Information Coordinator, Sioux Falls, South Dakota*

COURTESY KØROG



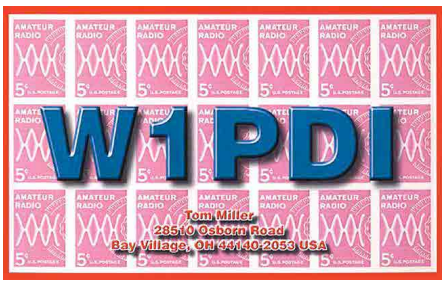
Thirteen hams, some of whom were QCWA members, supported this year's Volksmarch up Crazy Horse Mountain by providing 2 meter communications at the start, top, at four aid stations along the way and on two service vehicles.

DALE CLARK, WØCFQ

Look out—they're here! **When Dale Clark, WØCFQ, of Wellsville, Kansas, spotted this truck at a Missouri rest stop while en route to the Dayton Hamvention, he and the two hams traveling with him immediately went QRT—just in case!**

JASON GODFREY, NØRPM

This enthusiastic communicator was among the Girl Scouts on the air this past summer from special event station KØS during the Minnesota Dreams Jamboree. The special event station, controlled by 18-year-old Jean Arimond, KCØSAN, consisted of a multitude of radios, allowing the girls to get acquainted with repeaters, PSK31, CW and HF. About 150 Girl Scouts signed up. As ARRL Dakota Division Vice Director Twila Greenheck, NØJPH, reported: "With over 100 tantalizing exhibits to compete with, we felt good to get that many girls choosing to learn about Amateur Radio."



December 15 marks the 40th anniversary of the issuance of the US postage stamp honoring Amateur Radio operators. To commemorate the event, Tom Miller, W1PDI, of Bay Village, Ohio, has been using this special QSL all year. He was moved to use the design after coming across a block of the stamps in his father's January 1965 issue of *QST*. John Miller, who also held W1PDI, became a Silent Key in 2002.

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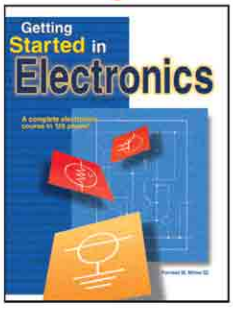

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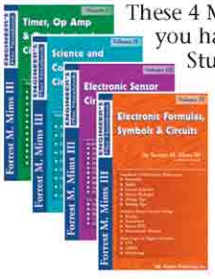

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NEVER MORE PROUD

♦ I am proud to be an Amateur Radio operator! During hurricane Frances, the Hurricane Watch Net (HWN) performed like the true professionals that they are, gathering real-time weather reports from Amateur Radio volunteers located in the communities dramatically impacted by that massive hurricane.

This group of volunteers relayed this vital information to the National Hurricane Center and also provided the latest weather information to these affected areas. Simultaneously, the Maritime Mobile Service Net (MMSN), the Salvation Army Team Emergency Radio Net (SATERN) and myriad other Amateur Radio nets worked tirelessly for days passing critical information as well as health and welfare messages in and out of these communities. While I could not monitor the local operations in the hurricane's path, I am sure that the same spirit prevailed in those venues as well. Listening to these networks in operation, I have never been more proud of Amateur Radio.

One of the impressive aspects of Amateur Radio is the courtesy that amateurs show each other, especially in times of emergency. I was impressed by the respect and cooperation that Amateur Radio operators gave to the various network control operators. Believe me, we all wanted to jump in and help, but everyone knows that too much "help" can create confusion and chaos. What I heard was a community of concerned people working together to maintain order, help when it was needed, and standing by quietly to allow the communications to flow effectively! My hat is off to the radio amateurs throughout the world who made it all possible.

Like every one else, I was amazed to hear a few stations intentionally interfering with the emergency communications. While there were a very small number of operators intentionally interfering, for the most part I believe the interference was unintentional. One source of unintentional interference came from stations operating too close to the network operating frequencies. Yet, once these amateurs were told that they were causing interference to the networks, they quickly moved. It is a beautiful sight to see amateurs cooperating with each other, especially in times such as that.

As for the intentional interferers, I would ask these few (and there were very few) individuals to consider for a moment how they would like others to behave if their loved ones were in danger? Would they want others to have more respect for the efforts of these volunteers? Would they be disappointed when someone interfered with communications critical to them or their loved ones? These people can only hope that others will not do the same thing when it's their turn to depend on an Amateur Radio to help them or their loved ones.

Today, Amateur Radio must deal with many problems and encroachments from outside our community that threaten its future, such as the constant desire of commercial interests for more bandwidth. I hope we can remain cohesive as a community and continue to promote the ideals upon which Amateur Radio has been based. And I hope that each of us will continue to demonstrate a spirit of caring, helpfulness and courtesy for each other on and off the bands.

I am proud of Amateur Radio!—*Keith Cheney, NØVYG, Austin, Texas*

THE NEW ARRL *HANDBOOK*

♦ Please accept my congratulations on the best *Handbook* ever! I was thrilled to see simple, interesting projects for nontechnical people like me. There are at least four must-build projects in there for this winter!—*Norman Osborne, AA7NP, Las Cruces, New Mexico*

♦ Just wanted you to know how much I am enjoying the new 2005 *Handbook* and the replica debut *QST*. Congratulations on a really super *Handbook* revision—I'm sure I'll have all the content absorbed and mastered shortly!

I also wanted to compliment you on the consistently interesting and readable issues of *QST*. It's always a delight to walk to the road, open the mailbox and see a new issue waiting there. From there it's just like sitting down to buffet meal of my favorite foods!—*Larry Kozal, K8PUJ, Grand Rapids, Michigan*

ON THE MOVE

♦ I just wanted to express my thanks and that of my fellow hams in Northern California for the great team of representatives that the ARRL sent to Pacificon. What a great bunch of people! These folks were knowledgeable, friendly and intellectually engaging. It is very apparent that the ARRL is on the move and leading the way in emergency communications as never before, and while we all hope the skills, equipment, systems and procedures never need to be used as the result of a war or terrorist event, we are all proud of the work the ARRL is doing to prepare Amateur Radio operators to respond to the needs of our communities, nation and world.—*Len Umina, WT6G, El Dorado Hills, California*

ANOTHER USE FOR OLD *QST*s

♦ One of the letters in the November issue gave some wonderful ideas about old copies of *QST* that accumulate around the ham shack. Since starting Technician classes in town, I have another use for copies of *QST*. I collect older copies and make them available to participants at our classes. Those magazines fly off the table! It's a great way to promote the interest that our class participants already have in Amateur Radio. I'm glad to see others are making good use of their old copies of *QST* as well.—*Jeff Crabill, KK7LU, Salem, Oregon*

TOWER SAFETY

♦ I did not like the picture in October 2004 *QST*, top left page 52. I'm now surprised that it reappears in November *QST*, top left page 112. This photo shows an extremely unsafe tower operation—no apparent safety belts, no hard hats or gloves, three people. I hate to see unsafe practices such as this, especially highlighted!

Tower work is one of my interests in Amateur Radio. I do a lot of tower work as a hobby and feel that safety has to be top priority! We have heard of many amateurs getting hurt and killed on tower projects. Last year three professional tower crewmen were killed on a commercial TV tower that collapsed here in Huntsville.—*Greg Sarratt, W4OZK, Alabama Section Manager, Harvest, Alabama*

♦ I am looking at the photo on page 52 in amazement. Good thing they were near a hospital. First, three people is a lot to have on Rohn 25 type tower. Second, none

of the three appears to be wearing any approved type of climbing/fall arrest gear. In fact, one appears to have *no* safety equipment, and the other two look to be using common straps, rather any type of safety belts or harnesses. Third, they are using a DB type antenna standoff mount kit, but they are using the top standoff (stabilizer) bracket to extend the antenna farther out from the actual mount. Glad none of this is happening on any sites I work on. Too bad to see this, considering the number of hams regularly maimed or killed in tower climbing accidents. —*Mark Krotz, N7MK, Mesa, Arizona*

AN HONOR

♦ I'm writing to express my appreciation for your license application processing service. Having never renewed my license before, I was unaware that ARRL provided such a service. Imagine my surprise and delight when I opened your letter and found renewal paperwork practically filled out and ready for my signature!

I work at a company that specializes in call center operations. We take customer service seriously. We're constantly looking at ways to enhance our existing service. Because I take customer service so seriously in my daily work, I appreciate organizations that go out of their way to do a little extra for their customers. ARRL has certainly demonstrated that it is one of *those* organizations.

Thank you for all that you do to foster an appreciation for radio communications. It is an honor to be associated with such good people.—*Michael Forinash, KBØRIA, Sioux Falls, South Dakota*

TO AMP OR NOT TO AMP?

♦ I don't need 1 kW to work DX! Many amateurs, including newcomers, buy big antennas and kW-class amplifiers with the hope of getting high scores in contests and reach DX stations more easily.

This is not the best way "to learn the job." For personal reasons, I sold my linear amplifier, some verticals, magnetic loop and wire antennas, and kept only one, my 40 meter long classic Windom.

For a while I continue to work barefoot, 100 W PEP, with these two little pistols.

Thanks to the quasi omnidirectional radiation pattern of the Windom, from Belgium I was able to work almost at first call North America (VE, K), South America (HK, YV, PY), Middle East (9K, A4, A9, YI), Asia (4S, JA) and many VK stations, and more than once just before the pileup begins (A9, YI, JA). Imagine my satisfaction!

A good off-center-fed dipole, a good ear, some experience on the bands and a good receiver will be sufficient for a long time to work DX stations and even some pileups.—*Thierry Lombry, ON4SKY*

SMALL LOGS—BIG REWARDS

♦ I can't emphasize enough the importance of sending in a log after any contest effort, be it large or small. These days, with computer logging and e-mail, a log submission is as simple as a mouse click. You can submit your log before you shut down the rig for the night.

Why am I such an advocate of sending in a log? A while back I had a few hours to spare and sat in on the Phone version of the 2003 ARRL DX Contest. I had planned to do nothing more than try to catch a few new countries for my DXCC totals. Since I run QRP, I like to take advantage of that mysterious 3 dB gain your signal gets when big gun stations are looking for contacts. I had enough time to make 71 contacts and I did add a few new countries to my list. Not a big effort, but since it was so easy to generate a log I sent it in a few minutes after the contest was over.

A few months later, long after I had forgotten about the contest, I found a big envelope in my mailbox. When I opened it I was surprised to find a certificate for First Place Single Operator—QRP—Wisconsin section. It seems that no other QRP operator in Wisconsin sent in a log. That award is proudly hanging in the shack.

So for the 2004 DXCC Phone contest I felt a need to defend my title. It was another effort where the operating time was broken up by chores and visitors. I picked up a few new countries with my 55 contacts. I wonder how I did. I'll be watching the mailbox.—*Brian Cieslak, K9WIS, Waterford, Wisconsin*

THE OTHER MAGIC BAND—12 METERS

♦ 12 meters seems to be a forgotten band. I am a member of a group of US hams that meets daily on 17 meters, then QSYs to 12 and 10 to check propagation. Three times in the last week there has been good propagation to other members of the group on 12 meters. My straw poll results are that if a path is present, signals are S6-9. If not, then nothing!

Active paths vary—I reached Iowa one day, North Carolina another day, from San Diego. On "active" days, I call and listen—but no one else is around. So this is an excuse for those of you with digital voice recorders to give them a workout, and stimulate some activity on the 12 meter band.—*Rod Adkins, WI6M, San Diego, California* QST

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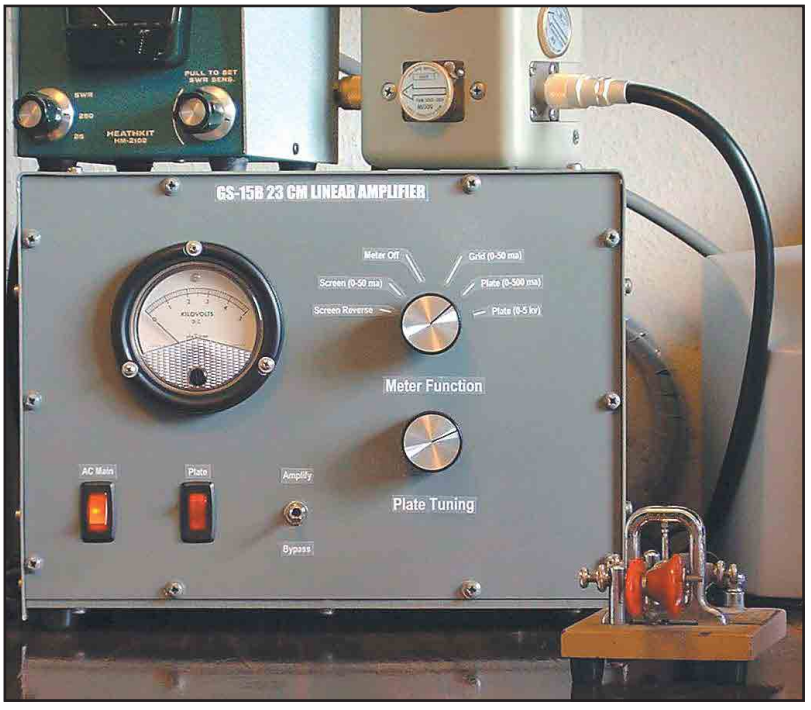
By Jim Klitzing, W6PQL

A Water Cooled Amplifier for 23 cm

The Russian GS-15B tetrode may not put a full gallon in your shack, but how about a quart and a half? This 400 W amp is a compact, desktop package.



At the core of this 23 cm amplifier is a Russian tetrode, the GS 15B, modified for water-cooling as shown in Figure 1. This tube is modern, rugged, inexpensive and plentiful at the time of this writing. Prior to the appearance of the GS-15B, most power amplifiers on 23 cm were using the venerable 2C39/7289, pressing the envelope of performance to the breaking point. Amplifiers made with them almost always suffered from thermal drift above 150 W and the tubes have become scarce. Solid-state amps are expensive and most are limited to less than 100 W.

The GS-15B works well in a quarter-wave cavity, such as the one that was designed and built by Mats Bengtsson, KD5FZX. Complete information on this cavity, including plans on how to build it, can be viewed on the Internet at the Web site of Paul Goble, ND2X (**www.nd2x.net/kd5fzx-gs15s.html**).

You can construct the cavity yourself if you have a lathe and a mill. Fortunately for those of us without such tools, an assembled and tested cavity complete with a spare tube can be obtained at a reasonable price by contacting KD5FZX at **mgbpcs@swbell.net**.

Building the Amplifier

This article gives an overview of the design and operation of the amplifier. The complete construction details, including numerous detail photos, can be found on the ARRLWeb.[1] The details include the TR switch, relay sequencer and all other controls necessary to operate the amplifier safely and reliably. The Web site also provides a set of operating guidelines and instructions. The complete schematic is downloadable as a PDF document.[2]

Why Water Cooling?

Well, why not? Here are some good reasons: Fans are noisy and water cooling is quiet and very efficient. At this power level, the tube needs a superior cooling method for thermal stability. Water-cooling is safe, easy and clean if you do it correctly.

You'll need a flow rate of around half-gallon per minute, easily achieved with a small submersible fountain pump from your local hardware store or nursery. Use distilled water. The 4.5 gallon water tank and pump are shown in Figure 2. Quarter inch ID vinyl tubing brings the water to and from the RF deck. After an hour or so of making long transmissions, the temperature of the 3 gallon reservoir will elevate about 10°F, not enough to affect tuning.

I did plan to do a more elegant system later; the power supply chassis is oversized to house a copper heat exchanger, pump and reservoir. However, the present system is so easy to service and is working so well that I'll probably never get around to changing things.

Power Supply Circuit

The "grounded screen" may be a bit confusing to those of us used to using a tetrode in the more conventional manner, with the cathode at chassis potential. Due to the design of this cavity, the screen is indeed at "ground" for RF. For dc, it can be more precisely described as being connected directly to the chassis and at a potential of +350 V with respect to the cathode. It is the cathode that floats below chassis potential at –350 V. This requires a change from traditional thinking in the design of the power supply.

Figure 3 shows the power supply circuitry required to operate the tube. The Variac transformer isn't needed unless the

[1]Notes appear on page 32.

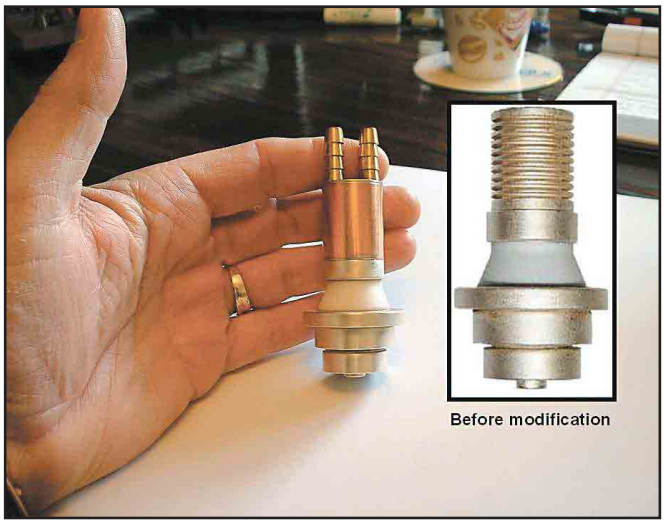


Figure 1—The Russian GS-15B tetrode is modified for water cooling by attaching a watertight sleeve around the anode cooling fins.

Figure 2—A small reservoir of water and submersible pump are all that is required to provide cooling for the GS-15B. The amplifier power supply is directly below the container. Be sure to keep the water system safely away from any power sources.

HV transformer is out of range, or you wish to experiment with different anode supply voltages. As you can see, even though the dc voltages are described in reference to the chassis potential, no connections are made to the chassis in the power supply; that happens in the RF deck. The full schematic on the ARRLWeb shows all of the necessary power circuitry needed for the complete amplifier.

I used power transformers I had on hand; if you have something that has all of the necessary windings on one unit, so much the better. My particular plate transformer and rectifier stack produced a little more than the recommended voltage (about 2 kV under load), but I did not find this to be a problem; I just reduced the idling current a bit, and all was well.

Normal operating voltages (referenced to the cathode) are:

Anode: +1600-1800 V dc @ 350 mA
Screen: +350 V dc @ 1 mA
Grid: –30 V dc @ 5-20 mA
Filament: 5.5-5.8 V ac @ 2 A

Note that the screen voltage is derived from the half-voltage point of the voltage doubler, eliminating the need for a separate screen supply. The Zener diode connected across the screen supply regulates the screen voltage and provides clamping protection for reverse screen current as described in the operating instructions. Any shunt regulator circuit would work well here (active or passive), but I found this to be the simplest way to satisfy the circuit requirements. I didn't have a 350 V Zener handy, so I used a series of 1 W diodes—10 at 33 V and one at 20 V.

Figure 4 shows the schematic for the low voltage supplies for the control circuits and antenna relays. I needed 28 V at 700 mA for relays, and 12 V at <500 mA for the sequencer and fans. I used a 25.2 V @ 2 A filament transformer, a full-wave bridge, and an LM317 regulator IC for the 28 V supply, which feeds a simple 7812 regulator for 12 V. If you will be using only 12 V relays, you can use a 14-16 V transformer, eliminate the LM317 circuit, and obtain 12 V from the 7812. I dislike noisy fans, so I used a simple speed control circuit to run the computer-type muffin fan at half speed. It's a lot quieter, yet it moves enough air to keep the entire power supply cool.

The chassis for the power supply was designed so that a sheet metal bending brake was not required; just one way of doing things if such a tool is not available. Dimensions for the power supply chassis are not critical; just make it large enough to house all of the components. Mine measures $8\frac{1}{2}$×12×19 inches (HDW). All of the pieces for the top, bottom and sides were cut from 0.060 inch aluminum sheet and connected with 0.375 inch square aluminum bar stock, drilled and tapped for 8/32 machine screws.

The connectors on the power supply (a separate unit from the RF deck) are female and the ones on the RF deck male. The ac power switches are in the RF deck, providing additional safety. Despite all of these precautions, under no circumstances should the interconnect cables be connected or disconnected while main ac power is on. Be safe!

The RF Deck

I made the RF deck chassis 12×12×8.5 inches high, using the same method of construction as the power supply with one exception: the sides and top are a one piece U-shaped hood instead of flat panels. It looked a bit nicer that way, and all pieces were painted with good quality spray enamel.

Safety First!

Remember that lethal voltages are present in this amplifier. Take extreme care when tuning or adjusting the cavity while in operation. *The ARRL Handbook* contains a section on working with high voltages. Some excerpts:

- If at all possible, troubleshoot with an ohmmeter.
- Keep a fair distance from energized circuits.
- If you need to measure the voltage of a circuit, install the voltmeter with the power safely off, back up and only then energize the circuit. Remove the power before disconnecting the meter.
- If you are building equipment that has hinged or easily removable covers that could expose someone to an energized circuit, install interlock switches that safely remove power in the event that the enclosure was opened with the power still on.
- Never assume that a circuit is at zero potential even if the power is switched off and the power cable disconnected.
- If you must hold a probe to take a measurement, always keep one hand in your pocket.

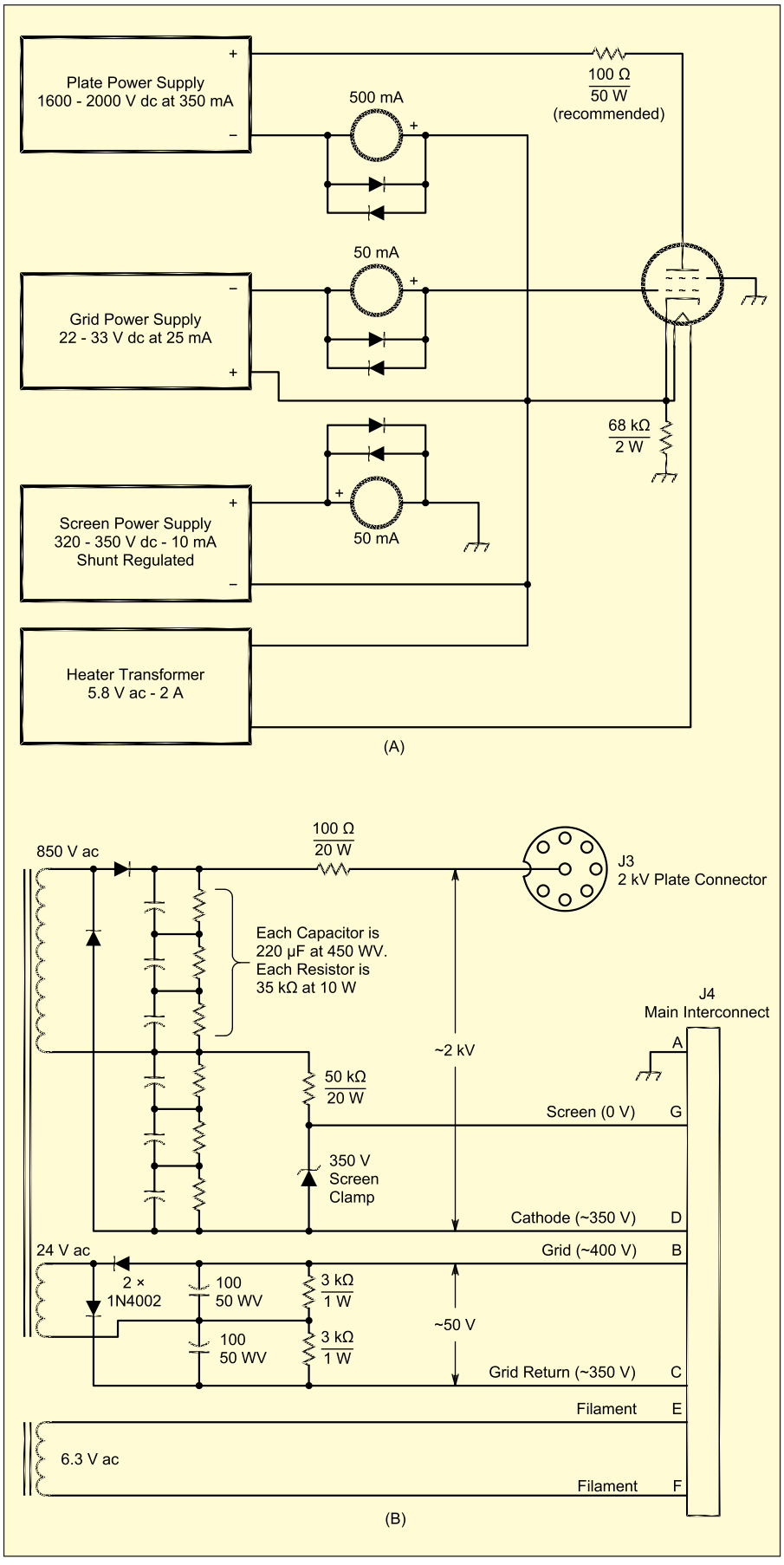


Figure 3—The power supply has four major sections to supply the plate, grid, screen, and heater. The screen is grounded, an unusual configuration, and the cathode is maintained at approximately –350 V dc. All chassis connections are made in the RF deck.

Metering and Bias

Figure 5 shows the circuit that regulates the grid bias—a simple Zener/Darlington combination. [Some components mentioned in the text appear in the detailed schematic available on the ARRLWeb. —*Ed.*] The load resistor (600 Ω @ 4 W) must draw at least enough current from the bias supply to at least equal maximum grid current (20 mA or so at 30 V bias). This particular resistor draws 50 mA. The tube is cut off during standby with a 35 kΩ cathode resistor, which is bypassed by the cutoff relay during transmit. The 10 kΩ bias adjust control sets the idle current for the tube.

Metering shunts in the screen and grid circuits develop about 250 mV for full-scale deflection. Variable resistors are employed to calibrate the various meter ranges. The only exception is a high voltage metering resistor; this is actually five 1 MΩ 1% resistors in series, providing a full-scale deflection at 5 kV.

A number of low-value 2 W resistors are placed in series with the filament supply. These can be switched in or out of the circuit with jumpers to set the minimum filament voltage required for proper emission. This helps extend tube life by minimizing the effects of cathode back-heating.

A 50 kΩ, 20 W resistor is connected between the cathode and screen to eliminate the possibility of the tube generating self-supplied screen voltage, should the connection to the screen supply and clamp fail.

Relay Sequencing

A sequencer circuit protects those expensive RF relays from damage by operating the relays in order, allowing the contacts enough time to close and be ready for all that RF coming their way. It happens like this:

- Key down, antenna relays close first, 100 ms later the cutoff relay turns on the tube, 100 ms later the transverter is keyed. If you are not using a transverter, you need not use this last connection.
- Key up, the transverter is released, 100 ms later the cutoff relay cuts off the tube, 100 ms later the antenna relays are released.

Do not change amplify/bypass switch setting while transmitting, as this will defeat the sequencing.

Antenna Relays

I rebuilt a couple of used Microwave Associates relays for the antenna switch seen in Figure 6. They have extremely low loss, switch over quickly, and can withstand the power levels developed by the amplifier. Similar units are available

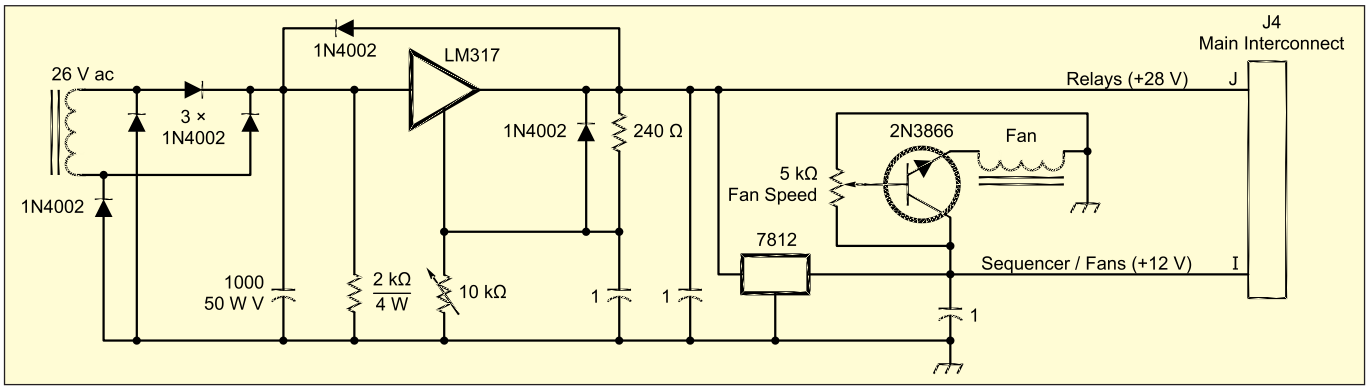


Figure 4—A low voltage transformer is used to generate the necessary voltages for the relays and control circuits.

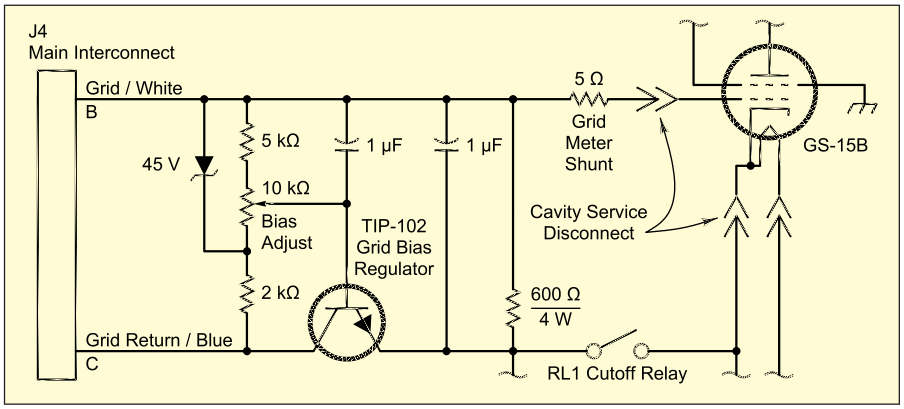


Figure 5—The bias regulator circuit for the grid of the amplifier.

Figure 6—Commercial relays were rebuilt and used for antenna switching.

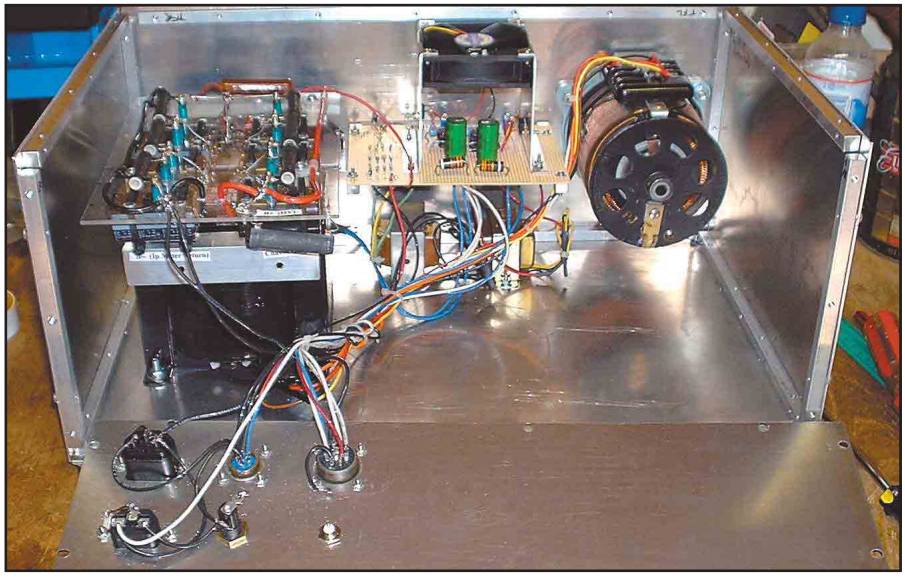


Figure 7—The general layout and wiring of the power supply.

from a number of sources. New ones sell for around $100 each at the time of this writing, so if you have them already, or can trade for them, you can save a bundle here. The mounting brackets are made from 0.060 aluminum scraps.

Tune-up

Mats recommended the following tune-up procedure. He did such a good job of tuning the cavity before sending it to me, I found that the only adjustments I needed to make were to peak the cathode and anode tuners. I did not experience large variations relating to reverse screen current, but the caution is certainly valid.

Naturally, if you experiment a bit and change the plate voltage, you'll need to reset the idling current (I set mine at 50 mA) and re-peak the anode tuner, which is why it's a good idea to have a front panel control for it. The cathode tuner can be set and forgotten unless the tube is replaced.

- Set idle current for 60-80 mA
- Monitor screen current. If the screen current goes more than 4-5 mA negative during tune-up, then stop immediately and turn the plate tuner slightly CCW before continuing.
- Apply 3-4 W drive to the input.
- Adjust input and output tuners for maximum power.
- Increase power 2-3 W at a time and repeat step 4 until 10-12 W drive is reached.
- Turn the plate tuner CCW until the output power drops 10-20 W to prevent negative screen current.
- Loosen the hose clamp for the input coupler.
- Apply drive and adjust the coupler depth and input tuner alternately for best

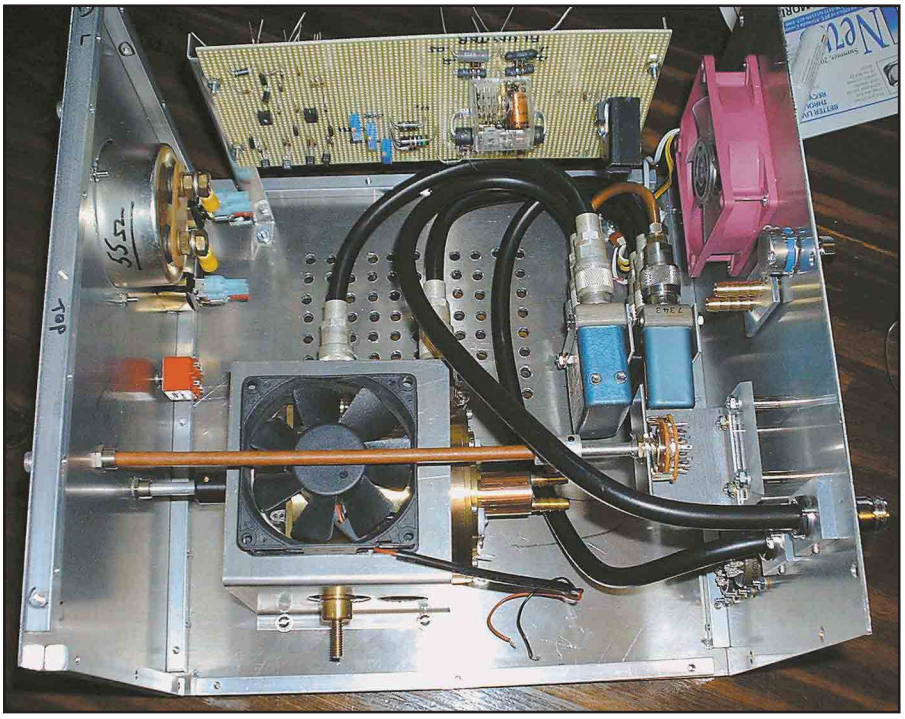


Figure 8—Taken prior to completing the high-voltage and control wiring, this photo shows the layout of the cavity, RF cables and all major assemblies in the RF deck.

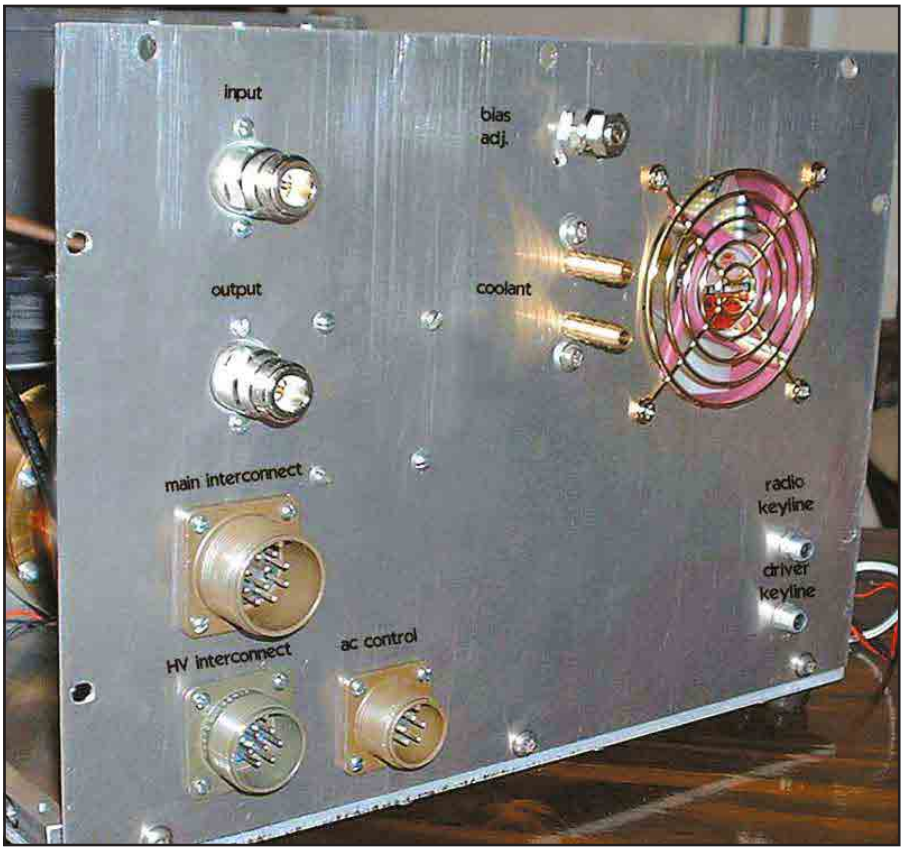


Figure 9—The uncluttered rear panel provides easy access to all connections. Note the use of male power connectors for safety and different styles to prevent connection errors.

input SWR.

- Tighten the hose clamp. Input tuning is completed.
- Loosen the hose clamp for the output coupler.
- Apply drive and alternately rotate the output coupler in small steps and tune the plate tuner until max output is reached. Monitor the screen current while doing this adjustment.
- Tighten the hose clamp. Loading tuning is completed
- Turn the plate tuner counterclockwise until power drops 10-20 W to prevent negative screen current.
- Leave carrier on for 1 minute or more to reach a stable temperature.
- Monitor screen current and turn plate tuner clockwise until you see a 1-2 mA current decrease. This should be about 10 W below maximum output.

Tune-up is completed.

As long as all voltages remain the same, you will not need to touch the tuning again. The screen current and output power is the only thing you need to watch during tuning. If you turn the plate tuner too far CW, then the screen current will go drastically negative, which could harm the tube and your screen stabilizer circuit.

The Completed Amplifier

Figures 7 and 8 show the general layouts of the power supply and RF deck. Figure 9 shows the rear panel of the amplifier with all electrical and coolant connectors. The amplifier delivers more than 300 W with 10 W of drive. At this power level it is free of thermal drift in all modes. I often drive it with 15 W to over 400 W output in SSB and CW service where the duty cycle is lower, also without thermal drift. It is stable and robust, and tunes very smoothly.

Notes

[1]A detailed schematic diagram and other resources can be found at **www.arrl.org/files/qst-binaries/23cm_amp.zip**.

[2]See Note 1.

[3]RadioShack part no. 273-1512.

[4]Tohtsu relays are available at RF Parts (**www.rfparts.com/coaxial.html**).

Jim Klitzing, W6PQL, was first licensed in 1964 as WB6MYC. He has been a metrologist for both the US Air Force and Hewlett-Packard Co, and has designed, manufactured and sold a line of solid state VHF/UHF linear amplifiers. He is currently engineering services manager for Agilent Laboratories in Palo Alto, California. You can reach the author at 38105 Paseo Padre Ct, Fremont, CA 94536; **qrz@w6pql.com**.

By L. B. Cebik, W4RNL

Building a Medium-Gain, Wide-Band, 2 Meter Yagi

Raid your local hardware store and build this transportable VHF Yagi. Easily duplicated using common materials, it's inexpensive—and ideal for Field Day or emergency use.

Practical Yagis for the 2 meter band abound. What makes this one a bit different is the selection of materials. The elements are high-grade aluminum. The boom, however, is PVC, and there are only two #6 nut/bolt sets and two #8 sheet metal screws in the entire antenna. The remaining fasteners are all hitch-pin clips. The result is a very durable 6 element Yagi that you can disassemble easily for transport.

The Basic Antenna Design

Every antenna begins with a basic design. The 6 element Yagi presented here is a derivative of the "optimized wide-band antenna" (OWA) designs developed for HF use by NW3Z and WA4FET.[1] Figure 1 shows the general outline. The reflector and first director largely set the impedance. The next two directors contribute to setting the operating bandwidth. The final director (director 4) sets the gain. This account is oversimplified, since every element plays a role in every facet of Yagi performance. The notes, however, give some idea of which elements are most sensitive in adjusting the performance figures.

Designed on *NEC-4*, the antenna uses 6 elements on a 56 inch boom. Table 1 gives the specific dimensions for the version described in these notes. The parasitic elements are all $^3/_{16}$ inch aluminum rods, while the driver—for reasons of construction—uses $^1/_2$ inch aluminum tubing. Do not alter the element diameters without referring to a source, such as *The VHF/UHF DX Book* (RSGB), edited by Ian White, G3SEK (Chapter 7), for information on how to recalculate element lengths.

The driver is the simplest element to

[1]L. Cebik, "Notes on the OWA Yagi," *QEX*, Jul/Aug 2002, pp 22-34.

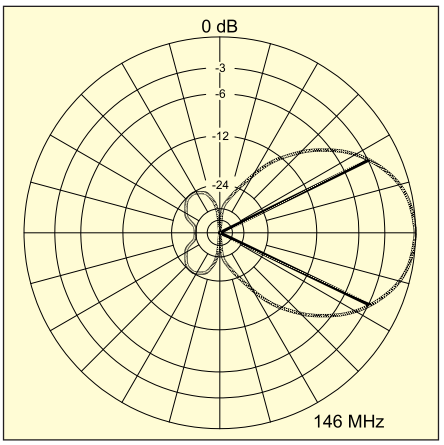


Figure 2—E-plane (horizontal azimuth) pattern in free space of the 2 meter, 6 element OWA Yagi at mid-band—146 MHz. The antenna exhibits a gain of about 10.2 dBi, consistent across the 2 meter band.

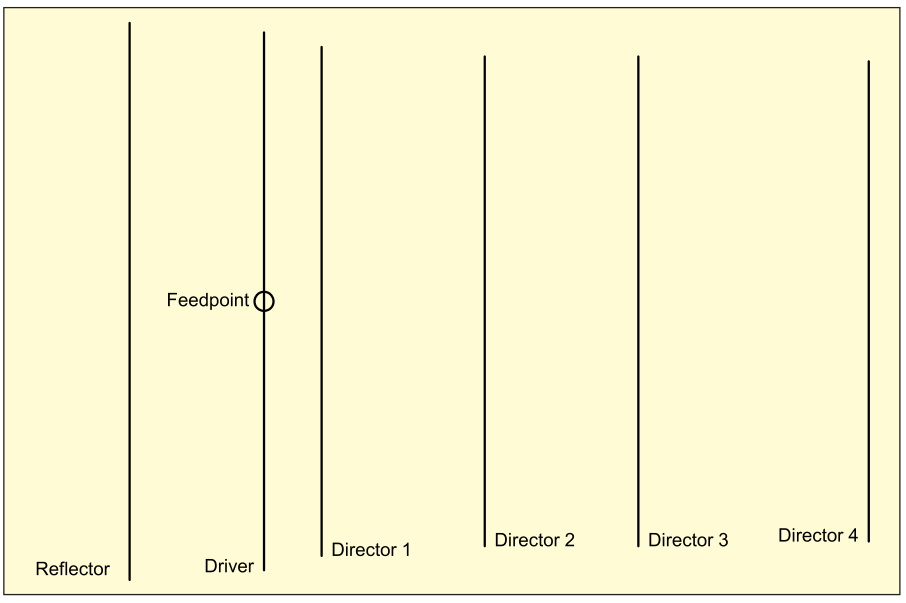


Figure 1—The general outline of the 2 meter, 6 element optimized wide-band antenna (OWA) Yagi. See Table 1 for dimensions.

Table 1
2 Meter OWA Yagi Dimensions (in inches)

Element	*Element Length*	*Reflector Spacing*	*Element Diameter*
Version Presented in Text:			
Reflector	40.52	—	0.1875
Driver	39.70	10.13	0.5000
Alternate Driver	*39.96*	*10.13*	*0.1875*
Director 1	37.36	14.32	0.1875
Director 2	36.32	25.93	0.1875
Director 3	36.32	37.28	0.1875
Director 4	34.96	54.22	0.1875

Element	*Element Length*	*Reflector Spacing*	*Element Diameter*
1/8" Diameter Version:			
Reflector	40.80	—	0.125
Driver	40.10	10.20	0.125
Director 1	37.63	14.27	0.125
Director 2	36.56	25.95	0.125
Director 3	36.56	37.39	0.125
Director 4	35.20	54.44	0.125

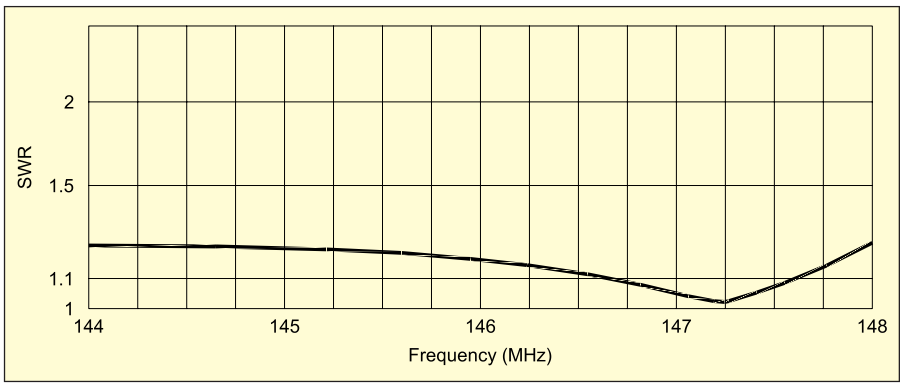


Figure 3—A 50 Ω SWR curve, as modeled on *NEC-4* for the 2 meter, 6 element OWA Yagi from 144 to 148 MHz.

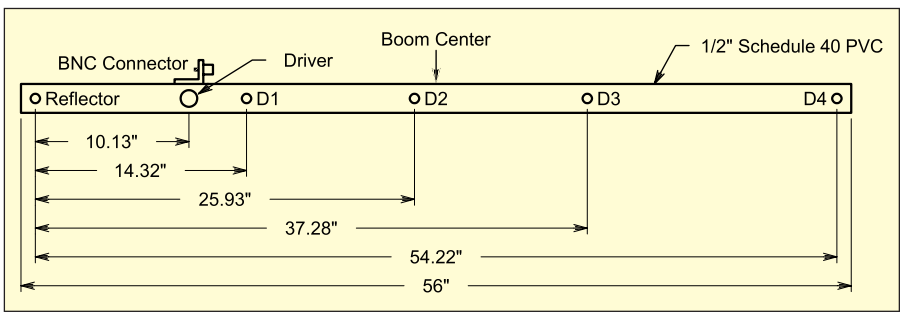


Figure 4—General layout of elements along the PVC boom for the 2 meter Yagi, showing the placement of the BNC connector and the boom center. See the text for element sizes, element to boom mounting and other details.

readjust. Table 1 shows an alternative driver using 3/16 inch diameter material. The driver is, perhaps, the only element that you can extrapolate a reasonable length for other diameters from the given lengths and diameters. The parasitic elements, however, may require more work than merely substituting one diameter and length for another. The right portion of Table 1 shows the design adjusted for 1/8 inch elements throughout. Not all element lengths change by the same amount using any single formula.

The OWA design provides about 10.2 dBi of free-space gain with better than a 20 dB front-to-back (or front-to-rear) ratio across the entire 2 meter band. Figure 2 shows a free-space azimuth (or E-plane) pattern at mid-band—146 MHz. The antenna is consistent in performance across the 2 meter band. The beamwidth will be considerably wider if we turn the antenna on edge for vertical polarization.

One significant feature of the OWA design is its direct 50 Ω feed-point impedance that requires no matching network. Of course, a common-mode choke to suppress any currents on the feed line is desirable, and a simple bead-choke of W2DU design works well in this application. The SWR, shown in Figure 3, is very flat across the band and never reaches 1.3:1. The SWR and the pattern consistency together create a very useful utility antenna for 2 meters, whether installed vertically or horizontally. The only question that remains is how to build the beam effectively in the average home shop.

Beam Materials

The first step in building the beam is acquiring the materials. Let's begin with the boom and then attack the elements. The boom is schedule 40, 1/2 inch PVC. I prefer using insulated booms for test antennas—they do not require refiguring the element lengths due to the effects of a metal boom. This is true whether or not we connect the parasitic elements directly to the boom material.

If the white plumbing material in your region is not well protected from the effects of ultraviolet (UV) radiation in sunlight, you may wish to use the gray electrical conduit version. White PVC stands up for a decade of exposure in Tennessee, but apparently does not do as well in every part of the US. If you use any other material for your boom, be sure that it is UV protected.

Figure 4 shows the element layout along the 56 inch boom. Centering the first element hole 1 inch from the rear end of the boom results in a succession of holes for the 3/16 inch pass-through parasitic elements. Only the driver requires special treatment. We will use a 3/8 inch hole to carry a short length of fiberglass rod that will support the two sides of the driver element. Note that I used a BNC connector mounted on a small plate, which we will meet along the way.

The boom is actually a more complex structure than initially meets the eye. We'll not only need a support for the elements, but a means of connecting the boom to the mast, as well. If we break the boom in the middle to install a T connector for the mast junction, we come very close to the second director. Figure 5 shows how to avoid this predicament.

Before we attack the boom with a drill, let's build it up from common schedule 40, 1/2 inch PVC fittings and linking lengths of PVC pipe. The figure shows

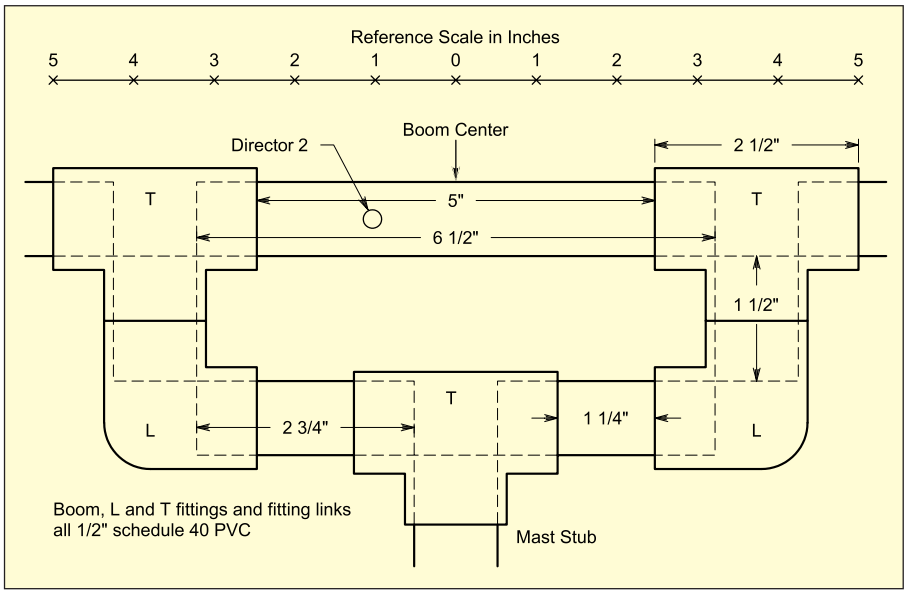


Figure 5—Details of a parallel PVC pipe structure for the Yagi boom and mount.

Figure 6—A close-up view of the parallel PVC boom and mount, the sequence of threaded fittings and the hitch-pin clips used to secure the parasitic elements.

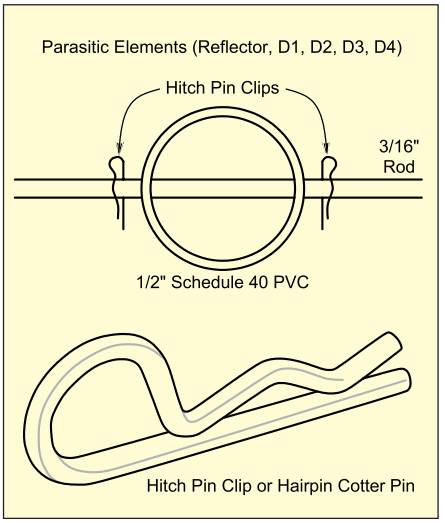


Figure 7—The parasitic element mounting system, showing the general placement of the hitch-pin clips and the shape of the clips.

the dimensions for the center section of the boom assembly. Note that PVC dimensions are always "nominal"; that is, they meet certain minimum size standards. For this reason, you may have to adjust the lengths of the linking pieces slightly to come up with a straight and true boom assembly.

I used scrap lumber to help keep everything aligned while cementing the pieces together. A 1×4 and a 1×6 nailed together along the edges produces a very good platform with a right angle. I assembled the two upper Ts and the Ls below each one first. I dry-fit scrap PVC into the openings, except for the short link that joins the fitting. I aligned them and cemented these in place, using the dry-fit pieces as guides, to keep everything parallel. I then cemented the two short ($2^3/_4$ inch) links into the third T. Next, I cemented one link into its L, using the dry-fit tube in the upper T as an alignment guide.

Before proceeding further, I carefully measured the required length of PVC for the boom section between Ts. How well we measure here will determine whether the boom will be straight or whether it will bow up or down. Then I cemented both the L and the T at the same time, pressing the cemented sections into the two-board jig to ensure alignment.

The final step in the process is to add the 23 inch boom end pieces to the open ends of the upper T. During the brief period when the PVC cement is wet, it's possible to misalign the tubing. I dry-fitted end caps on the boom ends and did the cement work within the two-board jig. By pressing the assembly into the right angle of the boards, I ensured a very true boom. And, it was ready to drill before I had moved the PVC cement back onto its shelf.

Let's pause here to consider the boom-to-mast connection. The lower T in Figure 5 receives a short length of $^1/_2$ inch schedule 40 PVC. This material has an outside diameter of about $^7/_8$ inch, not a useful size for joining to a mast. However, PVC fittings have a handy series of threaded couplers that allow you to screw-fit a series of ever-larger sizes until you reach a more useful size. As Figure 6 shows, I used enough of these fittings to finish off with a $1^1/_4$ inch threaded female side and a $1^1/_4$ inch cement-coupling side. To this fitting, I cemented a length of $1^1/_4$ inch nominal tubing that slides over a length of common TV mast. For a tight fit, I wrap the TV mast with several layers of electrical tape in two places—one near the upper end of the PVC pipe section and the other close to where the PVC pipe ends. You can then use stainless steel through-bolts or setscrews to prevent the PVC assembly from turning.

Incidentally, I find it very useful to keep a graduated set of threaded fittings on hand, replacing those that I use in a project. For each male and female threaded size, I keep a double-threaded version, a threaded male and smooth version, and a female threaded and smooth version. The result is instant coupling capabilities, no matter what the project. The threaded couplings have proven to be exceptionally strong due to the multiple thicknesses of PVC involved. None has ever failed.

Boom and Elements

Before installing the elements, we need to drill the holes in the boom. Here, the temporary two-board jig comes in handy, once again. The key goals in the drilling process are to (a) precisely position the holes, (b) create holes that are a fairly tight fit for the rod elements and (c) keep the elements aligned in a flat plane. For this purpose, a drill press is almost a necessity for all but those with the truest eyes. There are three good sources for drill presses. One is to purchase a good one for the shop. A second

is to purchase one of the better smaller substitutes that clamps your hand drill in a vertical position. A third source is a friend whose shop already has any type of drill press.

Use the jig and a couple of clamps to hold the boom assembly in place. Because the assembly has two parallel sections, laying it flat will present the drill press with the correct angle for drilling through the PVC in one stroke. Drill the holes at pre-marked positions, remembering that the driver hole is 3/8 inch while all the others are 3/16 inch. Clean the holes, taking care not to enlarge them in the process.

The rod and tube stock are dealt with next. For antenna elements, I prefer not to rely on questionable materials that are designed for other applications. Hence, I tend to obtain 6063-T832 tubing and 6061-T6 rods from mail order sources, such as Texas Towers, McMaster-Carr and others. These materials are often not available at local hardware outlets.

We are now ready to mount the elements—with a little preparation. Cut the parasitic elements to length and smooth their ends with a fine file or sandpaper. Find the center of each element and carefully mark a position about 1/16 inch outside, where the element will emerge from each side of the boom. We will drill small holes at these locations. You may want to very lightly file a flatted area where the hole is to go to prevent the drill bit from slipping as you start drilling.

Drill 1/16 inch holes at each marked location all the way through the rod. Deburr the exit ends so that the rod will pass through the boom hole. These holes are the locations for hitch-pin clips. Figure 7 shows the outline of a typical hitch-pin clip. Some suppliers also refer to this as a hairpin cotter pin. Obtain stainless steel pins whose bodies just fit tightly over the rod when they are installed. Initially, install one pin per parasitic element. Slide the element through the correct boom hole and install the second pin. Although the upper part of the drawing shows a bit of room between the boom and pin, that space is shown for clarity only. Install the pins as close to each side of the boom as possible.

Pins designed for a 3/16 inch rod are small enough so that they add no significant size to the element, and antenna tests show that they do not move the performance curve of the antenna. Yet, they have held securely through a series of shock tests that the prototype was subjected to. These pins—in various sizes—offer the home builder a handy fastener that is applicable to many types of portable or field antennas. While we may want to use better fasteners when making permanent metal-to-metal connections, for joining sections of Field Day and similar antennas the hitch-pin clips perform the mechanical function, while the clean tubing sections provide adequate electrical contact for the limited use period.

The Driver and Feed-line Connector

The final construction step is perhaps the one requiring the most attention to detail, as shown in Figure 8. The driver and feed-point assembly consists of a 4 to 6 inch length of 3/8 inch fiberglass or other nonconductive rod, two sections of the driver element made from 1/2 inch aluminum tubing, a BNC connector, a homemade mounting plate, 2 sets of stainless steel #6 nuts, bolts and lockwashers, and 2 stainless steel #8 sheet metal screws. Consult both the upper and lower portions of Figure 8, since some detail has been omitted from each one to show other detail more clearly. For example, the upper part does not show the BNC connector mounting hardware.

First, trial-fit the driver tubing and the fiberglass rod, marking where the rod exits the boom. Now pre-drill 9/64 inch holes through the tubing and the fiberglass rod. Do not use larger hardware, since the resulting hole will weaken the rod to the breaking point. If you use an alternative plastic material, observe the same caution and be certain that the rod remains strong after drilling. Do not use wooden dowels for this application, since they do not have sufficient post-drilling strength. Position the holes about 1/4 inch to 3/8 inch from the tubing end where the element presses against the boom. One hole will receive a solder lug and the other will connect to an extension of the BNC mounting plate.

Second, install the fiberglass rod through the boom. You can leave it loose, since the elements will press against boom and hold it in place. Alternatively, you may glue it in place with a two-part epoxy. Slide the driver element tubes over the rod and test the holes for alignment by placing the #6 bolts in them.

Next, cut and shape the BNC mounting plate from 1/16 inch thick aluminum. I made my fitting from a scrap of L-stock, 1 inch on a side. Before cutting the stock, I drilled the 3/8 inch hole needed for the BNC connector. I then cut the vertical portion. The horizontal portion requires a curved tab that reaches the bolt on one side of the boom. I used a bench vise to

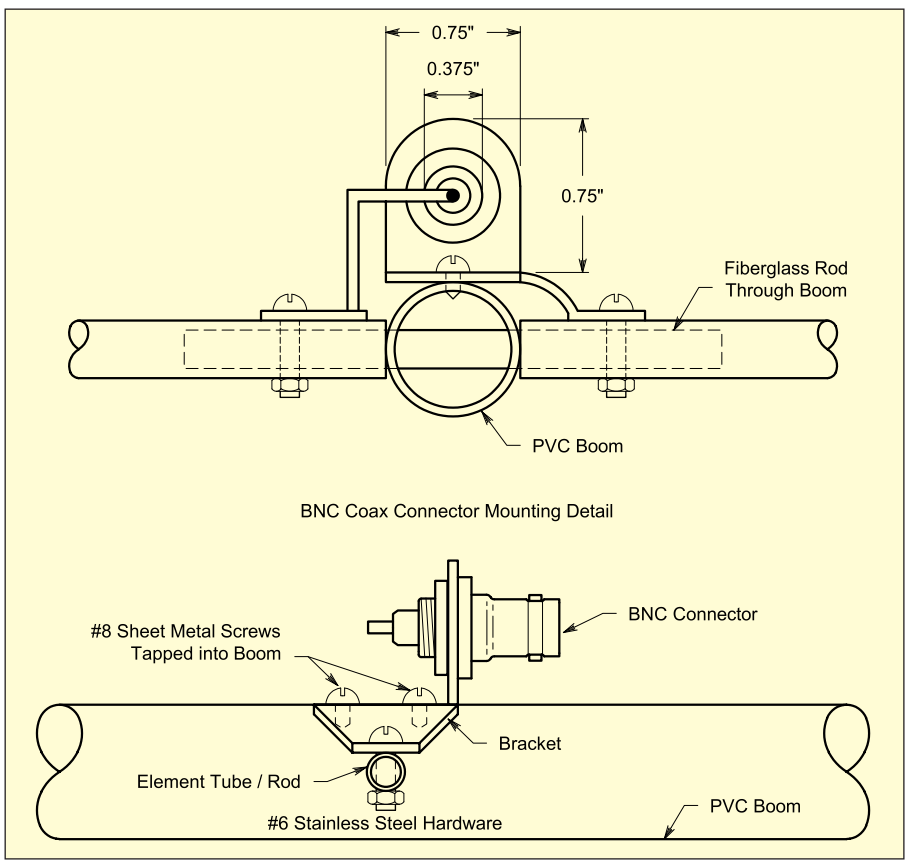


Figure 8—Details of the feed point of the Yagi, showing the BNC connector, the mounting plate and connections to the 1/2 inch driver element halves, which are placed over a central 3/8 inch fiberglass rod.

Figure 9—A photograph of the Yagi feed-point assembly. A study of this view and the drawing of Figure 8 should enable easy duplication of the feed system.

Table 2
Parts List for the 2 Meter OWA Yagi

Note: Sources in parentheses are suggestions only. The builder is encouraged to explore other sources.

17'	0.1875" ($^3/_{16}$") 6061-T6 aluminum rod (Texas Towers)
3.5'	0.5" ($^1/_2$") 6063-T832 aluminum tubing (Texas Towers)
7'	Schedule 40, $^1/_2$" PVC pipe (local hardware outlet)
3	Schedule 40, $^1/_2$" PVC T connectors (local hardware outlet)
2	Schedule 40, $^1/_2$" PVC L connectors (local hardware outlet)
2	Schedule 40, $^1/_2$" PVC (boom) end caps (optional) (local hardware outlet)
—	Miscellaneous male/female threaded pipe diameter transition fittings (local hardware outlet)
1	Support mast (RadioShack)
10	Stainless steel hitch-pin clips (hairpin cotter pins), $^3/_{16}$"-$^1/_4$" shaft range, 0.04" "wire" diameter (McMaster-Carr 9239A024)
2	Stainless steel #6 nut/bolt/lockwasher sets, bolt length 1" (local hardware outlet)
2	Stainless steel #8 sheet-metal screws (local hardware outlet)
1	BNC chassis-mount female connector (local electronics outlet)
2"	$^1/_{16}$" thick aluminum L-stock, 1" per side (local hardware outlet)
1	VHF bead balun choke (Wireman, Inc)
7"	Fiberglass or other nonconductive rod, $^3/_8$" diameter

bend the tab in a curve and then flatten it for the bolt-hole. It takes several tries to get the shape and tab exact, so be patient. When the squared-edge piece found its perfect shape, I took it to a disk sander and rounded the vertical piece to follow the connector shape. I also tapered the top edges to minimize excess material. The last step is to drill the mounting holes that receive the #8 sheet-metal screws.

Mounting the assembly requires loosely attaching both the #6 and #8 hardware and alternatively tightening up all the pieces. Be certain that the side of the BNC connector that receives the coax points toward the mast. Next, mount the BNC connector. The shield side is already connected to one side of the driver. Mount the other side of the driver, placing a solder lug under the bolt head. Connect a short wire as directly as possible from the solder lug to the center pin of the BNC connector. After initial testing, you may coat all exposed connections with Plasti-Dip for weather protection. Figure 9 shows the details.

Tune-Up

Testing and tuning the antenna is a simple process if you've built it carefully. The only significant test you can perform is to ensure that the SWR curve comes close to the one shown in Figure 3. If the SWR is high at 148 MHz but very low at 144 MHz, you will need to shorten the driver ends by a small amount—no more than $^1/_8$ inch per end at a time. I found that shaving the ends with a disk sander was most effective.

Using the antenna with vertical polarization will require good spacing from any support structure with metal vertical portions. One of the easiest ways to devise such a mounting is to create a PVC structure that turns the entire boom by 90°. If you feel the need for added support, you can create an angular brace by placing 45° connectors in both the vertical and horizontal supports and run a length of PVC between them.

As an alternative, you can let the rear part of the boom remain slightly long. To this end you can cement PVC fixtures—including the screw-thread series to enlarge the support pipe size. Create a smooth junction that you attach with a through-bolt instead of cement. By drilling one side of the connection with two sets of holes, 90° apart, you can change the antenna from horizontal to vertical polarization and back in short order.

The 6 element OWA Yagi for 2 meters performs well. It serves as a good utility antenna with more gain and directivity than the usual 3 element "general-use" Yagi. When it is vertically polarized, the added gain confirms the wisdom of using a longer boom and more elements. With a boom length under 5 feet, the antenna is still compact. The ability to disassemble the parts simplifies moving the antenna to various portable sites.

Perhaps the most satisfying feature for me has been the adaptation of some little-used materials, such as hitch-pin clips, to the mechanical needs of the antenna. If I eventually decide that I've found a better design, I can save the costlier parts of the antenna—the elements and the connector—and discard the PVC in favor of a new mount that is custom-made for the new design. If the elements are too short for the new 2 meter design, then I'll likely adapt them to a design for 222 or 432 MHz. For the frugal antenna experimenter, adaptation is the name of the game. This 2 meter OWA Yagi, however, appears to be an antenna that I will keep for a long time to come.

Photos by the author.

*Licensed since 1954, L. B. Cebik, W4RNL, is a prolific writer on the subject of antennas. Since retiring from teaching at the University of Tennessee, LB has hosted a Web site (***www.cebik.com***) discussing antennas—both theoretical and practical. He has written more than 15 books, including the ARRL course on antenna modeling. Serving both as a technical and an educational ARRL advisor, he's also been inducted into both the QRP and QCWA Halls of Fame. LB can be reached at 1434 High Mesa Dr, Knoxville, TN 37938 or at* **cebik@cebik.com**.

FEEDBACK

◊ As a follow-up to the October Feedback item involving the schematic of "A Simple, Well-Behaved Crystal Oscillator" [Technical Correspondence, Sep 2004, p 67], we should also point out that both FET sources connect to resistor R2. Although the text did specify that the oscillator used "…source coupling between stages," some readers were confused because the FET source position was unconventional; it was at the top rather than at the bottom of the FET symbol (when the FET is drawn vertically).

By M. Peri Cope, K7PER

Programming for the Pocket PC

Designing custom ham programs for a pocket PC can be a worthwhile challenge. K7PER shows us how to do it.

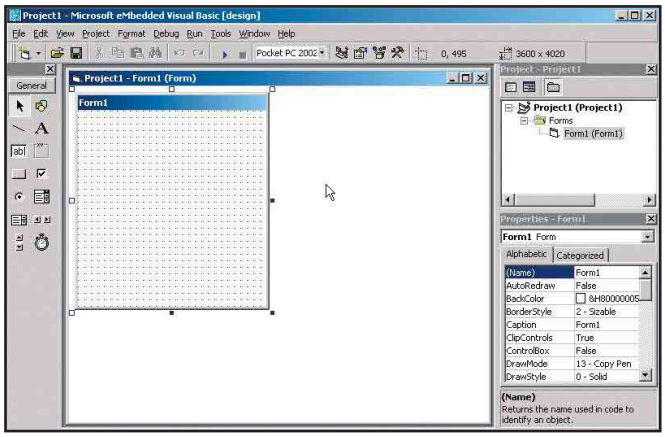


Figure 1—The *eVB* development screen.

A series of articles in *QST* extolling the virtues of high-level programming languages like *Visual Basic* and *Delphi* for writing simple ham radio programs for your desktop PC was presented by Steve Gradijan, WB5KIA.[1] He pointed out that you can often find inexpensive, older versions of programming tools for personal use through online auctions.

If you read Steve's articles you've had a chance to try your hand at programming, following his easy-to-use instructions. You may have even developed a certain level of proficiency in visual programming and rapid application development using these tools. If so, you have now learned just how easy it is to build fully functional, *Windows*-based applications to support everyday tasks in ham radio.

You may not be aware, however, that these same skills can also be used to write custom, *portable*, programs that will run on your personal digital assistant (PDA) devices, like your *Palm* pilot or *Pocket PC* handheld computer. For little or no cost, you can port mobile versions of your newly written programs and take these utilities on the road. This article will show you how to get started writing programs for *Pocket PC* devices.

Programming for the Pocket PC

When Microsoft first introduced the *Pocket PC* operating system a couple years ago, they also released new programming environment software known as *eMbedded Visual Tools 3.0* and made it freely available via their Web site. The programming software *eMbedded Visual Tools*, like its big brother *Microsoft Visual Studio*, includes professional editors and compilers for writing programs in either *C/C++* or *Visual Basic*-like languages (actually called *VB Script*). If you are familiar at all with *Visual Studio*, or the stand alone *Visual Basic* products, then you will be right at home with *eMbedded Visual Basic*, or *eVB*. Figure 1 shows the *eVB* development screen, which clearly resembles the development screen found in *Visual Basic*.

Writing programs in *eVB* isn't much different than writing a program using *Visual Basic*. Although you can't always port your *Visual Basic* code straight across to *eVB*, you will find that it takes very little effort to make most of your simpler programs available in lightweight, mobile versions.

Following the example shown earlier by WB5KIA, I will now walk you through the process of creating a small *Pocket PC* application for calculating the length of a dipole antenna, given the specific frequency of resonance. Although this example won't be a comprehensive guide to *Pocket PC* programming using *eVB*, the principles explained here should be enough to get you going on writing your own specific programs.

Software Tools

We will begin by downloading and installing the latest version of *eMbedded Visual Tools*. At the time of this writing, the software can be downloaded without cost from **www.microsoft.com**.[2] Alternatively, if you don't have the available time or bandwidth to download the software over the Internet, you can also purchase these tools on disk directly from Microsoft for a minimal fee. You can choose custom setup options that can lower the overall installation size. For beginners, however, I highly recommend installing the default selection of tools so you can make yourself familiar with all of the available options.

The system requirements for running *eMbedded Visual Tools* are relatively modest by today's standards. You will need approximately 32 MB of RAM, although 48 MB, or more, is recommended. The tools will run on any PC installed with one of the following operating systems: *Windows 2000*, *Windows NT*, *Windows XP* or *Windows 98*.[3]

As with most other *Windows* applications, you begin installing *eMbedded Visual Tools* by locating and double clicking on the setup file called "setup.exe." The setup wizard is fairly self-explanatory and is sufficiently documented within the actual software distribution, so I won't cover the entire setup process here. In addition to installing the core development tools and libraries, you will also be prompted to decide which, if any, of the *Windows CE*-based software development kits, or SDKs, you want to install on your computer.

There are many different flavors of *Windows CE* devices on the market today. Some were built to include the newer *Pocket PC*, *Pocket PC 2002* or *Windows Software for Pocket PC 2003* operating systems. Others were built around older

[1]Notes appear on page 42.

versions of the *Windows CE 2.x* operating system. Depending on the type of device you want to run your program on, you will need to install the appropriate SDK for that device's operating system. For more specific information on which version of operating system your device uses, or which SDKs you may want to install, please refer to the documentation included with your device and/or the *eMbedded Visual Tools* software distribution. For the sake of brevity, the rest of this example will assume that you are writing your program for a device running the *Pocket PC 2002* operating system.

Figure 2—The completed program interface as it appears in the device emulator.

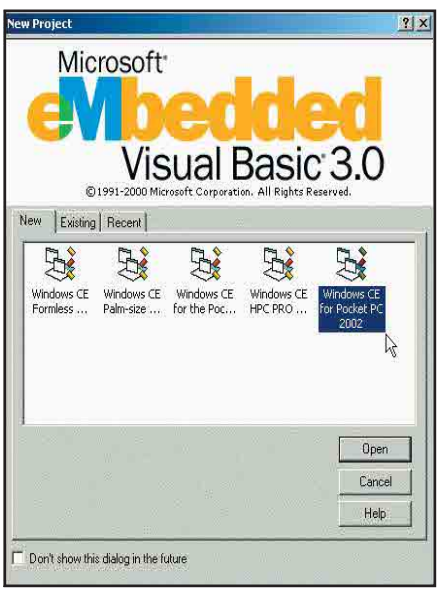


Figure 3—The PROJECT PROPERTIES pane.

Writing a Program

Having installed the *eMbedded Visual Tools* software and the appropriate SDKs, it's time to begin writing the program. You will recall that the formula for determining the length of a dipole is as follows:

Length (feet) = 492 × 0.95 / f (MHz) = 468 / f (MHz)

For our example program, we will take this formula and incorporate it into *eVB* code sitting behind a button on a form in the application. When the user enters a specific frequency in MHz into a text field on our program form, and taps on the button with the stylus, our program will return the length, in feet and inches, for a dipole antenna resonant at the given frequency. Figure 2 shows the completed program interface. Listing 1 shows the *eVB* code required to make this program work. Let's fire up *eVB* and start writing our program.

Each time you start up the *eVB* application, you will see a popup dialog similar to the one shown in Figure 3. Use this dialog to select the type of application that you wish to write. In this case, we want to create a *Pocket PC 2002* application, so we will click on the icon marked WINDOWS CE FOR POCKET PC 2002 and then click on the OK button. This will bring up the *eVB* development screen shown earlier (Figure 1).

The Project Setup

The first order of business will be to set up your project. Begin by clicking on the top menu marked PROJECT and select the menu item marked PROJECT PROPERTIES. This will bring up the window shown in Figure 3. On the tab marked GENERAL, first change the PROJECT NAME property from its present value of PROJECT1 to "dipolecalculator." Next, change the REMOTE PATH property from "windows\start menu\project1.vb" to "windows\start menu\dipolecalculator.vb." When you are done, click the OK button at the bottom of the window. Next, move your mouse over the PROPERTIES window located in the lower right corner of the main program window. Place your cursor over the caption property for Form 1 and change its value to "dipolecalculator," as shown in Figure 4. Click on the top menu marked FILE and select the menu item marked SAVE PROJECT. The program will then prompt you to specify a name and a location where you want to save the form and project description files. Select any location on your hard drive that you can easily find when you come back to work on your program.

Visual Controls and Labels

After setting up your project, you are ready to start populating the main form of your application with visual controls (buttons, labels and text fields). This is where previous experience with the desktop version of *Visual Basic* will come in handy. Take another look at Figure 2 to get an idea of what controls you will need and where you will want to place them on your form. For my initial version of this program, I ended up creating five label objects, one text box, one line and one command button.

To create and place a label object on your form, first move your mouse over to the toolbox palette on the upper left side of your screen and click on the label button (as shown in Figure 5). Next, move your mouse back to the form window and click and drag to draw the area where you want the label placed. Repeat this process for each label you want to place on your form. You may want to use the mouse to resize and adjust the placement of your labels for the best visual appearance. You can do this by clicking on the label control you want to adjust.

Listing 1
Source Code Listing for the Sample "Dipole Calculator" Application

```
Option Explicit
Private Sub cmdCalculate_Click()
  lblFullLength.Caption = 468 /
  txtFrequency.Text
  lblSideLength.Caption =
  lblFullLength.Caption / 2
End Sub
Private Sub Form_OKClick()
  App.End
End Sub
```

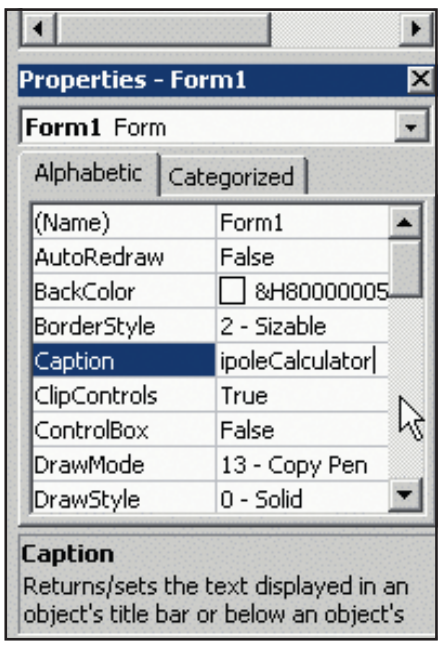


Figure 4—Changing the CAPTION property for a label control.

Once the label outline is highlighted, use your mouse to click and drag the anchor points on the control boundaries to adjust its size, or simply click and drag the label to its new location. The process for placing a text box, line or command button on your form is virtually the same. Simply select the appropriate tool item from the toolbox palette and use the mouse to draw the object on your form.

When you are finished placing your form controls, go back and name each control item and set its initial caption or value. To do this, simply use your mouse to select a control item on your form, then move your mouse down to the properties window and select the object property you want to edit, then make the appropriate changes. For example, I gave the first label on my form the name "lblFrequency" by highlighting the default name property and replacing the text. I also changed this label's caption to "Frequency (in MHz)" using the same process. I like to utilize the practice of giving my form objects names that reflect their specific type and purpose. You are free to name your controls whatever you like (or simply use the defaults). Just remember to keep their names unique so you can keep track of them when you start writing your actual code. Table 1 lists the control names and their initial values or captions that I used for this example.

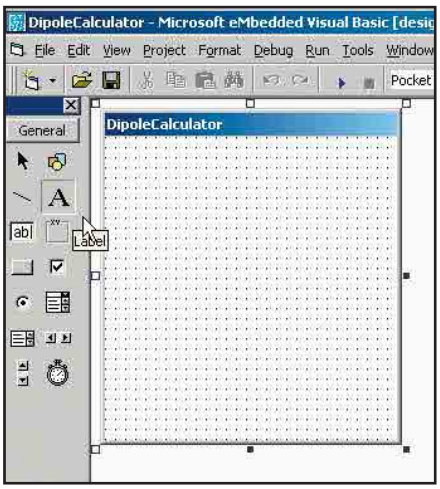


Figure 5—The tool palette pane with the label control button selected.

Coding

When you have named your controls and given them appropriate captions or initial values, you are ready to start coding your program. For this application, we will be placing all code within a single form event. We want all of our calculations to take place when the user taps their stylus on the command button marked CALCULATE.

To begin coding, double click on the form command button. Alternatively, you may also move your mouse over to the PROJECT EXPLORER window in the upper right corner of your screen, then click on the VIEW CODE button, as shown in Figure 6. Either method will pop up the form code window.

Next, locate the subroutine section of your code window marked CMDCALCULATE_CLICK(). (Note: If you double clicked on the form command button in the object view window, your cursor will already be placed within this section.) Now, enter the code shown in Listing 1, then check for errors (you can also download the source code for this project to save typing it in[4]). Be sure to remember to save your project again once you are finished entering the source code.

Testing Your Application

Now that you have built the visual interface and written in the required source code for your program, it is time to test your new application. You have two options for testing your program. First, you can run the program on an actual device connected to your desktop computer through a serial or USB synchronization cable. Second, if you are running one of the *Windows NT*, *Windows 2000* or *Windows XP Professional* operating systems on your desktop, you may test your program using a device emulator.

If you have the capability, I recommend starting your testing on the emulator before running a program on an actual device. Although our example program is rather simple and shouldn't pose any serious problems during testing, the possibility of a lockup does exist as does damage to your device by running faulty code in more complex applications. Usually, a lockup can be fixed by simply performing a "hard reset" on the device. You can generally avoid this inconvenience by starting the testing on the emulator and moving over to an actual device when you are fairly certain you have worked out all the bugs.

Regardless of which test method you choose, the process is generally the same. First, select the target test device (emulator or attached device) from the DEVICES drop-down selection box on the main tool bar, as shown in Figure 7. If you are testing on an actual device, make sure you have it turned on and properly connected to the synchronization cable or cradle and the cable is properly connected to the desktop computer.

Next, click on the START DEBUG button on the main tool bar (alternatively, you can select the START DEBUG item from RUN menu at the top of the page, or press the F5 function button on your keyboard). As the program starts running, you will see a pop-up status window indicating that your program is being loaded to the target device. You may also be prompted to update the runtime DLL files on your device or on the emulator, as shown in Figure 8. If so, simply click the YES button on each pop-up to proceed.

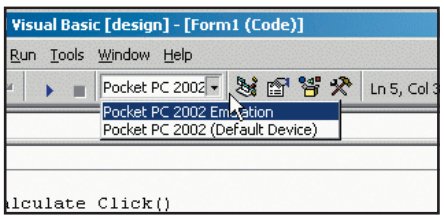


Figure 7—Selecting a deployment target for testing of your application.

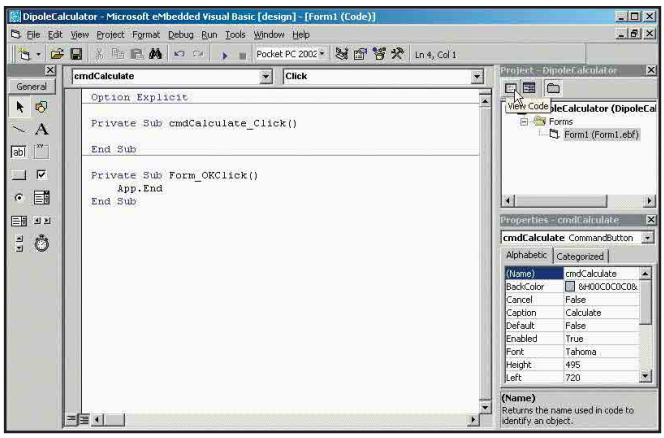


Figure 6—Click the VIEW CODE button in order to see the main code window.

Table 1
Names and Values for Form Controls Used in the Sample Application

Control Name	*Caption or Text Value*
lblFrequency	"Frequency (in MHz):"
txtFrequency	(blank)
Line1	n.a.
lblFullLengthTitle	"Full Dipole Length (in Feet):"
lblFullLength	(blank)
lblSideLengthTitle	"Length of Each Side (in Feet):"
lblSideLength	(blank)

Eventually, you should see the program screen shown in Figure 1. Tap your stylus (or use the mouse to click) on the text box entry field. Enter a frequency value in MHz, then tap or click on the CALCULATE command button. *Voilà!* Assuming there were no errors in your code, you should see a valid result in feet and inches for the length of a half wave dipole antenna resonant at the specified frequency.

Distributing Your Program

When you are done debugging and testing your program, it is now time to make a distribution file so that you can share your application with others. Fortunately, *eVB* includes a very handy, easy to use, tool called *Application Install Wizard* for creating your distributions. Before running it, however, you need to make a compiled version of your program. To do this, click on the FILE menu and select the item marked MAKE DIPOLECALCULATOR.VB as shown in Figure 9. You will be prompted to specify where you want to save your compiled file. Pick an appropriate location, then click the OK button. Now start the *Application Install Wizard* by clicking on the TOOLS menu, then select the REMOTE TOOLS sub menu item. From the sub menu that pops up, select the item marked APPLICATION INSTALL WIZARD (Figure 10).

The *Application Install Wizard* is straightforward and includes ample instructions. I won't include screenshots of each step of the Wizard here, but will instead guide you through the main points of the overall process:

1) This is an introductory screen that explains the purpose of the Wizard. Click the button marked NEXT to proceed to the next window.

2) Step 2 prompts you to specify the path to your main project file. If necessary, click on the BROWSE button and navigate down to the directory where you saved your project file (DIPOLECALCULATOR.EBP), then click NEXT.

3) You are prompted to specify the path to the compiled application file. Click on the BROWSE button and navigate down to the directory where you saved the compiled application file (DIPOLECALCULATOR.VB), then click NEXT.

4) This step asks you to specify a directory where you would like your output files to be created. You may either click on the BROWSE button to navigate down and select this directory or enter the directory path manually into the text field. When you are finished, click NEXT.

5) Step 5 prompts you to select the processors you would like your program to support. If you are writing your program to be run on one specific device, you can select that device's processor here, or you may select all the available device types. (For help in determining the processor type for a specific device, refer to your device documentation. For most *Pocket PC* devices, you will check the item marked ARM 1100.) When you are finished, click NEXT.

6) Select any additional Active X controls or library references you want added to your distribution. None of these apply to our sample application. Click NEXT.

7) You are asked to specify any additional data files you would like added to your distribution. Again, this step doesn't apply to our sample application. Click NEXT.

8) Step 8 prompts you to provide key application information. You are required to provide some entry in each field on this form before you can proceed. For the DEFAULT APPLICATION DIRECTORY, I

Figure 8—Sometimes *eVB* will prompt the user to update their DLL files on the target device before the test program will run.

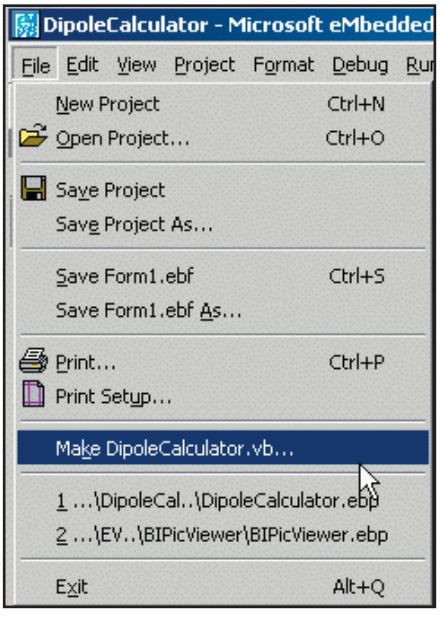


Figure 9—Selecting MAKE DIPOLECALCULATOR.VB.

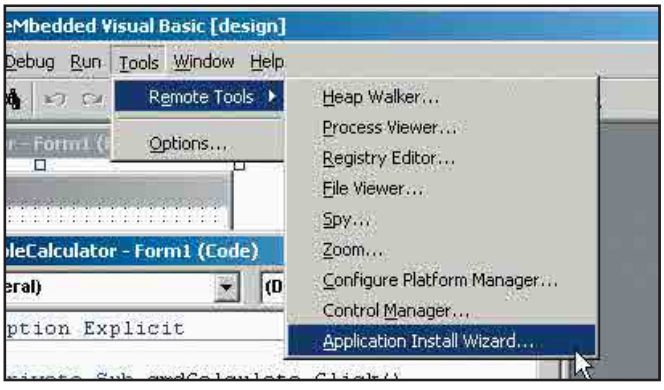


Figure 10—Opening the *Application Install Wizard*.

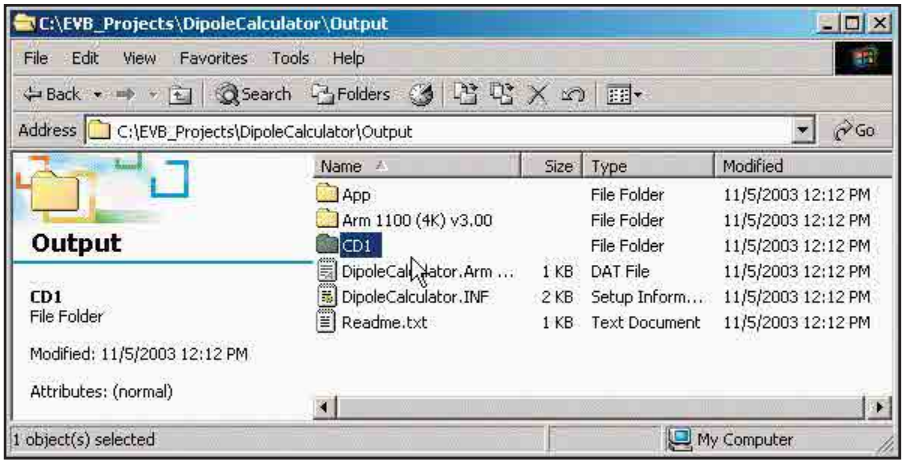


Figure 11—The contents of the OUTPUT folder generated in Step 4 of the Application Install Wizard.

There's More Than One Way to Skin a Cat

And so it is with programming for the pocket PC. If you have no interest in learning the ins and outs of programming *Visual Basic* or *C++*, there are other alternatives for getting your ideas to work on your *Pocket PC*.

One of the simplest approaches is to make use of the built-in Web browser and scripting capabilities of your *Pocket PC* device. If you've ever done any Web programming before (constructed Web pages using HTML and *JavaScript*), you're definitely in luck! *Pocket Internet Explorer* makes it possible for you to apply these same skills to writing custom applications for your *Pocket PC* device. *Pocket IE* includes a built-in scripting engine that is based on a *JavaScript/ECMA* Script variant called *JScript*. (You can get the full documentation for *Pocket IE JScript* in *MS Word* format from **www.microsoft.com/pocketpc/developer/html.doc**.)

Let's take a look at an example below. I won't go through all the details of *JScript* programming here, but will instead leave that up to you to research on your own. There are plenty of good tutorials and resources on the Web to help you get started. Here, we are building an HTML Web page that includes embedded *JScript* code to run our sample dipole calculator application described in the accompanying article. The code is pretty straightforward:

```
<html>
<head>
<title>JScript Dipole Calculator</title>
<script language="JavaScript">
     function calculate()
     {
          // Calculate the antenna length
          var freq = document.forms[0].elements[0].value;
          var length = 468 / freq;

          // Display the results
          document.forms[0].elements[3].value = length;
     }
</script>
</head>
<body>
<form method="POST" action="">
<p>Frequency (in MHz):  <input type="text" name="T1"
  size="20"></p>
<p><input type="button" value="Submit" name="B1"
  onClick="calculate()"><input type="reset" value="Reset"
  name="B2"></p>
<hr>
<p>Length (in Feet):  <input type="text" name="T2"
  size="20"></p>
</form>
</body>
</html>
```

In order to run this application on your pocket PC, just follow these steps:

1. Open a text editor on your computer (*WordPad*, *Notepad*, or any other simple text editor will work just fine.) Carefully copy the code shown below and save your file as DIPOLECALC.HTM. (Alternatively, you can download the source code from the Web site shown in Note 4.)

2. Using *ActiveSync*, copy the DIPOLECALC.HTM file over to the [MyDocuments] directory on your *Pocket PC*.

3. Remove your *Pocket PC* device from its cradle and start up the *Pocket Internet Explorer* application.

4. If the "address bar" isn't already visible at the top of the *Pocket IE* screen, tap on the VIEW menu at the bottom left of the screen, then make sure the ADDRESS BAR sub-item is checked by tapping on it.

5. Next, tap on the address bar, then use the virtual keyboard to enter the following address: FILE://\MY%20DOCUMENTS\DIPOLECALC.HTM. (Alternatively, you can use the *File Explorer* application on your device to browse your way down to the DIPOLECALC.HTM file and open it from there.)

The beauty of this method of device programming is that your application can now be used anywhere you have an HTML browser that supports *JavaScript*, including desktops, PDAs, Macintoshes, Linux machines, etc. Of course, if your *Pocket PC* device is equipped with a wireless card, you can also serve up this mini-application from a Web server. As you can see, the possibilities are almost endless!

entered my call sign. This means that when my program is downloaded to my device it will be stored within a subdirectory called [K7PER] that sits beneath the [Program Files] directory.

For the APPLICATION NAME, I again entered "dipolecalculator." In the description field, I entered "A simple program to calculate the length of a dipole antenna." For the COMPANY NAME, I again used my call sign.

9) The final step tells you that the *Wizard* is now complete. Click on the button marked CREATE INSTALL and the program will generate a set of distribution files in the directory you specified. Click FINISH to exit the *Wizard*.

To verify that your distribution files were successfully generated, navigate down to the directory you entered in Step 4, above. The contents of this folder should be similar to that shown in Figure 11. To install your application on your device, all you have to do is open the directory marked [CD1] and double-click the "setup" file. At that point, follow the instructions provided to continue the installation process.

Summary

As you can see, writing ham radio programs for your *Pocket PC* device is almost as simple as writing them for a desktop computer, and best of all, the tools are available for free! Happy coding!

Notes

[1]S. Gradijan, "Beginners' Computer Programming for Ham Radio," *QST*, Feb, Mar, Apr 2003 (Parts 1, 2 and 3; pp 32-37, 36-42 and 39-44, respectively).

[2]The current link for downloading the latest version of *eMbedded Visual Tools 3.0—2002 Edition* is: **www.microsoft.com/downloads/details.aspx?FamilyID=f663bf48-31ee-4cbe-aac5-0affd5fb27dd&displaylang=en**.

[3]Although the on-line documentation doesn't mention it specifically, *eMbedded Visual Tools 3.0—2002 Edition* should run fine on systems running the *Windows XP* operating system.

[4]The source code (in HEX) for this project is available on-line at **www.arrl.org/files/qst-binaries/cope1204.zip**.

Photos by the author

Introduced to Amateur Radio by his late father (Marvin, W7HKC), M. Peri Cope, K7PER, was first licensed as KA7LRW in 1981 at age 13. He is the third generation ham in his family. Although Peri enjoys all aspects of ham radio, he operates mostly low power (QRP) HF CW and PSK31 and enjoys homebrewing equipment. Currently employed as a software developer in the information technology field, Peri has a BA in geography from Weber State University and holds an Amateur Extra class license. You can reach him at 274 South 900 West, Tooele, UT 84074 or **k7per@arrl.net**.

By Mark Spencer, WA8SME

Kid's Day 2005

Your opportunity to "walk the walk" is coming January 2 and June 18.

Research has shown, and it is supported by my own personal observation, that the personal touch is the most effective way to gain someone's interest in ham radio. Many of us became involved in the hobby because of a family member, relative, or close friend. This even holds true in the classroom. During my years of teaching, those students who pursued a ham license in my classrooms did so because there was a personal connection between the student and teacher.

I receive calls and correspondence on a daily basis from well-meaning hams lamenting the demise of ham radio because we are not getting more youth involved in the hobby. The basic theme is "You should …." I usually ask the correspondent when was the last time they invited a youngster into their shack to operate, when they returned to a youthful CQ or monitoring call? The answer is usually evasive. During speeches on the topic, faces in the audience turn blush with recognition when I ask how many have tuned off frequency when they heard a youthful voice on the channel instead of opening a conversation. We are very good at talking about what needs to be done, we sometimes are not very good at taking action. We *talk the talk*, but don't *walk the walk*.

The Kid's Day operating events, the first Sunday in January and the third Saturday in June, are just two days when you can *walk the walk*. Make that personal connection that may result in a new licensee to the hobby by opening your station and inviting kids and neighbors to share in your hobby. You just might find yourself re-infected with that enthusiasm that you once had with ham radio. You'll have plenty of company; last year 280 stations were visited by over 900 kids who made 3200 QSOs. Listen for W1AW during the Kid's Day events; we'll be *walking the walk* here, too.

Kid's Day Rules

Purpose: Kid's Day is intended to encourage young people (licensed or not) to enjoy Amateur Radio. It can give young people on-the-air experience so they might develop an interest in pursuing a license in the future. It is intended to give hams a chance to share their station with children.

Date: *Sunday*, January 2, 2005.
Saturday, June 18, 2005.

Time: 1800 to 2400 UTC. No limit on operating time.

Suggested exchange: Name, age, location and favorite color. You are encouraged to work the same station again if an operator has changed. Call "CQ Kid's Day."

Suggested frequencies: 28,350 to 28,400 kHz, 21,380 to 21,400, 14,270 to 14,300 kHz and 2 meter repeater frequencies with permission from your area repeater sponsor. Observe third party traffic restrictions when making DX QSOs.

Awards: All participants are eligible to receive a colorful certificate (it becomes the child's personalized sales brochure on ham radio. Please visit **www.arrl.org/FandES/ead/kids-day-survey.html** to complete a short survey and post your comments. You will then have access to download the certificate page or send a 9×12 self-addressed, stamped envelope to Boring Amateur Radio Club, PO Box 1357, Boring, OR 97009.

Brighten the future of ham radio through Kid's Day.

SOAPBOX

Here is just a sampling of the comments received from recent Kid's Day events:

My 10 year old had an ear-to-ear grin chatting with an op in New Orleans. A really great day for all! Now we're working on converting my wife...to the Dark Side (as she calls it).—*AB3AP*

My daughter had a great time operating this year. She designed her own QSL card for Kid's Day with pictures of her two horses on the front.—*KAØIQT*

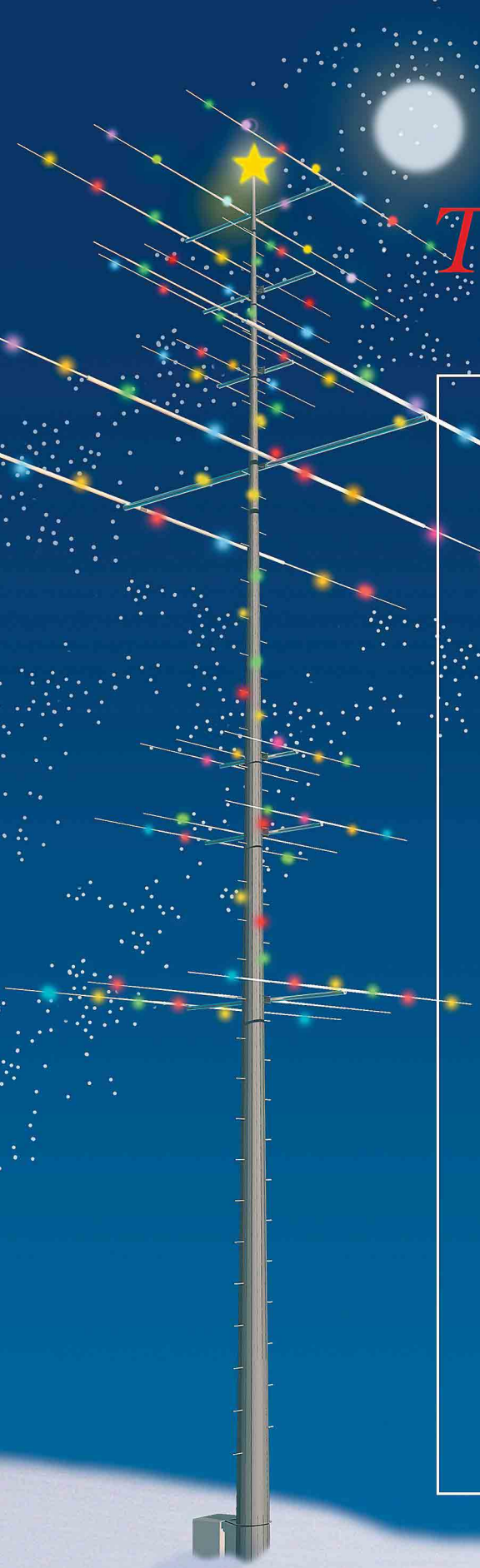
Mike, who operated my station, was a little nervous at the start, but seemed like a pro after just a few contacts. The stations that worked him said he was "a natural." I don't know if he got more out of it or I did.—*KB9CYL*

At first the kids were a little shy but soon got the hang of it.—*KF4UVT*

Cub Scouts had a wonderful time, learning much about ham radio and its vital role in our history and current lives. They enjoyed meeting other kids their age around the country.—*NØDPZ*

It was a wonderful experience for my children, who had never talked to someone their own ages (7 and 11 years old) via ham radio. Being able to talk on a common level meant a lot to them, and both asked when the next "Kid's Day" was.—*N4SRT*.

Mark Spencer, WA8SME, is ARRL Education and Technology Program Coordinator. He can be reached at **mspencer@arrl.org**.



The Christmas Tree

By Wayne C. Long, K9YNF

Two Sams celebrate the holiday season in a unique way.

It was one of those words that our high school English teacher thought we should learn. She had purchased *30 Days To A More Powerful Vocabulary* for each of us, and back in 1963 Sam and I were more than a little bored at the prospect of mastering such useless information. At the rate we were going, it might take 30 *years* for us to use such words.

Miss Pfister looked up from her notes and asked in a hopeful tone, "Samir, can you define *convergence*?" I squirmed and looked at Sam. He rolled his eyes and silently mocked her question. She had caught me daydreaming … again. *Where are we?* "Uh… uh… *convergence*…" I said, finding my place just in time "is when there is the formation of similarities in unrelated organisms living in the same environment!" *Wow, was I smart!* "Thank you Samir," said the cultivator of our vocabulary garden. If only she could see me now.

Back in the '60s, my buddy Samuel "Sam" Greenberg and I were inseparable. Talk about *convergence*! Sam's father Yosef had emigrated from the Soviet Union to Bethlehem, our midwestern city, to escape persecution in the old country. He was an accomplished woodworker and had built several houses in his hometown. Arriving in America, he was literally penniless. He set about building the American dream. Soon he would learn English and become a naturalized citizen, filling him with immense pride. But he took the greatest pride in his son, Sam.

Who Would be First?

At Cedars Hospital that January morning in 1946, two women were in labor. Sam's mother Marta, or "Mary," as her new American neighbors called her, was actually engaged in a contest, of sorts, with *my* mother Fatima ("Tina"). The newspaper and downtown merchants made a big hoopla about the first baby of each New Year, and this January was no exception.

While both women were behind delivery room doors, the two fathers drank coffee and nervously paced the well polished floor. Occasionally they would exchange a bit of bravado. Little did they know that today's events would intertwine our two families forever.

My father had arrived in America after the war, the eldest son of a farmer, a young man good with his hands, a scrounger. He had heard that several cities were looking for men to drive garbage trucks. Never mind that in the old country my father had pulled a small trailer behind his beat-up car, picking up old appliances, car parts and dead animals from neighboring farms. He had to learn English. And become a *real* American, with a commercial driver's license. He spent tedious hours in night classes learning how to assimilate into this country. But he *did* it and so did Mom. Their faces beamed as they repeated the Pledge of Allegiance before the naturalization judge.

Startled by the nurse, Sam's father was told that his wife had given birth to a son at 2:05 AM. I was born that same day, at 1:15 PM. My father cried with joy. As I grew, he would often say at dinnertime that he loved Mom and me *more than life itself!*

Sam and I lived across town from each other, Sam near the country club and I at the edge of town where Dad could keep his garbage truck. One of the first things Dad bought for our new home was a console radio. Mom enjoyed listening to big band music while she mended for others. But when Dad came home from a long day of slinging garbage cans, he relaxed in his easy chair, listening to programs from the old country. As he turned the dial, watching the green tuning eye, enormous speakers would belt out the news or music in his native Arabic. He never forgot his roots. And *I* was mesmerized.

Sam's father had bought him a Zenith Transoceanic radio for eighth grade graduation. When Sam and I stopped by his house after school, we would revel in the fidelity of those great Elvis tunes. The two Sams were welded together with the same interests—girls and dreams.

We Go for the General

As teenagers, we found ourselves sitting one day outside the FCC field office, nervously quizzing each other from the *License Manual*. Months earlier, we had agreed to forgo the Novice license and go for the General so we could work DX on 'phone. The examiner called me first. Less than an hour later, I emerged from the room, triumphant in the knowledge that I had passed the General class requirements. Sam was next.

I waited for Sam in the lobby, reading dog-eared copies of *Life Magazine*. Silently, I said a little prayer for Sam. Moments later, Samuel Greenberg emerged, ready to buy a rig!

For me, things would evolve differently. As the son of a scrounger, kit-building and home-brewing would be my thing.

Soon, the mail brought the two Sams their ham tickets. We were off and running! Sam, with his Hallicrafters HT-37 and SX-111, and me, with my Knight-Kit T-150 and R-100. Yosef was building houses all across town, and Dad's one-truck operation became six. 1961 was a very good year!

Sam and I were ferocious competitors, doggedly pursuing DXers for their valuable QSLs. It was neck-and-neck at the DXCC finish line for these radio pals. Sam joined DXCC first, after Gus Browning's QSL for a "New One" hit Sam's mailbox.

As high school played out, the world braced for another conflagration: Viet Nam. In the spring of 1964, graduation impacted us in ways similar, and yet totally different. I bought a used '57 Chevy with money I had saved driving a truck for Dad during vacations. At Sam's graduation party, he received the "Holy Grail" of Amateur Radio gifts…a Collins KWM-2 transceiver. And an envelope.

Sam handed me the envelope, with *To The Best Son In The World* written in the careful script of his immigrant father. "Will you do the honors?" he joked. He motioned for me to rip open the mysterious envelope. Like a movie star at the Academy Awards, I did my duty and gasped.

"My dear boy," the hand-written note began. "Mother and I are so proud of you. To accompany your new radio, we want you to have that antenna system you have been dreaming about." "Yes…yes?" teased Sam. "Did I really get one?" Yes he had! Sam Greenberg would become the proud owner of a 125-foot Telrex "Big Bertha" rotating antenna mast, complete with stacked wide-spaced monoband beams for 40, 20, 15 and 10 meters. "You *dog*, you," I exclaimed in mock jealousy. "You *dog*!"

On a sweltering July day in 1964, a semi pulled into Sam's driveway. We had staked out the ground for the backhoe and cement mixer. Later, the rigging crew and their mobile crane arrived to lift this puppy into the waiting skies. What an antenna party we had that week! The antennas gleamed in the midwestern sun as the crew buried the cables and routed them to the rig. Tests were run to peg the rotator perfectly on "North." But Sam had saved the best for last.

"Something Shiny Caught My Eye…"

Unbeknownst to us, he had cornered the crew foreman one morning, asking for a favor. Gazing at the most beautiful piece of DX firepower in the civilized world, something shiny caught my eye at the top. *What the heck? Could it be? It was a…star!* A big one, maybe 5 feet tall. Running from it was a shielded cable. But wait. *What's just below the star?* Why, …it's a pulley welded to the mast, complete with a long hank of rope, ending in a coil at the base of "Big Bertha."

I yelled over to Sam. "What's with that star and rope affair? You're not even Christian, you dummy!" Sam yelled back, "Either are you. Just wait until Christmas!"

Having attended every birthday party and Hanukkah celebration at Sam's beautiful house, I was not *nearly* ready for what I saw on my way over that Christmas Eve night!

Sam had arrived from college a week before, ready to unload his mind for a few playful days, before heading back east to dive into his business and ROTC courses. I was busy, too, being Dad's operations manager. And trying to stay focused, as the growing cadre of Uncle Sam's Army found it tougher "over there" each day. *Soon enough…Soon enough.*

Downshifting my Chevy near the country club, I saw it! Only *tonight* it was adorned with more red, green and blue lights than the tree at Rockefeller Center, or even the White House! Sam's holiday handiwork was ablaze in the night sky. His "Christmas Tree" looked

like…well…a *Christmas Tree!* And that…*STAR*! Shining like a beacon for the whole world to see!

Sam's mom met me at the door. "Samir! Happy holidays!" Sam and his dad were roughhousing on the floor. Sam looked up at me and exclaimed, "What do you think of our Christmas tree outside? I spent two days getting it wired and then Dad and I pulled the whole thing to the top of 'Big Bertha'! Isn't it great?" His Dad winked at me as I replied, "Yeah, fantastic!" *That it was*. People could see it for miles and a TV crew captured it for the late news. Wow!

Days later, Sam flew back east and I went back to the family business. It had been a Christmas to remember! These times were all too precious.

During Sam's senior year at his Ivy League school, he received orders to report for active duty. Now, from his vantage point on the northwest coast, Second Lieutenant Samuel Greenberg felt the tension in the air as he boarded the chartered plane for The 'Nam.

Months later, I felt it too, as my platoon snaked through the stinking jungle. "Charlie" was everywhere, and yet nowhere. As radioman for a motley crew of ground-pounders, I saw more than my share of firefights. *Could we win this thing*? I wondered as I lay in my mosquito netting in the dank night air. I never quite got an answer from those dreamscape characters in the purple haze.

"Allah Is Great," was the translation of my prayer. *He sure the heck was*, I thought, as I walked out of the discharge center, a trooper who had actually survived his tour. "Back in the world" we would brag. Back in the world we would kiss our girl, buy a fast car, or what *this* vet eventually did, get some civilian clothes and return to work. My parents noticed profound changes in me that first year back from Southeast Asia. But more changes awaited *all* of us.

"Hey Buddy, How's DX?"

My world came crashing down when I got that call the morning of the 19th. It was Sam's father. His voice was shaking as he tried to manage the enormity of it all. A rocket-propelled grenade had pierced the fuel tank of Sam's helicopter and taken his only son from him. Sam? Not…*Sam*!

As I sat in my darkened apartment, I imagined that I could hear him. "Hey buddy, how's DX?" the playful prankster said over the phone. "Great, man. Worked the DXpedition. Better put a few green stamps in that envelope, just to be sure!" "Right," he said, tweaking the rotor under 'Big Bertha.' "Right!" "Gotta go, man. See ya."

At Sam's funeral I learned he had proposed to his girlfriend over a MARS link in-country. She was hurting badly and so was his father. Several months later, his Mom couldn't bear her pain any longer. She passed in her sleep.

Sam's Dad retired after he sold out to a national builder. And Dad's company was scooped up by the world's largest waste hauling conglomerate. Dad and Mom retired to Florida. Sam's dad stayed in his house, fearing some even greater shock would come to his system. His son was gone. His wife too. And "Big Bertha" languished under the midwestern skies. I stopped by to check on Sam's old man. Regularly, at first. Later, our visits were just too much to bear, reminiscing about the good old days when the DX flew hot and heavy.

A few years later, Yosef Greenberg was laid to rest in the family mausoleum purchased years before. Happy years. Now they were *all* there … at last.

I received a call from an attorney a few weeks later, telling me that I should attend the reading of Yosef's will the following Wednesday at 10 in the morning. All the way to that meeting, I was haunted by ghostly memories. Good ones of Sam and his wonderful family. Bad ones of a faraway place where too many went down for the final count.

Sam's Gift

Settling into my chair, I was curious what the old man had up his sleeve. I loved him like a father. And he loved me as a second son. I was startled to hear my name read by the attorney. "…and to my dear 'second son' Samir I leave the following…my stamp collection, my country club membership and something more. I hereby bequeath to Samir the Amateur Radio station and its antenna system, which brought such joy to our household. This gift includes payment of all costs to relocate said items to a place of Samir's choosing. Enjoy them, my dear boy. May God bless you and keep you."

Autumn painted the leaves with brilliant hues, as I watched the riggers erecting Sam's "Big Bertha." My wife and I had chosen the crest of our capped landfill for the splendid rotating mast with its powerful arrays. Dad's humble old garbage truck had started this "mountain," and today it was the highest landform for miles around. *Perfect take-off angle for the Far East*, I thought, as I waved goodbye to the riggers.

As Christmas rolled around, I was enjoying the KWM-2 and its towering partner up the hill. I had made DXCC Honor Roll and owed it all to Yosef and Sam.

Wisps of the glorious December 24 sunset faded to black, as a huge crowd gathered at the base of the former landfill to catch the impending light show. A TV crew had been dispatched for the 10 o'clock news.

From the shack at the edge of town, I threw the big switch. You could hear the "oohs" and "ahhs" from the spectators, as thousands of red, green and blue lights shone brightly in the shape of a huge Christmas tree. Overhead in the pressurized cabin of a DC-10, another wave of "oohs" and "ahhs" arose, as the captain alerted his passengers to the singular event below. The TV commentator was running out of adjectives for this nighttime wonder. But more than any other thing they commented about that night was…that *Star*!

"Sam, old buddy," I whispered in the quiet of the shack, "this night is for *you*! Merry Christmas!"

Wayne Long, K9YNF, was first licensed as a Novice in 1960. On one of his first visits with his father to the then Allied Radio store in Chicago, Wayne met Jack Ekstrom (now K9JE) and his father. Over the 40-some years since that chance meeting, Wayne and Jack have each married, each had a son and a daughter, and each has been consumed with a love for DXing and contesting. This story is dedicated to Jack, whose lifelong friendship with the author is its inspiration. Wayne retired from a career in environmental sales in 2003, and is now a published freelance writer of travel essays and short stories. He attained his lifetime goal of conducting his first IOTA DXpedition to Roatan Island, Honduras, in 2003. K9YNF has 328 DXCC entities confirmed and has numerous first and second place DX contest certificates to his name. You can reach the author at 3229 Upper Woodland Dr, Colgate, WI 53017; **k9ynf@aol.com**.

By Dale Botkin, NØXAS

Surviving in Suburbia

...or how I learned to stop worrying and love simple antennas.

As do many hams, I live in a neighborhood having antenna restrictions. Not so much restrictions, actually, as an outright ban: "No exterior television or radio antenna of any sort shall be permitted on any lot." Many factors enter into the decision to buy a particular house. In my case, the antenna restriction was not a major issue—though I did try to bluff the real estate agent into getting it waived. Having read the covenants, I knew she would not be able to do so without the agreement of 75% of the homeowners in the area. Some inconvenience associated with my hobby was not going to keep us out of the otherwise perfect house we had found.

Of course half of the no-antenna section is already invalid; TV antennas are protected by FCC rule. Unfortunately, the radio antenna restriction still stands, at least for now. I have talked to some hams who see this as a major obstacle, and some who have simply given up and quit operating except when mobile. I simply saw it as a challenge to be overcome.

Figure 1—The attic-mounted dipole comes together.

So Many Choices...

I started by establishing what my requirements were, followed by the "nice to have" features. I operate low power on several bands, so decent efficiency and multiband operation were requirements. So were relatively compact size and the ability to be completely hidden, or at least well camouflaged. Cost was a factor, of course. There were many choices to be considered. I spent some time investigating "stealth" antenna designs, both indoor and outdoor. I looked at short verticals, verticals disguised as flagpoles, verticals and loaded vertical dipoles disguised as TV antennas, small loops, thin-wire loops, attic dipoles, loaded gutters and more. All had their advantages and drawbacks.

Though I have a decent size lot, the trees are a little young yet and are not well spaced for antenna supports. I know that in this area, with plenty of wind and winter ice, a wire thin enough not to attract unwanted attention would not survive long. A flagpole vertical was somewhat appealing, but multiband use for QRP did not sound promising, especially since the feed line would have to be coax due to the path from the shack to the front yard.

Eventually it became clear that an attic antenna would be the best route, but here again the feed-line issue came into play. I was not wild about the idea of spending hours in the attic tuning a multiband wire antenna well enough to feed it with a single coax feed line. In addition, the path between the attic and my basement shack had plenty of metal—which I had been told meant I couldn't use balanced feed line.

Or could I?

RF Safety First

Indoor antennas can present issues involving RF exposure. For a detailed look at RF safety, see **www.arrl.org/tis/info/rfexpose.html** or the ARRL book *RF Safety and You.*

The Twinlead/Tuner Combo

The more I asked about twinlead, the more encouraged I became. I had always heard that twinlead needed to be at least 6 to 12 inches away from any metallic object. Some hams who have used it for years, though, told me that the occasional pass across a pipe or other metal obstacle was not a big deal. The more research I did, the more I became convinced that it would be worth at least trying a twinlead-fed dipole. The only thing I lacked was a balanced line tuner; I picked up a used one for a little under $50 and decided to give it a try.

I started with a trip to the local home improvement store, where I bought a 100

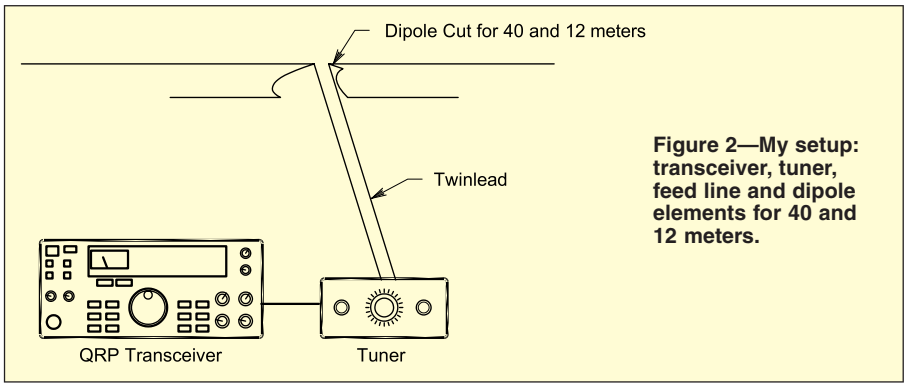


Figure 2—My setup: transceiver, tuner, feed line and dipole elements for 40 and 12 meters.

foot roll of 12 gauge insulated wire for around $13. On the way home I stopped by RadioShack and picked up a 100 foot roll of 300 Ω TV twinlead, the least expensive they had. I figured at less than $25 in materials I had very little to lose if it didn't work well. The tuner could always be resold or used for portable operation. Once home I measured out about 66 feet of wire, found the center and soldered one end of the twinlead to it. I now had a dipole fed with balanced line. I just had to get it in the attic!

The Fun Part

Getting the thing into the attic was the fun part. Though I could get up there without much trouble, one needs to move very carefully to avoid falling through the gypsum board ceiling. Using a drop light is far better than trying to get by with a flashlight, so I dragged an extension cord up with me for power for the light and soldering pencil.

A few words regarding safety are also in order. It's a good idea to take at least a minimal first-aid kit along; I managed to slice my finger while stripping insulation, and had to wait for one of my kids to find a bandage and run it up the ladder. I also encountered several rather large and menacing wasps, so the can of wasp and hornet killer came in handy. It shoots an easily controlled stream rather than fogging the entire attic with insecticide that you don't want to breathe. You'll probably want a helper down below for those items you inevitably forget to take along. Since such non-ham helpers often have other things to do, a set of handheld FRS radios is a good idea. I found that a tool belt loaded with stapler, wire ties, wire cutters, pliers, nails, solder, tape, flashlight, and other tools and supplies was indispensable.

I strung the wire as far as I could in each direction before needing to bend the ends. A staple gun anchored the wire to the roof beams and supports. I tried to keep it as high and straight as possible, but the antenna is 66 feet long and the house is not. I ended up with a few bends, but did as well as I could. It was obviously going to be very difficult to keep running from one end of the antenna to the other trying to trim it to resonance on 40 meters, so I decided to leave it and let the antenna matching circuit do its work. I added a few standoffs (also from RadioShack) to keep the feed line as far as possible from the pipes and other metal objects it needed to traverse on its way from the shack to the attic. Now to try it out!

I connected the twinlead to my newly purchased used tuner and plugged in the MFJ-259 antenna analyzer I had purchased several years ago. I was able to tune it for a good match quite easily on most bands 40 meters and above.

Eighty meters was not so good, but I had expected that. With a good deal of trepidation, I tuned it up for 40 meters and connected the tuner to my QRP rig. A QSO with a ham in Indiana was my reward, followed by a 20 meter contact in Maryland, then 40 meters to Oklahoma and Illinois and 20 meters to Ohio. The thing worked!

UAØ QRP

I'm pretty much just a casual operator, but since that day I have made several hundred contacts using CW, PSK31 and SSB. I operate mostly at 5 W or less, though I have run as much as 50 to 80 W on rare occasions. I have made contacts on 40, 30, 20, 15 and 10 meters in all parts of the country and a few DX locations, though due to terrain in my area and some foil-backed insulating board in the attic I do seem to favor the East and North. My best catch to date has been UAØAZ with 5 W—so I guess the antenna works. I do experience some trouble with touch lamps cycling on and off in rhythm with my CW. This may be from feed-line radiation or simply the proximity of the signal to the lamps. Eventually I'd like to replace the twinlead with some good quality coax and mount a remote antenna matching unit in the attic, but for now it's not a priority.

More recently, I did take the antenna analyzer into the attic and tuned the wire for a good match on the low end of 40 meters. I also re-strung it in a more regular zigzag pattern. I had a couple of 8 foot pieces of aluminum tubing left over from a defunct vertical antenna, and found that with a couple of short wire jumpers they resonated almost perfectly on 12 meters, just below 25 MHz. I connected them as a second dipole connected in parallel to the feed point of the existing antenna, which didn't affect the 40 meter tuning enough to bother with. Since that time I have found I can still load the antenna just fine on all bands 7 MHz and above. It seems to have a more omnidirectional pattern than before, with less of a null off the ends of the wire. I may add wire elements for a few other bands later on.

Lessons

I think the lessons to be learned here are pretty plain. An HF antenna system doesn't need to be complicated or expensive. Including the tuner, I have a total of less than $75 invested in my entire antenna system—and I could have built a tuner for less. In fact, I recently did build a NorCal "BLT" (Balanced Line Tuner), available for $25 in kit form.

If you have a big-antenna/high-power mindset and simply can't live without a big amp, tower and tribander, an antenna-restricted neighborhood is probably not a good choice for you. If you just want to get on the air, though, there is not much wrong with an antenna that will avoid problems with the neighbors (and the spouse) and still get you on the air with a respectable showing.

Don't be afraid of balanced feed line; my cheap TV twinlead snakes across several water and gas pipes, through some sheet metal flashing and runs alongside galvanized ductwork for a major part of its 80-odd feet. I have not noticed any major ill effects, and it works better than coax.

Most of all, don't listen to anyone who says, "It can't be done," or "It won't work." You're a ham; you can make it work!

Photos by the author.

Dale Botkin, NØXAS, of Omaha, Nebraska, was first licensed in 1981. He enjoys many different aspects of ham radio, particularly QRP and homebrewing. Dale spends much of his time working on new projects to make operating easier, focusing on simple antennas and using microcontrollers for ham applications. Dale is a systems architect with a major on-line brokerage firm, and is a member of the ARRL, QRP-ARCI and AmQRP. He can be reached at **n0xas@arrl.net**.

Season's Greetings

and Peace on Earth

Leona Adams
Katherine Allison, KA1RWY
JoAnn Arel
Zoe Belliveau
Jon Bloom, KE3Z
Shelly Bloom, WB1ENT
Joe Bottiglieri, AA1GW
Antoinette Brinius
Al Brogdon, W1AB
LouAnn Campanello
Kathy Capodicasa, N1GZO
Steve Capodicasa
Joe Carcia, NJ1Q
Heather Cirigliano
Steve Coffey
Stuart Cohen, N1SC
Martin Cook, N1FOC
Jill Crevoisier
Helen Dalton, KB1HLF
Michael Daniels
John Dilks, K2TQN
Carole Dimock, N1NAM
Don Durand
Mark Dzamba, KB1FMY
Pam Dzamba, KB1FMZ
Steve Ewald, WV1X
Sue Fagan
Ann Figat
Steve Ford, WB8IMY
Norm Fusaro, W3IZ
Scott Gee, WB9RRU
Perry Green, WY1O
Kristy Grondzik
Mike Gruber, W1MG
Joel Hallas, W1ZR
Ed Hare, W1RFI
Penny Harts, N1NAG
Dan Henderson, N1ND
John Hennessee, N1KB
Mary Hobart, K1MMH
Tom Hogerty, KC1J
Stan Horzepa, WA1LOU
Berta Hould
Gail Iannone
Chris Imlay, W3KD
Bob Inderbitzen, NQ1R
Walter Ireland, WB7CSL
Karen Isakson
Bart Jahnke, W9JJ
Debbie Jahnke
Debra Johnson, KB1LMT
Joel Kleinman, N1BKE
Linda Kleinschmidt
Lisa Kustosik, KA1UFZ
Greg Kwasowski, KB1GJF
Zachary Lau, W1VT
Rose-Anne Lawrence, KB1DMW
Monique Levesque
Robert Lincoln
Rick Lindquist, N1RL
Fatima Lorusso
Carl Luetzelschwab, K9LA
Sandy Lund
Maryann Macdonald
Nonie Madone
Bernie McClenny, W3UR
Dan Miller, K3UFG
Judy Miller
Wayne Mills, N7NG
Bill Moore, NC1L
Jodi Morin, KA1JPA
Dennis Motschenbacher, K7BV
Linda Mullally, KB1HSV
Diane Ortiz, K2DO
Dave Patton, NN1N
David Pingree, N1NAS
Ann-Marie Pinto
Allen Pitts, W1AGP
John Proctor, KB1KJA
Dana Reed, W1LC
Paul Rinaldo, W4RI
Howard Robins, W1HSR
Janet Rocco
Kim Rochette
Eileen Sapko
Daniel Sayad, KB1IIP
Cathy Scharr
Bob Schetgen, KU7G
Joe Shea
Andrew Shefrin
Barry Shelley, N1VXY
H. Ward Silver, NØAX
Jon Siverling, WB3ERA
Chuck Skolaut, KØBOG
Doug Smith, KF6DX
Maria Somma, KB1KJC
Mark Spencer, WA8SME
Cathy Stepina
Dean Straw, N6BV
David Sumner, K1ZZ
Diane Szlachetka
Sharon Taratula
Lisa Tardette
Michael Tracy, KC1SX
John Troster, W6ISQ
Ed Vibert
Pete Warner, KB1KJB
Maty Weinberg, KB1EIB
Rosalie White, K1STO
Perry Williams, W1UED
Tom Williams, WA1MBA
Dan Wolfgang
Jean Wolfgang, WB3IOS
Larry Wolfgang, WR1B
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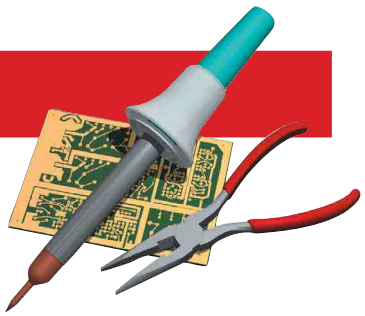
from the ARRL Staff and Contributing Editors

NEW PRODUCTS

SWITCHING POWER SUPPLY FOR AMERITRON ALS-600 AMPLIFIER

◊ The ALS-600SPS is a lightweight switching power supply designed to operate with the Ameritron ALS-600 HF solid-state power amplifier. The supply weighs a third as much as the linear power supply originally packaged with the amplifier. The included switching and filtering are said to make the supply free of RF hash. The supply can be set for a nominal input of either 120 or 240 V ac at 50 to 60 Hz. The power supply is designed to operate from 90 to 130 V ac in the low voltage position and 185 to 260 V ac in the high voltage position.

Nominal output is specified at 50 V dc at up to 25 A and ±14 V dc at 1 A. Metering of output voltage and current is provided. A 6 foot cable with connectors to mate with the ALS-600 amplifier is included. The switching power supply weighs 10 pounds and is 6 × 9 × 14½ inches in size. Price: ALS-600SPS, $629; ALS-600 amplifier and ALS-600SPS power supply combination, $1428. To order, or for your nearest dealer, contact Ameritron, 116 Willow Rd, Starkville, MS 39759; tel 800-713-3550; **www.ameritron.com**.



The Doctor is IN

Q Here's a question from Jim, W7QIS: I would like to have the instructions (and pictures, if possible) on exactly how to put a PL-259 type connector on the end of 9913 coaxial cable. The problem is the aluminum shield that seems to be bonded to the dielectric. I've tried scraping the bonded shield back from the center connection that enters the connector, but I wonder if there is a better way. In my copies of *The ARRL Operating Manual* and *The ARRL Handbook*, this cable/connector installation isn't mentioned.

I've a new ham station going in at our new home so would like this info ASAP so I can get the cable ordered and get on the air. I hesitate to proceed because of past problems. I will run a 1000 W on the HF bands (160-80) and 2-300 W on 2 meters and 440 MHz for now and I presume that the 9913 cable will be satisfactory.

A While 9913 has impressive low-loss specifications at VHF, I'd advise against its casual use because of its partial gas-filled center dielectric. This tends to be a magnet for water intrusion and unless the center dielectric is well sealed (no easy task), it will tend to "wick" water through the cable. Belden has addressed some of these problems with the manufacture of a new version of this cable, 9913F7.[1] This uses a gas-injected FHDPE (foam high density polyethylene) center dielectric, rather than the partial gas-filled dielectric. The solid dielectric comes at an increased loss of 0.1 dB/100 feet at 100 MHz (9913 has a loss of 1.40 dB; 9913F7 1.50 dB—both per 100 feet at 100 MHz). The increased loss is not consequential and I'd advise going with 9913F7 if you must go with 9913-type cable.

I would also urge you to consider 8214-type cable. The Belden variety has a loss of 1.70 dB/100 feet at 100 MHz. The advantage is that this cable uses a stranded center conductor (9913 is solid copper) with 97% copper braid shield coverage, giving a lot more flexibility than 9913. Of course, your choice of cable would also be dictated by the total cable length and the highest frequency of operation (you said that was 440 MHz). You might consider using different types of cable for each run. Use 8214 for the HF run, and, if the UHF run is excessive, 9913F7 for the 440 MHz run.

Now, on to your original question: While I can't give you pictures or an exact description of the 9913/PL-259 installation, *The ARRL Handbook* (2004 edition, p 22.7) details should be a good start (also, read the article in this issue by S. Ford, WB8IMY, "The Ubiquitous PL-259").

My own recommendation differs slightly from that presented in *The Handbook*, in one respect. It advises you to tin the shield braid before insertion into the connector body. I've found that the increased shield thickness caused by tinning makes it more difficult to force the shield of a large diameter cable into the connector. In this case, I'd advise against pre-tinning the shield. Position the shield flatly against the center dielectric (or the first shield, if you have a cable with multiple shields) then carefully insert it into the connector body so it doesn't push back. In any case, if you do elect to pre-tin, do it quickly or the center dielectric will melt, particularly in a cable with a core like the FHDPE type.

I believe the problem that you're having has to do with the Beldfoil Duobond shield. This aluminum foil shield is bonded to the center dielectric and there should be a 97% plated copper shield over the foil. The trick is to make a very clean and sharp cut through *both* the copper and the foil shields, so you don't disturb the lay of the shields or push back the tinned copper shield. Both foil and tinned copper shields should lie flat. Make sure both shields are inserted into the PL-259 connector so that the copper shield is visible through the shield solder holes. This will take a bit of skill. If the copper shield pushes back upon insertion into the connector, you'll have to start again. There should be just enough clearance for passage of both shields if the copper shield is lying flat, and it is as close as possible to the foil shield. Use a hot iron and solder the shield holes without imparting too much heat to the connector body, as this will melt the center dielectric. This will take some practice. The trade-off is in knowing how much heat is required for proper solder-wetting and flow, as opposed to excessive heating of the connector body. That knowledge will come with experience. The advantage of a hot iron is that you're concentrating on localized, quick heating of the solder holes, rather than prolonged heating of the entire connector body. Take your time with cable preparation, use a proper temperature iron and good luck!

Q Scott, KBØFHP, writes: I have a wire vertical antenna that is resonant at 3.8 MHz. I want to switch in, via a relay, an extra length of wire for 3.5 MHz. What type of relay would I use? Can Potter & Brumfield (or equal) 10A, 110V SPST or DPDT relays work? I'd also like to add another antenna for 80 meters—and I'd like both to be switchable in order to change directions. Can I use similar DPDT relays to achieve that—or am I looking at the more expensive coaxial relays?

A The relays should work, with a few cautions. Try to avoid "hot" switching (switching with RF applied), as special contacts are required to do this if the power level is going to be moderate to high (100 W to 1 kW). RF tends to arc during "make" or "break" at these power levels and this will damage and "pit" standard relay contacts. Generally, at the kilowatt level, we're talking of upwards of 5 A of RF into a typical antenna impedance. Also, relay contacts usually develop a high-resistance insulating layer in an outside environment. Without adequate current to "punch through" that layer, this can be troublesome. Gold contacts may also be needed if you expect to dry switch to be able to do receive only testing with no current through the relay.

Moisture can also be a problem. Sealing a relay inside a box rarely works, unless you are in a very dry climate. In a wet climate, water vapor will condense inside the box and collect, and the enclosure will need to be vented. The commercial technique is to keep enclosures at a small positive pressure, usually using dry nitrogen. Broadcasters typically do this at their transmitter sites with coaxial transmission lines (we're talking about 5-8" OD coaxial lines at power levels approaching 50 kW). The ham

[1] **bwccat.belden.com/ecat/pdf/9913F7.pdf**.

will rarely need to pressurize. Another concern is that the contact insulation may be inadequate for high voltage situations. Try to place the relays in locations where the RF voltage is not excessive.

Aside from the contact requirements, the coil voltage is another issue. I'd try to stay with low voltage dc coils (12-24 V dc) for outdoor use. It is safer, and it makes it easier to run the dc control voltage along with the RF with a suitable decoupling/isolation circuit. A circuit for doing this appeared recently in *QST*.[2] The basic idea is shown in Figure 1. The inductors (a *high* impedance at RF) and capacitors (a *low* impedance at RF) isolate the dc from the RF. It thus makes it unnecessary to decouple and choke the control cables that carry the coil voltage. RF getting into these lines tends to be a problem, especially if they are in close proximity to the antenna system.

You can probably use DPDT relays if the leads are kept short on 80 meters. On 10 meters, there may be a significant impedance discontinuity from the relays. There may also be isolation issues on receive—I wouldn't expect a lot of isolation from an open frame DPDT relay, even on 80 meters. This, of course, is where the coaxial relay shines, if used on a coaxial line. The isolation is high (especially at HF) and the impedance is nearly constant through the relay. Nevertheless, hams have been using open-frame relays to switch wire antennas for years, so good luck!

Q Tom, KC2GEP, writes: I have a short question regarding outdoor portable operation. I have a Kenwood TS-520 that we would like to operate outdoors at a weekend campout. There is a grounded three-pronged electrical outlet available that furnishes 120 V, 60 Hz ac. What safety precautions do we need to take for safe operation when used outdoors? We also plan to use a 20 meter dipole, suspended from trees, for an antenna. The site of operation will be 2 or 3 miles from a very large electric power generation plant. Could interference be a problem?

A As long as you use three-wire power cords for everything and observe all safety precautions in the generator owner's manual (if you use a generator), you should be fine. Installing a temporary ground rod would be advisable and run all of your equipment grounds to it. For general safety considerations, refer to the safety chapter in either *The ARRL Handbook* and/or *The ARRL Antenna Book*.

[2]P.Salas, AD5X, "Remote DC Power Through Your Coax," *QST*, Jul 2004, pp 35-37.

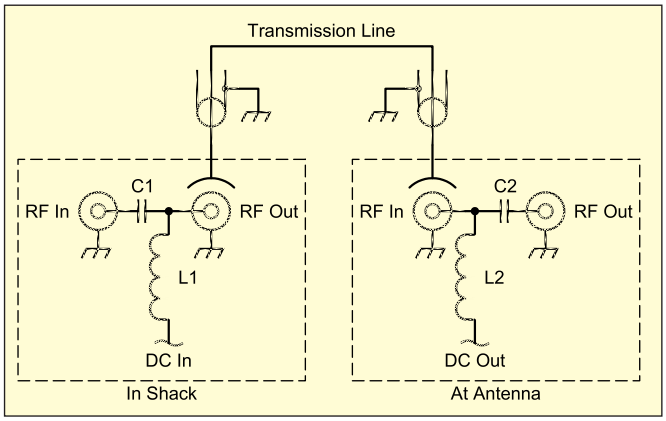


Figure 1—The basic technique used to send dc power on an RF transmission line. At the sending end a capacitor (C1) and a choke (L1) are used for coupling and isolation. At the receiving end a choke (L2) and capacitor (C2) decouple the RF and dc. The capacitors have *low* impedance at RF—the inductors *high* impedance. The circuit was described in detail in *QST* (see text).

Figure 2—A pair of utility ac testers. These come in various package styles. The three lights indicate crossed or missing connections and can check more than six possible failure modes. They should be part of every amateur's field/emergency kit.

I do suggest that you use an ac outlet tester, such as the ones shown in Figure 2. These are useful and worthwhile devices for determining open grounds, crossed neutral-ground connections and the myriad of other possible failure modes with ac outlets. If you consider that there are three connections available in a standard ac outlet, there are six paths to failure (plus the chance that any one or more of the three is open). I routinely use one before embarking on any field operation that's powered by an ac source; be it portable or fixed, and it should be a standard part of your field toolkit. You don't want to be around outlets with missing grounds or crossed neutrals, especially in the field! These problems are more common than you think, especially when homebrew three-wire ac extension cables are used. Also, I would check all ac equipment grounds and make sure the ground (green) lead (the long center pin of the plug) is connected to the equipment chassis or case. This can be easily and quickly done with an ohmmeter.

Whether or not there is a problem with the electric plant or the local power grid depends on the utility's power system maintenance program. Distributed power systems typically only generate interference when there is a problem with the hardware in the system like arcing line splices, defective insulators, poor pole transformer connections, etc. Many of these problems are detailed in the *AC Power Interference Handbook* that is available from the ARRL.[3] Stay safe and have fun!

And lastly, here's a comment from Don, AB2NM: *I read the question and your answer to Dwight in September* QST *(p 50), and I'd like to make a suggestion. Dwight, please contact Handi-Ham at: Courage Handi-Ham System, Courage Center, 3915 Golden Valley Rd, Minneapolis, MN 55422; tel 1-866-426-3442 (toll free);* **hamradio@courage.org**; **www.handiham.org**. *These great folks have been providing resources and wise counsel to hams and aspiring hams for years. Your loss of hearing is not a new problem to them—they will be able to assist you. Contact them before you decide to "give up" ham radio.*

Thanks, Don, for bringing attention to the wonderful work that the folks at Handi-Ham do. It's a good suggestion and a worthwhile addition to this month's column.

[3]Available from the ARRL Bookstore. Order no. 9055. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/; pubsales@arrl.org**.

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/.

By Jim Valdes, WA1GPO

The FARApole

A portable HF antenna for 6 through 20 meters that's ideal for toting.

The Falmouth Amateur Radio Association (FARA) is one of the largest and most active Amateur Radio groups on Cape Cod, Massachusetts. The group has a number of amateurs who enjoy the construction phase of our hobby—they are affectionately known as "hackers." Several of FARA's projects have been published and are available on the Web.[1] FARA's latest project is a low cost portable HF antenna, the FARApole—it's ideal for low power, multiband transceivers, like the Yaesu FT-817.

There are a number of commercially available HF portable antennas. Most, however, are relatively costly and they are frequency limited, factors that might discourage "casual" operating. One of our goals was to have an antenna as versatile as the FT-817 transceiver itself, and the pictures illustrate the flexibility of that design.

The antenna is compact; it will easily fit in a suitcase along with a UHF-style magnet mount for weekend getaways. Although primarily intended for low power operation, power levels up to the 100 W level can be tolerated when it is operated as a dipole or in a mobile configuration, provided the radio is located a satisfactory distance from the transmitter. This is necessary for safety and to minimize RF feedback at the

[1]Notes appear on page 54.

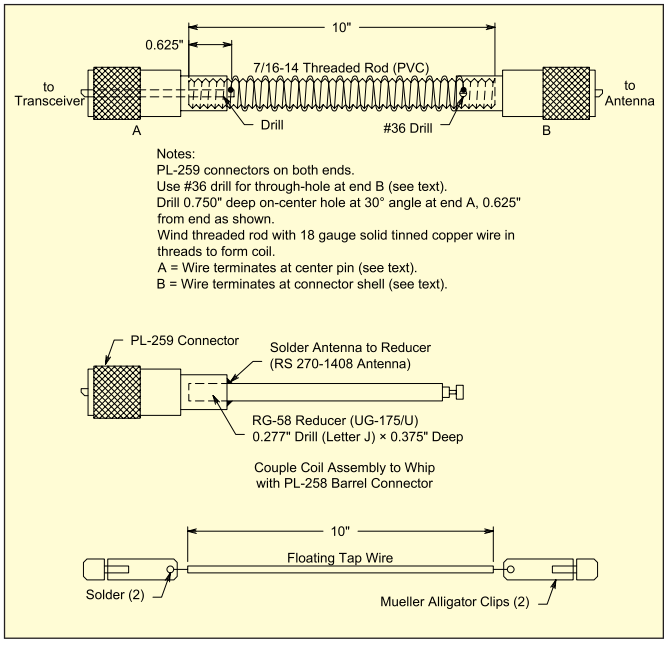


Figure 1—Construction details of the FARApole antenna. Note that the coil connects to the PL-259 center pin on one end, but to the connector shell at the other end. Construction of a dipole requires two "B" terminations for one element (see text).

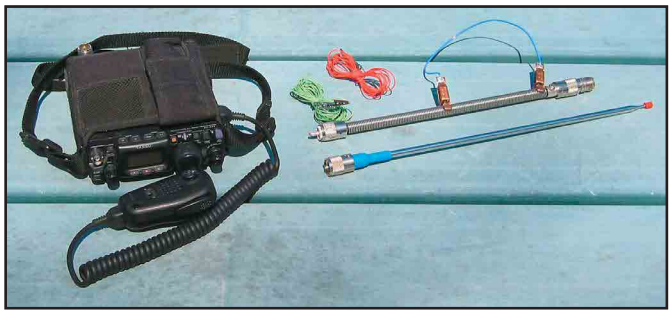


Figure 2—The completed FARApole antenna, dismantled, but ready for installation. The wire bundles are counterpoise radials that will be attached to the transceiver's ground terminal. Note the right-angle UHF connector at the rear of the transceiver. This will ensure that the vertical antenna is, indeed, vertical.

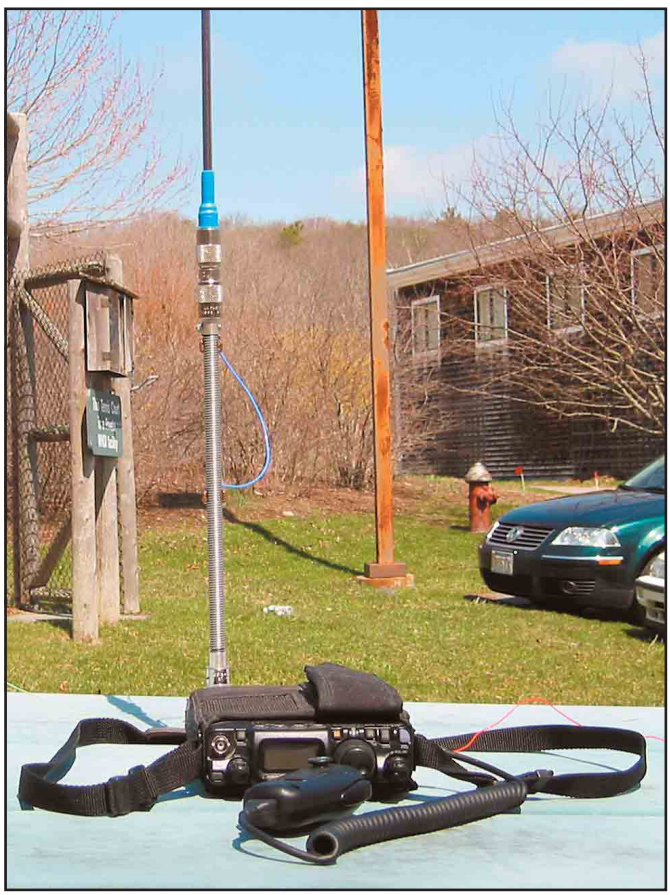


Figure 3—The antenna assembled and mounted on the transceiver. The counterpoise radials can be seen running to the left and right of the transceiver.

100 W power level. The operator is cautioned to observe recommended safe RF exposure limits. [This is always prudent when operating close to an antenna at moderate power levels. An excellent ARRL reference text, *RF Exposure and You*, contains effective safe guidelines for operation at various power levels with respect to frequency and distance.[2]—*Ed.*]

This is a portable antenna design utilizing readily available components and it is easy to construct—only simple hand tools are needed for fabrication. The antenna is base loaded with a telescoping whip and a "wandering" lead to tap a loading coil for various bands. The overall length is approximately 7 feet. With all parts on hand, it can be constructed in less than 15 minutes.

Assembly Hints

The construction of the antenna is detailed in Figure 1. Table 1 is the parts list and the completed antenna (dismantled) is shown in Figure 2, next to an FT-817 transceiver.

The loading/matching coil is wound with 18 gauge tinned solid copper wire. Stretch and straighten the wire by pulling it over the round end of a rake handle or other similar tool to remove any kinks. Temporarily install the PL-259 connectors and drill the holes in the 7/16 inch threaded PVC rod prior to starting the final assembly. Remove the connector near the 30° hole—bend one end of the wire into a "J" shape and work it through the 30° hole and out the end of the rod. Straighten the wire and reinstall the PL-259 connector.

Install the 4-40 hardware in the through-hole on the other PL-259 connector—do not tighten at this time. Carefully wind the wire onto the threaded rod using the threads as a coil form. Wind the coil as tightly as possible; this will take about 5 minutes.

At the far end of the windings, loop the wire over the 4-40 screw, pull it tight and secure the hardware. Refer to Figure 1 during the assembly. Trim the wire and solder the center pin of the first PL-259. You're almost done!

Place the RG-58 reducer in a vise and carefully enlarge the hole to accommodate the base of the telescoping element.[3] Drill very slowly as the brass fitting tends to seize and grab the drill bit. Use a 0.277 inch (letter size J) drill bit, as shown (Figure 1). Access to a small lathe is desirable, but is not essential. *Caution*—keep your fingers away!

Use a little emery paper to buff the lower end of the whip prior to assembly. A little rosen flux (don't use acid flux) will improve the solderability of the whip. Again, clamp the modified reducer in a vise, insert the whip (extend the upper sections so as not to overheat), and sweat-solder the whip with a butane torch. Install the reducer into the remaining PL-259 and secure the threads with some Loctite 242 thread-locking compound. A little shrink tubing over the assembly will enhance its appearance.

Lastly, solder the Mueller clips to the ends of the 10 inch piece of tap wire. This serves as a wandering lead to tap the coil for selecting the necessary loading in order to bring the antenna into resonance on various bands. That's it—you're done!

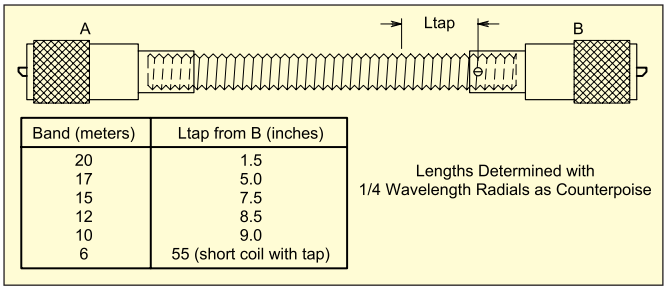
Operation

All loaded antennas represent some compromise—in this case it's the ease of construction. A center loaded antenna with an air-core inductor would likely be more efficient, but much more difficult (and expensive) to build. In effect, this antenna functions as a base loaded 1/4 wavelength vertical. As such, it *requires* some form of counterpoise (in this case, radials) to complete the "other half" of the dipole.

Figure 3 (a loaded 1/4 wave vertical with wire radials) and Figure 4 (a modified 1/2 wave dipole) illustrate two examples of the antenna, ready for use. The system SWR is as sensitive to the counterpoise as it is to the loading coil tap. Quarter wavelength radials using color-coded 22 gauge jacketed wire are a simple and cost effective solution to the counterpoise problem. In any case, the exact position of the coil tap must be determined experimentally, as it depends on the counterpoise placement (the position of the radials) or the use of a second element to form a dipole. Radials that are suspended on a deck or table will not have the same coil tap position as those that are placed directly on the ground.

Tune-up is simple. Place the FT-817 (or any other transceiver) in a low power mode and set the meter to the SWR position (or use an in-line SWR indicator). In FM or CW (you will need a steady carrier) alternately adjust the tap and key the transmitter until you obtain an acceptable SWR. Do not

Figure 4—A dipole version of the antenna can be constructed (see text). The portable mast is made of PVC pipe, joined by a PVC coupling. The elements are mated using a UHF T connector, supported by a PVC T section that is cut in half and joined with electrical tape. One of the elements requires two "B" terminations, as outlined in the text and shown in Figure 1.



Band (meters)	Ltap from B (inches)
20	1.5
17	5.0
15	7.5
12	8.5
10	9.0
6	55 (short coil with tap)

Lengths Determined with
1/4 Wavelength Radials as Counterpoise

Figure 5—The approximate tap positions for the loading coil. For 6 meter operation, the coil is shorted with the tap wire and the overall antenna length (including the tap wire) is adjusted to 55 inches.

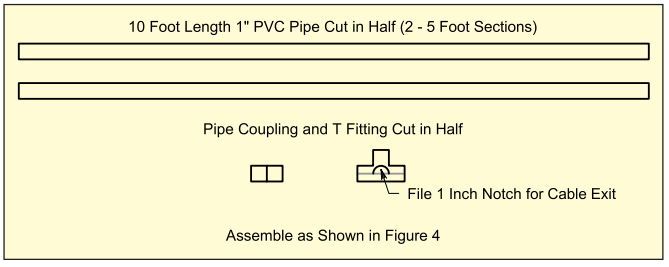


Figure 6—Details of the portable mast fabrication. The mast consists of two 5 foot PVC sections, joined with a coupling. A PVC T, cut in half, is used to support (with the help of electrical tape) the dipole version of the antenna. A notch filed in the T serves as an exit hole for the cable.

Table 1
Parts List for the FARApole Antenna
CI=Craftech Industries, **www.craftechind.com;** RS=RadioShack, **www.radioshack.com;** M=Mouser Electronics, **www.mouser.com**.

Description	*Quantity*	*Part Number*	*Source*	*Details*
7/16-14 PVC rod	1	D200-21-27	CI	10 inch (PVC threaded rod)
4-40 pan head × 5/8	1			Standard hardware item
4-40 flat washer	1			Standard hardware item
4-40 nylock nut	1			Standard hardware item
18 gauge bus wire	1	602-296-100	M	15 feet (tinned solid copper)
PL-259 connector	3	523-83-1SP	M	UHF coaxial connector
PL-258 coupler	1	523-83-1J	M	UHF coaxial female-female coupler
UG-175/U adapter	1	523-83-175	M	RG-58 reducer for PL-259
Telescoping antenna	1	270-1408	RS	72 inch
Shrink sleeve	1			1/2 × 2 inch
Mueller-type clips	2	13AC511	M	Large jaw type
Miscellaneous wire				10 inch wandering tap lead and radials

Figure 7—The FARApole used as a stationary mobile antenna with a magnet mount.

touch the antenna or wire lead assembly when transmitting. Figure 5 shows suggested tap positions. Short the coil with the clip assembly and adjust the overall length to approximately 55 inches for 6 meter operation.

There are two types of coil terminations, see Figure 1—A and B. In the dipole configuration (Figure 4) the second element is constructed with two "B" terminations (one at each end of the loading coil). Both elements of the dipole are joined with a UHF-type T connector.

You can mix and match— use the type B-B coil in series with the A-B coil for expanded (lower) frequency coverage. Use care, as the "B" terminations are RF "hot" on the connector shell and a longer coil assembly will place more strain on the coaxial connector. The "A" termination *always* connects to the radio or coaxial cable—as, here, the coil goes to the PL-259 center pin.

A Portable Mast

When the antenna is used in a dipole configuration a portable mast is handy; this can be seen in Figure 4. The mast is constructed from 1 inch PVC pipe and fittings; Figure 6 details the mast assembly. The T fitting is cut in half. A pipe coupling is attached to one of the mast pieces and the modified T to the other. Use a UHF-type coaxial T for the center of the dipole element, as outlined earlier, and electrical tape to hold it in position on the mast. You may wish to file a notch in the pipe T fitting for the cable to exit.

A Few Comments

In fussing with various types of portable antennas, I've noticed, on occasion, some RF feedback (RF output indicated on the meter when I wasn't talking). Winding the coax (I use 30 feet of RG-174/U cable) into a 5 or 6 turn, 4 inch diameter loop as a common mode choke at the radio's antenna connector was helpful. Small clip-on RF chokes also worked. I found Yaesu's tone-encoded microphone (MH-36) to be much more susceptible to RF feedback than the standard microphone (MH-31) supplied with the transceiver.

The orientation of the Yaesu FT-817 rear panel coax connector would not permit the antenna to be in a true vertical position when mounting the antenna to a right angle (UG-646/U) connector on the back of the radio. This was due to the index locking tabs on the mating connectors. I solved this problem by grinding the tabs off on the 90° connector with a Dremel tool.[4] The antenna looks better when it is truly vertical.

Fixed mobile operation (not in motion) with a magnet mount (Figure 7) was satisfactory on the higher frequency bands, but it required a "ground clip" to the car body on the 20 meter band for an effective counterpoise.

The antenna has only seen limited use outdoors, as it was winter on Cape Cod when it was completed. A number of successful coast-to-coast contacts were made and several contacts were made on 20 meters throughout the US and South America. It's lots of fun to use—even if it is cold outside!

The Falmouth Amateur Radio Association's Web site (**www.falara.org**) maintains some FAQ files on our TekTalk forum pages. Please check the Web site for any recent developments or modifications to the FARApole antenna. Thanks to our Webmaster, K1BI, for his support.

Notes

[1]FARA projects can be seen at the FARA Web site: **www.falara.org**.

[2]Available from the ARRL Bookstore. Order no. 6621. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[3]Be careful when clamping the reducer in a vise. Do not clamp the threads. Too much pressure will distort the cylinder and it will then be difficult to thread into the PL-259 connector.—*Ed.*

[4]A 90° UHF male-female connector with a smooth interior shoulder with no locking tabs at the male end is available commercially, although it may be difficult to find.—*Ed.*

Photos by the author

Licensed since 1962, Jim Valdes, WA1GPO, holds an Amateur Extra class license. He is active on all of the amateur bands from 160 meters through 70 cm. Jim has a BS degree in electrical engineering and has worked for the Woods Hole Oceanographic Institution for almost 30 years. You can contact him at 63 Alderberry Ln, East Falmouth, MA 02536 or at **wa1gpo@arrl.net**.

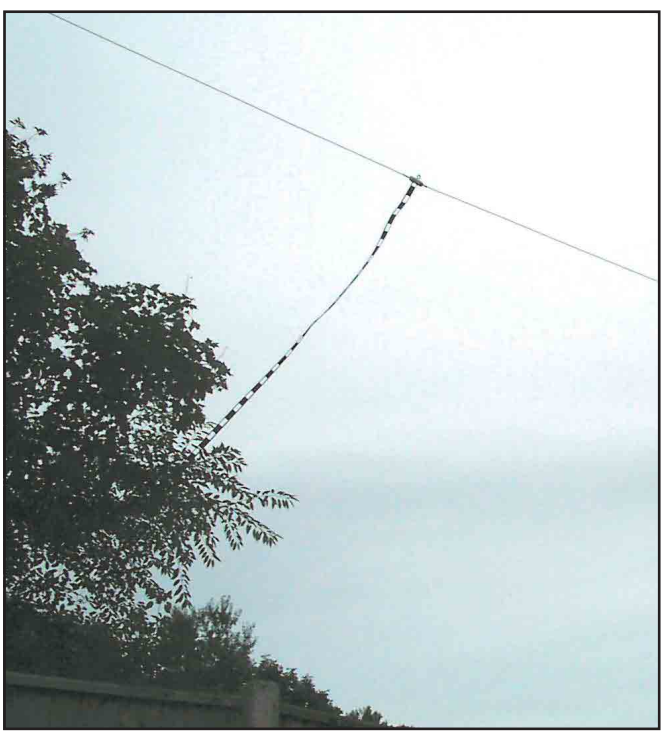
Spi-Ro AS-2 All-Band Antenna

The Spi-Ro Manufacturing AS-2 All-Band antenna touts its ability to provide 160-10 meter operation with a wire dipole that is only 70 feet in length. Considering the fact that a half-wavelength dipole for 160 meters is about 260 feet long, that is quite a claim.

How does the AS-2 do it? Through the use of sizable coils, or "shorteners" as Spi-Ro calls them, in each leg of the dipole. The coils are encased in durable PVC and they electrically shorten the overall length of the antenna. Of course, the laws of physics demand that there is no such thing as a free lunch, so the AS-2 is clearly a compromise design for 80 and 160 meters where it is shorter than a half wavelength for those bands. Even so, when you don't have room for monstrous antennas that include the low bands, a shortened all-band antenna like the AS-2 begins to look attractive.

Installation

The AS-2 arrives completely assembled, right down to the 100 feet of 450 Ω ladder line attached to the center insulator. I began the installation by removing the twist ties that secured the wire loops and unwinding both legs of the antenna in my backyard, being careful not to kink the wires. With Dacron lines attached to both end insulators, I hauled the AS-2 skyward, stretching it between two trees. Spi-Ro recommends installing the antenna as high as possible. My AS-2 hovered at 30 feet. Total installation time was about 30 minutes.



A partial view of the installed Spi-Ro AS-2 with the center insulator and 450-Ω feed line visible. (Wire antennas are notoriously difficult to photograph!)

Operation

Because the AS-2 is fed with ladder line, you need to use a balanced antenna tuner for all-band operation. For my tests I tried a small MFJ tuner.

I did indeed get the AS-2 tuned to a flat match on each band. The difficulty varied, however, depending on the band. For instance, I tuned the AS-2 for use on 160 meters easily, but on 80 meters the tuning was touchy. Your results may be different depending on the height of the AS-2, its proximity to other objects and the length of the 450 Ω feed line (I used 50 feet).

One of the AS-2 "shorteners."

If you can't bring the 450 Ω line all the way to your station, one possible solution is to use a balun. I decided to try this option as well, just for grins. I picked a 1:1 balun and installed it temporarily outside the window in the room where my station is located. From there, I ran a short length (10 feet) of coax to the antenna tuner. Once again, I was able to achieve a flat 1:1 match on all bands.

It is important to bear in mind that a high SWR condition can exist between the tuner and antenna. When you're working with a balanced feed line such as the 450 Ω ladder line, a high SWR isn't too worrisome thanks to the balanced line's extremely low loss characteristics. Coax, on the other hand, is unbalanced and can be very lossy when the SWR starts climbing. That's the reason for keeping the coax between the balun and the tuner as short as possible. Less coax equals less loss when the SWR is high.

Even with its limited length, I was pleasantly surprised with the AS-2's performance on 160 and 80 meters. At the height of summer, when this review was written, I used the AS-2 for CW contacts out to about 1000 miles.

It came as no surprise to see that performance improved on 40 meters and up. I received consistently good reports and worked a fair amount of DX, particularly on 20 and 17 meters.

As we wallow at the bottom of the solar cycle for the next few years, the lower HF bands will be especially inviting. You're not likely to earn an 80 or 160 meter DXCC with the AS-2, but you will at least be get on these bands and taste some of the excitement. On the higher HF bands, the AS-2 performed just as well as any dipole, which means plenty of contacts. With the quality construction of the AS-2, it should still be around when we reach the next solar maximum and *all* the bands really start popping again.

Manufacturer: Spi-Ro Manufacturing, PO Box 189, Jonesborough, TN 37659; tel 800-728-7594 (orders only); **www.spiromfg.com/index.htm***; $64.95.*

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

By Steve Ford, WB8IMY

The Ubiquitous PL-259

As Georg Ohm might have said, resistance is futile. It's time to come to grips with these common RF connectors.

It is confession time: I *hate* soldering RF connectors onto coaxial cable. I've been doing it for more than 30 years, and I've become reasonably proficient, but I still don't enjoy it.

Regardless of my feelings, RF connectors are here to stay. There are many different types of RF connectors for coaxial cable, but the three most common for amateur use are the UHF, Type N and BNC families. The type of connector used for a specific job depends on the size of the cable, the frequency of operation and the power levels involved. The so-called UHF connector is found on most HF and some VHF equipment. In fact, it is the only connector many hams will ever see on coaxial cable. *PL-259* is another name for the UHF male connector, and the female is also known as the SO-239.

Don't let the term "UHF" deceive you. These connectors are rated for full legal amateur power at HF, but they are poor choices for UHF work because they do not present a constant impedance. PL-259 connectors are designed to fit RG-8 and RG-11 size cable (0.405-inch outside diameter), and adapters are available for use with smaller RG-58, RG-59 and RG-8X size cable.

Soldering the PL-259

There are PL-259 crimp connectors available, but the purists and masochists among us prefer to punish ourselves by soldering these infernal connectors. Proper preparation of the cable end is the key to success.

With first-aid supplies handy, follow these simple, but maddening, steps:

- Measure back about $^{3}/_{4}$ inch from the cable end and slightly score the outer jacket around its circumference (see Figure 1A). With a sharp knife, cut through the outer jacket, through the braid, and through the dielectric, right down to the center conductor. Be careful not to score the center conductor, or your fingers. Cutting through all outer layers at once keeps the braid from separating.
- Pull the severed outer jacket, braid and dielectric off the end of the cable as one piece. Inspect the area around the cut, looking for any strands of braid (or flesh) hanging loose and snip them off. There won't be any if your knife was sharp enough (Figure 1B).
- Next, score the outer jacket about $^{5}/_{16}$ inch back from the first cut (Figure 1C). Cut through the jacket lightly; do not score the braid. This step takes practice. If you score the braid, curse loudly and start again. Remove the outer jacket.
- Tin the exposed braid and center conductor, but apply the solder sparingly and avoid melting the dielectric that separates the braid from the center conductor. If you're working with smaller coax, slip the adapter on first, fold the braid back over the adaptor as far as the threaded portion (cutting off any excess), then tin the braid.

[continued on page 87]

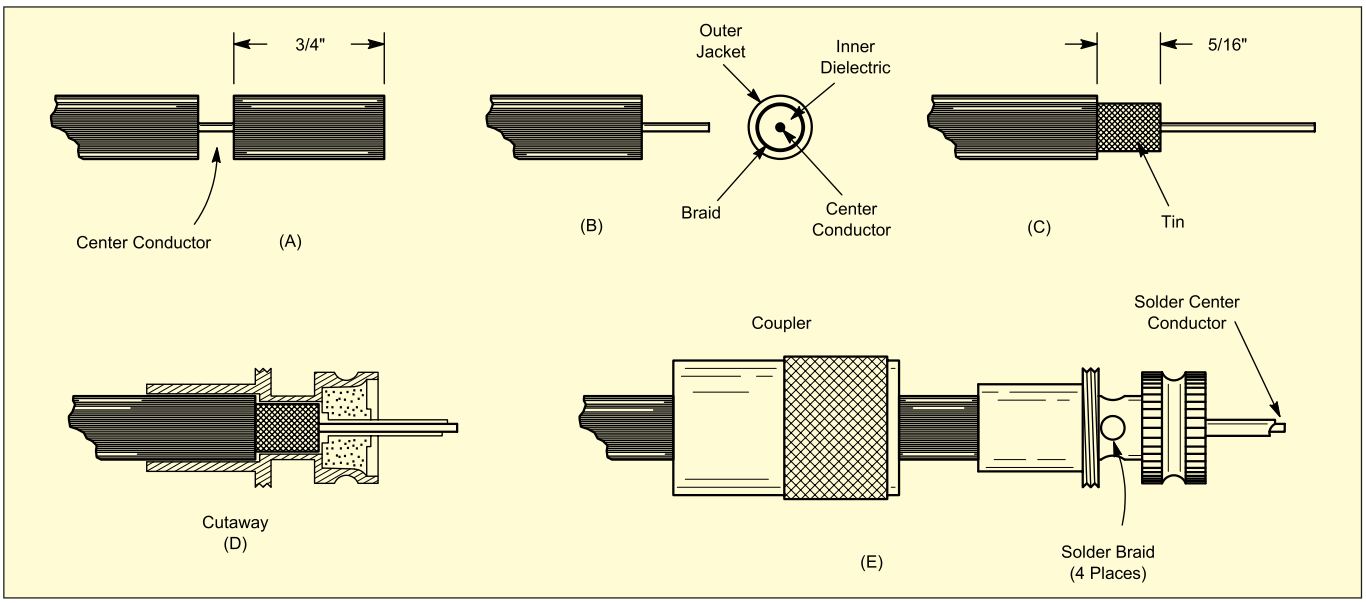


Figure 1—Attaching a PL-259 connector to RG-8 and RG-11 size cable (0.405-inch outside diameter).

Experiment #23: Open House in the NØAX Lab

What better way to celebrate the holiday season than with an open house for friends? In the case of Hands-On Radio, it will be "open lab." I'm delighted to wrap up the second year of the column by inviting you to take a look behind the word processor to see where the experiments come from.

The Lab

You may think I must have a big, industrial-sized facility with the latest in technical gadgetry and instrumentation. Not so! While my little shop is fairly well equipped, what makes it play is having the right tools and parts conveniently located. Figure 1 shows that my workbench is "co-located" with my ham shack and office. Having everything within arm's length or a step away has turned out to be a real boon after having had them in separate rooms before.

Even if you have a very small shack, it's a great idea to have a bit of room to do troubleshooting on the spot. You need to have access to antennas and power supplies to really check out the radio equipment. A piece of plywood, fiberboard, or even cardboard, will protect a desktop while you work on the electronics.

Figure 2 shows the equipment layout on the workbench. The bench surface is plywood, which tolerates the various mechanical insults I throw at it. When the plywood gets too grungy, I turn it over or get a new piece. For sensitive electronics work, I unroll a static dissipating mat that stays clean between uses. Heavy-duty tasks get done in the garage where I can really make a mess!

Lighting is very important to being able to work with small parts and dig into equipment. All of the lights are movable—there are two clamp fixtures that can slide horizontally, and one swing-arm lamp that can move in close. I also have some small photoflood bulbs that I can use for photography or when lots of light is needed. A pocket flashlight and a mini-gooseneck lamp illuminate those tight spots. A head-mounted magnifier comes in handier with each passing year.

The flooring is linoleum, not carpet. If possible, the floor in your lab should be a smooth surface. Carpeting in a lab environment traps dirt, shavings, metal bits, small parts and solder blobs melt it. If you're stuck with carpet, pick up some of the office rug protectors for rolling chairs and trim them to fit around your workbench. You won't regret it!

The room I use for all three jobs—shack, bench, and office—is just 10×16 feet, so I have to make the most of available space with drawers, shelves and carts. Tools are kept in a rolling set of drawers or in a toolbox. Even the radio equipment is on movable carts or cabinets so that I can easily work in back of the gear.

You can never have too many cables—dc, ac line cords, RF, data—they're all used in today's ham shack. Keeping them straight is another thing. You can see two cable racks in Figure 1, at the left. I also installed a piece of pegboard with long hooks to hold coils of coax and data cables. Avoid throwing your cables in a box. You'll waste a lot of time untangling them and you'll never find the one you want.

My Friends, the Test Instruments

Surveying the workbench shown in Figure 2, you'll see the equipment that I use most often. There are two power supplies; one is a dual 0-20 V dc lab supply and the other a high-current supply designed for powering radios. A Variac is to the left of the supplies—good for testing line-powered equipment.

The function generator and voltmeter are used for almost every experiment and building job. Don't scrimp on a voltmeter. A flexible function generator can substitute for several single-purpose generators and many can be found on the surplus market.

Other favorite instruments include the reliable Bird wattmeter and an assortment of common "slugs" or sensing elements and dummy loads. An MFJ Antenna Analyzer is never far from

Figure 1—The workbench is surrounded by parts and tools and the shack just a few feet away. Having what I need close by is a big help!

Figure 2—On the bench, you can see the instruments that I use most frequently. Parts bins hold bulk parts and small junk boxes. The oscilloscope is on a rolling cart.

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Figure 3—Keeping tools and parts in a toolbox means they're always in the same place and ready to go when you are.

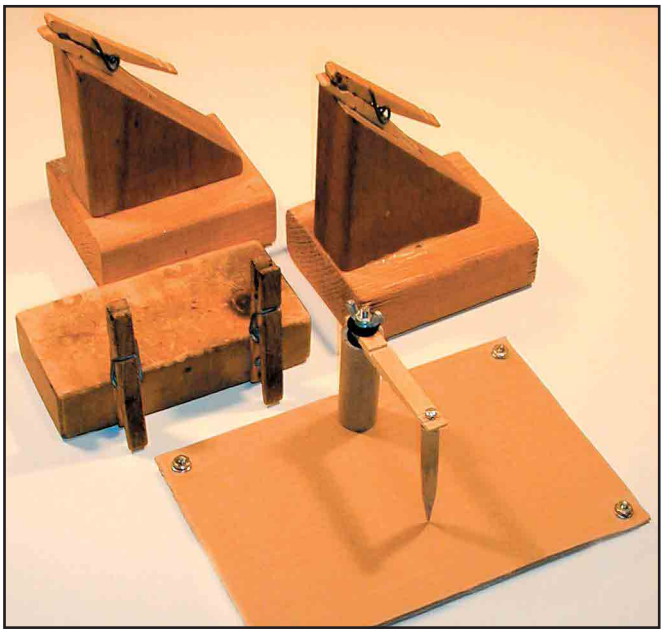

Figure 4—These handy homemade gadgets make working on cables and surface-mount parts a lot easier. Wooden materials won't melt or gouge. And, if charred or damaged, they're easy to replace.

my bench, either. I picked up a small gel-cell battery to run the analyzer; it's paid for itself several times over.

While I've certainly used a lot of oscilloscopes, I'm happy with my 15-year-old Hitachi 4-channel model. With a bandwidth of 100 MHz, it handles everything I'd use a 'scope for in ham radio. Above that frequency, a spectrum analyzer is more likely to do the job. There are lots of scopes like it available as surplus. The Hands-On Radio Web site (**www.arrl.org/tis/info/HTML/Hands-On-Radio/**) has numerous links to sources of test equipment. I found the 'scope cart at a hamfest for $15 where it did double duty as a shopping cart for the day!

The Trusty Toolboxes

My faithful, go-everywhere, hold-everything, toolboxes are shown in Figure 3. I splurged on the pallet case from Jensen (**www.jensentools. com**) years ago and I've never regretted it. The case is big enough to hold a spare voltmeter, soldering gear, spare parts and cables.

The tackle box has turned out to be a great way to store coax connectors and adapters. It contains everything I need to build or repair cables. All of my adapters are kept sorted and handy. Tackle boxes are inexpensive and great for all sorts of similar uses.

Along with tools and instruments, I find myself keeping a rather large collection of electronic parts and hardware. You can keep them in individual drawers or in cardboard parts bins. I like both, and I keep a few junk boxes going for parts and components, as well.

Buying parts one or two at a time is the most expensive way, so I try to buy extra. Hamfests are a great source of spare parts, too. Sometimes, entire parts cabinets are sold with parts inside. You can keep your lab well stocked by keeping a list of needed stuff in a notebook. When you see a sale or bargain, you'll know exactly what you need.

Gadgets

No shack and lab tour is complete without mentioning a special gadget or two. Figure 4 shows some of my all-time favorites—gadgets that I have used year-in and year-out. Just clothespins and wood? Yes! The three pin-and-block gadgets on the left make working with cables and connectors a lot easier. They hold wires and metal securely without biting into hot plastic. The clothespin jaws are rounded for a firm grip and spring-loaded for easy adjustment. All it takes is wood screws and/or glue to make a set of these.

The odd-looking apparatus in the front is the latest incarnation of my surface-mount "third hand." The printed-circuit board is placed on the cardboard and maneuvered under the point of the dowel (which swivels and can be raised or lowered). The tiny SMT parts are held on the board by the point of the dowel for me to solder. When the cardboard or dowel wear out, I replace them. I encourage you to make a set for yourself and improvise!

Organization and Cost

The best part about my lab (to me) is that I can put my hands on any tool, part, or instrument in seconds. The biggest barrier to accomplishment is the wasting of time or having your train of thought derailed as you go on a "tool hunt" or root around for parts. Keep your workbench reasonably organized and free of junk (well, mostly free) and you will reap benefits in fun and efficiency. There's nothing like getting an idea and being able to sit right down and build it!

You may be totaling costs in your head and thinking: "I can't afford to buy all of that!" Remember, this is my collection of more than 35 years of electronic-ing. My workbench is a work-in-progress—I am continually trading or upgrading. I always buy the highest quality materials I can afford, especially avoiding cheap tools. Start with the basics (**www.arrl.org/tis/info/homebrew.html**) and keep going. The holiday season is the time for big tool sales, as well (hint, hint)!

Thanks for taking part in my open house. I hope it will encourage you to build and repair your own circuits and equipment. I started a long time ago with modest capabilities and improved, step-by-step, with the help of friends and uncounted articles in *QST* and other magazines and books. Good luck!

Shopping List

- Wooden, spring-loaded clothespins
- Scraps of 2×4 wood, thick cardboard and 1/4 inch dowel
- Glue, wood screws and machine screws/nuts/washers

Next Month

How do you know if a transistor or an IC needs a heat sink before it fails? How do you choose one properly? We'll take a look at basic thermal analysis in the next installment of Hands-On Radio and meet an old friend, Ohm's Law, in disguise! QST

THE "TENNA-TUNE": A SIMPLE CONTROL/SWR INDICATOR FOR SCREWDRIVER ANTENNAS

◊ Antennas based on Don Johnson's (W6AAQ) "screwdriver" design have become extremely popular because of their performance and remote-tuning abilities. Miniature versions of these antennas have recently become available from numerous sources.

These miniature antennas interest me because I like to operate mostly "mobile-at-rest." Therefore, I want a small antenna package that I can easily remove and install on my car.

After considering several of the different antennas currently available, I settled on the Little Tarheel "screwdriver" antenna (**www.tarheelantennas.com**).

I like to pair my Little Tarheel with the MFJ-1954 10 foot telescoping whip (**www.mfjenterprises.com/products.php?prodid=MFJ-1954**). This combination makes a very effective mobile-at-rest/portable package, with operation down to 60 meters (and even 80 meters if you don't mind changing the base-matching coil for that band).

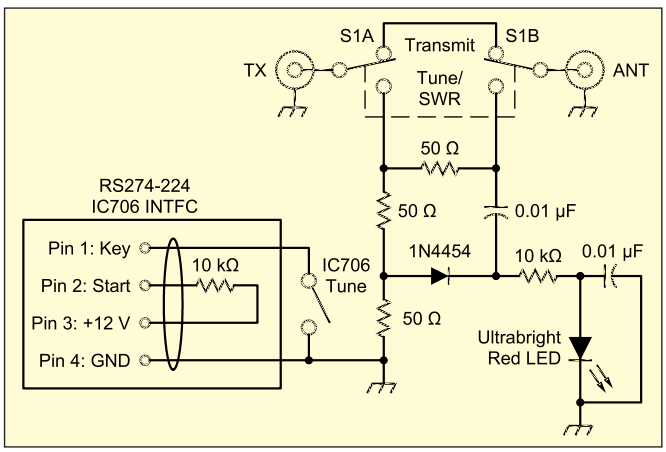

Figure 1—The Tenna-Tune schematic.

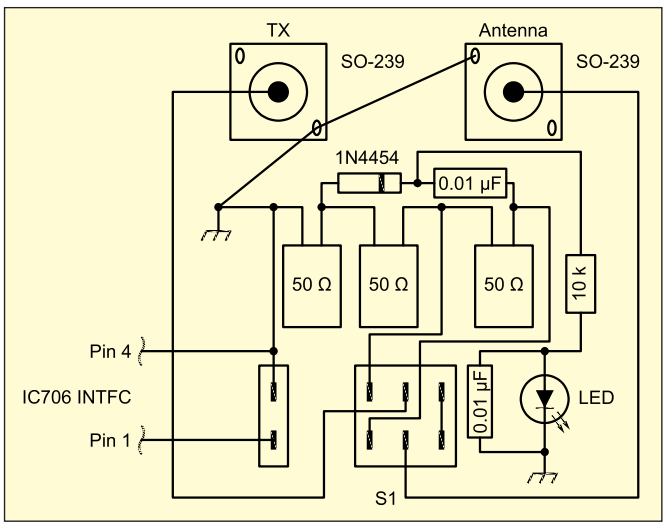

Figure 2—The Tenna-Tune wiring diagram drawn as if the box were folded flat.

Rather than purchase a commercial tuning device, I decided to build a simple, effective and inexpensive tuning indicator to help me tune the antenna remotely.

I normally operate mobile with either an SGC-2020 or an IC-706MKIIG, so my circuit is built to key my IC-706MKIIG in its 10-W tune mode.

The Tenna-Tune

The circuit is shown in Figures 1 and 2. The parts list is in Table 1. The circuit is simply a resistive 50 Ω bridge coupled with an IC-706MKIIG "tune" interface.

The bridge is the same circuit I used in an absorptive SWR indicator for the MFJ-902.[1]

The advantages of the resistive bridge are that it is simple, and it protects your radio during high-SWR conditions. (The worst-case SWR presented to the radio should be only 2:1.) The disadvantages are that two of three resistors must dissipate up to 100% of the tune-up power, and it can be difficult to find the suitable resistors.

This circuit is based on three Caddock 50-Ω 15-W power resistors in TO-126 packages (Mouser #684-MP915-50 at $2.78 each). These are excellent, noninductive power resistors. (If you want more power dissipation, a 30 W, TO-220 version is available—Mouser #684-MP930-50 at $3.58 each.) The 15 W resistors are fine for short periods of up to 25 W, if they have appropriate heat sinks.

The Interface

The IC-706 tune interface is very simple. A 10 kΩ resistor "fools" the radio into "thinking" that a tuner is connected, so the radio is keyed in the 10-W CW mode whenever pin 1 of the antenna-tuner interface) is grounded by the SPST toggle switch. I mounted the 10 kΩ resistor directly on the 4-pin plug, so only two wires need connect run to the Tenna-Tune.

The most difficult assembly task is cutting a rectangular hole for the DPDT slide switch. You may want to use a toggle switch (round-hole mount) to make things easier—I prefer

[1]P. Salas, AD5X, "An SWR Indicator for the MFJ-902 Antenna Tuner," *QST*, Oct 2004, pp 58-60.

Table 1
Tenna-Tune Parts

Qty	*Description (Source)*
3	50 Ω 15 W resistor (Mouser 684-MP915-50)
1	DPDT slide switch (Mouser 611-S602031SS03Q)
1	SPST toggle switch (Mouser 1055-TA1120)
1	Mini-box, 2.25×1.5×1.38 inches (Mouser 537-M00-P)
2	0.01 µF, 500 V capacitor (Mouser 75-5HKSS10)
2	10 kΩ resistor (RadioShack 271-1335)
1	6000 mcd red LED (All Electronics LED-94)
1	Terminal strip (RadioShack #274-688)*
1	Heat-sink grease (RadioShack #276-1372)
3	#2 screws (RadioShack #64-3010)
3	#2 nuts (RadioShack 64-3017)
1	4-pin Molex plug (RadioShack 274-224)
2	SO-239 connectors (All Electronics SO-239)
1	2-piece LED clip (All Electronics HLED-4)*

*Optional—see text.

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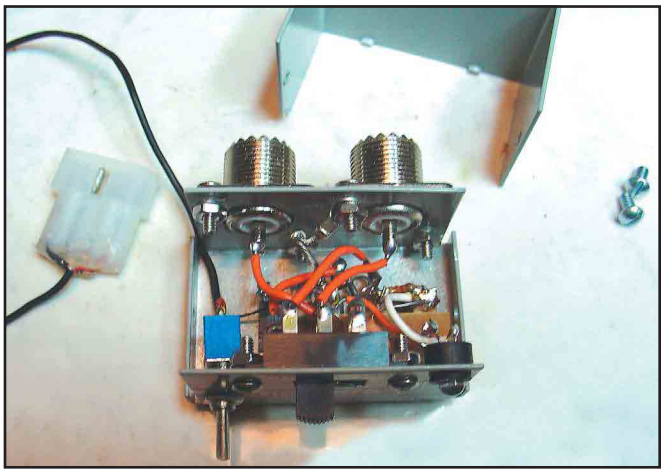

Figure 3—An Interior view of the Tenna Tune.

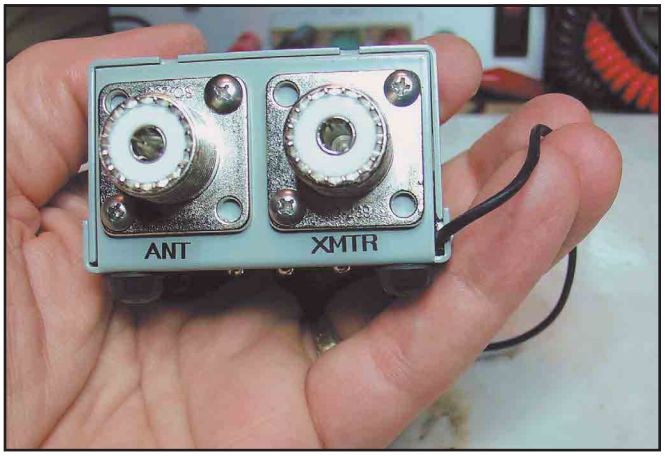

Figure 5—The Tenna Tune back panel.

the look of the slide switch.

I built everything into the tiny aluminum box in the parts list (see Figure 3). If yours is painted, scrape the paint away where the connectors and power resistors touch the box. (Use heat-sink grease under the power resistors.)

I chose a 6000 mcd ultra-bright red LED. This LED requires minimal current to give a good SWR indication. It's at the upper-right corner (see Figure 4). The LED clip in the parts list requires a $^1/_4$ inch hole. You could drill a $^3/_{16}$-inch-diameter hole and hold the LED in place with some hot glue if you prefer. The two SO-239 connectors just fit on the back panel as you can see in Figure 5.

The wiring diagram is shown in Figure 2. This figure is drawn as if the aluminum box were laid out flat. Wiring should be as direct as possible, but it is not shown that way for clarity. While I did use a terminal strip to mount some of the parts (see the parts list), this is probably not necessary. There are enough stiff leads on the 50 Ω resistors, SO-239s and the slide switch to support the few parts required. I also nibbled a little aluminum from the corner of the aluminum box cover so that the IC-706 interface cable can easily exit the box. Figure 3 gives you an idea of what my final wired unit looks like. All labeling "black on clear" tape from a Casio label maker. I also used stick-on rubber feet on the bottom of the unit. Figure 6 shows the Tenna-Tune mounted with my SG-2020 in the car.

Operation

I start with the antenna in its minimum-length position,

Figure 4—The Tenna Tune front panel.

Figure 6—The Tenna Tune installed with the author's SGC-2020.

which resonates with the fully extended 10 foot MFJ whip just above the 17 meter band. I always return the antenna to this minimum length position when I'm through operating so the antenna takes up as little room as possible in my trunk when I remove it from the quick-disconnect mount.

To tune the antenna, I push the slide-switch on the Tenna-Tune to TUNE, flip the IC-706 toggle switch to TUNE (when using the IC-706MKIIG), and then run the antenna motor up until the SWR LED dims noticeably or, preferably, goes out. I then turn off the IC-706 TUNE toggle switch, flip the slide switch to XMT, and I'm ready to go. This entire process is very easy, and takes very little time. I've had no problem with warming of the Tenna-Tune case during the time it takes me to tune the antenna. Obviously, the Tenna-Tune will work with all screwdriver antennas and other brands of radios. Just limit your tune-up power to no more than about 25 W. A good SWR indication occurs with 2-5 W of power.

This simple unit permits rapid tuning of screwdriver antennas. For IC-706 owners, it also sets the radio to the 10 W tune mode. While this unit does not provide automatic operation, it is easy to use and inexpensive, and it protects the radio during the tuning procedure.

If you have a screwdriver antenna and don't yet have one of those automatic tuning interfaces, give the Tenna-Tune a try!—*Phil Salas, AD5X, 1517 Creekside Dr, Richardson, TX 75081-2913;* **ad5x@arrl.net**

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Emtron DX-1d HF Linear Amplifier

The Emtron DX-1d is a 1 kW PEP MF/HF linear amplifier. It uses a grid-driven GU74B (equivalent to a 4CX800A) ceramic-metal tetrode. The amplifier is forced-air cooled and rated to 800 W continuous power output for an unlimited time. In addition to the amplifier and power supply, the compact enclosure provides an abundance of protective circuitry designed to make the tube and other components last a long time. A vacuum relay based full-break-in switching board is available as an option for CW operators.

I first became aware of the Emtron linear amplifier line when a member asked if we were ever going to review one. It was a new name to me, but an Internet search brought some information. Then I met Rudi at Dayton at a booth with his amplifiers. They sure looked nice, especially with the covers off!

I was impressed by the looks of his wares, especially the smallest, the one we chose to review. Emtron has two models FCC certificated for US use, the DX-1 and DX-2 series. The other amplifiers are higher powered than can be used here. The DX-1d is a refinement of his earlier DX-1 to include LED metering rather than analog meters. Some particular features that I found appealing, in addition to the solid looking construction, were a nine-position band switch and 6:1 vernier driven capacitors for the tune and load controls, a feature I am especially fond of. There may be other amplifiers with a dedicated band switch position and final coil tap for every one of the nine HF and MF bands, but I'm not aware of any.

Another feature that I appreciated was an optional QSK module using a vacuum relay and including a sequencer to avoid hot switching the output. I also found that I could easily lift this amp, an important consideration since my shack is down the basement stairs. A related design feature is high enough feet on the amplifier bottom to allow putting the amplifier down without pinching fingers.

Hooking it Up

This amplifier goes together in a straightforward way. SO-239 sockets are provided for both input and output RF connections. An ALC connection is provided via an RCA type phono jack, in case your radio supports a negative-going ALC connection. This is not necessary for amplifier operation. There is also a PTT connection on another RCA phono jack. This is used for TR switching in voice and semi-break-in modes, and also for full-break-in keying, if you have the QSK option.

This amplifier is designed for a worldwide market and thus can be configured to run from 100, 110, 120, 200, 220, 230 or 240 V ac mains! Needless to say the 115/230 V jumpers we may be used to seeing can't deal with this menu. The transformer taps are soldered and in very tight quarters. The solution—be sure to tell Rudi what voltage you want when you order the amplifier. I always go for 230/240 V to minimize drop in my power feed, but 20 A at 120 V is workable if you have the right wiring and outlet to support it. The amplifier does not come with a line plug, so it's a trip to the corner hardware store to get a plug to fit your style of outlet.

So How's it Play?

The DX-1d does everything just about the way you'd want it to. The manual has a tuning chart (hand annotated by serial number), providing a starting point for each band. With the vernier dials, it's easy to set to the indicated spot and then fine tune while looking at the multiple indicators. In many applications, I prefer the old-style analog meters, but with a requirement to watch output power, plate current and screen current at the same time, the Emtron data display is really easier to use. All indicators can be observed at once and tune-up is a snap, if you follow the manual directions, adjusting the load control for maximum output and keeping the screen current into the positive range (red). For some reason green indicates negative screen current, even though you want it positive; no matter, it's easy to spot.

This amplifier, with its hefty tube, has both plenty of plate dissipation and power gain. It only takes about 50 W of drive to bring it to the kW output level, so it would be really handy for those who like to operate lower power radios such as the Scout, Argonaut or SG-2020. An exciter with 25 W output should effortlessly get to 500 W. QRP is great, but as the sunspots wind down, it may be either get more power or move closer!

I operated this radio using SSB and CW and found that it performed as advertised on all bands and modes I tried. In addition to RF output, it does have audio output—from the fan. It's not as noisy as my usual amp, but it can be heard. I found it a softer sound than I'm used to, just airflow, not bearings or rattles. The fan is a two speed device,

Bottom Line

A new 1 kW HF amplifier from Austrailia delivers the goods in a compact, well designed package.

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Table 1
Emtron DX-1d, serial number 10441

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency range (US units): All amateur frequencies, 1.8 to 30 MHz, except 5 MHz.	As specified.
Power output: 1000 W PEP or 750 W carrier.*	As specified for SSB and CW.
Driving power required: 40-60 W nominal.	As specified.
Input SWR: less than 1.4:1	As specified.
Output matching: up to 2.6:1 SWR.	Not tested.
Spurious signal and harmonic suppression: 50 dB below rated output or greater.	45 dB, worst case. Meets FCC requirements.
Intermodulation distortion (IMD): –35 dB.	–37 dB. See Figure 2.
Primary power requirements: 230 V ac, 10 A or 120 V ac, 20 A.	
Size (HWD): 8×15×15 inches; weight, 44 pounds.	

*Note that operation on 30 meters in the US is limited to 200 W PEP output.

switched based on temperature. I never heard it speed up, nor did I feel much heat from the output, but perhaps after a 12 hour RTTY transmission it would need to crank up a notch. The fan outlet is on top of the amplifier, so higher placement may make it seem even quieter. I didn't find it troublesome even while using the speaker in either mode, but some may find it an irritation. It was also not noticeable to far end stations on SSB.

Now for a Fast Break

As noted, I opted for the DX-1d with the (installed) QSK module. This is a dual relay system to provide a delay so that the vacuum relay won't have to hot-switch the full output—a great idea in my view. When the PTT line is keyed the output/antenna vacuum relay switches first, then 2.5 ms later the drive is applied to the amplifier. On key-up, when the PTT line is opened, the drive is removed and 5 ms later the output relay switches back. This process will not allow the RF vacuum relay to switch while full output power is applied.

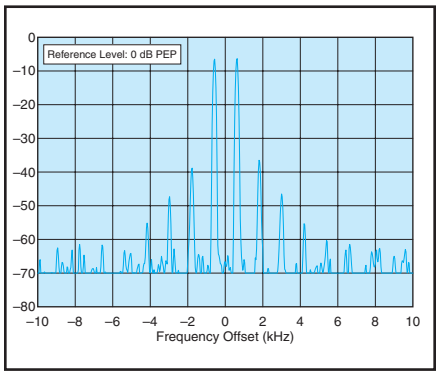


Figure 2—Worst-case spectral display of the Emtron DX-1d during two-tone intermodulation distortion (IMD) testing. The worst-case third order product is approximately 37 dB below PEP output, and the worst-case fifth order product is down approximately 46 dB. The transmitter is being operated at 900 W PEP output at 14.02 MHz.

In my station, I used my external solid-state keyer to key both the transceiver and the linear simultaneously in parallel.[1] According to the *QST* Product Review photo of the keying waveform for my transceiver, it takes 10 ms from key down to output and 15 ms from key up to no output. Depending on the delay within the QSK module, that means I will either be switching the vacuum relay at the beginning, or more likely the end of the code element while there is 50 W on the relay. It didn't seem to cause any problems, nor was it observable in either a second receiver or by any distant stations.

I believe most folk operate that way, or with even less consideration for TR timing while operating QSK. My usual transceiver and linear combination are from the same manufacturer and they provided a loop such that the amplifier is keyed first and it both keys and unkeys the transceiver corresponding to the linear's switching time, neatly sidestepping this issue. If this linear were my own, I think I would look into an external synchronizer to be sure that I didn't do keying anywhere while RF was present. One possible mechanism for this function is the Microprocessor Controlled Sequencer from JWM Engineering described in a Sep 2004 *QST* New Product Announcement (p 53). It is

[1]Make sure the two keying line voltages are compatible before you try this. The DX-1d QSK module specifies the keying of +35 V at 120 mA (my measurement was 38 mA).

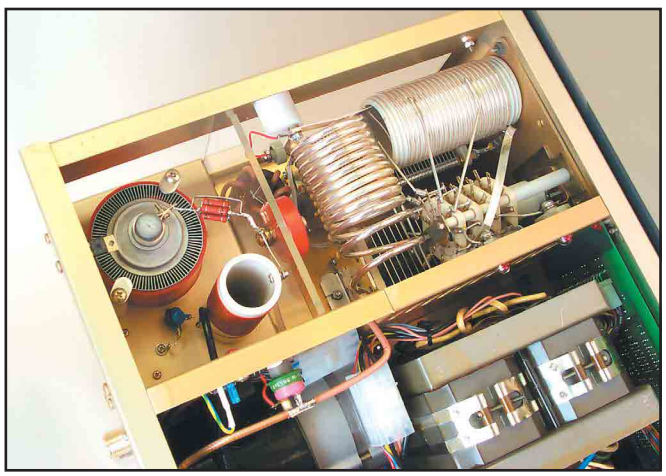


Figure 1—Inside view of the Emtron DX-1d RF section. The quality of construction is evident.

Figure 3—Metering panel of the Emtron DX-1d while on the air from W1ZR.

specified to provide programmable delays from 4 to 128 ms on each of four outputs (keying up to +35 V at 0.6 A). I haven't tried this yet and would be interested to hear if anyone finds it as useful as it looks.

One little frustration I had with this setup is that my transceiver doesn't close the KEY line when the TUNE button or PTT line is closed. This means that I need to have the cable from the amplifier PTT connector hooked to transceiver RELAY jack for operation on SSB, semi-break-in CW or tune, but have to move it to the keyer output for full-break-in CW. I believe that this is more of an issue with my transceiver manufacturer than with this amplifier, but you may want to look at your interconnection requirements if you are selecting an amplifier. This could be fixed with an extra switch in my "synchronizer box." Whether or not this is needed will depend on your transceiver's control circuitry.

Protection Features

This amplifier has been designed to be as bulletproof as possible. It's easy, especially late at night, or after the first 18 hours of a contest, to make a mistake. With a high-power amplifier, mistakes can be expensive. Modular construction allows any needed repairs to be completed in a straightforward manner. This amplifier is designed for those of us who don't always get it right!

You will notice the protection features as you first turn it on and, for a moment, wonder why nothing is happening. The *soft start* circuit is at work bringing power up gradually to avoid initial charging surges. It takes 3 to 5 seconds for the lights to act like something is happening. The other protection features come into play only when needed and include:

- The temperature of the amplifier tube is monitored; if it exceeds specification, the amplifier is switched off line (all failure modes switch to direct transceiver operation so you're still on the air), the READY light is extinguished and the FAULT LED is illuminated.
- The amplifier plate current is monitored and if a safe value is exceeded, the power-up timer is activated leaving the amplifier off-line for about two minutes.
- The amplifier screen current is limited to avoid tube damage. Even if plate voltage is lost, a condition that usually results in very high screen current, the limiting is said to protect the tube from meltdown for an extended period.
- The amplifier will switch to bypass if the SWR exceeds 2.6:1.
- The amplifier is set to flip to bypass if driven beyond the point at which distortion would occur. It stays that way for 2 seconds and then will check again, continuing to drop out until the condition is remedied.

Another automated function is provided, not exactly a safety feature, but a good idea in my view. Circuitry is provided to detect RF at the amplifier input. If there is less than 0.5 W of RF at the amplifier input, it changes the tube bias to cut off plate current. This should reduce average dissipation and heat load. It operates quickly enough to switch between syllables.

Documentation

The amplifier comes with a thorough 40 page manual. Following a description and specifications, it guides you through unpacking, installation and interconnections. Next, it provides a straightforward step by step turn-up and tune-up section, specifying exactly what indications are anticipated and what to do to make sure they happen.

Next are 12 pages devoted to full size schematics, board layout and timing diagrams. The last section consists of 6 pages devoted to tweaking the internal adjustments, should they ever need to be changed. A nice feature is a set of photos indicating the location of the internal controls.

Inside the manual front cover is a table of initial settings for each band, hand entered for this unit, with the serial number at the top of the sheet. Attached to the back cover is a test data sheet, again for this unit, by serial number, with all the critical voltage, current and power measurements, for each band. I was impressed.

How do You Get One?

Emtron is an Australian company and their products are sold directly from the plant in Sydney, in Australian dollars. The easiest way to purchase a unit is on-line by credit card. The credit card transaction is processed at the exchange rate at the time of purchase. Air shipping is rather expensive, but our unit made it to California in less than a week. On arrival, it went into US Customs and I received a call from the freight handling company. They needed a faxed authorization to act as our agent to retrieve the unit from Customs. Within 24 hours of faxing the form, the unit was on our dock in Newington! There was no additional charge for the service or Customs fee involved; however, make sure you will be at the phone number listed on your order, since if it doesn't get out of Customs within a certain number of days, it goes to a bonded warehouse and it takes $180 to retrieve it!

Manufacturer: Emtron, 92-94 Wentworth Ave, Sydney 2010, Australia; tel 612-92110988, **www.emtron.com.au**. Price (US prices[2] as of late September): AU$3060 ($2184); QSK module, AU$180 ($129); shipping, AU$245 ($175).

[2]See **www.x-rates.com/calculator.html**.

A Survey of 2 Meter/70 Centimeter Diplexers

Joel R. Hallas, W1ZR
Assistant Technical Editor

So What's a Diplexer?

A *diplexer* is a device that accepts a wideband signal and splits it into two signals that, in some way, divide up the wideband signal. It will also work the other way and combine two signals at different frequencies into a combined signal at a single port. The word *triplexer* is used to describe a similar function with three ports while *multiplexer* is used as a general term for this function. Note that we are quite used to this idea—the coax coming from a 20 meter Yagi includes many signals from at least 14 to 14.35 MHz. We take it for granted that our receiver will separate them. If we have two receivers connected, we perform the diplex function—without a second thought!

To add to the linguistic confusion, the term *duplexer* is often used to describe a diplexer that performs the splitting function between frequencies that are much closer together. This would be used as part of a 2 meter repeater, for example, in which a 100 W transmitter may share an antenna with a receiver looking for signals in the μV range with a separation of only 600 kHz. This allows simultaneous transmit and receive or *duplex* operation—hence duplexer. Often the words are used interchangeably. You will see

Bottom Line

Diplexers can be a useful addition to the multiband VHF station. The reviewed units all work as advertised.

similar units using different names.

We have selected readily available units from four different manufacturers—Comet, Diamond, DCI and MFJ—for this evaluation. As noted in each description, each manufacturer offers other part numbers with slightly different features, such as different connector genders or types—select carefully so you won't need adapters or extra cables for your installation. Some offer triplexers as well as diplexers with different break frequencies. In addition, DCI offers single band, or multiband filters without the diplexer function.

Why Might We Want One?

The typical use of these devices is to separate or combine signals on two bands, in this case 2 meters and 70 cm, to take advantage of dual-band antennas when faced with dual antenna ports. Or conversely, you can split the output from a single antenna port so that two antennas can be used, one for each band. Figures 4, 5 and 6 should give you the idea. Note that they can be used with RF from one band at a time or on both, as is the case with some dual-band radios that can operate both bands simultaneously, serving as translators or as between band repeaters.

The idea of using a single feed line to two antennas, with the diplexer at the antenna location is attractive, especially if it will allow purchase of a single more expensive lower loss coax cable (don't forget to include the additional diplexer loss in your analysis). A triplexer can be employed to also drive an HF or 6 meter antenna from the same cable. Note that none of these units is designed to be out in the weather, so a housing will have to be devised for the antenna end.

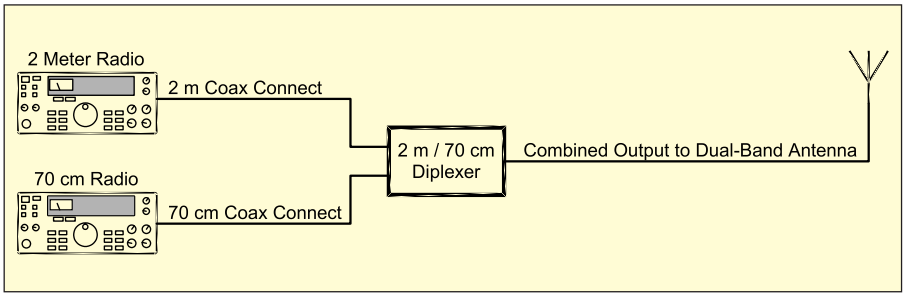


Figure 4—A diplexer used to connect two radios (or a single radio with separate antenna ports) to a dual-band antenna.

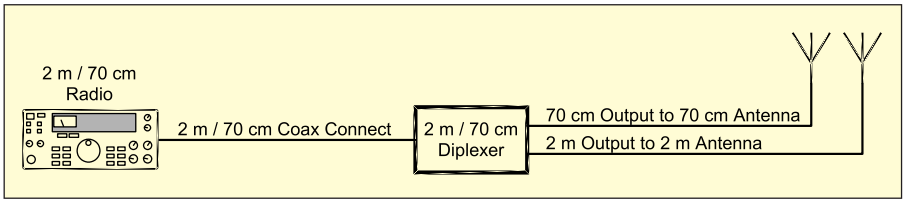


Figure 5—A diplexer used to connect a radio with a single antenna port to antennas for each band.

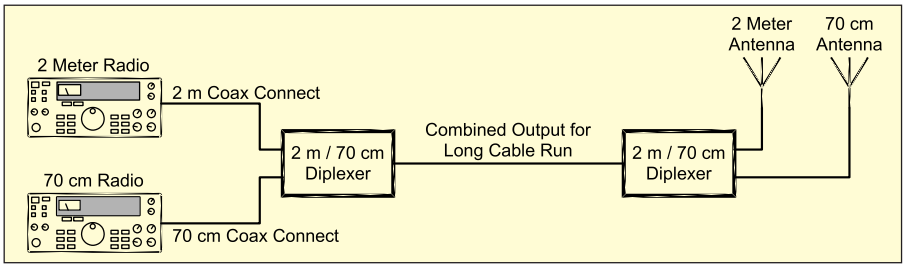


Figure 6—A diplexer used to connect two radios (or a single radio with separate antenna ports) to two antennas sharing a single coax cable.

How Do They Work?

The short answer is that they use filtering, as you would expect. We have actually included two different categories of devices in one review, since they can fit in the same spot. The smaller units employ high-pass and low-pass filters to perform the split. The larger DCI device employs sharp band-pass filters to not just split the frequencies, but to restrict throughput to just the two bands to eliminate out of band interference—more later.

Notice that the smaller ones' low-pass ports work right down through the MF/HF range, so they can be used for combined MF/HF/VHF (some include 222 MHz) operation, if that provides a useful function.

How Well Do They Work?

They all meet their specifications and perform very well at what they do. Table 2 and Figures 7 through 10 provide the story. The unit you choose may depend on the connector types and genders you need, the mounting arrangements, or which one your retailer has in stock. Frankly, the differences among the three "diplexer-only" units are quite small. In the section on the DCI unit we'll discuss more about why you might (or might not) want to pay the extra cost for the additional filtering.

Table 2
2 Meter/70 cm Diplexer Measured Performance Data

Insertion Loss	*2 MHz*	*14 MHz*	*28 MHz*	*50 MHz*	*146 MHz*	*440 MHz*
Comet CF-4160	< 0.1 dB	< 0.1 dB	< 0.1 dB	0.3 dB	0.4 dB	< 0.1 dB
DCI 144-148/438-450-DX-DB	N/A	N/A	N/A	N/A	0.8 dB	0.7 dB
Diamond MX-72D	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB	0.2 dB	0.3 dB
MFJ 961B	< 0.1 dB	< 0.1 dB	< 0.1 dB	< 0.1 dB	0.2 dB	0.3 dB

Input SWR	*2 MHz*	*14 MHz*	*28 MHz*	*50 MHz*	*146 MHz*	*440 MHz*
Comet CF-4160	1:1	1:1	1:1	1.1:1	1.3:1	1.1:1
DCI 144-148/438-450-DX-DB	N/A	N/A	N/A	N/A	1.1:1	1.1:1
Diamond MX-72D	1:1	1:1	1:1	1:1	1.1:1	1.4:1
MFJ 961B	1:1	1:1	1:1	1:1	1.1:1	1.3:1

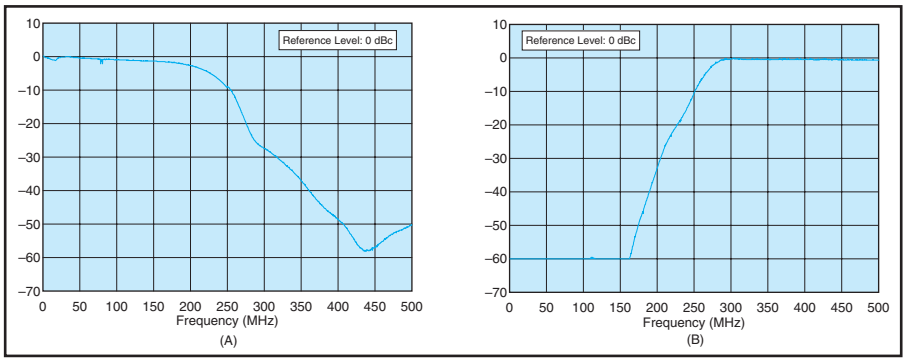


Figure 7—Frequency response plots of Comet CF4160K diplexer—at A, low-pass port; at B, high-pass port.

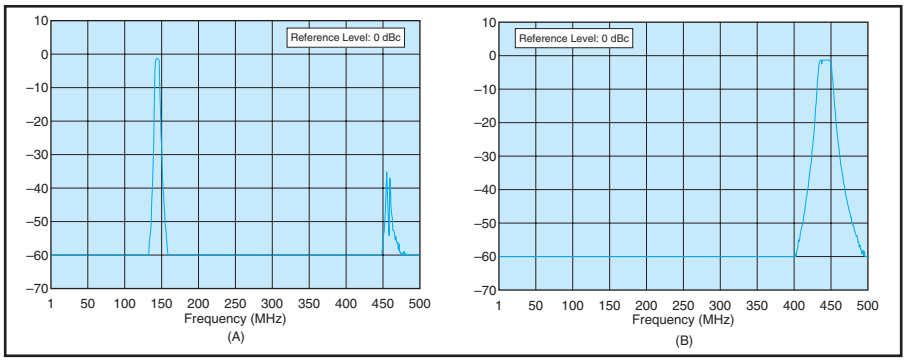


Figure 8—Frequency response plots of DCI 144-148/438-450-DX-DB diplexer/band pass filters—at A, low-pass port; at B, high-pass port.

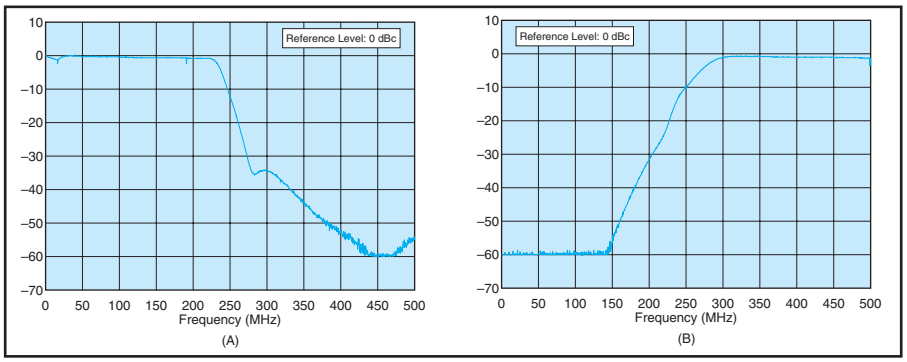


Figure 9—Frequency response plots of Diamond MX-72D diplexer—at A, low-pass port; at B, high-pass port.

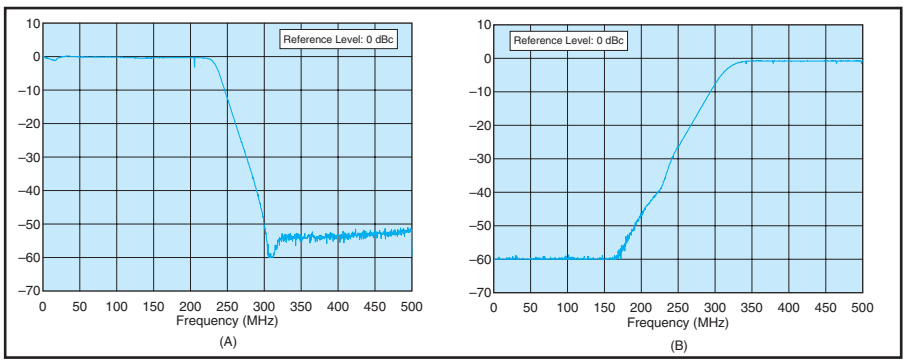


Figure 10—Frequency response plots of MFJ 961B diplexer—at A, low-pass port; at B, high-pass port.

THE COMET CF-4160J 2 METER/ 70 CM DIPLEXER

The Comet CF-4160 series is rated at 800 W PEP on 2 meters and 500 W PEP on 70 cm, notably higher than some units. This unit can be mounted via two holes on the side of the body. The CF-4160 series is available in three connector configurations—all have an SO-239 (female "UHF" connector) on the common port. The '4160J we tested has SO-239s on all ports. The '4160I has a PL-259 (male "UHF" connector) on the on the 2 meter port and a "Type N" male (a better constant impedance connector, more suited for serious 70 cm operation) on the 70 cm port. The '4160K has PL-259s on both band ports.

They offer a number of other configurations as well. The CF-416 series has pigtails on the band ports to connect to radios without added cables. The CF-142 is similar but groups 222 MHz with the 70 cm band port. They also offer diplexers designed to support the specific port allocations of the IC-706 and FT-100 radios and *triplexers*, with a separate HF port. Check their Web site for the exact configuration and frequency grouping you need, chances are they have one. *US Distributor:* NCG Companies, 1275 North Grove St, Anaheim, CA 92806; tel 800-962-2611; **www.cometantenna.com**. Diplexer prices (with connectors), around $49, with leads around $50, triplexers around $75.

THE DCI 144-148/438-450-DX-DB 2 METER/70 CM DIPLEXER AND BAND-PASS FILTERS

As noted previously, this unit is different than the others. While it splits (or combines) signals from the two bands, it does so very sharply to eliminate out-of-band signals. Its price tag is higher and it inserts a bit more loss, but significantly reduces out-of-band sources of intermodulation distortion and receiver overload. It also restricts reception to the

amateur bands only, eliminating reception of aircraft, public service, marine and weather channels—the sources of most intermod problems. This unit is rated at 200 W on each channel.

Let's digress a moment and discuss intermod. This is a topic that receives a lot of attention when discussing HF transceiver performance, but not as much on VHF. The receivers in many VHF transceivers make a point of indicating that their front ends are wide open so other services can be received. This can be an important feature for some users. On the other hand, the same design can cause serious reception problems. All designs require choices and often compromise.

Perhaps a few examples will help.[3] Let's say you are listening to a distant repeater at 146.35 MHz and you have a TV channel 2 transmitter and an FM broadcast transmitter at 91.1 MHz nearby. Channel 2 has the picture carrier at 55.25 MHz and this will mix in your receiver to result in a second-order intermodulation product at 146.35 MHz. Some receiver front ends will keep out these far-off-frequency signals, and some won't. An example of a third-order response that will almost always get in is the product of 2F1–F2 where both frequencies are near the desired signal. We'll use round numbers, if you are in the vicinity of a strong business or paging transmitter at 156 MHz and another at 166 MHz. All three signals will make it through the receiver front end to the first mixer. The spurious response will be right on 146 MHz (312–166=146). There are many other possible combinations—and they all happen at once.

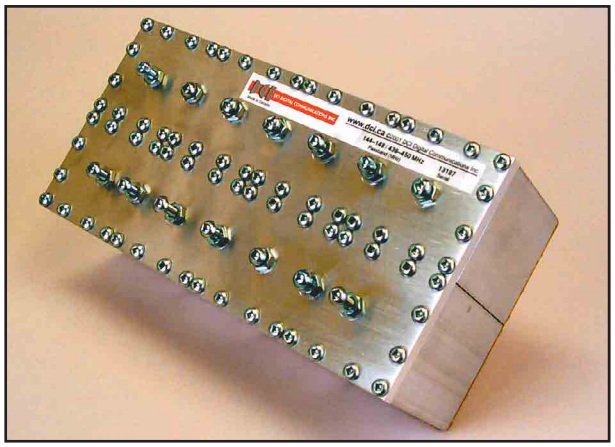
Depending on the relative levels of the signals, the spurious response could capture the receiver making reception difficult. Reading from the DCI specification sheet, with their unit the 156 MHz signal will be down 40 dB and the 166 MHz signal down 70 dB. This is very likely to make the problem go away, especially since third order IMD drops three times as fast as the signals. A diplexer only unit will happily pass all signals without attenuation, which is great if you want to check the weather.

I used to work and commute along Route 128 outside of Boston. This road seemed to have TV and radio towers every quarter mile and to those who tried to keep in touch using 2 meters it became known as "intermod alley." If you are faced with such problems, you may well consider it a reasonable trade to give up listening to weather channels in order to hear your friends on 2 meters.

This unit is thoughtfully provided with the warning not to change the adjustments. I strongly suggest that you follow this advice and not tighten the exposed tuning screws!

DCI makes a number of models, including single and dual band units that just filter and don't perform the diplexing function. Modules for the European bands 144-146 and 430-440 MHz are available. There is probably a model that will help resolve most V/UHF out of band interference problems. *Manufacturer:* DCI Digital Communications, 20 S Plains Rd, Emerald Park, SK S4L 1B7, Canada; tel 800-563-5351; **www.dci.ca**. Price: 144-148/438-450-DX-DB diplexer, or dual band filter, $170; single band filters $100 to $120, depending on band.

[3]E. Hare, "Intermod—A Modern Urban Problem," *QST*, Aug 1996, p 40. Also available at **www.arrl.org/tis/info/intermod/intermod.html**.



THE DIAMOND MX-72D 2 METER/70 CM DIPLEXER

The Diamond MX-72D is similar in size to the other "diplexer only" units. This one mounts with an adhesive pad on the bottom panel of the unit and is rated at 1 kW PEP on HF, 400 W PEP (150 W FM) on 2 meters and 250 W PEP (100 W FM) on 70 cm. As with the Comet series, this unit is available with different combinations of connectors and with or without cable leads. Both diplexers and triplexers are available and Diamond even has two triplexers, the MX2000 and MX3000 that work into the microwave region. The MX-2000 has a port for MH/HF to 6 meters, one for 2 meters and the third covers the 70 cm and 33 cm bands. The MX3000 has a port for MF through 2 meters, one for 70 cm and another for 33 and 23 cm. A serious V/UHF operator could save some expensive coax runs with these, at the cost of some triplexer loss.

Manufacturer: Diamond Antennas, division of RF Parts, 435 S Pacific St, San Marcos, CA 92078; tel 760-744-0900; **www.rfparts.com/diamond/**. Price: MX-72D, $44; other diplexers, $47 to $75; triplexers, $80 to $100.

THE MFJ-961B 2 METER/70 CM DIPLEXER

MFJ offers two diplexer versions. The MFJ-961B is a straightforward diplexer with SO-239 connectors and feet designed to rest on a desk or shelf. The MFJ-961BN is similar in configuration but has female N connectors on all ports. While no documentation is provided

with the unit, an instruction sheet with specifications is available on the MFJ Web site. Either unit is rated to handle 500 W to 35 MHz, 300 W to 225 MHz and on the 70 cm port. Manufacturer: MFJ Enterprises Inc, 300 Industrial Park Rd, Starkville, MS 39759; tel 800-647-1800; **www.mfjenterprises.com**. Price: either unit, $30.

USING DIPLEXERS IN THE REAL WORLD

Joe Carcia, NJ1Q
W1AW Station Manager

After reading Joel's explanation of diplexers, one can generally understand why they come in handy. Simply put, a diplexer can be used to *separate* a common signal port to be able to drive two antennas, or visa-versa. A diplexer combined with more serious filters can significantly reduce intermodulation distortion caused by out of band signals and the resulting mixer byproducts. I am fortunate that I don't live in or near an area prone to intermod, so I was unable to verify the benefit of sharp band-pass filters. The Laboratory tests speak for themselves on that front.

For my part, I conducted straightforward transmitting and receiving tests. I wanted to verify basic operation of these units in the field. As radio equipment, I used my Yaesu FT-90R on 70 cm, an ICOM IC-229 for 2 meters and a Kenwood TH-205 (handheld transceiver) for monitoring 2 meters when necessary. The antennas consisted of a $^5/_8$-λ 2-meter Larsen mobile whip, an MFJ 2-meter/70-cm mobile whip, and a $^1/_4$-λ 70-cm whip. I ran 10 W on both bands, so we did not attempt to verify the power ratings.

As Joel mentions, the diplexers can come with different antenna connections. Given the radios' antenna connectors and those of the diplexers under test, I had to use a few gender changing adapters. For SWR measurements, I used a Daiwa CN630 V/UHF SWR meter.

I should mention that prior to my testing, I casually scanned both bands. I didn't hear anything significant, other than an occasional squelch break or a commercial service, sounding like paging.

Up first was the DCI model. The transceivers were attached to the band ports and the dual-band whip to the COMMON connector. I was able to bring up both 2 meter and 70 cm repeaters with no difficulty. Isolation between the bands seemed quite good for I was unable to hear either signal on the other band radio. Attenuation outside the amateur bands was quite good as well. I tuned to the strong 162.400 MHz NOAA weather broadcast without the diplexer in line. As soon as I attached the diplexer/band-pass filter, NOAA went away! I had the FT-90R scan the 70 cm band, looking for out of band signals. All I heard were hams talking on the local repeaters.

Next came the MX-72D. The radio/antenna configuration was similar, with the exception of having to use PL-258 barrel connectors for the radios. The results were very similar to the DCI, except that the NOAA broadcast was received at full strength, as you would expect based on the frequency response plot for this unit.

I was fortunate in that during the course of my testing, my wife needed to run a quick errand. My lovely bride accommodated the wires and whatnot splayed out in the truck! This errand took me to within a mile or so of both a firehouse and police station, each with their own large towers and various antennas. I thought for sure that if there were to be intermod, I'd get it here! While she did her errand, I quickly tested the MX-72D (since it was still connected). I didn't hear anything unusual. I installed the DCI as before, and conducted similar receiving tests. Again, scans just brought me to the hams on the local repeaters.

Since my time out was running short, I quickly receive-tested the MFJ-961B and CF-4160. As expected, the NOAA broadcasts came in loud and clear. Quick scans on 2 meters and 70 cm indicated no problems. And then it was time to go home!

With the MFJ-961B back in place, I ran my transmitting tests. As with the two previous units, I had no difficulty bringing up repeaters.

The CF-4160, like the others before it, operated normally on both transmit and receive tests. I noticed no degradation of signals on either band, and still nothing that came close to intermod.

Joel mentions there are a few antenna/radio combinations. For the purposes of my tests, I used both the two radio/one diplexer/one antenna, and one-radio/one diplexer/two antenna combinations. I also used the MFJ-916B and CF-4160 in the two-radio/two-diplexer/two-antenna configuration. I wanted to see what would happen! Not much, except to say that I was still able to bring up repeaters without difficulty. I also spoke with a ham on the 70 cm machine. He didn't indicate any problem with my signal.

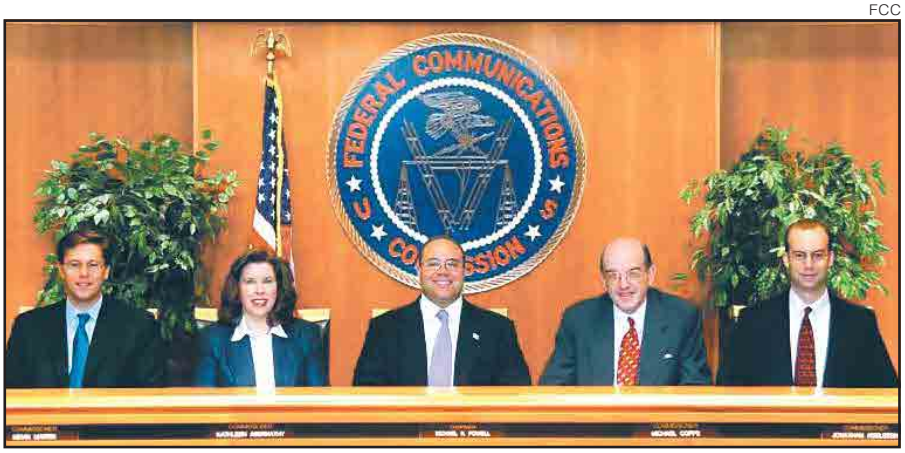
When it came to SWR measurements, I noticed no significant increase at all with any of the diplexers in-line.

As can be seen from the frequency response charts, three of the diplexer-only units will pass any H/VHF signal up to its cutoff point. If you have an intermod problem, you may need the extra filtering that the DCI units provide at the cost of giving up general coverage, taking up more space and paying a bit more. If you are having problems, I'll bet the difference will be worthwhile.

On the other hand, if your problem were merely one of having a dual band radio with one antenna port, and you'd like to run separate antennas, the other units would work just fine. That was the point of the tests—to make sure that all units performed their functions—and they did.

FCC Adopts New Rules to Govern BPL, Acknowledges Its Interference Potential

FCC



The FCC: **(L-R) Commissioners Kevin J. Martin, Kathleen Q. Abernathy, Michael K. Powell (Chairman), Michael J. Copps and Jonathan S. Adelstein.**

The FCC has adopted revised Part 15 (unlicensed services) rules to specifically regulate broadband over power line (BPL) systems. Meeting October 14 in open session, the Commission accepted a draft *Report and Order* in ET Docket 04-37. In comments before voting, three Commission members, including Chairman Michael Powell, specifically cited the concerns of Amateur Radio operators and expressed either assurances or hope that the new BPL rules would adequately address interference to licensed services. Republican FCC Commissioner Kevin Martin mentioned Amateur Radio's and broadcasters' interference concerns in a later written statement. ARRL President Jim Haynie, W5JBP, said he was encouraged to see the FCC acknowledge interference to amateurs as a genuine issue in the proceeding.

"What the League has done in the last year and a half on this issue showed in the Commission's public meeting," Haynie said. He cited the FCC's approval of three major points that the League had been pushing for: Certification of BPL equipment instead of verification, a requirement for a public BPL database—something the BPL industry did not want—and mechanisms to deal swiftly with interference complaints.

"Those were things that we brought to the table," he said. "I think we scored some pretty good points." Haynie conceded, however, that the devil is in the details of the *R&O*, which had not been made public by press time.

ARRL CEO David Sumner, K1ZZ, noted that the *R&O* is "more restrictive" than the FCC's February 2004 *Notice of Proposed Rule Making*. Among other things, he pointed out, the new rules will address concerns expressed by the National Telecommunications and Information Administration (NTIA) by requiring BPL exclusion zones, setting certain HF frequencies off limits to BPL and establishing BPL coordination areas, which include the vicinity of FCC field offices.

Anh Wride of the FCC Office of Engineering and Technology (OET), who outlined the draft *R&O*, acknowledged BPL's "somewhat higher potential for interference to licensed radio services than typical Part 15 devices." But, she continued, BPL's benefits "warrant acceptance of a small degree of additional risk, and that this interference potential can be satisfactorily managed."

Copps Comments on Amateur Radio Concerns

Commissioner Michael Copps, a Democrat, was the most forceful among his colleagues in expressing concern about interference to Amateur Radio users. "I take the concerns of this community very seriously," he said, "and believe that the FCC has an obligation to work hard to monitor, investigate and take quick action, where appropriate, to resolve harmful interference."

FCC

Commissioner Copps offered the strongest support for Amateur Radio's concerns.

Copps said if interference occurs, "we must have a system in place to resolve it immediately." Dissenting in part with the *R&O*, Copps raised the question of whether utility ratepayers should have to "subsidize an electric power company's foray into broadband."

Peaceful Coexistence

The Commission's other Democrat, Jonathan Adelstein, said the interference question made the proceeding a challenging one because it had to accommodate concerns raised by Public Safety licensees, federal government users and Amateur Radio operators. "These are important services that we need to protect from harmful interference," Adelstein said.

Adelstein also said that while it's clear that some BPL systems can co-exist with incumbent users, others "haven't fared so well." He said those systems shouldn't be deployed commercially until it's assured that they won't cause harmful interference.

Commissioner Kathleen Abernathy, a Republican, said the FCC had to "make some hard compromises" to deal with questions about interference. But she expressed confidence in "technical solutions."

"A Banner Day"

Calling it "a banner day" for communications in the US, Chairman Powell, a Republican, conceded that BPL will affect some spectrum users—including "all those wonderful Amateur Radio operators out there." Powell said the FCC has taken Amateur Radio interference concerns seriously from the start and has put protections in place "to allow that service to continue." At the same time, he implied that the FCC must balance the benefits of BPL against the relative value of other licensed services.

Powell said BPL's potential for the US economy "is too great, too enormous, too

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ARRL Asks FCC to Shut Down New York BPL Field Trial

The ARRL has asked the FCC to shut down a BPL field trial system in Briarcliff Manor, New York. In an October 8 letter, the League said the system, operated by Ambient Corporation under an FCC Experimental license, continues to cause "harmful interference" to amateur stations and that the FCC must require it to cease operation immediately.

"The operator of the system has attempted what it referred to as 'adjustments' in this system in order to reduce the severe interference potential to licensed radio services such as the Amateur Service," wrote ARRL General Counsel Chris Imlay, W3KD. "These 'adjustments' have come to be inaccurately referred to as 'notching' of certain bands, and as a solution to interference to Amateur Service stations, they are incomplete and inadequate."

The ARRL complaint asserted that the Briarcliff Manor system not only was causing interference but failed to comply with either applicable FCC Part 15 regulations or with the terms of its FCC experimental authorization. The system should not be permitted to resume operation until it can demonstrate "full compliance" with FCC rules, the League insisted. It also called on the FCC to impose "appropriate monetary forfeitures" against Ambient.

Accompanying the complaint were technical exhibits substantiating the degree of interference the League alleged. One showed the results of frequency-shifting adjustments Ambient made to the system. The complaint maintained that the adjustments failed to reduce interference on "a substantial portion" of the HF amateur allocations. The ARRL study said Ambient tried for more than a year to mitigate interference by using "notching" techniques, "but to no avail."

The ARRL said measurements taken at 14.3 MHz at one point in the system "revealed 30 to 40 dB of degradation to Amateur Radio operations along a stretch of road over a kilometer in length." A sweep at another location showed that BPL signals occupying the entire 15-meter band remained strong more than a quarter mile from the BPL injector.

"The levels of interfering BPL signals are sufficient to obscure virtually all Amateur Radio received signals and preclude Amateur Radio communications in the areas and on the bands identified in the report," the ARRL concluded.

ARRL member Alan Crosswell, N2YGK, a resident of the community, has documented interference, complaints and related information on his "BPL in Briarcliff Manor" Web site, **www.columbia.edu/~alan/bpl/**.

Operated by utility Consolidated Edison, the Briarcliff Manor BPL system was the focus of a March 2004 front-page *Wall Street Journal* article, "In This Power Play, High-Wire Act Riles Ham-Radio Fans," by technology writer Ken Brown. ARRL staff members accompanied Brown to the BPL site so he could hear the interference firsthand.

potentially groundbreaking to sit idly by and allow any claim or any possible speculative fear" keep the Commission from promoting adoption of BPL technology.

Sumner suggested that Powell was overstating the necessity of yet another broadband pipeline. "It's astonishing to me that the chairman of the FCC can talk about needing a 'third way' to provide broadband to consumers when multiple technologies *already* are available, including wireless broadband," he said.

As for balancing the probability of interference against the greater public good, Sumner said one could make that argument if the interference probability were very low. "But when it's 100 percent, you can't," he said, citing the results of NTIA studies that show BPL interference is likely at a distance of 200 meters from a source.

Spinning It

In a post-meeting news conference, OET Deputy Chief Bruce Franca emphasized that "life and safety" radio systems would receive priority protection from BPL interference through frequency notching and exclusion zones. Other licensed users, such as Amateur Radio, would be protected on a complaint basis, "when and if interference occurs," he said.

OET Chief Ed Thomas said the *R&O* contains "an administrative procedure, step by step" to address interference complaints. He characterized the procedure as "a bit of a refinement" to current Part 15 requirements. He also maintained that the FCC determines "black and white" what constitutes "harmful interference" under the rules.

"It's our belief that the notching provides the protection that's reasonable and in the public interest," Thomas continued, "and we don't think that's a major problem. There's been a lot of rhetoric surrounding this as well."

The United Power Line Council (UPLC) applauded the FCC's action, saying the new rules should encourage BPL deployment while protecting licensed services from harmful interference. "We didn't get everything we wanted," said UPLC President and CEO William R. Moroney, who called the *R&O* "the result of close cooperation and compromise" with the NTIA to address its concerns about potential interference.

For more information on BPL, visit the "Broadband Over Power Line (BPL) and Amateur Radio" page on the ARRL Web site, **www.arrl.org/bpl**.

GREETING FROM SPACE, CHANGE OF GUARD HIGHLIGHT AMSAT-NA GATHERING

A congratulatory greeting via ham radio from the crew of the International Space Station was among the highlights of the 2004 AMSAT-NA Symposium and Annual Meeting October 8-10 in Arlington, Virginia. The gathering—for the first time held in conjunction with the Amateur Radio on the International Space Station (ARISS) International delegates meeting—attracted upward of 200 attendees—among them some of the best-known names in the amateur satellite

CARRIE CUNNINGHAM, KA7SKY

Kenneth Ransom, N5VHO, works ISS astronaut Mike Fincke, KE5AIT, from NA1SS, during the AMSAT Symposium. ARISS-Russia delegate Sergei Samburov, RV3DR, looks on.

world. Fincke joined the celebration vicariously by working ARISS Ham Radio Technical Manager Kenneth Ransom, N5VHO, during an ISS pass October 9.

"I'd like to send a greeting to all the people attending the AMSAT conference and congratulate you all on 35 years of Amateur Radio in space," astronaut Mike Fincke, KE5AIT, said from NA1SS on behalf of himself and Expedition 9 Commander Gennady Padalka, RN3DT. "Wishing you all the best from the International Space Station!" Fincke jumped in to work Ransom and several other stations while the ARISS amateur gear was in FM repeater mode.

FCC News

NO CHANGES YET TO MORSE REQUIREMENT, LICENSE STRUCTURE

The FCC continues to review thousands of comments it's received on 18 petitions for rule making—including one from the ARRL—that call for changes in the Amateur Service Part 97 rules. Petitions filed addressed the Morse code question as well further restructuring of the amateur licensing system. Prompting most of them were changes at the international level approved during World Radiocommunication Conference 2003 (WRC-03), including one leaving the choice of requiring Morse proficiency for HF access up to individual countries.

Before the FCC adopts any changes regarding the Morse requirement and further license restructuring, it must complete its comment review, then draft and issue a *Notice of Proposed Rule Making* (*NPRM*) with a new docket number. That *NPRM* will reflect the FCC's interpretation of consensus within the amateur community regarding the various proposals, based on the comments received and now under review. The Commission then will invite further comments on whatever it proposes in the *NPRM*.

At press time, an FCC Wireless Telecommunications Bureau staffer confirmed that the WTB was still working on the Morse and license restructuring petitions but was unable to say how far along the process was. While this process is under way, however, the 5 WPM Morse code requirement (Element 1) to gain HF privileges remains in place, and no changes have been made in the Amateur Radio license structure.

Once that process is complete, the FCC must review comments filed on the *NPRM* before it issues any final action in the form of a *Report and Order*. The ARRL does not anticipate that will occur until sometime in 2006, perhaps later.

The ARRL has posted answers to frequently asked questions on its own restructuring initiative on its Web site, **www.arrl.org/news/restructuring2/faq.html**.

The FCC has indicated that once it's done dealing with the Morse and license restructuring-related petitions and comments, it will take up revisions to Part 97 it proposed and/or ordered last April in a so-called "omnibus" *Notice of Proposed Rule Making and Order* in WT Docket 04-140. Among other changes in that proceeding, the FCC recommended adoption of the ARRL's "Novice refarming" plan, **www.arrl.org/announce/regulatory/refarm/**.

Amateur Enforcement

♦ **FCC affirms fine for former California amateur licensee:** In an October 5 *Forfeiture Order*, the FCC has affirmed a $10,000 fine it proposed earlier this year to levy on Jack Gerritsen, ex-KG6IRO, of Bell, California. The FCC asserts that Gerritsen doesn't have an Amateur Radio license but continues to operate. The FCC's Wireless Telecommunications Bureau (WTB) promptly rescinded its 2001 Amateur Radio license grant to Gerritsen after learning of his California court conviction a year earlier for interfering with police communications. The fine is the next step in a case that eventually could lead to criminal prosecution.

Responding to the earlier FCC *Notice of Apparent Liability* (*NAL*) in July, Gerritsen maintained that he still has a ham ticket. He asserted that the *NAL* does not show that his interference conviction is under appeal, that the set-aside of his amateur license was unfounded and is only a claim made by Commission personnel; that he holds a valid license and that any possible suspension of his license is pending a hearing, making the *NAL* moot until a suspension actually occurs.

Not so, said the FCC, citing chapter and verse to back up its *Forfeiture Order*. Section 1.113(a) of its rules gives the WTB 30 days from publication to modify or set aside an action, such as a license grant, on its own motion, the Commission pointed out. As a result, Gerritsen's amateur application has reverted to pending status, and no amateur license exists, the FCC said.

Gerritsen also argued that he preserved his license by seeking a hearing under §1.85 of the FCC's rules and, further, that he'd been told by FCC personnel that he would get a hearing. Wrong again, the FCC concluded. The Commission pointed out that §1.85 spells out when the FCC may suspend an operator license, but since Gerritsen has no license, just a pending application, there is no license to suspend, and §1.85 doesn't apply. The WTB did tell Gerritsen, however, that his amateur application would be designated for a hearing to determine if he's qualified to be a Commission license. A *Hearing Designation Order* is said to be working its way through the FCC bureaucracy.

Amateurs and law officers—some of them also amateur licensees—continue to express extreme displeasure at the slow pace of progress in the Gerritsen case. Reports from Los Angeles area hams indicate that Gerritsen continues to use KG6IRO, although the call sign appears in the FCC's Universal Licensing System as "terminated." Recent letters have implored the ARRL to somehow intervene in the situation.

"Imagine BPL—a million times worse," one radio amateur recently wrote the League. For some time now, repeater owners have been shutting down their machines rather than let an unlicensed user transmit through them.

The FCC said in its *Forfeiture Order* that agents who tracked transmissions to Gerritsen's house and interviewed him said he admitted to transmitting on various Amateur Radio frequencies as well as various business radio frequencies.

In a handwritten letter he wrote while in jail last March on a federal trespassing conviction to the president of one repeater association, Gerritsen suggested that repeater owners should tolerate his commentaries "a few times a day."

"Thanks to you guys, people in the world are a little bit closer together," Fincke added.

In a second QSO with WF5X, Fincke reiterated his greeting and expressed gratitude to AMSAT—an ARISS partner—for the amateur equipment aboard the space station. Fincke briefly switched to Russian to also greet ARISS-Russia delegate Sergei Samburov, RV3DR, who was with Ransom during the QSO.

The annual gathering marked the official changing of the guard at AMSAT-NA as Robin Haighton, VE3FRH, presided over his last Board of Directors meeting October 8 before turning over the gavel to incoming president Rick Hambly, W2GPS. Among other things, board members agreed to file a *Petition for Reconsideration* of the FCC *Second Report and Order* in IB Docket 02-54 dealing with orbital debris.

Haighton's four-year tenure spanned this year's success of the Echo/AO-51 satellite, which has helped the organization to rebound from the earlier, less-than-successful outcome of the now-defunct Phase 3D/AO-40—the most expensive and elaborate amateur satellite project in history. Planning for the pro-

Outgoing AMSAT-NA President Robin Haighton, VE3FRH (left), shakes hands with incoming President Rick Hambly, W2GPS.

posed Project Eagle satellite also got under way under Haighton's leadership.

That work will continue under Hambly, who also hopes expand AMSAT-NA's educational mission. He faces the additional challenge of finding a new home for the AMSAT Lab, damaged beyond repair by Hurricane Charley.

During the wide-ranging presentations, AMSAT-DL President Peter Gülzow, DB2OS, outlined plans for the Phase 3 Express (P3E) satellite—essentially a scaled-down version of AO-40. AMSAT-NA is a partner in the P3E high-altitude-orbit satellite, a prelude to an ambitious Mars-orbiting spacecraft.

ISS Expedition 4 crew member and astronaut Carl Walz, KC5TIE, keynoted the October 9 banquet.

Media Hits

■ An article on DXpeditioning appeared in California's *Fresno Bee* October 14. In late July, when Madera County resident Mike Staal, K6MYC, and 11 others went to Aves Island for the YVØD DXpedition, he found the equatorial sun and whipping trade winds could suck moisture right out of his body. While the island rises no more than 4 feet above the surrounding sea, it was a mountain of good will as the article discusses the international cooperation and communication among hams.

■ A major hit was scored with an article in the International Association of Emergency Managers' *Bulletin* in which Luis Martinez, KD7GMK, wrote about the collaboration between ARES and emergency management officials. Martinez is the District Emergency Coordinator for Pinal County, Arizona.

■ "Any Way You Slice It, Hams Have Fun" was the punning title of an October 9 article in *West Hawaii Today*. The article offers general information about ham radio and encourages interested readers with basic information on how to get involved.

■ *The Wall Street Journal* on October 11 plugged Amateur Radio in an article about a patent dispute involving free electron lasers. While ham radio is not a part of the dispute, the *WSJ* indicated that the expert in the field is John M J Madey, K2KGH, of Honolulu. The article relates how Madey first became interested in electronics as a teenaged ham in New Jersey. You never know where ham radio can take you!

In Brief

● **ARRL digital communications study deadline looms:** The ARRL Ad-Hoc Committee on Amateur Radio Emergency Service—ARES—Communications (ARESCOM) wants the amateur community to help it document what digital communications systems now are in use on VHF and UHF. While the majority of digital communication is via packet, many different packet systems are in use, and they are interconnected using a variety of methods. "We are seeking input from packet system administrators, not individual users, as we need information on how the packet nodes are linked and what connectivity methods the packet systems use with systems outside their coverage area," said ARRL Ad-hoc ARESCOM Committee Chair Dick Mondro, W8FQT. Data collection wraps up December 31. The ARRL Board of Directors resolved at its July 2004 meeting to encourage the deployment of e-mail via Amateur Radio "as exemplified by *Winlink 2000*" to meet the needs of served agencies and others involved in providing disaster communications. To participate, visit the ARRL Digital Communications Study Web page, **www.arrl.org/digtest**.

● **EMA getting new Section Manager; six incumbents gain new terms:** Mike Neilsen, W1MPN, will take over January 1 as ARRL Eastern Massachusetts Section Manager. He'll succeed current SM Phil Temples, K9HI, who decided not to run for another term. Neilsen, who lives in Hudson, has served as Eastern Massachusetts Section Emergency Coordinator for three years. He was the sole nominee for the position. Six incumbent SMs also had no opposition at the end of the nomination period in September and have been declared elected. SMs continuing in office for new two-year terms starting January 1 are Dale Bagley, KØKY, Missouri; Rich Beaver, N3SRJ, Western Pennsylvania; Jim Boehner, N2ZZ, South Carolina; Tom Dick, KF2GC, Northern New York; Jean Priestley, KA2YKN, Southern New Jersey; Dale Williams, WA8EFK, Michigan.

● **Deadline is December 31 for ARRL WAS/90 Award:** There's still time to make your 50 contacts to qualify for the ARRL Worked All States in the 90th Award. No QSLs are necessary. Just fill out the application showing the contacts you've logged. To be valid for the award, all contacts must be made between 0000 UTC on April 3, 2004, and 2359 UTC on December 31, 2004. WAS in the 90th applications will be accepted through 2005. There's more information on the WAS in the 90th Web page, **www.arrl.org/awards/was-90**.

● **Van Field, W2OQI, wins September *QST* Cover Plaque Award:** The winner of the *QST* Cover Plaque Award for September is Van Field, W2OQI, for his article "HF Antennas 101." Congratulations, Van! The winner of the *QST* Cover Plaque award—given to the author or authors of the best article in each issue—is determined by a vote of ARRL members. Voting takes place each month on the *QST* Cover Plaque Poll Web page, **www.arrl.org/members-only/qstvote.html**. Cast a ballot for your favorite article!

● **ARRL Foundation scholarships filing deadline near:** The deadline to apply for ARRL Foundation scholarships for the 2005-2006 academic year is just ahead. The application, transcript, *Free Application for Federal Student Aid* (*FAFSA*) and *Student Aid Report* (*SAR*) package must be received at ARRL Headquarters by February 1, 2005. The full listing of available scholarships is available on the ARRL Foundation Scholarship Programs Web page, **www.arrl.org/arrlf/scholgen.html**. Use one application to apply for the main pool of scholarships. A separate application is required to apply for The William R. Goldfarb Memorial Scholarship, **www.arrl.org/arrlf/goldfarb.html**.

SKYWARN Recognition Day is December 4 Storm Spotters Show Their Dedication

By David Floyd, N5DBZ
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david.l.floyd@noaa.gov

The sixth annual SKYWARN Recognition Day (SRD) special event will take place Saturday, December 4, 2004. SKYWARN Recognition Day, cosponsored by the American Radio Relay League and the National Weather Service, pays tribute to Amateur Radio operators for the vital public service they perform. During the 24 hour event, Amateur Radio operators visit their local National Weather Service (NWS) office and work as a team to contact other hams across the world.

"Ham radio operators are a tremendous resource for the National Weather Service," says Scott Mentzer, NØQE, organizer of the event and Meteorologist In-Charge at the NWS office in Goodland, Kansas. "The dedication these amateurs have shown is inspirational, and their assistance during the year is invaluable."

Ham radio operators have an unrelenting desire to serve others in time of need, and they are usually in it for the long haul. When the eyewall of hurricane Charley moved over Florida in mid-August, radio amateurs provided the Melbourne NWS office with initial damage reports. Operators remained on duty for 36 hours during hurricanes Frances and Jeanne, a unique contribution considering they could have been home with their families. Last year, Montana hams felt so compelled to participate in the 2003 SRD event that they drove 100 miles to Glasgow through snow and ice.

Amateurs themselves may not fully appreciate just how they assist the NWS. For example, direct communication between mobile spotters and the LaCrosse, Wisconsin, office during a tornado event provided vital information needed to warn the public with higher confidence. In Illinois, effective spotter communication during an F3 tornado resulted in strongly worded statements conveying a much greater sense of urgency. The result was greater public response. In May, spotters tracked a tornado passing within miles of the Indianapolis 500 race where 100,000 people were in attendance. Their detailed reports allowed NWS forecasters to keep race officials informed.

Hams are also busy when the weather is quiet. Dedicated amateurs in North Dakota and Minnesota have assembled a "superlink" repeater/digipeater system making it possible for the local NWS office in Grand Forks to track spotters, and receive spotter reports beneath more distant storms. During Alaska's worst wildfire season on record, hams relayed locations of dense smoke to the Fairbanks office, providing crucial local wind information to forecasters and firefighters.

SKYWARN Recognition Day will be held from 0000 UTC to 2400 UTC on December 4. Last year, participants logged nearly 19,000 QSOs during the 24 hour event. To learn more, check out the Web site **hamradio.noaa.gov**.

BUILD YOUR OWN STATEWIDE PACKET NETWORK

By Erik Westgard, NY9D, and Paul Emeott, KØLAV

In discussing the plans in place for dealing with a variety of domestic terrorist threats, we concluded that there was an opportunity to provide Amateur Radio resources to help with large scale evacuations and interagency disaster teams, as well as providing rapid response to incidents like tornados or plane crashes that may occur in remote areas with limited communication infrastructure.

The packet network we built is an inexpensive, homegrown version of the keyboard-to-keyboard messaging system being installed by the State of Pennsylvania and the CAPWIN project in Washington, DC. Our network supports reliable data connections at 1200 bps, and can handle multiple users, as a person typing on the system has a maximum data rate of around 70 bits/second. Our network supports conferencing, which has been shown to be useful in emergency responses, as well as the basic data base function in the older ARES-Data and new Linux based Trivnetdb type applications.

The network is intended to support the field deployment of volunteer emergency services personnel for severe weather response and other disaster-related communication, where normal landline and wireless facilities are unavailable or overloaded. The tornado in Ladysmith, Wisconsin, is an example of such a situation. Engineers we know report that an average commercial cell site can handle 24-200 simultaneous calls, so in the event of a disaster, these facilities, if operational, can also be subject to overload.

In the November 2002 outbreak of tornados in the southeastern US, news accounts mentioned the failure of landline communication facilities as a complicating factor in rescue operations. The network uses readily available stock Amateur Radio hardware, which can be purchased inexpensively, has limited training requirements and uses no specialized software.

The Network Expands

With the cooperation of amateurs and site owners around Minnesota, we have expanded an existing core network that has been serving the Twin Cities for the last 10 years or so. We have added sites for coverage out of the Twin Cities, and are nearly done with a ring network that reaches much of the population of Minnesota. The ring design means if you lose a site, you can go around the ring in the other direction. Ring networks are also more difficult to jam from a single location.

Along with excellent coverage of the Twin Cities Metro Area, we have stations located as far north as Brainerd and Pequot Lakes as well as Duluth. To the South, there is a link to Rochester, and then to the Iowa border. To ensure reliable coverage to those areas, we will need additional nodes for redundancy, and to reduce the average radio paths to less than 40 miles. This work has been facilitated by the support of volunteer engineers from amateur groups in the outlying areas so we have not had to spend our weekends on the road.

There are also existing amateur packet radio stations on the air in Bemidji, Barnsville (near Fargo) and Mankato, and well into Wisconsin and North Dakota. There is a strong interest in reaching the State Fire Coordination Center in Grand Rapids as it is a backup emergency operations center for the state. We have a request from the University of Minnesota, which currently hosts one of our sites, for an emergency link to Duluth and other campus locations.

Expenditures

Each of the wide-area node sites we have built so far has cost between $300 and $3000 depending on the level of our inventory of surplus equipment and donations. We have funded more than 10 new ones so far and will need about 10 more to cover the state more fully. In some areas, local amateurs, clubs and agencies have built nodes. In other cases, we have had to provide equipment and support or complete node sites.

All of our funded nodes are built in locking metal cabinets. Secured commercial or government sites are the best location for nodes, as there is a tendency for the backyard amateur sites to be lost due to a lack of interest, health problems or the sale of property. Our favorite sites are city water tanks. These are grounded and secure. We get calls all the time from radio amateurs around the state who are working on getting us more sites. It's a great thrill when a new node appears on the air and on our lists

of station-beacons we are hearing.

Thus far, we have not had to pay much site rent or electricity or other running costs. Each site uses minimal electricity. We have been able to get riders on the ARRL club insurance to cover liability when requested by site owners. In all cases, we have requested site access in writing with support of our ARRL Section Leaders, State Division of Emergency Management and the Amateur Communications Teams from groups and agencies we support like ARES, the Red Cross and Minnesota Department of Health. We try to comply with requests from site owners for low visibility antennas and very small node cabinets.

Standards

We have had outstanding results with Kantronics terminal node controllers. The core 145.67 MHz network built by KØLAV had been running for 10 years on older KPC-1 TNCs with no TNC failures. We were able to buy quite a number of KPC-2 TNCs from local hamfests and on on-line auction sites for around $40 each. Most were running new-enough firmware to allow the use of the KA-Node feature and support open squelch. As we have received some donations, we are switching to only TNCs with built-in timeout timers such as the KPC-3 and 4. You should always make sure the jumpers and parameter settings in any used TNCs are first reset to their stock positions.

Node Components

Amateur Radio 144 MHz FM transceiver: $150.

Controller—Used Kantronics KPC-3: $75 (no computer needed).

Antenna—6 foot omni whip , amateur grade: $75 (Ringo Ranger); commercial grade: $130 (Maxrad).

Feed line—Belden 9913/LMR-400 costs about $1/foot. The average site uses 100 feet.

Power supply—12 A switching: $60-$100.

Cabinet—2 to 3 cubic foot locking metal cabinets have ranged from free surplus donations up to $100 for a cabinet.

The use of standard firmware and "plain AX.25" means we are compatible with the entire stock of TNCs out there in ham shacks round the state, we are not doing any programming. We are convinced that in the event of a disaster, there will not be time to distribute, install and tailor specialized software, and request registered IP network addresses as an example.

We have had good luck with new stock 2 meter amateur FM transceivers, such as the Kenwood TM-261A. This one, we discovered, has a built-in timeout timer (10 minutes) that can be enabled in the setup menus. In our early days when funds were short, we used some older 2 meter only mobile radios without extended receive. We require that the radio have a lithium type battery (or be crystal controlled or have a diode selector-switch) to retain the correct frequency after an extended (2 week) power outage.

No radio modifications have been required. There are those who prefer to use modified commercial radios. We have found the cost of channel elements ($80) is the same price as a used Amateur Radio. Used radios are often less expensive with bad displays or missing microphones. We prefer 25 W radios. These reduce any possible RFI and allow the use of less expensive 7-10 A dc power supplies.

For power supplies, we also use a mixture of 13.5 V, 10 A-20 A switching power supplies. We have experimented with some alarm-type chargers and gel-cell batteries we have found surplus. The chargers have tended to have rather unfiltered outputs, so we have seen ac hum on radios. In some cases, we have used computer UPS units. We believe in the long term, the only really reliable disaster emergency power is solar, so we are thinking in that direction.

[To be continued next month]

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
September 2004

This listing is to recognize radio amateurs whose public service performance during the month indicted qualifies for 70 or more total points in the following 6 categories (as reported to their Section Managers). Please note the maximum points for each category:

1) Participating in a public service net, using any mode. —1 point per net session; maximum 40.

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

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

4) Participation in scheduled short-term public service events such as walk-a-thons, bike-a-thons, parades, simulated emergency tests and related practice events. This includes off-the-air meetings and coordination efforts with related emergency groups and served agencies. —5 points per hour (or any portion thereof) of time spent in either coordinating and/or operating in the public service event; no limit.

5) Participation in an unplanned emergency response when the Amateur Radio operator is on the scene. This also includes unplanned incident requests by public or served agencies for Amateur Radio participation. —5 points per hour (or any portion thereof) of time spent directly involved in the emergency operation; no limit.

6) Providing and maintaining a) an automated digital system that handles ARRL radiogram-formatted messages; b) a Web page or e-mail list server oriented toward Amateur Radio public service —10 points per item.

Amateur Radio stations that qualify for PSHR 12 consecutive months, or 18 out of a 24- month period, will be awarded a certificate from Headquarters upon written notification of qualifying months to the Public Service Branch of Field and Educational Services at ARRL HQ.

837
KZ7T
680
W7TVA
675
AB2IZ
500
N2LTC
470
WA2YL
430
N2YBB
409
NC2F
404
K4MVO
394
N2YJZ
385
KC2HUV
N9VE
350
WA2YBM
345
KB2RTZ
330
KA2ZNZ
314
W2MTA
300
K4SCL
KC2MBC
WA1QAA
290
KB2KOJ
W2LC
265
N2OBY
252
K5ER
247
WB2LEX
230
KA2GJV
KB2SNP
225
AB5WF
222
N2VDK
221
W5PY
220
KB2DQ
212
KD5ITA
210
N4SGQ
205
N2QZ
WB2ZCM
K2MPE
200
K5DPG
W7ARC
K2AN
KB2CCD
195
KK3F
193
K9JPS
185
W2FPG
182
KC5OZT
181
K2ABX
180
NF5B
177
W4ZJY
175
KB5JBV
KA2BCE
167
W5XX
KD5ONS
KC2MVC
165
WB7WOW
163
AA4BN
160
W2DWR
KC2MQU
WA9JWL
157
KB2ETO
155
WI2G
151
K8ZJU
150
W8IM
WB5ZED
KE4UOF
AG9G
K9LGU
KG4VDR
AC5XK
147
WB2KNS
146
AC5SU
145
WB8RCR
144
KD7ZLF
140
W2DSX
KB2VRO
K7BFL
W4NTI
N8IO
KC8UTL
KD1LE
135
KD4GR
W3YVQ
132
WA0KAQ
KD5TXD
130
W4EAT
W4DAC
K4FQU
KA5KLU
N5OUJ
127
NN7H
125
K2GW
KC5LFB
120
WX4H
K2UL
K6YR
K4IWW
AD4XV
K7UGT
KA4FZI
KE4UEI
W9BHL
WA9ZTY
W1GMF
N1LKJ
KW1U
K4BEH
W9NXC
KØIBS
W3BBQ
VE3EUI
119
W5JYJ
117
KA0DBK
KI4FBF
116
WA2GUP
115
W2QOB
K7EAJ
AB0WR
112
W2LTB
K5HHS
KI0BK
110
K5MC
N7EIE
W7QM
N7YSS
W7GB
W0LAW
WA1JVV
KD4CQJ
AB4XK
KE4JHJ
W0UCE
N7CM
N7YSS
K9FHI
KB9KEG
N3SW
N2JWW
N1IQI
W6QZ
AF4NS
108
N3RB
W5GKH
106
W4DLZ
W3ZQN
105
AB1AV
KL7OR
W8YS
104
WB4NCW
103
KD4GBA
K3JL
101
W5IM
100
N2AKZ
KC2GOW
KB2KLH
NR2F
WA0TFC
N2YIR
WA2WMJ
WA8SSI
KF6SHU
WA4EIC
W9CBE
W9RCW
KA4UIV
K1YCQ
KK5GY
WN0Y
W7GHT
WD8DHC
N8IY
WB2QIX
K3SS
KI4JW
KG4OTL
K8AE
96
W2CC
W3CB
95
W7LG
WG8Z
94
KG4FXG
93
KA4LRM
KB3CEZ
92
W1ALE
91
AF2K
90
N1JX
N2GJ
K2BCL
N9MN
N2HQL
WA2CUW
N8DD
WD8Q
K6JT
K2YYF
KF6OIF
W4LN
WD4LSS
W4DNA
KC7SGM
W3TWV
W5UYH
WB7VYH
W6ZOH
KG2D
WB2IJH
WB4GGS
K4BG
K4WKT
K4FUM
KA1GWE
KA1RMV
K3CN
KB4CAU
K2VX
AA3SB
N3WK
N3OR
AA3GV
K8VFZ
KB0DTI
AB0UY
WW3JC
N3KB
89
W4FAL
N1TPU
KD6YJB
88
KG4OQA
87
W0HXB
W5CU
K3IN
86
WD0GUF
N8FXH
W8CPG
83
KC6SKK
82
N2VQA
KV4AN
81
AE5V
AD4BL
80
W2MTO
K7GXZ
KC2JQE
AL7N
KC6NBI
AA4YW
W6JPH
WB4BIK
N3ZOC
K8KV
79
K7MQF
KA0O
77
KO4OL
KC5EOK
75
K6RAU
AA4AT
74
AG4ZB
KB8UIH
73
AI4DV
KK7TN
70
KF4WIJ

The following stations qualified for PSHR in previous months, but were not recognized in this column: (Aug) W2MTA 255, WA9JWL 135, W1QU 100, W6JPH 84.

Section Traffic Manager Reports
September 2004

The following ARRL Section Traffic Managers reported: AK, AL, AR, AZ, CO, CT, DE, EMA, ENY, EPA, EWA, GA, ID, IL, IN, KS, KY, LA, MDC, MI, MN, MO, MS, NC, NE, NFL, NH, NLI, NNJ, NNY, NTX, OH, OK, OR, ORG, SB, SC, SDG, SFL, SJV, SNJ, STX, TN, VA, VT, WCF, WI, WNY, WPA, WV, WWA, WY.

Section Emergency Coordinator Reports
September 2004

The following ARRL Section Emergency Coordinators reported: AK, AZ, CO, EWA, GA, IN, KS, KY, LA, MDC, MN, MO, NC, NE, NLI, NNJ, SD, SDG, SFL, SJV, SNJ, STX, SV, VA, VT, WWA, WTX.

Brass Pounders League
September 2004

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
KK3F	36	1342	1288	54	2720
N2LTC	0	964	950	52	1966
W1GMF	0	222	1508	24	1754
WB5ZED	30	790	865	30	1715
N1IQI	0	318	979	0	1297
KA5KLU	0	507	733	6	1246
W4ZJY	0	612	615	0	1227
K9JPS	0	571	32	554	1157
KW1U	0	521	394	0	915
K7BDU	24	368	327	7	726
W7QM	0	304	410	28	742
W4EAT	0	387	307	1	695
WB4GGS	0	336	335	1	672
W4DAC	12	286	295	25	618
W4UEF	16	249	265	0	530
KA9EKG	3	265	260	1	529

BPL for 100 or more originations plus deliveries: KA9EKG 182, KK5GY 139, and N9VE 137.

Forward and Back

Two years ago in my first column, I described what was to be found in my "World Above 50 MHz" (WA50) columns. I wrote that the WA50 would emphasize operating on the VHF+ bands and the propa-gation milieu, equipment and technical achievements that make this all possible. This month, I want to go into a little more detail about how the WA50 column has evolved during these first two years and ask readers to help me make this a column that appeals to *you*. It is important that WA50 is interesting and informative to the VHF+ community; for that is its purpose.

Publication issues. *QST* production costs dictate that the magazine be limited to a certain number of pages dependent on advertising revenue. Each interest column has a fixed number of pages—WA50 normally gets three pages (including the Standings box) in the months that it is published. There are strict publication deadlines: the last week of the month, two months before the issue appears. So, for the December issue, all information must be to me by the last week in September so I can integrate it into the column and meet the space requirements. If you don't send me the information, it is not likely to be published in the column. You should e-mail information to me at **w3zz@arrl.org** if possible. Send it again if it bounces; I have a very aggressive spam filter. You can also call me or send snail mail (complete contact information is at the bottom of the first page of this column).

Structure. As a rule, the column has two major segments: a *feature*, which may include almost anything that is current or interesting and *operating news* [ON THE BANDS]. Features include almost anything of current interest, things I have encountered or subjects that come from readers. The operating news comes primarily from the readership, some from my own station operations, some from Internet propagation loggers and even e-mail or telephone calls to specific people based on rumors. The column also contains the VHF+ Standings and informational items like notices of contests and their results, conventions, newsworthy events of various kinds and other informational items like optimal weekends for EME operation based on the W5LUU data. Let's look specifically at what has appeared in the past two years.

Figure 1—WZ8D provided lots of rare multiband Maritime grid contacts on his recent vacation. Here is his 4WD camper set up on a hilltop overlooking the Atlantic in GN05.

Feature issues. A quick analysis of the columns since December 2002 reveals that fully one-third of them have unusual operating events as the lead feature. It surprised me somewhat that enough exciting things happened in that short period to warrant filling eight columns with detailed information. Indeed, upon reviewing these, I find

- A discussion of the decline of the Leonids certainly the most spectacular MS event in the last few decades;
- Three columns on the 2003 summer openings from the Pacific Northwest to Europe on 50, 144 and 222 MHz E_s in the US, and the unprecedented 2 meter E_s activity in Europe;
- The September 2003, tropo records;
- The enormous flares and resulting auroras in late October 2003; and
- The recent two-part discussion of the amazing 144/222 E_s openings the first 10 days of July 2004 that still did not do justice to the subject.

There's not a one that I wouldn't use again.

Five columns dealt with basic resources available to the VHF+ amateur: the basic station; antennas; VHF-oriented clubs; VHF+ nets; VHF+ Web resources and links from the WA50 Web site. I have intertwined discussions of digital technology and EME operation in three different columns: a basic exposition of weak-signal digital technology and its relationship to EME, a description of 6 meter EME using digital technology and my visit to K2UYH for the 2003 EME contest. EME certainly defines one edge of the state of the VHF+ art. (It's one that I cannot do to any effective degree from my small, tree-filled location.)

I've tried to suppress my natural interest in propagation and contesting. As for the former, my predecessor Emil Pocock, W3EP, covered almost all aspects of this subject during his tenure. You should go back and read his columns on propagation; it will be well worth your effort. Still, three columns deal with propagation issues: the Brendan trophy and possible tropo paths over the Atlantic, early detection of 2-meter E_s and the declining years of sunspot Cycle 23.

Contesting issues appeared in only two columns that dealt with potential changes in contesting structure to increase participation and the recommendations of Tom Frenaye's (K1KI) *ad hoc* VHF contesting committee. Finally I have had two columns featuring VHF stations and their operators—one fixed station and one rover. These have been popular and I intend to do more.

The feature sections of three columns were essentially written by experts in those areas: Bob Cooper, ZL4AAA, on long-distance tropospheric propagation; Ned Stearns, AA7A, on early detection

This Month

December 4-5	ARRL International EME Contest (second weekend 50-1296 MHz)
December 13	Geminids meteor shower peaks at 2045Z

There are no weekend days with good EME conditions in December*

*Moon data from W5LUU

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of E_s and Lance Collister, W7GJ, on 6 meter EME. I will be looking for other experts who are willing to write about their specialized interests in the VHF world.

I also would like to know of any interest in excerpting parts of the resource columns (clubs, nets and equipment/antennas) for placement on the ARRL Web site. If so, the information needs to be updated. I am likewise open to suggestions from readers of feature topics.

Operating News. I usually cover operating news in the ON THE BANDS section by propagation classes: tropo, E_s, aurora, meteor scatter. I then go by band for 6 meters and the microwaves, or by mode in the case of digital, where the report does not fit one of the other headings. Here I am greatly dependent on the reports that you send me. Operating news covers the month of the deadline. For example, for this issue the deadline is the end of September, so the news is for the month of September. I can usually add operating information that reaches me by the first few days of the following month. The old maxim says that all politics is local; even more so in the case of most VHF propagation.

Because of the nature of the beast, something interesting or even noteworthy may occur in one part of the country and those outside the area may know nothing of it. For example, 2 meter E_s is often confined to very narrow areas. A very short opening with only one or two contacts may be completely missed unless someone sends me a report. Tropo openings even several-hundred kilometers in length go unreported.

Yes, the propagation loggers are useful, but because everything is logged in real time, not everything you see actually turns out to have happened. Or, it is impossible to determine whether something was worked or just heard. In such cases, I try to track down one end of the QSO by e-mail or telephone, but surprisingly often that does not work. I get regular reports from many people—these are often very valuable and spot things like Pacific and Asian openings from the US West Coast that otherwise go unannounced. Because of the history functions of some of the loggers, I cannot check reports unless I know about them rather quickly and I have access to the Internet at that time (not so if I am away from home).

What kind of news do I want to see, and how do I decide what to put in the column? That depends on how newsworthy the observation is, how many reports and how much space I have. I am looking for things that are somewhat out of the ordinary. How to judge this depends, in part, on experience.

Tropo. The average 100 W station with a reasonably clear horizon can work a similarly situated station on tropo 500 km (300 miles) away up through 70 cm. A high-power station with big antennas from a quiet, superior location can work a similarly situated station 800 km (500 miles) away. Tropo distances beyond that are worth reporting, especially with stronger signals than normal along the path.

E-skip. Single-hop E_s is most common on 6 meters between early May and mid/late August. To tell me that you worked stations in Florida from Chicago on June 15 might not be of particular interest, but to tell me that you experienced single hop E_s on 24 out of the 30 days in June would be useful. E_s openings of any kind outside those months are usually of interest. Double-hop E_s and multiple-hop E_s are always of interest; these are contacts in excess of 2300 km (1430 mi). Single-hop E_s contacts on 2 meters should be reported, particularly if you are located in a sparsely populated area and/or do not hear much activity. All 222 MHz E_s contacts should be reported.

Aurora. There is much more aurora than is reported in the column because I don't get the reports. If the opening is *marginal*, send a report, particularly if you are at a high latitude and you don't hear much activity. I would also like to hear from *anybody* making aurora contacts located at 36°N latitude or less. I try to highlight the long-distance contacts during the better aurora openings and contacts with stations in the most southerly locations. Contacts are made by reflecting signals off the auroral curtain located at E-layer heights. Maximal distances depend on auroral geometry—about 1000 km (600 miles) on a N/S axis to 2200 km (1367 miles) on an E/W axis. Aurora contacts on 222 MHz and particularly 432 MHz should always be reported.

Meteor Scatter. WSJT (FSK441) has revolutionized MS communication. Even modest stations can now make MS contacts essentially 24 hours a day without the benefit of meteor showers. For the column, I am interested in reports of conditions and contacts made during known meteor showers like the Perseids and the Geminids. Please specify the mode you used to make the contact—SSB, CW or digital. Reports of long-distance digital contacts, whether during a shower or not, are always welcome.

Six meters. Most 6 meter news in the column is multiple-hop E_s, F2 propagation when it happens and DX contacts. For the most part, this covers the summer months and, to a lesser extent, the secondary E_s season December and January. Six-meter E_s in the months of September, October early/mid November, February, March and early April is real news and ought to be reported.

Microwaves. Most unusual microwave contacts are via enhanced tropo ducting. Distances vary depending on the terrain and the amount of power at each end. Again, I'd like to know about distances beyond normal and contacts made by non-tropo means like long rain/snow scatter. News of large organized activities at 24 GHz and above is always welcome.

Informational items. I use the HERE AND THERE section to deal with items that do not readily fit the "Operating News" subdivisions. These might include conventions, contests, unusual records and the like. If you want mention in the column, make sure to mind the deadlines (see above). I also include a sidebar, This Month, which delineates operating and/or social events for the month and points out the optimal weekend(s) for EME conditions.

ON THE BANDS

After a summer stuffed with openings of all kinds, this September was much, much quieter. The month featured an unusual number of hurricanes making landfall in Florida and often moving northeastward fairly far inland over the Appalachians. This often means strong tropo ducting along the Atlantic coast and even inland in the Midwest. Some of this did occur, but for the most part September did not produce any notable openings supporting very-long-distance contacts. Perhaps associated slow-moving high-pressure systems combined with storm movement offshore up the Atlantic coast would have produced better conditions, like those we saw on September 25.

Contests. Early reports from the September ARRL VHF contest indicate that there was some tropospheric enhancement, at least along the East Coast. Dave, K1WHS (FN43mj), indicates that he worked 40-50 contacts on 144, 222 and 432 MHz with stations in the EN90s, 80s and 70s after 21Z on September 11. Roger, K2SMN (FN20), found enhanced conditions down the coast to the Carolinas the following morning. The 2 meter Fall Sprint on September 20 featured enhanced conditions along the East Coast. Ron, WZ1V (FN31), worked westward to VE3TMG (EN82) and southward as far as W4WA (EM84ej), who was worked also by many others in the Northeast. The 222 Sprint was rainy and looked unpromising but I worked 25 grids from FM19 including W4WA, K1WHS and W8RU (EN82).

Tropospheric ducting. Good conditions occurred around the 10-12th, 18-22nd, 25th and 29-30th. The month's highlight was a contact between Dave, K1WHS, and Dex, W4DEX (EM95tg), at 0400Z on September 25 on all bands between 2.3 and 10 GHz. The 5 and 10 GHz contacts were a new North American overland record (1212 km—753 mi) and were aided by a combination of a cold front to the west and Hurricane Jeanne just off the FL coast. Dave was running 21 W to a

50-MHz Standings

Published 50-MHz standings include call-area leaders as of October 1. For a complete listing, check the Standings Boxes on the "World Above 50 MHz" ARRL Web pages at **www.arrl.org/qst/worldabove/**. To ensure that the Standings Boxes reflect current activity, submit reports at least every two years by e-mail to **standings@arrl.org**. For printed forms, send a request with an ASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call sign	QTH	States Worked	DXCC Entities Worked	Grids Worked	Best DX† (km)
1					
W1JJ	RI	50	167	—	15,594
K1SIX *	NH	50	164	1000	14,982
K1SG	MA	50	147	500	14,521
W3EP/1	CT	50	143	1003	15,750
K1GUN	ME	50	136	—	—
K1MS	MA	50	135	—	14,498
KA1A	NH	50	135	—	14,533
AA6TT/1	VT	50	132	681	14,589
K1LPS	VT	50	129	675	14,592
W1AIM	VT	50	129	525	14,928
K1TEO	CT	50	123	880	14,430
2					
K2ZD	NJ	50	154	—	15,502
K2MUB	NY	50	148	—	—
WA2BPE	NY	50	141	—	15,390
K2AXX	NY	50	126	925	14,198
WA1RKS	NY	37	126	204	13613
W2MPK	NY	50	115	—	—
K2OVS	NY	50	110	441	13,124
K1JT	NJ	50	90	554	14,150
W2GKR	NY	50	85	459	14,470
KB2YVC	NY	48	64	395	12,300
3					
W3JO	PA	50	157	—	14,929
W3VZ	MD	50	148	700	14,038
W3NZL	MD	50	140	—	15,835
W3ZZ	MD	50	137	830	15,769
W3TC	PA	50	130	681	14,945
K3ZO	MD	50	128	617	15,066
N3DB	MD	50	125	743	15,083
AK3E	MD	50	99	648	14,445
4					
K4MM	FL	50	145	—	16,326
N4MM	VA	50	138	865	—
WA4LOX	FL	50	132	—	15,664
W4TJ	VA	50	125	718	15,688
WA4NJP *	GA	50	122	985	13,171
K4PI	GA	49	122	748	12,555
W4TRH	SC	50	120	75	14,675
NW5E	FL	50	119	653	15,103
KE4WBO	FL	47	118	—	10,700
AC4TO	FL	50	113	650	14,760
WB4WXE	GA	50	111	—	14,320
K4RX	FL	—	110	—	—
5					
W5OZI	TX	50	152	1029	15,141
W5EU	TX	50	150	—	16,278
WD5K	TX	50	140	1067	14,927
K5AM	NM	50	135	842	17,861
K5UR	AR	50	134	1013	—
WA5JCI	TX	50	120	789	—
AA5XE	TX	50	115	677	15,142
W5HNK*	TX	50	109	—	14,815
W5LUA	TX	50	99	—	—
N5HYV	LA	50	85	700	—
6					
K6QXY *	CA	50	128	—	15,555
N6CA	CA	50	122	—	18,445
WA6PEV *	CA	50	116	—	18,246
W6BYA	CA	50	114	771	16,708
W6CPL	CA	50	104	—	18,422
KH6/K6MIO	HI	50	100	470	19,360
N6RZ	CA	50	82	—	14,778
NH7RO	HI	41	82	448	16,810
KB6NAN	CA	50	81	680	16,638
W6TOD	CA	50	72	—	—
7					
W7RV	AZ	50	132	987	18,227
AA7A	AX	50	110	—	—
W7KNT	MT	50	97	714	15,557
W7GJ *	MT	50	88	—	7,534
W7MEM	ID	50	74	612	16,106
WA7KYM	WY	50	50	426	14,526
N7IR	AZ	50	43	434	13,216
8					
K8MFO	OH	50	150	—	—
WB8XX	OH	50	112	700	15,224
N8KOL	OH	50	107	624	13,163
W8PAT	OH	50	104	478	13,459
W8UV	OH	50	104	165	14,378
W8TN	WV	50	101	475	12,436
WB8TGY	MI	50	91	472	13,939
K8ROX	OH	50	73	525	11,138
WA8JOC	OH	50	65	329	12,142
W8SIX	OH	50	58	395	13,800
9					
W9RPM	WI	50	111	506	14,092
W9RM	IL	50	99	635	13,712
N9NJY	IL	50	86	472	14,582
K9SM	IL	50	82	481	15,148
W9GM	WI	50	53	363	10,200
WA9PWP	WI	50	45	406	10,400
K9MU	WI	50	43	370	10,447
Ø					
KØFF	MO	50	122	740	16,246
KMØA	MO	50	115	860	16,190
KØSQ	MN	50	114	349	16,106
KØGU	CO	50	97	728	17,142
WAØKBZ	MO	50	97	612	16,354
WØJRP	MO	50	88	631	14,310
KØCS	CO	50	84	530	17,204
KØCJ	MN	50	78	—	15,500
Canada					
VE3KKL	ON	50	114	618	15,302
VE3DSS	ON	50	106	120	15,230
VE2PEP	PQ	50	92	655	11,574
VE3TMG	ON	50	61	500	15,454
VE2PIJ	PQ	49	51	403	6,104
International					
SV1DH	INT	29	228	904	16,600
IKØFTA	INT	37	222	1053	18,263
EH7KW	INT	44	214	1009	19,910
IK2GSO	INT	37	211	1034	18,861
SM7FJE	INT	43	202	1085	15,912
GØJHC	INT	43	202	1040	15,951
IØWTD	INT	30	195	775	18,262
SM7AED	INT	42	191	997	15,931
F5LNU	INT	40	188	863	19,183
IZ1EPM	INT	—	171	621	18,813
9A1Z	INT	—	168	—	—
PY5CC	INT	48	161	569	18,257
F5DE	INT	36	154	674	15,789
GW8ASA	INT	21	141	546	14,630
ZS6WB	INT	11	137	632	19,288
TI5KD	INT	50	134	866	18,757
YV4DDK	INT	—	122	—	—
ZS6NK *	INT	16	119	373	19,360

†Terrestrial
* Includes EME contacts
—Not given

0.9 m (3 ft) dish on 10 GHz and 10 W to a similar dish on 5.7 GHz. Dex was running 20 W to a 0.6 (2 ft) dish on 10 GHz and 10 W to a homebrew horn on 5.7 GHz. Jon, NØJK (EM18), noted mildly enhanced propagation to WI and a contact between NØLL (EM09) and EN41 on the 9th and 10th. Between September 18 and 21, Bob, AA9MY (EN50), worked W4ZRZ (EM63) and K4XR (EM64) on 144, 222, 432 and 1296 MHz among others in EM54, 56, 74 and 75. Stan, W8MIL, also worked W4ZRZ on 222 FM on the 18th. Mark, K2AXX (FN12cs), worked K5QE (EM31cj) over an 1896 km (1178 mile) path on September 22 with a 2 meter halo. Dan, NØURW (EN41), made it to W4ZRZ on the 21st and W8MIL reached K5QE and WB5UOI (EM20) in Texas on the 22nd, both on 2 meters. Greg, W8GG (EM88), notes that he has now worked 100 grids and 30 states on 2 meters in the last 45 days on tropo and meteor scatter. The great news is that he is about to provide 222 and 432 MHz from his rare grid square.

6 meters. The dearth of activity heralds the end of the E-skip season. Gary, N3JPU (FM19), and Ken, WB2AMU (FN30), report a minor opening from New England and the Mid-Atlantic states to Florida. NØJK worked to the northeast on September 29 and reports that NØLL (EM09) was having good luck from western Pennsylvania, New York and VE3. A more widespread opening appeared on September 30 with numerous contacts from Memphis (EM55) and northeastward, to VE4, from the EM17 area to DM57 (Montana) and the East Coast (thanks NØJK) and EN10 to EN66, DM54 and the Mid-Atlantic (thanks Bill, KØHA). Bill also heard VE1CSM in FN74. Gary, N3JPU, also worked several VEs in the FN60s and '70s before an opening out to the Midwest. Reports of TE were even scarcer. The dxworld.com propagation logger showed N8UUP hearing LU9EHF on the 21st and HP3XUG hearing LU, CE and ZP beacons on the 27th. John, WZ8D, conducted one of his well-known vacation trips to Canada (see Figure 1), this time to the Maritime Provinces after a short stay in FN53 in Maine.

EME. There are several interesting reports on the EME scene. Via JT65a, Lance, W7GJ, logged country #89, 7P8NK, for what appears to be the first North American/7P8 contact on 6 meters on August 2. Gary, KB8RQ, had a great summer with five new countries on 2 meter EME: OJØ/DL8YHR; HI3TEJ; YVØD; 7P8NK and V73AX; his DXCC total now stands at 159. Dave, W5UN, worked VQ9LA and then VQ9X on 2 meters on September 8 on CW for the first-ever EME QSOs from Diego Garcia. Dave is running 32 × 2M5WL 17-element Yagis and now has 171 DXCC countries confirmed on 2 meters with the recent additions of V73AX and HI3TEJ.

HERE AND THERE

Reflections from the Genesis Mission. We all know about meteor scatter and EME. What about other sources of ionospheric ionization? On September 8 between 1552-1600Z, Robert, KR7O (DM07), recorded signals from KC6ZWT (CM98) and WA6KLK (CM89) back scattered off the ionized trail created by the reentry of the Genesis Mission capsule. Robert was using a pair of 11-meter (34 ft)-boom M^2 Yagis on an azimuth heading of 15° toward the capsule while the stations he heard were inaudible on their direct headings of 335° and 312°, respectively. No forward-scatter signals were heard.

Geminids meteor shower. This is one of the biggest showers of the year, with ZHRs reaching 100 at times. The meteors are generally relatively slow [35 km/s] and the bursts are usually short. The shower is predicted to peak on December 13 at 2045Z. As with any shower that has short bursts, WSJT is often very effective.

Northern California DX Foundation Makes Two Large Grants to Benefit DXers

On September 18 at the W9DXCC DX Convention in Chicago, the Northern California DX Foundation, Inc (NCDXF) announced that it has awarded two major sponsorship grants for the 2005 Kerguelen Islands (FT/X) and Peter I (3YØX) DXpeditions. Together, these grants exceed $100,000, and represent the largest ever made by the NCDXF.

The Northern California DX Foundation was founded in 1972 to assist worthwhile Amateur Radio and scientific projects with funding and equipment. Although the words "Northern California" still appear in its title, the activities of the Foundation are international in scope, rather than regional. In addition to providing financial aid to significant DXpeditions, the Foundation, in cooperation with the IARU, maintains a worldwide network of high-frequency radio beacons that help amateurs assess the current condition of the ionosphere. The entire system is designed, built and maintained by volunteers at no charge except for the actual cost of the hardware and related components.

The Foundation is an organization described in Section 501(c)(3) of the United States Internal Revenue Code, and all contributions are tax-deductible to the extent permitted by law for US taxpayers. The Foundation does not have a paid staff, and no Foundation officer, director or advisor receives a salary or compensation in any form from the Foundation. More information about the NCDXF can be found on its Web site, **www.ncdxf.org**.

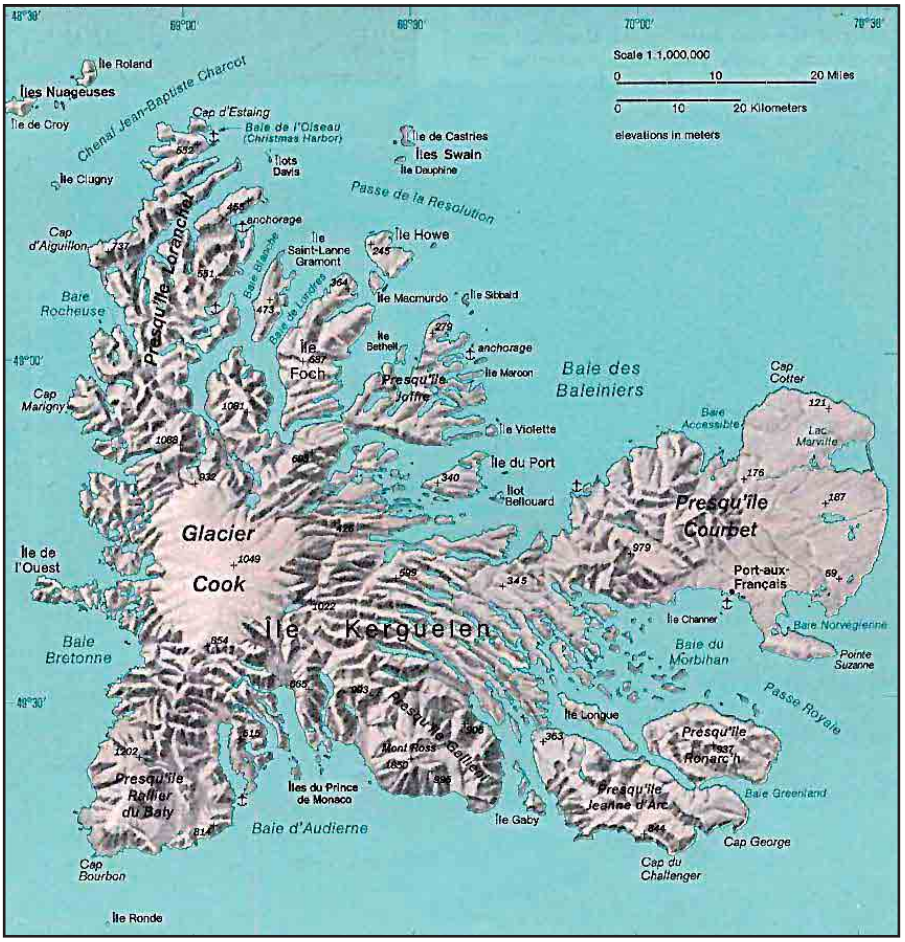


Figure 1—Kerguelen Island ranks #13 on *The DX Magazine*'s 2003 Most Wanted List and will surely go up in value on the 2004 list!

PETER I ISLAND HISTORY

On January 21, 1821 Fabian Gottlieb von Bellingshausen, an Estonian admiral sailing under the Russian flag, discovered Peter I Island, naming it after the Russian Czar Peter the Great. Bellingshausen only got within 15 miles and never made a landing on the new-found island. This was the first island to be discovered south of the Antarctic Circle. On January 17, 1927 the Norwegian whaler *ODD I* manned by Captain Andersen circumnavigated the island, but was unable to land because of rough seas. Then on February 2, 1929 the "Second Norvegia Expedition" landed on the island and claimed it in the name of Norway. The crew spent one week on the isolated island. While there, the Norwegians were preoccupied with "soundings, dredging, charting the island and establishing a depot for provisions." Norway made a parliamentary decision to make Peter I Island a Territory on March 6, 1931, and it eventually became a Dependency in 1933.

The island measures approximately 23 km (14 miles) long and 10 km (6 miles) wide and is located in the Bellingshausen Sea at 68º 49' S and 90º 44' W. The highest point on Peter I Island is Lars Christensen Peak rising 1755 meters (5791 feet), located next to the island's extinct volcano.

At the April 21-22, 1983 ARRL Board of Directors meeting, John Kanode, N4MM, presented a report of the DX Advisory Committee (DXAC) recognizing Peter I Island as a new country. In the September 1983 "How's DX?" column it was officially announced that the ARRL Awards Committee "accepted the recommendation of the DX Advisory Committee to add Peter I Island (3Y) to the DXCC list when the first creditable operation occurs from there."

Just over three years later Norwegian operators Einar Enderud, LA1EE/3Y1EE, and Kare Pedersen, LA2GV/3Y2GV, activated Peter I Island for the first time. Both team members and all of their equipment were loaded on a small helicopter and transported to the icy island. They set up camp at Eva's Odd about 125 meters (425 feet) ASL with a clear shot to all directions, except the south. The two made a

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

total of 17,000 QSOs in just 10 days of operations.

The next DXpedition to the remote island took place in the first half of February 1994. The team departed from the Falklands aboard the Russian icebreaker MV *Kapitan Khlebnikov*. The journey took 6 days. This operation managed just over 60,000 QSOs in 15 days with eight operators.

PETER I ISLAND DXPEDITION JANUARY-FEBRUARY 2005

A multinational team of DXpeditioners and one explorer, led by Antarctic DXpedition veterans Ralph Fedor, KØIR, and Bob Allphin, K4UEE, will activate Peter I Island between January 14 and February 10, 2005. Other team members include F2JD, HB9AHL, HB9BHW, K3NA, K4SV, K5AB, K9SG, LA6VM, N2WB, N4GRN, N6OX, NK7C, NP4IW, OH2BH, OH2PM, PA5M, UA3AB, VK4GL and WØRUN. "Alternates are in place for any unexpected cancellations." The Chilean registered vessel *Antarctic Dream*, and its dedicated helicopter, will be supporting the group for their entire journey.

"This DXpedition is funded principally by the contributions of its twenty-one members plus this very generous grant by the Northern California DX Foundation," said Bob Allphin, K4UEE, co-leader of the DXpedition. However, because of the extraordinary cost of chartering the *Antarctic Dream* to travel safely to and from this remote location, additional assistance is still being sought from the worldwide DX community.

The voyage to Peter I will take 6 to 7 days. The exact landing date is weather dependent. The ship will stand off shore until there is adequate flying weather for the helicopter. Then the crew will move as fast as possible to get all men and gear safely ashore before the weather window closes. The group is hoping for two full weeks of operation from Peter I.

Plans are to have nine stations with eight amplifiers ready to be on any open band 24 hours a day. So there may be more than one station on a band at a time! Suggested frequencies are as follows:

CW—1826.5, 3504, 7004, 10104/10124, 14024, 18074, 21024, 24894, 28024, 50115

SSB—3799, 7057, 14195, 18145, 21295, 24945, 28475, 50115

RTTY—14080, 21080, 28080

Details were still coming together as we went to press. For further information on the Peter I DXpedition, and how to contribute to its success, go to **www.peterone.com**.

FT#X—KERGUELEN ISLANDS

A multinational team of 12 highly experienced operators from France, Ireland, Switzerland, Canada, Australia, Singapore, South Africa and the United States will activate Kerguelen on the HF bands between March 15 and April 2, 2005. The New Zealand registered vessel *Braveheart*, used during the 2002 Microlite DXpedition to South Georgia (VP8GEO) and South Sandwich (VP8THU), will again be supporting the group for their entire 30 day journey.

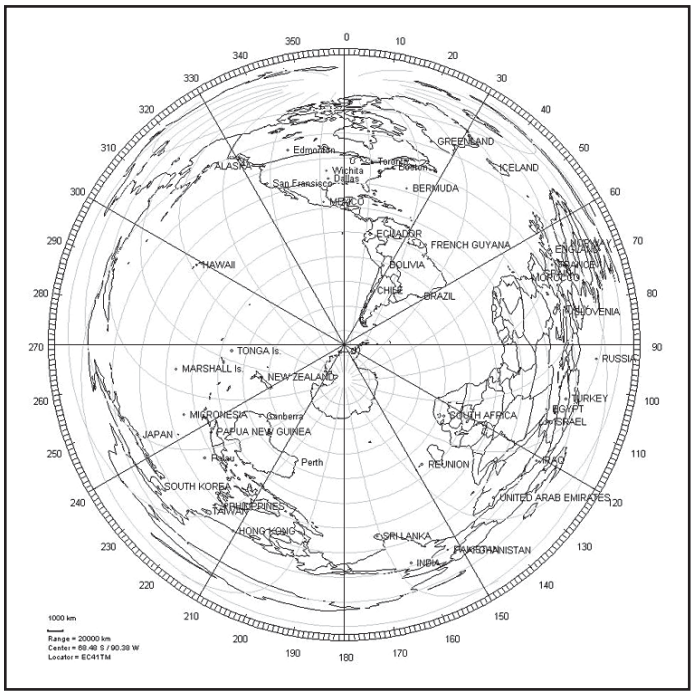


Figure 2—Peter I is in the top five on the most wanted lists.

"This DXpedition is funded entirely by the 12 team members and a generous and exclusive grant by the Northern California DX Foundation," said James Brooks, 9V1YC, DXpedition Team Leader. "There are no other club, foundation, individual, manufacturer or QSL sponsors." Additional details regarding the Kerguelen Islands DXpedition will be released through the DX bulletins.

KERGUELEN ISLAND

The Kerguelen Islands consist of one main island Kerguelen, which is also known as Desolation Island, along with about 300 other islets. King Louis XV of France commissioned Yves-Joseph de Kerguelen-Tremarec, a French navigator, to find a southern hemisphere colony for France. Kerguelen departed Mauritius (3B8) on January 16, 1772 sailing south. Discovered on February 12, 1772, the islands were annexed by the French in 1893. During the early 1900s sheep raising, whaling and colonization were all attempted, and each failed.

Shortly after World War II the Australian National Antarctic Research Expeditions (ANARE) started visiting the islands, which forced France to inhabit the islands in order to retain possession. With this in mind, Frenchman Pierre Sicaud established a garrison called Port aux Francais in December 1949. In January 1951 he installed a weather station. The islands became part of the Terres Australes et Antarctiques Françaises (TAAF) in early August 1955. These days, the islands are home to some 50-100 scientists.

Amateur Radio on Kerguelen Island

Although Kerguelen Island was on the original DXCC list from November 1945, the first operation from this entity was not until January 1950. The first station was FB8XX, operated by Henri Mobre. During the 1950s until 1972 multiple operators used this "club call sign." From 1972 until the mid '80s, the French authorities issued FB8X calls in sequential order (FB8XA, XB, XC, etc). By the mid '80s another change was made. At first the prefix was FT8Xx, which was then changed to FT#Xx. During the '80s until the late '90s there were usually one or two operators from the French Antarctic islands (Crozet, Amsterdam or Kerguelen). The last operator from Kerguelen was in 1998. This upcoming DXpedition to Kerguelen will surely be the biggest-ever operation from this semi-rare DXCC Entity.

WRAPUP

That's it for this month. A special thanks to F6AJA, KØIR, K4UEE, N4GN and NCDXF for making this month's column possible. Do you have DX news? Don't forget to let your DX editor know. Until next month, see you in the pileups!—*Bernie, W3UR* QST

Early Photos and Postcards

Some time ago I was given a wonderful box of photos of early wireless stations from around the world. I have been cataloging them so that I could share them with you in our column.

Sorting and organizing something this old is not easy. It's difficult to identify all of them. I found that some photos are from the same stations, and others appear to be singles. They are all interesting.

The ones that fascinated me the most were the photos from Japan. One very knowledgeable collector friend who specializes in postcards and wireless photos told me he has never seen pre-war, color, radio station postcards from Japan. I have also found some great old photographs that were taken inside these same stations. So I'll start with the Japan Wireless Telegraph Company and will comment on them with captions under the pictures.

Figure 1—Logo of the Japan Wireless Telegraph Company. This is also displayed on the company flags, which you can barely see in the photos.

Figure 2—Map of the International Radio Communication System of Japan.

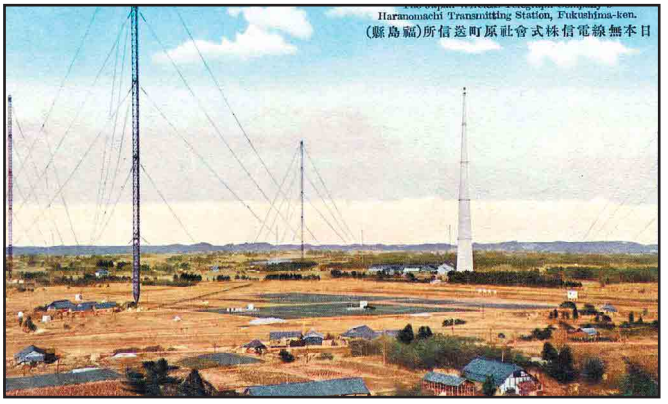


Figure 3—Haranomachi Transmitting Station, Fukushima-ken.

Figure 4—Oyama Transmitting Station, Toehigi-ken.

Figure 5—Tomioka Short Wave Transmitting Station, Fukushima-ken.

Figure 6—Yokkaichi Receiving Station, Mie-ken.

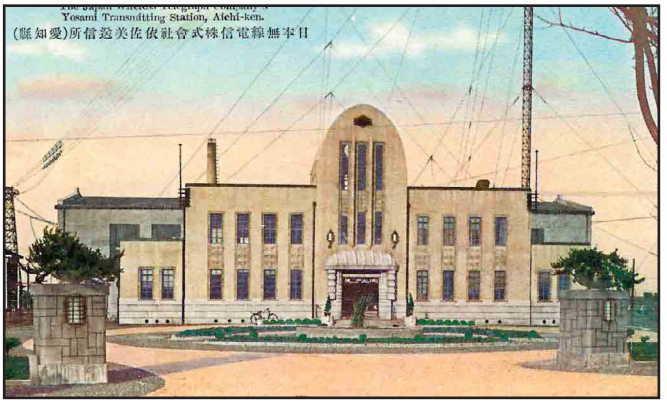


Figure 7—Yosami Transmitting Station, Aichi-ken.

John Dilks, K2TQN ♦ 125 Wharf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

Figure 8—Fukuoka Receiving Station, Saitama-ken.

Figure 9—Kaizo Receiving Station, Mie-ken.

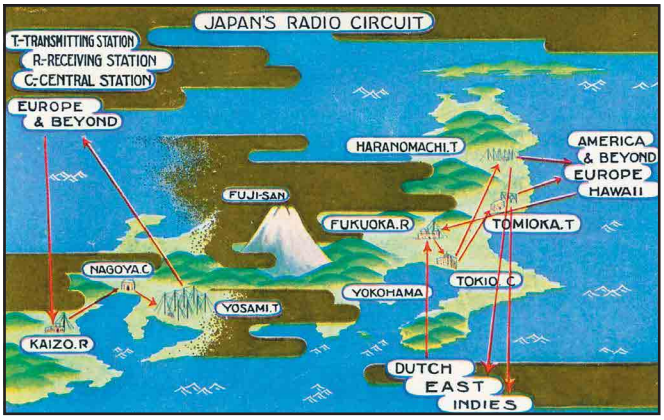


Figure 10—Japan's Radio Circuit. This map of Japan shows locations of transmitting, receiving and central stations, and the eventual far end destination of the circuit.

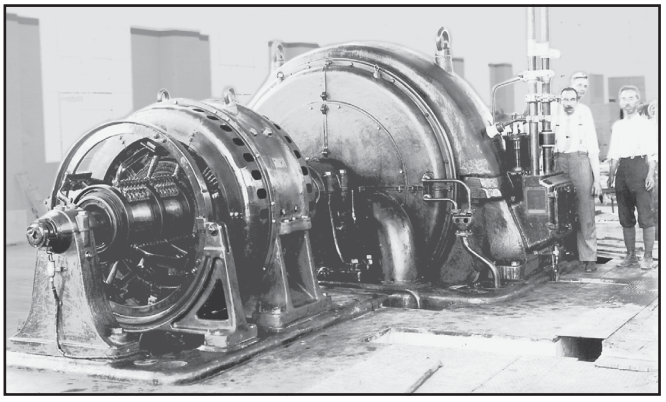


Figure 11—High Frequency Generator used for transmitting. (Photo 1929)

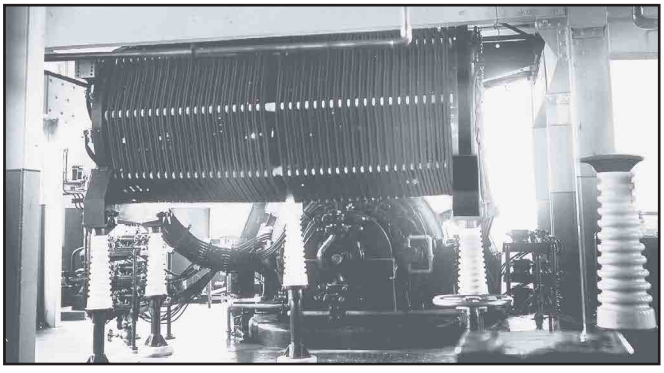


Figure 12—Huge Oscillation Coil for the High Frequency Generator. (Photo 1929)

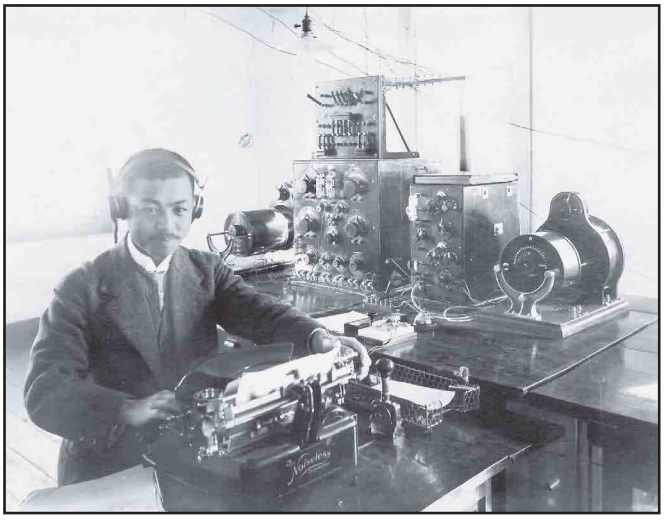


Figure 14—Sitting at his "mill," Superintendent Yonemura is ready to copy the next message at the Tomioka Receiving Station, call letters "JAA." Note the early tubes on the panels of the two receivers. The cylindrical units at either end of the receivers are called Loose Couplers. They have tapped and movable coils, and are used to help tune in stations. The antenna selector switches are on the panel above the receivers. There is a single light bulb overhead. His logbook is on top of the receiver on the right. (Photo 1921)

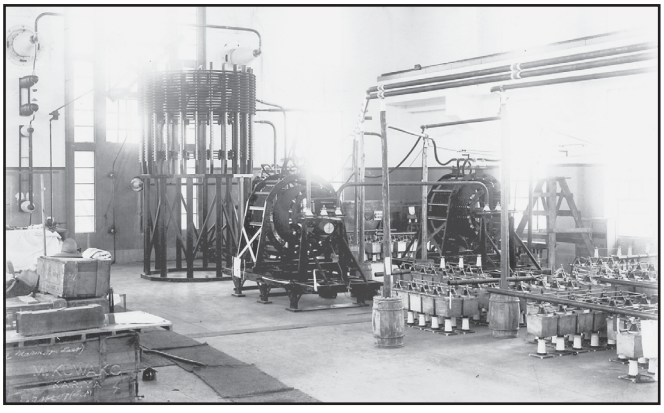


Figure 13—Antenna Coils and Loading Capacitors. (Photo 1929)

Conclusion

I tried to find some additional information on the Japan Wireless Telegraph Company and on early radio history in Japan on the Internet, without success. I think you will agree, though, that they had a very substantial wireless system. I hope you enjoyed seeing it.—*K2TQN* QST

IARU Region 2 Executive Committee, IARU Region 2 Conference and IARU Administrative Council Meet in Trinidad & Tobago

Region 2 of the International Amateur Radio Union (IARU) held its triennial conference in Port of Spain, Trinidad & Tobago, September 27-October 1, and Region 2's Executive Committee held its meeting just prior to the conference, on September 25. The Region 2 conference attendees elected its new leadership, including elevating Rod Stafford, W6ROD, to President, replacing Pedro Seidemann, YV5BPG. Reinaldo Leandro, YV5AMH, replaced Stafford as Region 2 Secretary. Daniel Lamoureux, VE2KA, replaced Tim Ellam, VE6SH (who is now IARU Vice President) as Area A Director. Returning to the Committee are incumbents Dario Jurado, HP1DJ, Vice President; Noel Donawa, 9Y4NED, Treasurer and Director; Gustavo de Faria Franco, PT2ADM, Director; Pedro Rodriguez, CO2RP, Director; Ron Szama, LU2AH, Director, and Marco Tulio Gudiel, TG9AGD, Director.

The new IARU Region 2 Executive Committee. Front row (Left to right): Reinaldo Leandro, YV5AMH (R2 Secretary-Elect); Rod Stafford, W6ROD (President-Elect); Dario Jurado, HP1DJ (R2 Vice President) and Noel Donawa, 9Y4NED (R2 Treasurer). Standing (left to right): Pedro Rodriguez, CO2RP (R2 Director); Marco Tulio Gudiel, TG9AGD (R2 Director); Gustavo de Faria Franco, PT2ADM (R2 Director); Ron Szama, LU2AH (R2 Director). Also elected to the Region 2 Executive Committee, but not pictured was Daniel Lamoureux, VE2KA, who was unable to travel to the conference. The Executive Committee members' new three-year terms of office begin November 15.

IARU Administrative Council Adopts Three-Year Plan

Following the Region 2 conference, The International Amateur Radio Union (IARU) Administrative Council met October 2-4 in Trinidad. The Council has adopted a three-year plan for the development of support for Amateur Radio frequency allocations. The plan provides for the IARU to maintain and increase contact with regional telecommunications organizations through its regional offices. The Council also adopted positions on agenda items for World Radiocommunication Conference 2007 (WRC-07). The IARU will seek a future WRC agenda item looking toward a worldwide amateur allocation at 50 MHz. Six meters is not now available in all parts of the world.

In other business, the Council adopted a resolution calling attention to the obligation of telecommunication administrations "to take all practicable and necessary steps to avoid harmful interference to radiocommunication services from power and telecommunication distribution networks, including so-called Broadband over Power Line (BPL) systems that use the HF spectrum."

The Council also received a report of a recent International Telecommunication Union (ITU) Development Sector Study Group 2 meeting that outlines progress toward revising a Recommendation concerning effective utilization of Amateur Radio in disaster mitigation and relief. Amendments to the international Radio Regulations at World Radiocommunication Conference 2003 placed additional emphasis on this role. The Council also agreed to rename the position of IARU disaster communications adviser to IARU international coordinator for emergency communications. Hans Zimmermann, HB9AQS, will continue to serve the IARU in this capacity.

Focusing primarily on WRC-07, the Council developed a list of ITU meetings during the coming year at which IARU representation will be required and reviewed plans for staffing them.

The Council also charged the IARU leadership with drafting a "white paper" to scope the environment and develop options for the IARU's long-term role and structure. Council members also discussed issues relating to the constitutions of the IARU and its regional organizations and agreed to further consider these matters when the white paper is nearing completion.

The International Secretariat—ARRL—presented the 2005-2007 budget, which includes provision for financial contributions from the three regional organizations to defray a portion of the expenses, in accordance with previously adopted policy.

In other action, the IARU Administrative Council:

- selected "Radio Amateurs Expanding the World of Wireless Communications" as the theme for World Amateur Radio Day 2005—celebrated each April 18. World Amateur Radio Day marks the anniversary of the founding of the IARU in 1925 and provides an opportunity to present a positive image of Amateur Radio to the public.
- reviewed and updated a working document describing the requirements for radio spectrum allocations to the Amateur and Amateur-Satellite services.
- received reports on successful IARU participation in ITU Telecom World 2003 (Geneva), Africa Telecom 2004 (Cairo), and Asia Telecom 2004 (Busan, Republic of Korea).
- noted initial preparations by IARU Region 2 to participate in the upcoming Americas Telecom next October in Brazil. Telecoms offer opportunities to demonstrate the benefits of Amateur Radio to telecommunications administrators and other important officials.
- received an interim report on the development of a suitable memorial for radio amateurs who lost their lives while performing humanitarian service.

Attending the Port of Spain meeting were IARU President Larry Price, W4RA; Vice President Tim Ellam, VE6SH; Secretary David Sumner, K1ZZ; regional representatives Ole Garpestad, LA2RR, Don Beattie, G3BJ, Panayot Danev, LZ1US, Pedro Seidemann, YV5BPG, Rod Stafford, W6ROD, Noel Donawa, 9Y4NED, Peter Naish, VK2BPN, and Yoshi Sekido, JJ1OEY; and recording secretary Paul Rinaldo, W4RI.

The next IARU Administrative Council meeting is set for September 17-18, 2005, in Switzerland following the IARU Region 1 Conference. QST

A Little Courtesy, Please

AMSAT

AMSAT-OSCAR 51 (aka Echo) prior to launch. It's the cube located to the right of the hexagonal Unisat.

AMSAT-OSCAR 51, better known as Echo, remains relentlessly healthy at the time of this writing. The only problem discovered so far is its overwhelming popularity.

It seems that everyone with a dual-band VHF/UHF FM transceiver is attempting to make contacts as this amazing little satellite streaks overhead. The result is pandemonium, which is to be expected with a single uplink/downlink frequency pair. Unlike Fuji-OSCAR 29, for example, which spreads its activity over 100 kHz, Echo is forced to drink from a single RF fire hose.

Too many signals compete for the attention of Echo's uplink receiver. Since we can't modify the laws of physics to accommodate all of them, we have to rely on simple courtesy. When you reach for the push-to-talk button, remember that you are one of dozens of stations attempting to use the satellite during that 10 or 15 minute pass window. Act accordingly and limit your transmissions to a couple of *brief* exchanges. (If you organize your thoughts, you can communicate a surprising amount of information in about 10 seconds!)

Sadly, I've heard a number of operators who are either unaware of the crowded uplink condition, or choose to ignore it. They have the RF muscle to seize the satellite and they hold it through much of the pass, chit-chatting about the weather, their equipment or whatever. This effectively locks out the weaker signals, denying many stations their chance to make a satellite contact.

If you want to enjoy a lengthy QSO, Echo is not the satellite to use. Switch to SSB or CW and try OSCAR 29, or perhaps OSCAR 7 when it is in sunlight. These satellites are designed to accommodate many conversations at once.

Experimenter's Days on Echo

Every Wednesday is "Experimenter's Day" aboard OSCAR 51. This is the day the command team sets aside to try different operating frequencies and modes. As this column was written, there had been tests of the 2.4 GHz downlink, the 38.4 kbps data mode and the PSK31 mode.

If you are curious and in the mood for a challenge, I recommend Experimenter's Days highly. We had W1AW on the air for one of the PSK31 tests back in September. The PSK31 uplink is on 10 meter SSB with the downlink on 70 cm FM. Several stations saw us calling CQ, but we failed to copy anyone on the downlink. You can bet we'll try again, though.

Mike Kingery, KE4AZN, maintains the Echo page on the AMSAT Web site at **www.amsat.org/amsat-new/echo/**. Visit this page and you'll get the scoop on what is being planned for upcoming Experimenter's Days.

VE3VRW

VE3VRW's satellite tracking antennas. Don ports the downlink receive audio to a group of networked repeaters in Toronto. You can listen to the action by connecting to the repeater network via Echolink.

Satellites on Echolink

If you'd like to eavesdrop on OSCAR 51, OSCAR 50 or the International Space Station, but you don't own the radio gear to do so, you can now listen to these spacecraft on the Internet using Echolink VoIP software.

This remarkable capability is all thanks to Don Agro, VE3VRW, and his "satellite gateway." Don has a set of satellite antennas on a motorized az/el mount. The antennas automatically track the birds during every pass at his location in Scarborough, Ontario, Canada. When a satellite is in view, his station automatically sends the downlink receive audio to a network of linked FM repeaters in the metropolitan Toronto area.

All you need to do is download and install the Echolink software on your computer (**www.Echolink.org**), then connect to the VA3SF-R repeater. When Don is tracking OSCAR 50, 51 or the International Space Station, you'll hear it via Echolink.

Remember that you'll be listening to the birds when they are passing over Don's location, so you need to determine when that will happen. Luckily, VA3SF has made that information available on the Web at **members.rogers.com/va3sf/gateway.htm**. Scroll down the page until you see the "Latest Keplerian elements" buttons. Click on the spacecraft of your choice and you'll see the pass times for individual dates. All times are US Eastern (UTC –5), so you'll need to recalculate for your own local time. QST

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

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

N1APM, Daniel Cooley, Lempster, NH
AG1B, Abraham Goldberg, Stamford, CT
W1JIO, Robert W. Turner, Groton, CT
*W1JP, William J. Hall, Stuart, FL
W1RSX, Stephen J. White, Portland, ME
W1SMQ, Harry J. Raye, Perry, ME
*KB2BLX, Theodore A. Wolf Jr, West Milford, NJ
N2EKM, Herbert Kappenberg, Calverton, NY
KC2FWT, Marbrey L. Rogers Jr, Prescott Valley, AZ
KG2OW, Vincent J. Gerber, Conesus, NY
K2RCG, Philip G. Stein, Pennington, NJ
N3DAU, Mary S. Kittel, Norristown, PA
KB3JGT, Bruce W. Fisher, Temple, PA
WI3J, Louis N. Seltzer, Bryn Mawr, PA
W3LEY, Oris A. Grim Sr, Aberdeen, MD
K3RGD, Lee E. Reisenweber, St Thomas, VI
K3RLW, Roger L. Waller, Princess Anne, MD
K3TJM, Howard John Johnston, Erie, PA
KF4AVE, Jerry L. Miller Sr, Winchester, TN
WA4BUP, William R. Chumley, Hixson, TN
ex-NP4CF, Wilfredo Alvarez, Pago Pago, AS
W4DAM, Clyde Johnson Jr, Sanford, NC
W4DVJ, Robert M. Page, Somerset, KY
KC4EHT, Gerry W. Wentz, Melbourne, FL
N4EIX, George A. Lavender Jr, Dora, AL
W4ERS, Earl R. Stephens, Newport, TN
W4JEL, James E. Lowry, Atlanta, GA
W4JMB, William R. Phillips, Memphis, TN
KE4JUL, Brett P. Barr, Hopkinsville, KY
K4KM, Thomas S. Pryor, Huntsville, AL
N4LC, Kenneth H. Leiner, Kissimmee, FL
K4NKA, John H. Coffing, Indiantown, FL
WD4NYF, Thomas W. Love, Burlington, NC
*K4PJ, Melvin F. Wardell, Oak Ridge, TN
KE4PYU, William K. Hundley Jr, Memphis, TN
K4RR, D. B. Appleton, Hendersonville, NC
KU4UC, James C. Shy Jr, Fort Valley, GA
WB5EXO, Katherine W. Benge, Goliad, TX
N5GOO, Francis DeMaeyer, Nieuwherken Waas, Belgium
K5HVJ, Ed R. Baxter, Pass Christian, MS
N5KQP, E M. Wilson, Southaven, MS
N5MAR, Charles H. Cockrell, Punta Gorda, FL
W5SWQ, Richard S. Rogers, San Antonio, TX
W5VJI, Ralph W. Wright, Oklahoma City, OK
N5WVL, Nancy E. Williams, Santa Fe, TX
AC5XD, Harold J. Gage, Spring, TX
KM6FX, Ken McCown, Sun City, CA
KF6HNG, Nancy A. Schram, Fresno, CA
N6LZK, Franc Tamits, San Rafael, CA
K6PM, John P. McCann, Highland, CA
WH6SJ, Lyle M. Nagahiro, Honolulu, HI
AE6W, Carl V. Miller, Stockton, CA
W7LVN, James C. Walsh, Eugene, OR
N7MZH, Barry M. Wickham, Wilsonville, OR
W7OWS, Don R. Carmichael, Spokane, WA
N7PS, Paul L. Staudenmayer, Spokane, WA
KA7TOT, Fred C. Kessler, Cottonwood, AZ
K7VAS, Lawrence J. Fitzpatrick, Yakima, WA
W8AGQ, Art S. Townsend, Saint David, AZ
WO8A, Ray R. St Peter, Ferndale, MI
KG8BK, Lionel Owen, Jenison, MI
WB8BSZ, Jack E. Olger, Grand Haven, MI
W8CCR, Laymon J. Knicely, Kingsport Tn, TN
W8HKY, Michael J. Anuta, Peshtigo, WI
NR8H, Alfred B. Slinglend, Sanford, MI
KA8JQO, Hersel L. Cottrill, Charleston, WV
WA8LGO, Amos Fleming, Coldwater, MI
KB8NNE, Delton L. McCarty, Carsonville, MI
W8PTG, Carl G. Schuman, Franklin, IN
N8QMY, Robert S. Morse, Flint, MI
W8TZQ, Kenneth H. Weller, Wilmington, OH
N8VCO, Craig R. Paul, Greenville, OH
WA8VFN, Robert H. Thomas, Columbus, OH
K9CPG, William H. Brooks, Cedar Rapids, IA
N9DMS, David J. Schaefer, Madison, WI
KC9EFR, Edward L. Stobbs, Burlington, WI
KB9GIF, Malvina A. Brewer, Jasonville, IN
KE9HE, Morris D. Leigh, De Forest, WI
WS9H, Michael W. Schaefer, Beecher, IL
K9JZI, Wesley L. Christensen Sr, Monticello, IN
KB9KTU, Sharon L. Demet, Waterford, WI
WA9NAR, William L. Cumback, Richmond, IN
ex-N9RSH, Robert A. Trainor, Milwaukee, WI
WB9UKU, Paul N. Davig, Middleton, WI
KGØBM, Alex J. House, Elizabeth, CO
ex-WØDGO, Francis Weeks, Roeland Park, KS
WAØEPX, Don Johnson, Lewiston, MN
WDØFXS, Leslie W. La Due, Minneapolis, MN
*WØGI, David L. Fayman, Lawrence, KS
WØIT, Stanley Burghardt, Watertown, SD
NØJFK, Milton L. Oldham, Gladstone, MO
KØJKP, Robert E. Barnes, Independence, MO
WØLLI, Terry D. Triggiani, Cedar Rapids, IA
ex-NØTHH, Arnold V. Riess, Cedar Rapids, IA
KBØVDT, Martha E. De Weese, Saint Joseph, MO
NØVGT, Robert S. Wera, Winona, MN
WBØYHP, Blaine G. Lowthorp, Northfield, MN
G4IDE, Roger Barker, Lincolnshire, Great Britain

The October 2004 Silent Key Column erroneously listed the city of residence for Morris Guzick, W5IO, as Round Rock, Texas. The city should have been listed as Sherman, Texas. We regret the error.

*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

Kathy Capodicasa, N1GZO ♦ Silent Key Administrator ♦ n1gzo@arrl.org

QEX INCLUDING: COMMUNICATIONS QUARTERLY

In the November/December 2004 issue:

- John Champa, K8OCL, and John Stephensen, KD6OZH, describe their work with high-speed multimedia (HSMM) networking on the microwave bands using 802.11 and other equipment. Much of the work is associated with successes achieved by the ARRL HSMM Working Group. KD6OZH also contributes a separate piece on software-defined radio.
- Karl-Otto Müller, DG1MFT, discusses coaxial traps for antennas. For synthesizer fans, Kjell Karlsen, LA2NI, writes about measuring phase noise in oscillators.
- Robert LaFrance, N9NEO, describes a unique way of modulating a class-E transmitter in AM mode. Phil Eide, KF6ZZ, opens the mysteries of loop control and magnetics in switching power supplies as he tells us how to resurrect an ATX computer power supply as a main station (13.8 V, 20 A) supply.

QEX is edited by Doug Smith, KF6DX (**dsmith@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; elsewhere by surface mail (4-8 week delivery) it's $31. In Canada by airmail it's $40. Elsewhere by airmail it's $59. Nonmembers add $12 to these rates.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an Author's Guide at: **www.arrl.org/writing.html**. If you prefer postal mail, send a business-size self-addressed, stamped envelope to Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494, and request an Author's Guide.

STRAYS

QST congratulates...

◊ Lisa Scott, of the Emergency Preparedness Division, Belleview, Washington, who received a certificate of merit from the Eastside Amateur Radio Support Group and the ARRL for her 10 years of service to the Division. With her help, the Division has installed antennas and power supplies in each of the city's nine fire stations, the emergency operations center and its 911 center. It has also purchased radios for the group and completed drills with the Fire, Police, Parks and Utilities Departments.—*Mike Matteson, N7SIC*

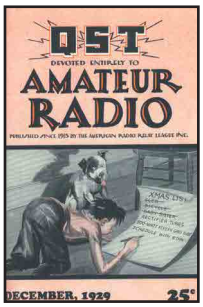
◊ the Starved Rock Radio Club, which recently celebrated the 70th anniversary of its founding and its 70 years of ARRL Affiliation by becoming an ARRL Special Service Club.—*Pat Ryan, KC6VVT*

FINDING A REPEATER IN TA-LAND

◊ For updated information about Echolink repeaters in Turkey, see **echolink.sitemynet.com/**. For updated information about other Ta-land repeaters, see **turkiyehamrpt.sitemynet.com/**. —*TA2CDL and DO1NGT*

75, 50 AND 25 YEARS AGO

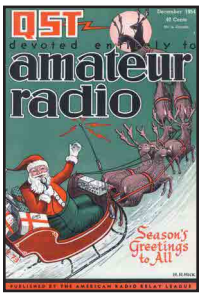
December 1929



♦ The cover cartoon shows a young ham adding a 500-watt screen grid tube and a schedule with League HQ station W1MK to his "Xmas List." League President Maxim writes the editorial this month, considering the current state of the radio art and saying, "I have an abiding faith that there is a whole world of undeveloped stuff lying just around the corner now, just as there was in 1914."

Harry Tummonds, W8BAH, in "Amateur Radio and the National Air Races," tells how the Cleveland Wireless Association provided communication for the 1929 races. In "Arctic Auroral Radio Interference," Paul Oscanyan relates his experiences with short-wave signals at NX1XL, in Greenland's Mt. Evans Observatory. "The Amateur and the C.C.I.R.," by K. B. Warner, reports that the Hague Conference has agreed that each nation may make its own amateur regulations. George Grammer tells about "The Single Control Transmitter," a Hartley oscillator using a single UX-210 tube. H. C. Clark, W1AOF, and Clark Rodimon describe "The Receiver at W1AOF." Ed Handy, W1BDI, announces "Coming—Operating Activities" for January and February that include another message-handling contest and the second International-DX Contest. This month's entry (the final one) in the Station Description Contest, tells about "W2FL."

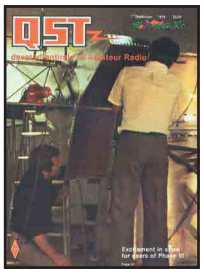
December 1954



♦ The cover drawing by H. R. Hick shows Santa himself with an h.f. mobile setup in his sleigh. The editorial announces that the ARRL Board of Directors has endorsed the FCC proposal to open the 50-Mc. band to Technician class licensees, but opposes opening the 144-Mc. band to Technicians.

Lew McCoy, W1ICP, presents a two-band rig *and* a two-band antenna, in "40 Watts on the 7- and 21-Mc. Bands." George Grammer, W11DF, tells how to get "120 Watts of Audio without Driving Power." Jack Gallagher, W5HZB, discusses "A Thyratron-Controlled Electronic Keyer." Mason Southworth, W1VLH, tells about his "Technician Rig for 220 and 420 Mc." R. R. Campbell, W4DFR, discusses "Using the B.F.O. as an Interpolation Oscillator" between 10-Kc. marker points. W. W. Deane, W6RET, describes "Simple Crystal-Controlled Converters," an extrapolation of his original converter (*QST*, Nov. 1952) for other bands. T. H. Puckett, W5JXM/1, provides "Notes on Grounded-Grid R.F. Amplifiers." "Field Day—1954" reports that the number of participating stations "soars to 8380." The annual DXCC listings show W1FH on top, with 252 countries overall and 224 on phone. Heath Company's ad this month announces the new Heathkit VF-1 VFO, priced at $19.50; the popular AT-1 transmitter kit is $29.50 and the AR-2 communications receiver kit is $25.50.

December 1979



♦ The cover shows the AMSAT-OSCAR Phase III satellite being tested. The editorial reports that the FCC has started developing rules to allow hams to use ASCII-coded transmissions.

Doug DeMaw, W1FB, and Bob Shriner, WAØUZO, review "Transmitter Fundamentals," and tell how to build a simple solid-state transmitter. Willie Baber, WB6UAG/4, describes a "Simple, Band-Switching Receiver Design." Al Brogdon, K3KMO, tells about signing "This Is K3KMO, Mobile on the Steamboat *Mississippi Queen*," during the two weeks his Dixieland band, Southern Comfort, played on- board. Doug DeMaw, W1FB, explains how to "Build a VMOS Audio Amplifier." James Bryant, G4CLF, reports on "A Single Channel VHF Monitor Receiver." R. E. Barber, G4NEF/ZC4RE, describes "An Inexpensive High-Z Accurate Transistor Voltmeter." "Compatible RTTY," by Everett Gayhart, WB2IXW, tells how to add simultaneous RTTY to your 2-meter repeater. Hal Gullstad, W7AAK, tells how to add "The Phantom Stub" to a quad loop to yield a multiband antenna. Steve Place, WB1EYI, presents Part 1 of "AMSAT-OSCAR Phase III on the Horizon." Bill Clede, K1AH, in "Without Warning," tells about a rare tornado devastating a small area in Connecticut, and how hams helped. QST

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	TELEPRINTER BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	TELEPRINTER BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ **Morse code transmissions:**
Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 2001 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by K6YR. See "Contest Corral" in this issue. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The fee structure is $10 for a certificate, and $7.50 for endorsements.

♦ **Teleprinter transmissions:**
Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz. Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.
On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:**
Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Miscellanea:**
On Fridays, UTC, a DX bulletin replaces the regular bulletins.
W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, Presidents' Day (Feb 16), Good Friday (Apr 9), Memorial Day (May 31), Independence Day (Jul 5), Labor Day (Sep 6), Thanksgiving and the following Friday (Nov 25-26), and Christmas Day (Dec 24). QST

CONTEST CORRAL

W1AW Qualifying Runs are 10 PM EST Friday, December 3 (0300Z December 4), and 9 AM Tuesday, December 21 (1400Z December 21) (10-40 WPM QRL). The K6YR West Coast Qualifying Run will be at 9 PM PST Wednesday, December 15 (0500Z December 16) (10-40 WPM). Check the W1AW Schedule elsewhere in this issue for details.

Abbreviations

SO—Single-Op, M2—Multiop, 2 Transmitters, MO—Multiop, MS—Multiop, Single Transmitter, MM—Multiop, Multiple Transmitters, AB—All Band, SB—Single Band, S/P/C—State/Province/DXCC Entity, HP—High Power, LP—Low Power, Entity—DXCC Entity, HP—High Power >150 W, LP—Low Power >5 W and <150 W, QRP is <5 W.

No contest activity on 30, 17 and 12 meters. Refer to the contest Web sites for information about awards. Unless stated otherwise, regional contests only count QSOs with stations in the region. Publication deadline for Contest Corral listings is the first of the second month prior to publication.

Dec 2-6

ARRL 160 Meter Contest—2200Z Dec 3-1600Z Dec 5. See Nov *QST*, p 105 or **www.arrl.org/contests/forms/**.

Top Band Sprint—CW/SSB, sponsored by QRP ARCI, 0000Z-0600Z Dec 2. Frequencies: 160-meters only. SO-CW, SO-SSB, SO Mixed-Mode categories. Exchange: RST, S/P/C and power or QRP ARCI number—work stations once per mode. QSO points: members—5 pts, non-members/different continent—4 pts, non-members/same cont—2 pts. Score: QSO points × total S/P/C × power multiplier (see Web site). Portable using battery and temp antenna add 5000 pts. For more information: **2hams.net/ARCI/index.htm**. Submit entry form via contest Web site. Logs due 30 days after contest to **wb5khc@2hams.net** or QRP ARCI Contest Manager, Tom Owens, WB5KHC, 1916 Addington St, Irving, TX 75062-3505.

ARRL International EME Contest—0000Z Dec 4-2400Z Dec 5, 50 – 1296 MHz. See Sep *QST*, p 98 or **www.arrl.org/contests/forms/**.

TARA RTTY Mêlée—sponsored by the Troy Amateur Radio Assn, 0000Z-2400Z Dec 4. Categories: SOAB-HP (>150 W), SOAB-LP (<150 W), MOAB, SWL, 10 min band change rule for MO. Frequencies: 80-10 meters, operate 16 hours max. Exchange: RS + State/Province or serial number for DX. QSO points: 1 pt/QSO. Score: QSO points ×S/P/C counted once only (US and VE only count as S/P). For more information: **www.n2ty.org/seasons/tara_melee_rules.html**. Summary sheets (no logs) due Dec 31 via online submission form at **www.n2ty.org/seasons/tara_melee_score.html**.

TOPS Activity Contest—CW—sponsored by TOPS, from 1800Z Dec 4-1800Z Dec 5. Frequencies: 80 m. Categories: SO, SO-QRP, MO. Exchange: RST, serial number (+ TOPS number, if member). QSO points: own entity—1 pt, own continent—2 pts, different cont—6 pts, with /MM—6 pts, with TOPS member—2 pts, between TOPS members, 6 points, with GB6AQ—10 points. Score: QSO points × WPX prefixes worked. Logs due Jan 31 to **helmut.klein@chello.at** or Helmut Klein, OE1TKW, Nauseagasse 24/26, A-1160 Wien, Austria.

Holiday Spirits Homebrew CW Sprint—sponsored by the QRP ARCI, 2000Z-2400Z Dec 5. Frequencies (MHz)—1.810, 3.560, 7.040, 14.060, 21.060, 28.060 kHz. Categories: SOAB, SOSB, SO20-10, SO160-40, MOAB, DX stations are SOAB only. Exchange: RST, S/P/C, and Power or QRP ARCI number. QSO points: members—5 pts, non-members/different continent—4 pts, non-members/same cont—2 pts. Score: QSO points × S/P/C (counted once per band) × Power multiplier (<250 mW ×15, 250 mW-1 W×10, 1-5 W ×7, >5 W ×1) + Bonus points (2000 for homebrew [HB] xmtr, 3000 HB rcvr, 5000 HB xcvr). For more information: **2hams.net/ARCI/index.htm**. Submit entry form via contest Web site. Logs due 30 days after contest to **wb5khc@2hams.net** or QRP ARCI Contest Manager, Tom Owens, WB5KHC, 1916 Addington St, Irving, TX 75062-3505.

Dec 11-15

ARRL 10 Meter Contest—0000Z Dec 11-2400Z Dec 12. See Nov *QST*, p 104 or **www.arrl.org/contests/forms/**.

28 MHz SWL Contest—sponsored by Lambert Wijshake NL-10175, coincident with ARRL 10-Meter contest. SO-SSB and SO-CW categories, no packet. Log the ARRL 10-Meter multipliers and signal report at the SWL QTH, with a minimum RS/RST of 33/339 and a maximum of only three stations from each DXCC entity. QSO points: The first station from a DXCC entity counts 5 points, the second 3 points, and the third 1 point. Score: QSO points × States and Provinces × DXCC entities. Logs due Jan 31 to **nl10175@amsat.org** or Lambert Wijshake NL-10175, Kattedoorn 6, 8265-MJ Kampen, Netherlands. To receive the results, include 2 IRCs or $1.

Great Colorado Snowshoe Run—CW, sponsored by the Colorado QRP Club from 0200Z-0359Z Dec 11. Frequencies: 40 meters only. Categories: SO-QRP (Antenna classes of Wires, Verticals or Beam) Exchange: RST + S/P/C + Antenna Class + CQC no. or Power. The same station may be worked up to three times, with 30 minutes between QSOs. QSO points: 1st QSO with station—3 pts, 2nd QSO—2 pts, 3rd QSO—1 pt. Score: QSO points × S/P/C × CQC members. For more information: **www.cqc.org/contests/snow2004.htm**. Logs due Jan 17 to **contest@cqc.org** (ASCII only) or Colorado QRP Club, PO Box 17174, Golden, CO 80402.

North American Meteor Scatter Contest—any mode, sponsored by the WSJTGROUP from 0000Z Dec 11-0700Z Dec 15 (the Geminids meteor shower). Frequencies (MHz): 50, 144, 222, 432, via meteor scatter. Categories: SOSB, SOAB, (HP, LP < 200 W), Assisted or Unassisted. No QSOs with your own or adjacent grid squares, QSOs are counted as Scheduled or Random. Exchange: full call signs, grid square and QSOs must be acknowledged. QSO points, Assisted / Unassisted: 50—1 / 3 pt, 144—1 / 3 pts, 222—3 / 9 pts, 432—10 / 30 pts. Score: QSO points × grid squares counted once per band + random QSOs. For more information: **www.ykc.com/wa5ufh/Rally/NAHSMS.htm**. Logs due Jan 12 to **wa5ufh@ykc.com** or Randy Tipton, 778CR123, Edna, TX 77957.

Dec 18-19

OK DX RTTY Contest—sponsored by the Czech Radio Club, 0000Z-2400Z Dec 18. Categories: SOAB (LP, HP >100W), SOSB, MOAB, SWL. Frequencies: 80-10 meters according to IARU band plan. Exchange: RST and CQ Zone. QSO points: 80 and 40—3 pts on same continent, 6 pts different cont, 20-10—1 pt same cont, 2 pts different cont. Score: QSO points × DXCC entities + OK stations (multipliers counted once per band). For information: **www.crk.cz/ENG/DXCONTE.HTM**. Logs due Jan 15 to **okrtty@crk.cz** or Czech Radio Club, OK DX RTTY Contest, PO Box 69, 113 27 Praha 1, Czech Republic.

Stew Perry Top Band Distance Challenge—CW, sponsored by the Boring Amateur Radio Club, 1500Z Dec 18-1500Z Dec 19. Categories: SO and MS. Operate 14 hours max. Exchange: grid square only. QSO points: 1 pt + 1 pt for every 500 km distance calculated between grid centers (see Web page for calculation information), QSOs with QRP stations that submit a log count double QSO points. Score: QSO points × Power mult (<5 W ×4, 5-100 W ×2, >100 W ×1). For more information: **jzap.com/k7rat/stew.rules.txt**. Logs due Jan 31 (Cabrillo format only) to **tbdc@contesting.com** or Boring Amateur Radio Club, 15125 SE Bartell Rd, Boring, OR 97009.

PSK31 Death Match—PSK31 and PSK63, sponsored by the Michigan DX Association, 0000Z Dec 18-2400Z Dec 19. Frequencies: 80-6 meters, PSK31 and PSK63 count as separate "bands". Categories: SO, Class 1 (<100 W), Class 2 (<25 W), Class 3 (<10 W). Exchange: Name + S/P/C. QSO points: 20 meters—1 pt/QSO, 6 meters—3 pts/QSO, other bands—2 pts/QSO. Bonus points: W8DXI 500 pts (once) and 100 pts for uploading logs to LoTW within 30 days of contest. Score: QSO points × total S/P/C + bonus points. For more information: **www.mdxa1.org/deathmatch.html**. Logs due 30 days after the contest to **k8khz@yahoo.com** or Brian R. Pawloski, W8BRI, PO Box 140012, Grand Rapids, MI 49514-0012.

Russian 160-Meter Contest—CW/SSB—sponsored by *Radio* Magazine, from 0000Z-0200Z Dec 18. Categories: SO, MO, SO and MO 18 years and younger, Mixed Mode only. Exchange: RST, serial number, and square ID (see **www.radio.ru/cq/contest/rule/map-2.gif** for a map showing the squares) QSO points: own square—1 pt, adjacent sq—2 pts, 1 additional pt each additional square distant. Score: total QSO points. For more information: **www.radio.ru/cq/contest/rule** (Cyrillic only). Logs to **contest@radio.ru**, or *Radio* Magazine, Seliverstov per. 10, Moscow 107045, Russia.

Croatian CW Contest—sponsored by Hrvatski Radioameterski Savez (HRS), from 1400Z Dec 18-1400Z Dec 19. Frequencies: 160-10 meters. Categories: SOAB (HP >100 W, LP, QRP <5 W), SOSB (HP, LP), MO, SWL. Exchange: RST + serial number. QSO points: 9A stations—10 pts on 160-40, 6 pts 20-10; different cont—6 pts 160-40, 3 pts 20-10; own cont and country—2 pts 160-40, 1 pt 20-10. Score: QSO points × WAE countries on all bands. For more information: **www.qsl.net/ctc/**. Logs due 30 days after the contest to **zmaticic@inet.hr** or Hrvatski Radioameterski Savez (HRS), Croatian CW Contest, PO Box 149, 10003 Zagreb, Croatia.

Dec 18-Jan 2

Lighthouse Christmas Lights QSO Party—all modes, sponsored by the Amateur Radio Lighthouse Society, 0000Z Dec 18-2400Z Jan 2, 2005. Frequencies (MHz): CW—1.830, 3.530, 7.030, 14.030, 21.030, 28.030, SSB—1.970, 3.970, 7.270, 14.270, 21.370, 28.370, plus VHF and repeaters. Exchange: sequential serial number or ARLHS member number or ARLHS Lighthouse number + name + S/P/C. QSO points: 1 pt/QSO, plus 2 pts for ARLHS member, plus 3 pts for lighthouse. Score is QSO points. Stations activating light beacons multiply by 2. Special logging requirements apply. For more information: **arlhs.com** or send SASE to ARLHS, Box 2178, Riverton, NJ 08077. Logs due Jan 31 to Dave Ruch, NFØJ, PO Box 20696, Bloomington, MN 55420-0696.

Dec 25-26

DARC Christmas Contest—CW/SSB, sponsored by the Deutscher Amateur Radio Club, 0830Z-1100Z Dec 26. Frequencies (MHz): CW—3.510-3.560, 7.010-7.040, SSB—3.610-3.650 and 3.700-3.775, 7.040. Categories: SO-Mixed, SO-CW. Exchange: RS(T) + DOK or Special Station code. QSO points: 1 pt/QSO. The station calling CQ must QSY after making a QSO. Score: QSO points × DOK codes + WPX prefixes. For more information: **www.darc.de/referate/dx/fedcx.htm**. Logs due 3 weeks after the contest to **xmas@darc.de** or Markus van Bergerem, Brandenberg 5, D-47533 Kleve, Germany.

RAC Winter Contest—CW/Phone, sponsored by the Radio Amateurs of Canada, 0000Z-2359Z Dec 18. Frequencies (MHz): CW—25 kHz up from the band edge (check on the half hour), Phone—1.850, 3.775, 7.075, 7.225, 14.175, 21.250, 28.500, 50 and 144 MHz. Categories: SOAB-LP, SOAB-HP, SOAB-QRP, SOSB, SO-NonVE, MS-LP, MO-HP, and MM. VE stations exchange RST + Province, VEØ and non-VE stations exchange RST + serial number. QSO points: Outside Canada—2 pts, VE/VEØ stations—10 pts, RAC stations—20 pts. Score: QSO points × VE provinces + territories (counted once per band and mode). For information: **www.rac.ca/downloads/canwin2004.pdf**. Logs due Jan 31 to **ve5sf@rac.ca** or Radio Amateurs of Canada, 720 Belfast Rd, Ste 217, Ottawa, ON K1G 0Z5, Canada.

Dec 31

ARRL Straight Key Night—see page 105 of this issue or **www.arrl.org/contests/forms/**.

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

SPECIAL EVENTS

Plymouth, MA: Whitman Amateur Radio Club, WA1NPO. 1400Z **Nov 27**-2000Z **Nov 28**. The first Pilgrim landing in Plymouth, MA. 28.360 14.280 7.250 3.890. Certificate. Bruce Hayden, NI1X, 1000 Locust St, Raynham, MA 02767.

Quincy, IL: Western Illinois Amateur Radio Club, K9C. 0000Z **Dec 3**-2400Z **Dec 14**. Quincy, Illinois, Christmas Avenue of Lights. 28.325 21.325 14.250 7.250 SSB CW RTTY PSK. Certificate. Robert G. Mitchell, 816 Long Dr, Quincy, IL 62305.

Duluth, MN: Arrowhead Radio Amateur Club, WØGKP. 1500Z-2300Z **Dec 4**. 75th Anniversary of club affiliation with ARRL. 21.375 14.280 7.275 3.875. Certificate. Robert Schulz, 115 Eden Ln, Duluth, MN 55805-1533. **www.qsl.net/w0gkp/**.

Pittsburgh, PA: Carnegie Science Center, NY3EC. 1500Z-2000Z **Dec 4**. 50th Anniversary Miniature Railroad and Display. 147.03 14.250 7.265. Certificate. Art Mueller, WA3BKD, 1532 Millers Run Rd, McDonald, PA 15057. **www.miniaturerailroad.org**.

Various, United States: National Weather Service and ARRL. 0000Z-2400Z **Dec 4**. Sixth annual SKYWARN Recognition Day (SRD). See page 72 in this issue or go to **hamradio.noaa.gov** for complete information.

Grand Junction, CO: Western Colorado Amateur Radio Club, NØW. 0000Z **Dec 4**-0000Z **Dec 5**. 2004 SKYWARN Recognition Day at Walker Field Airport. 28.460 21.260 14.260 7.260. QSL. Bob Vogel, WØRY, 155 Ponderosa Dr, Fruita, CO 81521. **www.wcarc.ws/status.htm**.

Homestead, FL: Everglades Amateur Radio Club, W4SVI. 1600Z **Dec 4**-1600Z **Dec 5**. Commemorating the dedication of Everglades National Park by President Harry S. Truman, December 6, 1947. SSB 40 20 15 10 m. Certificate. Everglades Amateur Radio Club, PO Box 900113, Homestead, FL 33090-0113.

Linthicum, MD: Historical Electronics Museum ARC, W2W. 1400Z **Dec 4**-2200Z **Dec 7**. Commemorating the 1941 attack on Pearl Harbor. 14.241 14.041 7.241 7.041. Certificate. HEMARC-W2W, PO Box 742, MS 4015, Baltimore, MD 21203. A QSL card may be requested. **www.qsl.net/w3hem**.

Baton Rouge, LA: USS *Kidd* ARC/Baton Rouge ARC, W5KID. 1500Z-2300Z **Dec 7**. Pearl Harbor Day. General class bands, 14.250 to 14.320; CW QRP subbands. QSL. W5KID, c/o USS *Kidd* Museum, 305 S River Rd, Baton Rouge, LA 70802.

Nazareth-Bethlehem, PA: Christmas ARC and Delaware-Lehigh ARC, WX3MAS. 1400Z **Dec 11**-0200Z **Dec 13**. 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**.

Delmar, NY: Marconi Net, W2M. 0200Z-0400Z **Dec 13**. Commemorating the first anniversary of the Marconi Net. 3.872. Certificate. Fred Thumhart, Jr, 5 Old Oxe Rd, Delmar, NY 12054.

Santa Ana, CA: Anaheim Police Radio Club, K6B. 0000Z **Dec 16**-2359Z **Dec 30**. 60th anniversary of the Battle of the Bulge WW2. 21.350 18.150 14.250 7.250. QSL. Mark McMullin, KM6HB, PO Box 27271, Santa Ana, CA 92799. **km6hb@arrl.net**.

Belen (Bethlehem), NM: Valencia County Amateur Radio Association, KC5OUR. 1400Z **Dec 18**-2359Z **Dec 26**. Celebrating the Christmas season from Bethlehem, New Mexico. 28.272 21.272 14.272 7.272. QSL. VCARA, PO Box 268, Peralta, NM 87042.

Lake Charles, LA: , N1CC. 0000Z **Dec 24**-2359Z **Dec 25**. Christmas Carol. 28.475 21.375 14.275 7.245. QSL. Via **qrz.com** listing or **users.aol.com/N1CC**.

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.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form. Copies of this form are available via Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). You can also submit your special event information on-line at **www.arrl.org/contests/spevform.html**. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Feb** *QST* would have to be received by **Dec 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

LIFE MEMBERS ELECTED OCTOBER 16, 2004

◊ Roy H. Adam, N6FUN; Wallace E. Adams, WB7NDJ; Jay C. Adrick, K8CJY; Raymond L. Alvaro, KF6IFU; Josephine M. Alvaro, KF6IFV; Michael L. Anderson, WV7T; Scott Armstrong, AA5AM; Thomas R. Arvo, WA8DXD; Christopher J. Barr, KF6YSV; David G. Bartholomew, AD7DB; John R. Bechtoldt, WB9FHL; Donald R. Begolka, N9EZJ; Ralph R. Behnke, N5XA; Ernest W. Beland, KA2JCN; Joe Bennett, KA3NAM; Christopher K. Blackmon, N4VGK; Michael Blaha, Jr; William R. Bleyle, K2SYR; Jason A. Bonnough, AD5IY; Larry A. Brechner, WB9FQS; Greg W. Carlson, N7JOD; Bry Carter, N1BRY; David K. Chan, WZ6X; Richard W. Chapman, K5RIK; Robbin E. Chapman, K5RBN; Myron C. China, KBØLMQ; Steven A. Christensen, KE9AT; Jim Clark, N5RO; Jim Cochran, KE5PG; Nelson E. Coles, N2QHE; Michael C. Conlon, KB3CPV; Douglas D. Cooper, N7CNH; Dennis B. Cope, KD4NVM; Joseph L. Corones, N6SZO; Robert C. Couric, KB4RLS; Joe C. Daniel, N5VY; Mark R. Danner, AB7MP; Geert Jan De Groot, PE1HZG; Robert F. Di Lucchio, N2QDQ; Jill T. Dybka, WA4CZD; Bette Eames, KD6NDW; John W. Emmett, NØMHZ; Martin C. Ernst, Jr, KD4HLV; Roger L. Ewing, KA7BGE; Robert Fanfant, N7QT; Jeff A. Farrar, W3JAF; Charles D. Ferguson, KU4OY; Robert E. Feuer, WØZPE; W. A. Fleming, N1HKO; Richard A. Fletcher, Sr, KG6IAL; Maury Gimbel, KG6GZU; Cameron D. Glidewell, W6BFT; Christopher L. Goosman, K8MZO; Mikio Goto, AA2Z; Nathaniel M. Greenman, KB2HPX; Douglas R. Hanna, N4YKQ; Joseph G. Hartwell, KCØRHX; John A. Hawkinson, KB1CGZ; David M. Hedley, KG6MSF; Roger G. Hill, W7ZHE; Russell A. Holt, AB1DY; Steve Hopkins, K5RS; John E. Howard, KD1YW; John S. Howell, AF3K; Edward P. Hutchinson, WE7H; Richard H. Jackson, KSØJ; W John. Jacob, KC5GLG; Terral Jamison, NE1CQ; Thomas G. Jenkins, KC8LOC; Raymond K. Johnson, W7RKJ; Michael D. Johnson, KW7V; Gerald J. Jurrens, N2GJ; Eamonn Kavanagh, EI3FFB; Jon K. Kenneke, KA7PGB; Michael Klein, WA4NFG; Richard L. Konold, KGØZM; Richard L. Kraemer, W7RLK; Pete Ladjimi, Jr, KA6LWX; David E. Lamb, W6DEL; Simone L. Lambert, KA1YVF; Donald N. Landes, WX4C; Dale R. Lash, KB9ZRO; Thomas C. Lewis, KE4RFT; Ruth Lind, KC2GXQ; Laura M. Lubner, KJ7UN; Richard C. Lucas, AIØRL; Scott F. Ludwig, WO8N; Anthony A. Luscre, K8ZT; John E. Mackey, Jr, KSØF; Kenneth Mak, K2MAK; James T. McDonald, Jr, KC7EFP; Craig A. McManus, KØJJM; Alphonse J. Milano, AA3OK; Joseph V. Miller, Jr, K9OWU; Paul C. Morganthall, N1ZPR; Cooper L. Morris, WA4PZD; Donald G. Munsey, KA4UHL; Wanda L. Munsey, KA4UAU; Dr Dale R. Myers, N7WFA; William J. Newman, KØNSA; Linda S. Newman, WØNSA; Raymond J. Novak, N9JA; Elizabeth A. Nowik, KC2ITY; Garvin G. O'Hare, ACØAU; Jeffrey D. Ollis, K3UV; Steven A. Ostrove, K2SO; James A. Pierson, Jr, N1SZ; Jose Planes, EA3UX; Christopher D. Pope, KG4CFX; Lucia F. Porter, K4TFL; James L. Price, KD4GCF; Ralph P. Quallich, Jr, KF4HR; James E. Rhodes, W5TQC; Jimmy L. Richardson, KC6WTV; Esteban J. Romagni, W4DTA; Richard L. Rudeen, NØGVT; Timothy D. Rulon, WA2KQD; Debra S. Schall, KB9ISE; Dale W. Schelske, KB8SPD; Robert L. Scherlacher, KB2EYX; George Schultheis, N2FVV; Penelope Scott, KI4FPY; Robert R. Scott, W4ZY; Ronald W. Seidl, KAØORM; Edward L. Shaw, Jr, KC4OLU; Kenneth S. Silverman, K2KW; Gary R. Skinner, KF4BE; Demetrios N. Skordas, KC2CYH; Thomas W. Sommers, WA8ZNC; Daniel L. Staffen, Jr, KCØHBP; Stephen D. Stearns, K6OIK; Dennis E. Steinert, KC6UZH; John W. Taylor, Jr, W9NZR; Jeramy T. Thibodeaux, KG4AZT; Renny Thomas II, KC6LQV; Joe T. Travis, K5AD; Timothy A. Tribbett, N2TAT; Paula M. Uscian, K9IR; Catherine Vade Bon Coeur, W6VBC; Mark Vrkljan, VE6VRK; William E. Wald, KR6DE; Donald L. Want, WB7TTR; Elizabeth K. Want, WB7TTS; Donald J. Want, N7XZC; Robert J. Warren, W2ZXQ; James R. Wasson, N7ELL; George K. Watson, KØIW; Richard E. Weingarten, NØSH; Ted Wells, KB9JUP; Roy C. Willis, KC7MTH; John L. Wiman, N7GOC; Theodore N. Wright, KC2BLE; Hans-diete Zuchhold, DJ4UI.

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **December 1** to be listed in the **February** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

†Florida (Ft Myers)—Jan 8; set up Friday 6-8 PM, Saturday 6-8 AM; public 9 AM to 3 PM. *Spr:* Fort Myers ARC. Araba Shrine Auditorium, 2010 Hanson St; I-75 to Exit 136, go W on Colonial Blvd (SR 882) to US 41, go N (right) on US 41 to Hanson St, turn E (right) onto Hanson St, go 1/2 block to Auditorium. Hamfest/Computer Show, vendors, tailgating ($10 for first space, includes 1 admission; $5 for each additional space), free parking, handicapped parking, refreshments. *TI:* 146.88. *Adm:* $5, under 17 free with paying adult (all children must be supervised). Tables: $15 (plus admission). Earl Spencer, K4FQU, 1735 Hanson St, Ft Myers, FL 33901; 239-332-1503; fax 239-334-9362; **k4fqu@juno.com**; **www.fmarc.net**.

†Florida (Ocala)—Dec 11, 8 AM to 1 PM. *Spr:* Silver Springs RC. Marion County Government Complex (Green Clover Hall), SE 25th Ave, just E of the 300 block of SE 29th Ct; turn S on SE 25th Ave off State Rd 40 (Silver Springs Blvd). Inside vendors, tailgating ($3 per space). *TI:* 146.61 (123 Hz). *Adm:* Free (donation accepted). Tables: $5. Bill Miller, N6WGM, 3381 SW 46th Ave, Ocala, FL 34474; 352-873-2017; **n6wgm@cfl.rr.com**; **www.qsl.net/ssrc/hamfest/index.html**.

†Louisiana (Minden)—Dec 18, 8 AM to 2 PM. *Spr:* Minden ARA. Minden Civic Center, 520 Broadway St; from I-20 take Minden/Sibley Exit 47, turn N on US Hwy 371, go 1 1/2 miles to US Hwy 79/80 E, turn right, go 1/4 mile to Civic Center on right. Annual Christmas Hamfest, dealers, VE sessions. *TI:* 147.3. *Adm:* $4. Tables: $5 (swap), $10 (dealers). Dusty Collins, KB5WFE, 231 Garrett Dr, Dubberly, LA 71024; 318-371-0636; **dusty1@microgear.net**; **www.bayou.com/~k5dlh/mara.html**.

†Michigan (Lowell)—Dec 18; set up Friday 6-9 PM, Saturday 6-9 AM; public 9 AM to 1 PM. *Spr:* AR Youth Club. Lowell High School, 11700 Vergennes, located 15 miles E of Grand Rapids; Lowell High School is 1 1/2 miles NW of the city of Lowell; take Lincoln Lake Ave for 1 1/2 miles N to Vergennes, then 1/2 mile W to High School. VE sessions (10 AM; walk-ins welcomed). *TI:* 146.62 (94.8 Hz). *Adm:* $5. Tables: $8. Al Eckman, WW8WW, 1602 Bowes Rd, Lowell, MI 49331; 616-897-7659; **al.eckman@sbcglobal.net**.

†Missouri (Willard)—Jan 8, 8 AM to 2 PM. *Spr:* 145.49 Repeater Group. Willard Recreation Center, 128 N State Highway Z; from I-44 and US Highway 160 Exit go N for 6 miles to Willard; go to second traffic light, turn right (N), go 1 mile to Highway Z, continue N for 1/4 mile to Willard City Park and Recreation Center on left side of highway. VE sessions. *TI:* 145.49 (136.5 Hz). *Adm:* $3. Tables: $8. Michael Blake, NØNQW, Box 246, Willard, MO 65781; 417-839-2071; **n0nqw@att.net**; **www.sgf49ers.org**.

†North Carolina (Winston-Salem)—Jan 8, 6 AM to Noon. *Spr:* Forsyth ARC. Summit School Parking Lot, 2100 Reynolda Rd; take Business 40 (US-421) to Silas Creek Parkway N (toward Wake Forest University), bear right at split towards University, turn right onto Reynolda Rd, take 3rd right on Ken Way. Tailgating (free with admission), free coffee. *TI:* 145.47 (100 Hz), 146.64 (100 Hz). *Adm:* $5. Henry Heidtmann, W2DZO, Box 11361, Winston-Salem, NC 27116-1361; 336-723-7388; **w4nc@triad.rr.com**; **www.w4nc.org**.

†South Carolina (Greenwood)—Jan 8; set up Friday 2-5 PM, Saturday 7 AM; public 9 AM to 3 PM. *Spr:* Greenwood ARS. Greenwood Civic Center, 1610 Highway 72 and 221 E; take Highway 72, E from Greenwood. Inside flea market, vendors, tailgating (free with admission), VE sessions, ARRL, SERA. *TI:* 147.165 (107.2 Hz). *Adm:* $6. Tables: $10. Alice Taylor, KC4JWM, 310 Alabama Ave, Greenwood, SC 29646; 864-227-9773; or Buddy Willis, W4DEW, **w4dew@emeraldis.com**.

†Wisconsin (Waukesha)—Jan 8, 8 AM to 2 PM. *Spr:* West Allis RAC. Waukesha County Expo Center Forum, 1000 Northview Rd; I-94 W to Exit 294 (Cty J), S to Cty FT, W to Expo Center. Ham Radio, Computer, and Electronics Swapfest; VE sessions (AMF Waukesha Lanes, across from Expo; bring your original license with photocopy, CSCEs with 2 photocopies, 2 IDs, 1 must be photo ID); ham radio group meetings, free parking. *Adm:* $5. Tables: 8-ft $15 (plus admission; reserve); electrical outlet $17 (advance only). Send business size SASE for advance reservation by Dec 31 to WARAC Swapfest, Box 1072, Milwaukee, WI 53201. Phil Gural, W9NAW, 414-425-3649; **janphil68@earthlink.net**; **www.warac.org**.

†ARRL Hamfest

COMING CONVENTIONS

December 4-5
West Central Florida Section, Palmetto/Tampa*

January 9
NLI Section, Bethpage, NY

January 15
SWOH Digital Symposium, Middletown, OH

February 4-5
Mississippi State, Jackson

February 4-6
Southern Florida Section, Miami

***See November *QST* for details.**

Gail Iannone ♦ Convention Program Manager

The Ubiquitous PL-259

[continued from page 56]

● Slide the coupling ring onto the cable. Please don't forget this step. If you solder your connector and neglect the ring, you may be able to redeem your sanity by slipping it on from the other end of the cable. But if this option isn't available… well…there will be no printable words adequate to describe your situation.

● Screw the connector body onto the cable (Figure 1D). If you've managed to prepare the cable to the right dimensions without putting your fist through the nearest wall, the center conductor will protrude neatly through the center pin, the braid will show through the solder holes and the body will actually thread onto the outer cable jacket. If not, go ahead and put your fist through the wall, then start over.

● Solder the braid through the solder holes (Figure 1E). Solder through all four holes; poor connection to the braid is the most common form of PL-259 failure. A good connection between connector and braid is just as important as that between the center conductor and connector.

Use a large soldering iron for this job. With education obtained through repeated failures and second-degree burns, you'll learn how much heat to use. If you use too little heat, the solder will bead up, not really flowing onto the connector body. If you use too much heat, the dielectric will melt, letting the braid and center conductor touch, creating what is known in the industry as the "shorted PL-259." This configuration is particularly hostile to RF in general and transceiver warranties in particular.

● Solder the center conductor to the center pin. The solder should flow on the inside, not the outside, of the center pin. Trim the center conductor to be even with the end of the center pin. Use a small file to round the end, removing any solder that built up on the outer surface of the center pin. Use a sharp knife, very fine sandpaper or steel wool to remove any solder flux from the outer surface of the center pin. Screw the coupling ring onto the connector body (you remembered the ring, didn't you?) and you're finished.

Relax your jaw and take several deep breaths. Apply bandages and ointment, if necessary. Sit back and admire your finished work of RF art.

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

By **Dan Henderson, N1ND**
Contest Branch Manager

ARRL Field Day 2004

With a nod to Mother Goose and "The House That Jack Built."

This is the Day that Hams Build. Any ham licensed more than a year can probably tell you the significance of the fourth full weekend in June… It is "The Day That Hams Build," better known in official circles as ARRL Field Day.

These are the Places they go to Play on the Day that Hams Build.

Since the early 1930s, amateurs across the US and Canada have tested their mettle, packed their gear and supplies, and headed out to fields and forests, mountains and deserts, parks, malls and backyards to participate in what is the most popular on-the-air operating event. Since 2002 stations from across the Americas have actively participated. In 2004 logs were received from 12 DXCC entities (don't forget that the US and Canada are DXCC entities!) And as if that wasn't enough, since 2001, ARRL Field Day has been "out of this world." This year residents of the International Space Station participated once again—this time making QSOs on both 144 MHz and 432 MHz—another Field Day first! In all, 79 ARRL Sections were represented in the entries for FD2004.

Entries By Class

Sec	Entries	Sec	Entries	Sec	Entries
1A	198	1B1	150	1E	176
2A	494	2B1	2	2E	20
3A	333	3B1	1	3E	7
4A	147	1B2	61	4E	1
5A	73	2B2	31	5E	3
6A	31	6B2	1	1F	30
7A	18	1C	57	2F	56
8A	7	2C	5	3F	25
9A	5	3C	2	4F	14
10A	2	1D	239	5F	8
11A	5	2D	19	6F	2
12A	2	3D	3	8F	1
14A	2	4D	3	9F	1
21A	1	5D	1	11F	1
50A	1	6D	1	12F	1

High Claimed Scores

Call Sign	Score	Class
W3AO	32,372	50 A
KP2AA	25,630	4 A Battery
W6YX	22,694	8 F
W4IY	21,002	12 A
AA5B	16,445	6 A Battery
W2GD	16,305	2 A Battery
WØGG	15,936	3 A
K4BFT	15,754	5 A
N6ME	14,984	6 A
K7LED	14,634	6 A

Steve, WB6UZX, in front of the Henry transmitters for 14 and 7 MHz used at the K6KPH site for the West Coast transmission of the W1AW Field Day bulletin. Also shown are the signal generators and frequency counter, and in the back row the Henry for 21 MHz. Be sure to see the complete story on the Web at www.arrl.org/contests/results and look for Field Day 2004.

Virginia, WA6DOV, Colette, KG6SYL, East Bay SM Ti, NJ6T, and Ron, KC6MTO, outside the Benicia Amateur Radio Club shack.

These are the Stations they set up in the Places they go to Play on the Day that Hams Build.

A record number of 2241 entries were received for FD2004. This is a 6% increase in logs from last year. As always Class A was the category bell cow as 59% of all reports indicated that the FD site was a portable operation set up in a place not normally used for Amateur Radio. Class D, the home station, was second with 12% of all entries while another 11% were class B, small 1-2 person operations in the field. The relatively new Class F—EOC stations—accounted for 6% of all entries. And one of the key components for Field Day is emergency power, and a total of 82% of all stations reported use of emergency or alternative power sources—generators, battery, solar, wind or other.

Flexibility is the goal for Field Day. Dipoles and inverted Vs dotted the landscapes. Verticals were raised on temporary masts. Some clubs assembled a wide variety of beams, hoisting them up on tower sections brought in for the event. Some creative groups used their contacts to raise antennas from cranes, fire department ladder trucks or power company bucket trucks. Many clubs use Field Day as a teaching day: learn how to solder, put together an antenna, lay out radials for a vertical, log, use an antenna tuner, complete contacts… The list goes on as this is a perfect education venue—share the expertise of those in your club with new or interested operators.

These are People that assemble the Stations they set up in the Places they go to Play on the Day that Hams Build.

According to the reports submitted, over 33,000 persons visited or participated at the various Field Day sites in 2004. This is about a 3% increase over 2004 and is the second highest total in the past seven years. And experience tells us the impact goes far beyond the reported numbers. Some clubs don't include the number of visitors because they don't operate. Some don't include those who attend for the various social events always accompanying Field Day. And there is no way to really count the number of people to whom participants bring the Field Day message of "we are ready" via the various media notices or news stories that are disseminated.

Exciting is the continued popularity of the GOTA station—Get On The Air! The incarnation of the old Novice/Tech station, 436 GOTA stations were reported, which means 39% of all groups eligible to use one put a GOTA station on the air. Any way you look at it, something that gets new persons or inactive licensees interested in operating benefits our hobby. We hope to see GOTA participation continue to increase in the coming years.

These are the Contacts that are made by the People that assemble the Stations they set up in the Places they go to Play

A New Club's First Field Day—Silver Comet Amateur Radio Society

By Emory Gordy, W4WRO

In the fall of 2003 some like-minded hams in the NW Georgia county of Paulding got together to form a service oriented club; a club dedicated to the promotion of Amateur Radio; a club that would provide communications and assistance to local government and public not-for-profit organizations. We started off with less than 10 members, so almost everyone was either an officer and/or a member of the Board of Directors. Even though we were a "small but tiny" group, we were determined to get off on the right foot. We set four main goals to be accomplished by year's end: 1) ARES participation, 2) ARRL affiliation, 3) tax exempt nonprofit 501[c][3] incorporation status, and 4) participation in the 2004 Field Day event.

Since club member Sean (W4JFL) and I held ARES appointments of EC and Assistant EC, respectively, and many of the other members were already ARES members, the first goal was very easy. For our kickoff meeting in April, we invited ARRL Southeastern Division Vice Director Sandy Donahue (W4RU) to give a speech about the ARRL, with the focus on the threat of BPL to Amateur Radio's future. After his impressive presentation, we signed up enough new ARRL members to qualify for, and receive, our ARRL affiliation. Poof! Number 2 accomplished!

Country entertainer Patty Loveless, KD4WUJ, gets some help from Michael Sparks at the SCARS GOTA station. Michael is the son of Paulding County ARES EC Sean Sparks, W4JFL.

Goal number 3 was a toughie, but with the hard work of club treasurer Dave (K4DMF), and the kind help of Alford Memorial Radio Club member Bill Carter (KG4FXG) and ARRL GA Section OOC Mike Swiderski (K4HBI), we got our 501[c][3]. SCARS Inc, had just one more goal left: Field Day 2004.

For a service oriented club, Field Day is a natural. Almost all the elements necessary to test the emergency preparedness of our newly formed club were wrapped up into one glorious late-June weekend. And, it promised to be lots of fun.

Sean (W4JFL) and I had worked well together in putting together other Field Day events, so we were *volunteered* by the other SCARS members to organize our new club's participation. As FD Chairman, I immediately delegated almost *all* the work to Sean, Andrew (KG4NFL), SCARS, Inc officers Lee, WB4QOJ (President), Ellery, KG4NFS (VP), Dave, K4DMF (Treasurer), Bea (Secretary, "KMOM," aka Future Ham), and Board members Ron (WB3ILX, Bea's OM), and Paul (KG4NZA). Our group went to work.

We dedicated May's club meeting to planning our FD activities. First things first: What's on the menu, who's gonna cook it, and how? We took a quick vote, and a menu of Caesar salad, steak and lobster, with a nice Merlot won, hands down. A quicker check with the club treasurer indicated that hot dogs and hamburgers on the grill would be a more appropriate choice (maybe surf and turf next year). With the most important decision out of the way, we had a brief discussion and decided to enter as 2A (Battery @ 5 W) with rigs on CW and SSB, plus a GOTA station (under Al, KF4RPQ's call) with two-point-per QSO, PSK31 capability. So far, so good. Question: Antennas? Answer: You can't beat balanced-fed 80-10 meter dipoles for cost, simplicity of use and ease of installation. We could see the points stacking up.

Were there other ways to raise our score? What about those bonus points? Well, courtesy of Nigel (KG4ARS) we could pick up 100 of them by using his solar panels to charge some of our batteries on site. Believe it or not, the concept of bonus points goes hand in hand with emergency preparedness. It encourages participants to try alternate methods of communication. In an emergency situation you need to take advantage of every bit of knowledge, and every piece of gear you've got. You never can tell when ATV, SSTV and APRS might get the job done. Oh, and don't forget amateur satellites.

Bonus points also promote community awareness of Amateur Radio's emergency capabilities by seeking media publicity, operating from public facilities, and inviting government officials and agencies to attend. We tried it all.

After tackling the bonus points issue we addressed the task of pooling equipment, appointing captains of the CW, GOTA and SSB stations, and assigning operators.

Given our "small but tiny" status, it was obvious that we would need outside help. So, we started contacting non-club (aka potential) members from the Metro Atlanta area, especially non-active hams. As captain of the CW station, I called upon my old "code or die" buddies, Sammy (N4YDX), Jorge (K4KB), Mike (KE4GBE), and Ed (K4DVJ). These guys are "hot-shot" code-sters. For instance, Ed spent his military duty in the early '60s as a code op, copying CW over in Turkey for about 8 hours per day. With guys like that, I felt confident in challenging the other stations at our Field Day site. A little intramural competition never hurts, you know. After the dust had settled, I had won my bet. *CW rules!* The SSB guys were humble, but I know they're conspiring for next year.

One of the nice things about Field Day is the opportunity for family members to participate. In my case I asked my XYL, Patty (KD4WUJ, aka country music entertainer Patty Loveless) to help out. Now, being a recording artist is extremely time-consuming. You're either on the road, rehearsing for the road, in the studio, or doing interviews. There's very little downtime. But it just so happened that Patty was off the Sunday of Field Day. She enjoys local ham activity on 222, operates 40 meter CW occasionally, and having participated in local emergency nets in the NW Georgia area, she's a big supporter of the potential of Amateur Radio to aid in times of disaster. Maybe next Field Day she'll help out cooking those steaks and lobsters. In the meantime, I'll be busy stringing balanced fed transmission line from a dog house.—*73 ES CU FD05*

on the Day that Hams Build.

After a decline in the number of QSOs in 2003 due to some pretty bad propagation, FD2004 saw an increase of almost 200,000 QSOs to 1,326,122. The number of QSOs on all three modes—CW, Digital and Phone—was up as well. Almost 50 ,000 additional QSOs were made on CW, once again proving it is still a popular and viable mode of communication among amateurs. Phone QSOs were up about 22% to hold onto its position as the most popular Field Day mode. And Digital popularity continues, as a record number 20,940 QSOs were made, a 67% increase over 2003, proving that there is something in this hobby for everyone.

These are the Reasons that they make the Contacts that are made by the People that assemble the Stations they set up in the Places they go to Play on the Day that Hams Build.

While some may disagree, Field Day really isn't about score. It is about things far more important.

It is about demonstrating our emergency communications capabilities to city, county and state officials. Over 1000 Class A stations claimed the 100 point bonus for being visited by an official from a served agency or local government. We demonstrate what we can do to supplement their existing communications in times of need. By doing so, we meet part of the responsibility that our Amateur Radio licenses entail.

It is about educating the public and promoting our hobby. Each participating station has a role to play in Field Day. But the stations that set up in public places, that make the effort to try and get media involved, that go the extra step to get people on the air, perhaps make the greatest impact on Field Day. When the public sees what we are about—Public Service and Emergency Communications at the forefront of Field Day—we begin to tap a new pool of potential amateurs. Helping our hobby grow is a responsibility all of us should accept as our own.

It is about testing our readiness. All of the written plans and ideas are great—but if they don't work, then what is their worth? Would you rather discover the coax on the emergency antenna is bad at Field Day or as you set up in the aftermath of a Category 3 hurricane? Is it better to discover the club generator won't power the command post while testing during Field Day or while plugging it in at the Red Cross shelter after a tornado knocks out power?

And along the way, another reason comes across loud and clear. It is about having *fun* in our hobby. Some will find that fun in having a high claimed score (although by its nature no single entry "wins" Field Day). Some will find it in the socializing at the covered dish supper. Operating all night will be the impetus for fun for some while seeing a technically well prepared station on the air will do it for another. Don't forget the basis of FD is "FUNdamentals".

These are Faces that are the Reasons that they make the Contacts that are made by the People that assemble the Stations they set up in the Places they go to Play on the Day that Hams Build.

Over 200 groups, clubs and individuals have submitted their Field Day 2004 stories and photographs to the ARRL Contest Soapbox at **www.arrl.org/contests/soapbox/**. Be sure you browse the site. You may be amazed by some of the great ideas that are employed by your fellow amateurs during Field. And consider posting your Field Day story in the future. You may have just the idea that someone else is looking for to make the next Field Day a success.

ARRL members can read an expanded FD report on-line at **www.arrl.org/contests/results**. You will find various special breakdown boxes with interesting information. Also, there are several sidebars, including a look behind the scenes of the first-ever West Coast transmission of the special W1AW Field Day bulletin, from the Maritime Radio Historical Society's K6KPH and an expanded version of the Silver Comet Amateur Radio Society sidebar included in this *QST* report, featuring country music entertainer Patty Loveless, KD4WUJ, and her OM, noted musician and record producer Emory Gordy, W4WRO.

As always Field Day is the fourth full weekend in June, which in 2005 will be June 25-26. It may be December, but now is the time to start planning how you will be involved. Because, after all, ***YOU are the most important part on the Day that Hams Build.***

Scores

Class A stations are clubs or groups operating with more than two 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.

1A Battery

Chew's Ridge Gang					
K6MI	1139	5	7	12,725	SCV
N4BP	1036	5	3	11,245	SFL
Buffalo Lighthouse Crew					
K2ZR	633	5	4	7,290	WNY
Friends, Alumni & Users of LT					
W8LX	570	5	3	5,850	OH
Las Chupacabras					
WW5X	520	5	8	5,150	STX
Neurosa's Gopher Munchers					
AE6C	484	5	4	5,140	SV
VA2RC	411	5	3	4,280	QC
Bear Mountain QRP Group					
WA5Y	335	5	11	3,920	MN
Anaconda ARC					
W7VNE	373	5	13	3,740	MT
Soper Hill ARC					
NN7N	359	5	15	3,625	EWA
US Department of State ARC					
W3DOS	279	5	5	2,960	MDC
Frankenmuth ARP Club					
KY8I	260	5	4	2,800	MI
North Augusta-Belvedere RC					
K4NAB	245	5	13	2,785	SC
Wyoming DX Contest Club					
W7SE	267	5	3	2,770	WY
Hilo ARC & Hawaii QRP Club					
KH6IN	187	5	55	2,595	PAC
Hiawatha/Falls City ARC					
KØERX	254	5	16	2,425	NE
New Cuyama Quad Hoppers					
N6PC	293	5	4	2,340	SJV
North Georgia VHF Society					
K4NGA	268	5	3	2,255	GA
New England QRP Club					
WQ1RP	165	5	3	1,730	NH
Wisconsin Rapids ARC					
W9DQA	195	5	10	1,690	WI
Austin, Travis Cty ARES					
W5KA	55	5	35	1,285	STX
The Three Amigos					
K7HZ	79	5	3	940	OR
University of Southern California ARC					
W6YV	81	5	3	865	LAX
SHBP&M					
KB3BUE	72	5	7	460	WPA

1A

San Diego DX/Pt Loma ARC					
W6PT	2301	2	8	8,318	SDG
San Lorenzo Contest Club					
NA5S	2393	2	3	7,606	NM
Bonfield Amateur Radio Fraternity					
K9TP	1910	2	3	6,574	IL
The Motley Crew ARC					
W9GG	1775	2	16	6,428	IL
Southern IL DX & Contest Club					
W9HUZ	1377	2	6	6,346	IL
Metro DX Club					
W9TY	1608	2	7	5,994	IL
Central NC DX Chasers					
N4OL	1527	2	8	5,730	NC
Parma RC					
K8EE	1278	2	3	5,702	OH
Flying Beers International Broadcast Society					
K8FBI	1654	2	5	5,400	MI
Bozo and the Lids					
W9TG	1151	2	6	5,204	IN
Case ARC					
W8EDU	1333	2	4	5,078	OH
ARVARF					
K5PXP	1197	2	15	4,930	AR
Robert F Heytow Memorial RC					
K9YA	993	2	4	4,902	IL
Big Hill ARC					
KØHP	1085	2	7	4,890	SD
Owensboro ARC					
K4HY	968	2	15	4,624	KY
Udder RC					
W1MOO	1222	2	8	4,522	VT
Richmond ARC					
VE7RAR	786	2	40	4,432	BC
QCWA Chapter 17					
W3GS (+NL7XM)	1147	2	7	4,376	EPA
Alberta Clippers					
VE6EX	957	2	5	4,244	AB
Echo-Sierra DX Club of Brevard					
K9ES/4	1094	2	3	3,928	SFL
Greer ARC					
W4IT	865	2	20	3,826	SC
Dr Loomis Memorial Junior Mechanics League					
W3KDR	1190	2	16	3,718	MDC
Southwest Ohio DX Assn					
W8EX/9	890	2	3	3,642	IN
Earlysville ARS					
K4MW	1275	2	3	3,616	VA
Pamrapo ARC					
N2NO	866	2	3	3,582	NNJ
West Texas ARC					
K5EG	1351	2	10	3,538	WTX
RSRCI					
AK2P	990	2	4	3,506	NNY
Blackstone Valley ARC					
W1DDD	771	2	16	3,458	RI
Loop Group					
KØRK	959	2	14	3,418	WCF
South Georgian Bay West Simcoe Cty ARES					
VE3SGB	1010	2	12	3,254	ON
Thibodaux ARC					
W5YL	879	2	10	3,250	LA
RCA ARC					
W9RCA	1495	2	12	3,216	IN
IOOK Support Group					
W8ED	887	2	9	3,184	WV
Clear Channel Communicators					
KB4VC	959	2	7	3,082	WCF
Hattiesburg ARC					
K5PN	1255	2	17	3,052	MS
K4LSC	461	2	3	2,960	SC
Butte ARC					
W7FO	1404	1	15	2,839	MT
Jasper RC					
K4BEH	551	2	10	2,628	GA
Marshall Co Amateur Radio Repeater Assn					
WØDOD	655	2	6	2,578	KS
Southwest MS ARC					
KD5QNC	838	2	21	2,576	MS
Central WI Radio Amateurs, Ltd at UWSP					
K9UW	652	2	6	2,568	WI
East Bay All Banders					
N6RX	773	2	3	2,470	SJV
Red Ant Annihilators/SCAN					
WA6P	1079	2	8	2,450	LAX
Valley Center (KS) ARC					
KØRH	926	2	15	2,302	KS
Sam Houston Amateur Radio Klub					
N5AF	446	2	34	2,302	STX
Middle Tennessee DX Club					
W4SK	643	2	6	2,254	TN
Coastal Pender ARC					
W4TSI	817	2	5	2,204	NC
Northeast Maryland ARC					
KE3I	863	2	10	2,188	MDC
N6TU	603	2	3	2,166	SJV
Woodchuck ARC					
KC8KLU	325	2	34	2,144	OH
Framingham ARA					
W1FY	502	2	35	2,116	EMA
Muskegon River CW Group					
N8VYS	504	2	5	2,084	MI

Morris RC
W2YD 475 2 36 2,050 NNJ
Lanark and North Leeds ARES
VE3LCA 443 2 35 2,026 ON
Union Métropolitaine des Sans-Filistes de Montréal
VE2UMS 417 2 45 1,998 QC
Hot Springs Village ARC
K5ID 392 2 12 1,926 AR
Club Radio Amateur de Beauce
VE2CRB 523 2 12 1,896 QC
Athens Cty ARA
NC8V 412 2 11 1,860 OH
Stanly Cty ARC
K4OGB 361 2 17 1,850 NC
Chicago FM Club
W9XB 571 2 10 1,786 IL
409th ASA Hogs On Amateur Radio
N7ASA 437 2 3 1,754 AZ
Edisto Amateur Society
AD4U 398 2 29 1,746 SC
KH6RS 1170 1 8 1,733 PAC
South Georgia ARC
N4BIM 462 2 6 1,714 GA
WN0G 687 2 3 1,674 IA
Triode ARC
N4WCO 543 2 7 1,658 NC
Middle Peninsula ARC
W4M 583 2 12 1,648 VA
Mayerthorpe Flying Dinosaurs
VE6FD 733 1 19 1,646 AB
Hull Neck ARC
K4AAB 768 2 8 1,636 VA
Great Falls Area ARC
W7ECA 508 2 25 1,618 MT
Palouse Hills ARC
W7NGI 619 2 8 1,588 ID
Atchison County Amateur Radio Serv/Jackson ARC
K0HK 441 2 10 1,582 KS
Parma RC II
W8PRC 329 2 7 1,460 OH
Moxoneers
W0IVJ 647 2 3 1,444 OK
The Fly Swatters
W7NNN 662 2 4 1,424 WWA
Chiggers Field Day Group
K1DW 398 2 10 1,414 NC
Waltzing With Bears
K1CE 307 2 5 1,400 NH
W0OPW 342 2 3 1,382 MN
Lake County ARC
W9LJ 445 2 15 1,370 IN
USS Jurassic ARC
K8SSJ 103 2 10 1,368 OH
Juneau ARC
KL7R 459 2 30 1,368 AK
Pinawa Amateur Radio
VE4CD 304 2 9 1,258 MB
AA3TL 732 1 3 1,242 EPA
Los Banos ARC
AA6LB 241 2 5 1,232 SJV
Turkey Heaven Mountain Repeater Assn
N4THM 399 2 10 1,218 AL
Yuba Sutter Hams
KI6ZX 180 2 14 1,218 SV
Covey Hill ARC
VE2CYH 287 2 19 1,216 QC
Uinta Cty ARS
N7XKT (+KD5HTJ) 51 2 3 1,214 WY
Kona ARS
WH6DEW 329 2 5 1,210 PAC
Benson Cty ARC
N0BG 303 2 15 1,206 ND
Southern Plains Amateur Radio Klub
W0KKS 352 2 15 1,204 KS
Free Try Ham Radio
W6W 238 2 40 1,176 SDG
Reno Cty (KS) ARC
W0WR 373 2 12 1,146 KS
W1RK 217 2 3 1,146 EMA
K2EI 195 2 3 1,140 VT
AB7QG 512 2 2 1,124 UT
Bawating Amateur Group
VE3LSC 261 2 5 1,108 ON
HSB Hams
KG5E 296 2 3 1,100 NTX
KA2BEO 222 2 12 1,076 SNJ
Thomasvile ARC
W4UCJ (+KG4SEA) 136 2 32 1,072 GA
Utica ARC
K2IQ 329 2 5 1,072 WNY
Amherstburg
VA3ARG 233 2 12 1,066 ON
9-0-4 ARC
K9IM 182 2 7 1,064 IL
Laguna Beach Em Com Team (RACES)
KE6GFI 186 2 36 1,042 ORG
WorldRadio Staff ARC
WR6WR 410 2 3 1,020 SV
ARES D24 Franktown Fire Group
N0LP 403 2 12 1,006 CO
KC7EMZ 176 2 3 902 OR
Socorro Amateur Radio Assn
W5AQA 276 2 5 902 NM
WA2EQF 262 2 3 866 NNJ
The Piqua ARC
W8SWS 155 2 17 860 OH
North Brevard ARC
WN3DHI 230 2 10 860 SFL
University of Arkansas ARC
K5GOE 111 2 9 848 AR
Pathfinders ARC
VE4PAR 373 2 9 846 MB
Enterprise ARS
WD4ROJ 161 2 15 836 AL
Tidelands ARS
K5BS 58 2 30 800 NTX
HQ-Coy, 1st Canadian Parachute Battalion (Reenacted)
W1HIS 60 2 8 790 CT
University of Minnesota Gopher ARC
W0YC 165 2 8 788 MN
Pamlico ARC
K4BCH 213 2 7 786 NC
Shy-Wy QCWA
K7TFW 102 2 4 758 WY
Brookings Amateur Radio Research Club
W0BXO 152 2 11 754 SD
VE6CJ 503 1 5 753 AB
USS Cod ARC
W8COD 114 2 5 728 OH
Free State ARC
K3IVO 231 2 6 712 MDC
Presque Isle Cty ARC
W8HIB 167 2 4 712 MI
K1FQ 195 2 3 690 ME
Huntington ARS
K9HC 167 2 7 634 IN
ARINC Radio ARC
W3ZH 138 2 3 626 MDC
Alexander Amateur Radio Assn
W4ERT 130 2 7 610 NC
Bitterroot ARC
W7FTX 222 2 13 594 MT
North Island ARS
VE7ARK 125 2 10 580 BC
Pitkin ARC
W0CO 118 2 3 580 CO
Mountain Valley ARC
K1PV 209 2 6 568 ME
Wheatstraw Club
KD5YUL 22 2 20 544 OK
WEDIXIE ARC
WB4MZO 93 2 6 536 GA
Oxford County ARES
W1SK 142 2 8 534 ME
WV0H 154 2 3 508 CO
Small Town Amateur Radio Service
W5STR 37 2 29 474 AR
Central Idaho RC
KC7MCC 107 2 8 466 ID
Hualapai ARC
WB6RER 62 2 4 424 AZ
Sacramento Area Latin ARC
AE6LH 111 2 4 422 SV
N9DWE 110 2 5 420 IL
Highlands Emergency Group
VE7TIN 57 2 3 420 BC
St Marys ARC
VE3SDF 51 2 3 402 ON
U H F Associates
WB6ZOD 66 2 6 382 ORG
Lincoln County ARES/RACES
WA7RF 62 2 8 374 EWA
NKDXE
KD4EVB 84 2 3 368 KY
Bobcat ARC
KE6RC 52 2 7 354 SJV
Snyder Group
KI0QM 120 2 3 340 STX
N4XED 47 2 3 294 NFL
BSA Troop 272
KC9GFI 46 2 6 292 IN
Brady Amateur Radio Network
N0EAT 93 2 4 286 MO
Denver RC
W0TX 54 2 4 258 CO
ARS of Nantucket
N1NBQ 24 2 6 248 EMA
WD4NIT 10 2 4 220 GA
Carroll ARS
W8FEC 98 2 4 196 OH
KC0RPS 11 2 3 172 CO
Watertown ARC
N9HR 33 2 4 166 WI
University of Toronto ARS
VA3UOT 56 2 3 162 ON
Snohomish County DEM-RACES
WA7DEM 27 2 4 104 WWA

1A Commercial

CRA Soral-Tracy
VE2CBS 473 2 20 1,892 QC
Macon ARC
W4BKM 588 2 18 1,526 GA
BARC
NA9US 438 2 3 1,252 IL
St Louis DX & Contest Assn
AA0A 1129 1 3 1,139 MO
Estero RC
W6JU 306 1 15 895 SB
Mayes County ARC
KD5AFE 128 2 30 806 OK
Star Valley ARC
KD7LVE 243 2 8 686 WY
Oceanside Radio Communications Assn
VE7PQE 107 2 4 594 BC
Dallas LDS Stake
KJ5UY 84 2 10 368 NTX
Elmira ARC
VE3ERC 120 2 12 240 ON
Great Lakes AR Rovers
KC8ELY 85 2 3 170 MI

2A Battery

Frankford RC—NNJ Group
W2GD (+N4HY) 1596 5 6 16,305 NNJ
Colorado QRP Club
W0CQC (+AB0CD) 1530 5 10 14,435 CO
West Park Radiops
W8VM 718 5 17 7,375 OH
2K2 CWOPS
N7QT (+WA7NCL) 661 5 4 6,660 EWA
Silver Comet ARS
W4WRO 542 5 11 5,665 GA
Walton RA
W2LZ 486 5 11 5,270 WNY
Every Amateurs RS
K0EAR (+KC0EUJ) 359 5 35 4,150 MO
Franklin County ARC Inc
AC1L 371 5 21 4,080 WMA
Barstow ARC
WA6TST (+KC6IIH) 379 5 36 3,895 ORG
Mutton Top Group
K4CMS 443 5 6 3,685 VA
North Georgia QRP Club
NQ4RP 253 5 8 3,350 GA
Suburban Technical Amateur Radio System
W9SRC 275 5 4 3,120 IL
N1QS (+N1BQ) 346 5 15 2,520 VT
Open Repeater Group
KO6OL 266 5 25 2,430 LAX
Independent Radio Assn
N8IH 255 5 19 2,245 OH
Radops of El Jebel Shrine
K0FEZ 157 5 11 1,690 CO
Lodi ARC
N6SJV 167 5 8 1,370 SJV
Head Lake Group
VE3MB 243 5 4 1,365 ON
Houston QRP Club
W5ACM 81 5 10 1,150 STX
Colorado QRP Club Aloha Noncompetitive FD Site
N0BN 46 5 11 1,030 CO
Halifax Em Com Krewe
N2JFS 40 5 3 600 VT

2A

B.A.R.C./N.C.A.A.R.S.
W5ZN (+NG5M) 4424 2 20 13,972 AR
CorTek Radio Assn
W9CA (+KI9R) 3821 2 25 12,644 IL
Radio Amateurs of Northern VT
W1NVT (+W1PU) 3780 2 30 11,360 VT
Sonoma County Radio Amateurs
W6SON (+W6LFJ) 3777 2 31 11,174 SF
Midland ARC
W5QGG (+W5PBR) 3329 2 35 10,948 WTX
McMinn Cty ARC
NA4K (+K4BP) 3119 2 39 10,284 TN
Hoosier DX & Contest Club
KJ9D (+WO9Z) 2832 2 15 9,948 IN
Santa Barbara ARC
K6TZ (+KD6SVV) 2721 2 32 9,878 SB
Tampa ARC
N4TP (+N4SEX) 2611 2 45 9,846 WCF
Buckhead Contest Club
W4KJ (+W4TE) 3016 2 7 9,792 GA
Raytown ARC
K0GQ (+AB0WA) 2644 2 16 9,508 MO
JPL ARC/Caltech ARC
W6VIO (+W6UE) 2819 2 28 9,322 LAX
Falmouth Amateur Radio Assn
K1RK (+W1NOB) 2593 2 51 9,230 EMA
Halifax ARC
VE1FO (+VE1JMA) 2471 2 40 8,888 MAR
Minnesota Wireless Assn
W0AA (+N0FP) 2641 2 7 8,844 MN
Pikes Peak Radio Amateur Assn & Mountain ARC
AF0S (+NX0G) 2708 2 70 8,598 CO
MARC
W5EJK (+KA5IIS) 2362 2 17 8,530 OK
Motorola ARC
K9MOT (+KC9X) 2615 2 22 8,518 IL
High Desert Contest Club
K7AW (+N7OU) 2561 2 7 8,432 OR
Shelby ARC
AA4S (+W4KQ) 2475 2 21 8,402 NC
Port City ARC
K1RX (+W1WQM) 2695 2 25 8,282 NH
Massanutten ARA & Valley ARA
N4XU (+KZ1A) 2345 2 99 8,254 VA
The Canton ARC
W8AL (+KI0DE) 2204 2 69 8,022 OH
The Sakonnet 49'ers
KD1MW (+KB1CUB) 2343 2 26 7,904 RI
Mother Lode DX & Contest Club
K6AO (+K6TKD) 2256 2 12 7,850 SV
Big Bend ARC
K5FD (+W5ATO) 2391 2 21 7,844 WTX
Randallstown ARC
N3IC (+W4AOL) 2512 2 12 7,836 MDC
Decatur ARC
W4ATD (+KB4CAY) 2266 2 23 7,786 AL
Mid Missouri ARC
N0SS (+WB0TPN) 2104 2 20 7,758 MO
Motor City RC
W8MRM (+KI8GR) 2228 2 61 7,700 MI
Nashoba Valley ARC
N1NC (+AB1CV) 1950 2 19 7,458 EMA
Scott County Amateur Broadcasting Society
N4TY 2440 2 8 7,444 KY
Fond Du Lac ARC
W9EBV (+KG9IN) 2196 2 26 7,422 WI
Eastern Michigan ARC
K8EPV 1665 2 15 7,406 MI
Wayne ARC
W8AV (+N8IW) 2146 2 15 7,390 OH
Hudson Valley Contesters & DX'ers
W2MU (+K2UG) 2307 2 15 7,338 ENY
Madera County ARC
W6GR (+W6SSB) 2092 2 17 7,254 SJV
Oakville ARC
VE3HB (+VE3HG) 2153 2 18 7,246 ON
Montgomery ARC
W4AP (+KU4PY) 2057 2 26 7,170 AL
W9LDX (+WR9A) 1983 2 16 7,122 IN
Palos Verdes ARC
K6PV 2197 2 15 7,118 LAX
Texas DX Society
K5DX (+KB5GTB) 2220 2 10 7,040 STX
Montrose ARC
K0SX (+KI0KY) 1990 2 38 7,038 CO
C.A.R.S.
W4S (+W4BWC) 1970 2 18 6,994 NC
Twin City FM Club
W0EF (+ND0M) 1972 2 40 6,920 MN
North Shore Repeater Assn
NS1RA 1805 2 45 6,870 EMA
Smith Chart ARS
K4OO 1858 2 13 6,784 VA
W/K ARC of Greater Milwaukee
N9AW (+W9LR) 1688 2 12 6,748 WI
VECTOR
VE7VCT (+VA7EOC) 1677 2 48 6,538 BC
North-East Tarrant ARC
N5EOC (+AD5RK) 1594 2 20 6,402 NTX
Central Louisiana ARC
KK5LE (+KC5WWU) 1644 2 25 6,352 LA
Escondido ARS
N6WB (+N6SD) 2135 2 30 6,294 SDG
Meriden ARC
W1NRG (+KB1KEA) 1585 2 37 6,274 CT
Temple ARC
W5LM (+W5T) 1920 2 25 6,160 NTX
Massillon ARC
W8NP (+K8FUN) 1659 2 15 6,122 OH
Palo Alto Amateur Radio Assn
W6OTX (+K6YQT) 1764 2 12 6,004 SCV
Clinton Cty ARC
W9PC (+WM9M) 1509 2 25 5,980 IN
Hazel Park ARC
W8HP (+W8JXU) 1835 2 30 5,870 MI
Spokane DX Assn
K7SDX (+W3AS) 1520 2 13 5,870 ID
Cape Fear ARS
K4MN (+KG4KMV) 1613 2 31 5,814 NC

ARFY
W0YH (+AA0YX)
2039 2 7 5,790 CO
Delaware ARA
K8ES (+N8OB)
1376 2 46 5,768 OH
Koolau ARC
KH6J (+KH7Q)
1605 2 10 5,716 PAC
Mountaineer ARA
W8SP 1443 2 20 5,618 WV
Southwest MO ARC
K0WB (+W0EBE)
1437 2 15 5,610 MO
San Angelo ARC
W5QX (+KD5PIX)
1567 2 26 5,608 WTX
Oklahoma City Autopatch Assn
W5MEL (+N5VWF)
1416 2 64 5,518 OK
Ocean Monmouth ARC
N2MO (+W2YR)
1311 2 11 5,510 NNJ
Green River Valley ARS
K9WM 1520 2 15 5,506 IL
Heart Of Texas ARC
W5ZDN 1566 2 15 5,504 NTX
St Louis ARC
K0LIR 1528 2 14 5,496 MO
Reelfoot ARC
K4RFT (+N4MJ)
1179 2 12 5,444 TN
Stu Rockafellow ARS
W8NJH (+K3ETH)
1590 2 25 5,410 MI
BSA Explorer Post 599
WA2DFI (+W7BSA)
1748 2 18 5,396 AZ
Anderson ARC
N4AW (+WB4RSU)
1315 2 18 5,350 SC
550 DX Club
K4TDP (+AB4DN)
1387 2 7 5,292 AL
Two Rivers ARC
W3OC 1301 2 31 5,240 WPA
Gallatin Ham RC
W7ED 1590 2 10 5,222 MT
Middletown ARC
W2MAR (+W2IMU)
1327 2 22 5,164 NNJ
Green Mountain Wireless Society
N1VT (+AB1CH)
1423 2 25 4,976 VT
Johnson City ARA
W4ABR 1453 2 43 4,884 TN
Straits Area ARC
W8GQN 1555 2 15 4,826 MI
NW MS Amateurs
W5K (+W4FP)
1202 2 68 4,774 MS
Eastern Panhandle ARC
K8EP (+KW8I)
1428 2 25 4,764 WV
Cedar Valley ARC
W0GQ (+AA0XJ)
1217 2 20 4,704 IA
Fidelity ARC
K1KT (+WA1WM)
1326 2 18 4,690 RI
Carbon ARC
W3HA 1279 2 14 4,630 EPA
Tennessee Valley DX Association
W4FOA 1424 2 18 4,620 GA
ARC of Parker Cty
W5PC 1374 2 23 4,608 NTX
Fresno ARC
W6TO (+K6ORJ)
1042 2 10 4,608 SJV
Northwest Illinois ARC
W9UIJ (+N9RPN)
1268 2 14 4,556 IL
University of Arizona ARC
K7UAZ (+KC7B)
1297 2 12 4,484 AZ
Coconino ARC & Northern Arizona DX Assn
W7TB 1313 2 8 4,474 AZ
Mt Baker ARC
K7ZC (+K7SKW)
934 2 35 4,466 WWA
San Mateo RC
W6UQ (+W6VJK)
1323 2 18 4,446 SCV
OCARS
W8TNO 1560 2 10 4,406 MI
N4ZI 1134 2 13 4,370 TN
Howell County ARC
K0RWL 960 2 13 4,370 MO
Tupelo ARC
KK5K (+KD5NSP)
1501 2 21 4,364 MS
Trident ARC
W4ANK (+N4EE)
1174 2 26 4,354 SC
Benton ARS
K5NE (+WD5C)
1478 2 22 4,308 AR
Blackford Amateurs
AA9Z (+WB9HLA)
1411 2 18 4,304 IN
Delaware Valley RA
W2ZQ (+AB2RC)
1155 2 26 4,288 SNJ
Williamson County ARC
N5TT (+WC5T)
1096 2 28 4,158 STX
Vintage Iron RC
N3KR (+N3OD)
1468 2 6 4,124 NNJ
LeFrog
N9VA (+N9EAX)
1216 2 12 4,104 WI
Ashe County ARC
W4FD (+W4YSB)
1238 2 20 4,098 NC
Ski Country ARC
K0RV (+N3NXM)
1487 2 24 4,094 CO
Radio Operadores Del Este
KP3RE (+WP4WV)
1185 2 30 4,040 PR
Capeway RC
W1AA (+N1EY)
1260 2 21 4,028 EMA
Lincoln County RACES/ARES
NC4LC (+NC4CQ)
1380 2 55 4,020 NC
K7ZS 1380 2 6 4,014 OR
Baltimore ARC
W3FT (+KB3JJY)
940 2 39 4,004 MDC
Florida Atlantic Univ ARC & Boca Raton RC
K4FAU (+N4YQU)
1200 2 21 3,992 SFL
MARCA
W7MOT 1062 2 12 3,990 AZ
Humboldt ARC
K6XG (+W6ZZK)
897 2 20 3,978 SF
Bullitt ARS
KY4KY (+W4KBR)
939 2 35 3,966 KY
Nittany ARC
W3YA (+W3GA)
1195 2 11 3,898 WPA
CTARC A
WD5IYF 1331 2 8 3,812 OK
K4TLH (+KG4YZM)
845 2 30 3,778 NFL
Tri-County (WI) ARC
W9MQB 811 2 15 3,772 WI
Canadian Police College & Manotick ARG
VE3CPC 842 2 13 3,764 ON
Sierra Blanca ARC
KR5NM 709 2 12 3,746 NM
Forsyth ARC
W4NC (+W4WS)
976 2 28 3,696 NC
Fort Madison ARC
WF0RT (+NW0X)
862 2 21 3,694 IA
Johnson County Radio Amateurs Club
W0ERH 1085 2 44 3,686 KS
QRZ.ca Field Day Crew
VE6US 952 2 7 3,678 AB
Northern Ohio DX Assn
W8DXA 1388 2 16 3,642 OH
Foothills ARS
K6YA 854 2 25 3,626 SCV
South Towns Amateur RS
WB2ELW 939 2 30 3,594 WNY
P-R ARES Group
VA3PRA 1097 2 18 3,584 ON
Radio Central ARC
W2RC 985 2 14 3,582 NLI
Monroe County Radio Communications Assn
K8RPT (+W8DWL)
881 2 18 3,568 MI
WD4OAR (+AE4FC)
1186 2 19 3,566 TN
North GA ARC
W4QQ 1163 2 28 3,566 GA
Souris Valley ARC
K0AJW 1334 2 10 3,530 ND
Forx ARC
N0GF (+WA0JXT)
1084 2 16 3,526 ND
Northeastern Wyoming ARC
NE7WY (+KD7QDM)
1147 2 10 3,504 WY
Hancock ARC
W9ATG (+N9TT)
789 2 26 3,452 IN
West Allis ARC
W9FK 1132 2 21 3,448 WI
Coshocton County Amateur Radio Assn
W8CCA (+AB8SV)
925 2 17 3,440 OH
Ottawa ARC
VE3RC 786 2 25 3,432 ON
Lynchburg ARC
K4CQ (+KC1BH)
940 2 11 3,428 VA
Candlewood ARA
W1QI 996 2 29 3,410 CT
MCARA-MSUARC
K4MSU (+W4GZ)
1091 2 20 3,390 KY
Dixie ARC
W7DRC 925 2 35 3,388 UT
St Clair ARC
K9GXU 841 2 13 3,376 IL
Sevier County ARES
W4A (+AG4ZU)
995 2 14 3,364 TN
Guilford County ARES
NA4GC (+KF4ZGZ)
842 2 25 3,360 NC
Chaparral ARS
W6MV (+KF6YGI)
875 2 12 3,342 SB
Pine State ARC
N1ME (+K1GUP)
898 2 30 3,334 ME
Southwest Louisiana Amateur Repeater Club
W5BII (+N5XKF)
1058 2 35 3,318 LA
W2VJN 934 2 3 3,264 OR
Cres ARC
W8ZPF 941 2 18 3,262 OH
American Red Cross Em Com Service
WB2QBP (+K2ARC)
919 2 25 3,256 NLI
Police Amateur Radio Team of Westford
K1EJ (+WB1GOF)
670 2 19 3,246 EMA
Okaw Valley ARC
KK9N (+W9KXQ)
976 2 21 3,202 IL
K8RO 908 2 5 3,166 MI
Ellsworth Amateur Wireless Assn
W1TU (+KA1BFA)
783 2 14 3,148 ME
Legion of Indianapolis DXers
W9VW/5 1111 2 3 3,142 NM
North Shore ARC
VE7NSR (+VE7OJ)
724 2 35 3,136 BC
Austin ARC
W5TQ 671 2 35 3,132 STX
Big Island ARC
KH6EJ (+AH7A)
651 2 13 3,124 PAC
First State ARC
K3QBD 874 2 12 3,090 DE
Lakes Region Repeater Assn
W1BST 955 2 28 3,070 NH
Blossomland ARA
W8MAI (+W8KIT)
702 2 24 3,070 MI
Venture Crew 59
KC3BSA (+NT3V)
883 2 10 3,066 EPA
New Providence ARC
N2XJ 728 2 5 3,044 NNJ
Lancaster Cty ARC
AK4N 662 2 20 3,010 SC
Puerto Rico ARL
KP4ES 649 2 23 3,004 PR
Kamloops ARC
VE7UT (+VE7DUF)
572 2 17 2,996 BC
Peekskill/Cortlandt Amateur Radio Assn
W2NYW 968 2 12 2,996 ENY
Newington Amateur Radio League
W1OKY 1008 2 20 2,982 CT
Larkfield ARC
W2LRC (+AB2NJ)
575 2 34 2,968 NLI
St Clair Cty ARES
K4SCC 1226 2 40 2,952 AL
Trojan ARC
W0WOB 708 2 9 2,952 KS
Surrey ARC & White Rock ARC
VE7SAR 788 2 13 2,944 BC
Em Com Assn
W0ECA (+N0PNP)
761 2 17 2,912 MO
District 7 Advisory Council
KR4MA (+N4NSP)
651 2 30 2,908 VA
Florence ARC
W4ULH 622 2 34 2,892 SC
Clairemont Repeater Assn / BEARS
W6VLD (+KC6ZOW)
713 2 51 2,864 ORG
Grand Nelson Clan
WB9GNC 1113 2 12 2,862 MT
Virginia DX Century Club
W4DZ (+K1OB)
730 2 19 2,844 VA
Irvine Disaster Em Com
N6IPD (+K6NL)
725 2 42 2,818 ORG
Eastern Shore ARC
K4BW 667 2 19 2,816 VA
Kawartha ARG
VE3KRG 597 2 28 2,768 ON
Texas A&M ARC
W5AC 711 2 18 2,766 STX
Hornby Islanders
VE7KW 1029 2 4 2,762 BC
Palms West ARC
W4SS 838 2 30 2,756 SFL
Brockville ARC
VA3BRC 650 2 18 2,744 ON
Charlotte ARC
W4CQ 657 2 37 2,708 NC
Azalea Coast ARC
AC4RC 718 2 40 2,704 NC
Albemarle ARC
WA4TFZ (+W4YRA)
914 2 40 2,678 VA
Epcom
VE7PCE 1035 2 24 2,676 BC
Blue Ridge ARS
K4TET 533 2 35 2,676 SC
Delaware Amateur Radio Assn
W9DUK (+N9AMA)
673 2 17 2,664 IN
West Tennessee ARS
WF4Q 797 2 45 2,660 TN
Fox Cities ARC
W9ZL (+KE6IFC)
510 2 78 2,640 WI
Southern Oregon ARC
K7LIX (+WM7K)
537 2 65 2,632 OR
Norwood ARC
N1OP 467 2 30 2,632 EMA
Iowa City ARC
W0JV (+KC0IYG)
619 2 25 2,616 IA
Historical Electronics Museum ARC
W3HEM (+WA6ABD)
538 2 19 2,580 MDC
North Okaloosa ARC
W4AAZ (+W5RE)
674 2 24 2,568 NFL
Penn-Mar RC
W3MUM 931 2 13 2,542 EPA
ARA of Bremerton
W7VE 592 2 9 2,540 WWA
FARL-LARC
K8UTT 639 2 25 2,532 MI
Irving ARC
WA5CKF (+W5I)
516 2 30 2,522 NTX
Lake Erie ARA
WB8CQR (+WA8TJL)
579 2 44 2,512 OH
HDSCS
K6EW 683 2 22 2,506 ORG
Victor Valley ARC
K6QWR (+KD6YLT)
838 2 41 2,500 ORG
Nortel Networks ARC
NT5NT 813 2 14 2,492 NTX
Central Michigan ARC
W8MAR 628 2 23 2,490 MI
Hambuds
KA5E 773 2 15 2,488 STX
Harris Intersil ARC
K4HRS 872 2 10 2,486 SFL
South Lyon Area RC
N8SL 686 2 20 2,480 MI
Quinte ARC & Prince Edward RC
VA3PEC 600 2 15 2,478 ON
Endless Mountains ARC
N3EP 1038 2 10 2,476 EPA
Englewood ARS
K4OU 583 2 15 2,466 WCF
BEARONS
W7FLY 576 2 12 2,446 WWA
Jayhawk ARS
W0LB 550 2 19 2,400 KS
Gaston County ARS, Inc
N4GAS 541 2 68 2,384 NC
W5ON 588 2 42 2,380 AR
Mich-A-Con ARC
KC8VC (+N8LT)
520 2 10 2,372 MI
K9HAM 407 2 12 2,348 IL
Verde Valley ARA
W7EI 863 2 50 2,326 AZ
WPPS RC
KG7GK 463 2 4 2,324 OR
Wantagh ARC
W2VA 451 2 10 2,308 NLI
Barrie ARC & 700 Communications Reserve Squadron
VE3GCB 482 2 17 2,296 ON
Mountain ARC
W6BW 471 2 70 2,286 SJV
Shoreline Auxillary Communications Service
W7AUX 545 2 20 2,282 WWA
Valencia County ARA
KC5OUR 296 2 41 2,256 NM
N9HC 526 2 44 2,232 IN
Edmond ARS
K5EOK 418 2 56 2,228 OK
Hiawatha ARC
N0DH 853 2 20 2,216 MN
Rivers Bend ARC
KB0SWK 564 2 20 2,214 MO
Kendallville CNTSTR/21 Repeater Group
K8IAT (+KC9DSB)
462 2 10 2,192 IN
North West Texas ARC
WA5CSF 644 2 12 2,188 WTX
Riverside County Amateur Radio Assn
W6TJ (+KN6N)
463 2 55 2,182 ORG
Foothills ARC
WT4F 549 2 15 2,174 SC
Putnam Emergency ARL
K2PUT (+K2PC)
733 2 11 2,166 ENY
Franklin Cty ARC
WE4A (+WD4MYU)
491 2 24 2,160 NC
Los Alamos ARC / Northern NM RC
W5PDO 612 2 20 2,156 NM
Westside ARC
WA6RC 554 2 29 2,146 LAX
Walla Walla Valley ARC
W7DP (+K7UH)
385 2 25 2,146 EWA
The Reading RC
W3BN (+KB3EJX)
542 2 50 2,136 EPA

Johnson County ARC
W4MCT 578 2 18 2,122 TN
Hidden Valleys ARC & UW-Platteville ARC
KC9KQ 408 2 31 2,116 WI
Lapeer Co Amateur Radio Assn
W8LAP 608 2 10 2,098 MI
Hephzibah DX Club
K4ADP 561 2 10 2,072 GA
North Kitsap ARC
KC7Z (+KD7WDG)
436 2 14 2,064 WWA
Theodore Roosevelt ARC
KØND 680 2 24 2,060 ND
Montgomery ARS
NC4MC (+KI4DH)
416 2 29 2,060 NC
McHenry County Wireless Assn
K9RN (+KC9AAX)
790 2 15 2,030 IL
Mesilla Valley RC
N5BL (+W5TLU)
533 2 21 2,018 NM
Hatfield and McCoy Amateur Radio Assn
WV8KY 683 2 7 2,016 WV
Williamsburg Area ARC
K4RC 510 2 12 2,014 VA
Auburn University ARC
K4RY (+KK4RP)
331 2 7 2,014 AL
CBRA/DRA
WD3E (+W3YR)
480 2 10 2,010 MDC
Coastside ARC
WA6TOW 446 2 12 2,006 SCV
Halton ARC
VE3OD 432 2 26 2,006 ON
Acadiana ARA
W5DDL 468 2 32 1,996 LA
Santa Clarita RC
W6JW (+K7TN)
585 2 79 1,982 LAX
Amateur RC of Augusta
W4DV 382 2 35 1,968 GA
Honeywell Amateur Radio Assn
N7TWB 521 2 3 1,952 AZ
Atlanta IBM RC
W4IBM (+WD4PAQ)
494 2 10 1,948 GA
Control Chief/McKean Cty ARC Team
W3QD 591 2 6 1,932 WPA
West Virginia Amateur Radio
WV8AR 456 2 26 1,926 WV
Bolingbrook ARS
N9LJY 437 2 24 1,906 IL
Stockton-Delta ARC
W6SF 681 2 26 1,896 SJV
Albuquerque ARC
N5VA (+KD5RHR)
423 2 47 1,894 NM
Ozark ARC & Twin Lakes ARC
K5BAX 605 2 16 1,892 AR
Spring Hill RC
W8LS 286 2 26 1,886 NFL
Manteca CA ARC
KF6GDM 425 2 10 1,872 SJV
Milwaukee Repeater Club
K9IZV (+K9VS)
499 2 14 1,866 WI
Vero Beach ARC
W4OT (+W4STB)
275 2 20 1,862 SFL
Northland ARC
W9BCY 1311 1 40 1,862 WI
Paducah Amateur Radio Assn
W4NJA 396 2 18 1,850 KY
Abbotsford Amateur Radio Emergency Service Society
VE7ECC (+VE7AQS)
437 2 9 1,844 BC
Garland ARC
K5QHD 490 2 20 1,836 NTX
Benzie Amateur Radio Friends
W8BNZ 531 2 42 1,834 MI
Ellijay ARS
K4SWU 467 2 17 1,812 GA
Nanaimo ARA
VE7NA 414 2 18 1,812 BC
CARS Columbia ARS
KE4BQI 380 2 18 1,812 NFL
Santa Clara Cty ARA
W6UW (+W6UU)
513 2 35 1,810 SCV
Alcorn County ARES
W4TX 487 2 21 1,800 MS
Moosehorn ARC
AL7LE 356 2 13 1,788 AK
Hellgate ARC
W7PX 517 2 30 1,784 MT
Madonna Mountain Boys
WA6NPC 420 2 4 1,782 SCV
Curmudgeons Ham Radio Net
KR7Q 280 2 5 1,780 WWA
Lake Area Radio Klub
WØWTN 335 2 21 1,762 SD
Old Post ARS
W9EOC 526 2 20 1,752 IN
TriCounty Radio Assn
W2LI 377 2 22 1,738 NNJ
Victoria Haliburton ARA
VE3LNZ (+VA3VHA)
567 2 30 1,734 ON
Midwest ARS
W9MAR (+KA9NOO)
366 2 5 1,732 IN
Fort Venango Mike & Key
W3ZIC 677 2 20 1,730 WPA
Cass County ARC
W9VMW (+W9LVY)
539 2 45 1,728 IN
Campbell River ARS
VE7CRC 420 2 10 1,724 BC
Michigan Amateur Radio Alliance
W8USA 537 2 14 1,722 MI
UCSC IEEE Student Branch
AC6P 345 2 15 1,708 SCV
Jefferson ARC
W5GAD (+AF4AN)
371 2 12 1,692 LA
Kingsport ARC
W4TRC 596 2 25 1,692 TN
Au Sable Valley Amateur Radio
W8SZ 243 2 29 1,686 MI
Triangle ARC
K8BLP 287 2 41 1,682 WV
Spring ARC
WØMAC 226 2 8 1,680 STX
Bloomington ARC
W9INL (+K9SOU)
274 2 39 1,670 IN
Tri County Repeater Assn
W9NG 473 2 45 1,650 WI
W8M (+KC8WJA)
341 2 6 1,648 MI
Issaquah ARC
W7BI 400 2 12 1,620 WWA
C3I ARG
AC4XQ (+N4GDV)
389 2 21 1,606 SFL
Evergreen Baptist Church ARC
K7EBC 317 2 9 1,588 WWA
Sandhills ARC
WØMI 537 2 12 1,574 KS
Tech ARA/Socorro ARA
KC5ORO 347 2 15 1,566 NM
North Port ARC
KI4DFA (+K1ARL)
390 2 13 1,540 WCF
Milpitas AR and Electronics Society
W6MLP 159 2 6 1,534 SCV
Union City Wireless Assn
WA3UC (+N2KZI)
255 2 25 1,518 WPA
Clay County ARC
WØTE 535 2 30 1,518 MO
DeForest ARC
K8GE 282 2 20 1,514 OH
Sooland ARA
KØTFT 308 2 24 1,498 IA
Owatonna Steele County Amateur Radio
KCØBXJ 410 2 12 1,490 MN
Gulf Coast ARC
WA4GDN (+K4C)
361 2 25 1,482 WCF
Horned Toad Acres Wireless Assn
N7KQ (+NN7PC)
571 2 10 1,476 AZ
Union Parish ARES
N5JU 386 2 12 1,474 LA
Ocean State ARG
K1OS 368 2 10 1,468 RI
Arlington ARC
K5SLD (+AA5RS)
234 2 30 1,468 NTX
Sportsman's Paradise ARC
K4WAK 421 2 17 1,466 NFL
Wright County ARS
KAØCSW 398 2 8 1,458 MN
Discreet Cinoinents of 955
AE3J (+N3CJM)
565 2 12 1,442 DE
K9KE 507 2 10 1,442 IL
Athens ARC
K5EPH 342 2 18 1,430 NTX
KØMIW 358 2 10 1,426 IA
Toronto ARC
VE3TNC 489 2 12 1,422 ON
Clinton ARC
WØCS 337 2 10 1,420 IA
The Radio Farm
NØMA 958 1 9 1,408 IA
Fayette ARA
N8EMZ 366 2 16 1,406 OH
Shuswap ARC/Salmon Arm Seniors ARC
VE7RAW 280 2 14 1,404 BC
Albert Lea ARC
NXØC 257 2 15 1,394 MN
SARES
W6YPE 234 2 37 1,372 SCV
Danville ARS
K4UM (+AD4AX)
308 2 6 1,366 VA
Winona ARC
WØNE 431 2 20 1,364 MN
Mr Wiggles RC
KI8IM 356 2 7 1,362 OH
Hill Country ARC
W5W 386 2 13 1,358 STX
Santa Fe Trail ARC
KSØKS 252 2 25 1,330 KS
Southern Illinois University ARC
W9UIH 360 2 15 1,320 IL
Clark Cty ARC
W9WWI (+N9UGP)
284 2 28 1,300 IN
Opelousas Area ARC
W5OPL (+KM5OR)
374 2 29 1,298 LA
Clinton County Amateur Radio Association
W8GO 227 2 6 1,294 OH
West Central Minnesota ARC
NØM 194 2 10 1,292 MN
Calumet ARES
KN9P 271 2 7 1,292 WI
River Cities ARA
K4IT 262 2 24 1,290 KY
Philips ARC
WE8T 197 2 6 1,282 OH
Thick Mountain Group
KB3GDG 422 2 3 1,278 EPA
Land of Lakes ARC
K9HD 252 2 20 1,268 IN
Naval Research Lab ARC
W3NKF 216 2 10 1,260 MDC
Portland Amateur Wireless Assn
W1KVI 320 2 25 1,256 ME
Buffalo Amateur Radio Repeater Assn
W2EUP 246 2 3 1,250 WNY
N1JAC (+KU4JZ)
349 2 6 1,248 VA
Los Angeles ARC—W6QET
W6QET 245 2 38 1,248 LAX
Anoka County RC
WØYFZ 186 2 12 1,238 MN
Independence ARC
NØID 163 2 13 1,230 KS
Hurst ARC
W5HRC (+N5YM)
265 2 46 1,230 NTX
Salem Area ARA
K8BTP 155 2 11 1,230 OH
Fulton Cty ARC
K9ILS 264 2 20 1,228 IL
Westminster RACES
W6JNU 148 2 13 1,208 ORG
Coon Valley ARC
NØNAF 267 2 3 1,198 IA
Dixie Amateur Radio Klub
WW4GP 282 2 4 1,194 NFL
Jamesville Dewitt School ARC
WW2N 331 2 11 1,194 WNY
K9JQE 415 2 3 1,180 WI
W6BIV 224 2 4 1,162 LAX
Saltillo Amateur Repeater Club
KE5BPA 203 2 12 1,156 MS
South East ARC
N8T (+KC8UIQ)
277 2 10 1,154 OH
Sumter Amateur Radio Assn
W4GL 399 2 11 1,150 SC
South Alabama RC
WC4M 273 2 11 1,146 AL
Northwest Amateur Radio & Electronics Assn
NØMS 292 2 5 1,144 MO
Metuchen RC
K2YNT 227 2 8 1,140 NNJ
Snohomish Cty Hams Club
WA7LAW 159 2 25 1,120 WWA
Mason County ARC
N7SK 269 2 30 1,102 WWA
Manistee Cty ARES
WZ8N 163 2 7 1,102 MI
Kentucky Colonels ARC
KY4BG 156 2 10 1,098 KY
Maple Valley ARC
KC7KEY 191 2 39 1,084 WWA
San Gorgonio Pass ARC
WA6KAI 141 2 14 1,082 ORG
Wellesley ARS
W1TKZ 155 2 28 1,072 EMA
Rains ARA
W5ENT 425 2 8 1,052 NTX
SCARE
KM7P 376 2 3 1,052 OR
Newport Cty RC
W1SYE (+W1GTA)
300 2 10 1,046 RI
Ogle County ARES
W9GD 243 2 8 1,046 IL
Southern Alberta ARC
VE6CAM 262 2 6 1,038 AB
Grayson County ARC
K5GCC 131 2 20 1,012 NTX
Woodford Cty ARC
KF4INN 148 2 20 996 KY
Suffolk Cty RC
W2DQ 147 2 9 994 NLI
K9FRT 371 2 5 992 IL
Vashon-Maury Island RC
W7VMI 433 1 29 983 WWA
North Shores ARC
K6HAI 284 2 15 968 SDG
Amateur Radio Scouting
KØBSA 259 2 15 968 MN
Meridian ARC
W5FQ 230 2 40 960 MS
TESARO
W1IM 234 2 13 960 NH
Southeast Louisiana ARC
WB5NET 187 2 16 948 LA
South Brevard ARC
K4SBA (+KD4JRJ)
155 2 6 936 SFL
York RC
W9PCS 404 1 10 900 IL
Arizona DPS ARC
K7DPS 208 2 4 900 AZ
Northeast Missouri ARC
WØCBL 189 2 7 900 MO
Moose Jaw ARC
VE5MA 171 2 26 900 SK
Scranton Pocono Amateur Radio Klub
K3CSG 242 2 26 884 EPA
Wolseley Repeater Group
VE5WRG 160 2 6 870 SK
Aerospace & Xerox Corps Employee RC
W6AGO 119 2 14 866 SB
The Maxim Club
AD6IC/7 410 1 3 861 OR
Elko ARC
W7V 138 2 6 852 NV
Palestine/Anderson Cty ARC
K5PAL (+KB5JHW)
125 2 20 850 NTX
Greenfield Road Gang
AD4IH 193 2 12 846 WCF
Sunparlor ARC
VE3SPR 247 2 6 844 ON
Mid-South Amateur Radio Assn
W4EM (+W4RMV)
244 2 55 838 TN
Douglas Cty ARC
WØUK (+KØTOY)
218 2 10 836 KS
Fayette County Skywarn
N8KU 90 2 3 830 KY
Winchester Pioneer ARC
AC4YD 287 2 5 824 KY
HP Boise ARC
AB7HP 233 2 15 822 ID
Emporia ARS
KBØSSR (+WXØU)
131 2 25 812 KS
NCARS Nassau County—ARS
W4NAS 227 2 8 804 NFL
Yellowhead ARC
VE6YAC 293 2 10 786 AB
Whitley County ARC, Inc
N9HM 166 2 12 786 IN
Shawnee Radio Amateurms Comm Team
WBØHAC (+KB8TR)
240 2 6 780 KS
North Berkeley AR Emergency Team
AG4EG 112 2 4 778 SC
Sierra Radio Assn
K6SRA 129 2 5 776 SCV
Lower Yellowstone ARC
W7DXQ 184 2 18 768 MT
Rodeo City RC
N7AAW 78 2 15 756 EWA
Cass County, MO ARES
NØUMP 135 2 7 732 MO
Seaway Valley ARC
VE3VSW 138 2 10 724 ON
Lewis Clark ARC
W7VJD 56 2 13 712 ID
Mine Creek ARC
WAØPPN 127 2 7 704 KS
Schenectady Museum Amateur Radio Assn
W2IR 172 2 10 694 ENY
Thumb ARC
W8AX 152 2 15 688 MI
WB2HBO ARC
WB2HBO 118 2 10 686 NLI
Mesa Verde Area ARC
WØMVC 60 2 22 680 CO
Drumilns ARC Inc
WA2AAZ 77 2 9 656 WNY
ARGYL
K8LHS 96 2 11 642 MI
Dayton North ARC
N8SD 146 2 7 642 OH
Hill Country Mountain Toppers Assn
K5W 94 2 3 642 STX
Southwest Arizona Contest Club
KZ7X 149 2 3 626 AZ
Assn Radio Amateur
VE2MO 192 2 7 590 QC
Ultimate Barefoot Radio Operators
K1OIQ 12 2 3 574 AZ
San Gabriel Valley RC, Inc
W6FU 314 1 10 559 LAX
Moose Amateur Repeater Club
K9SAD 48 2 8 546 IL
Sparta Ridgeview Hams
AB8ND 45 2 5 540 MI
KB9PTI 143 2 8 536 IL
Tioga County ARC
NR3K 167 2 25 534 EPA
Fullerton RC
W6ULI 45 2 5 490 ORG
Altus Area Amateur Radio Assn
AJ5Q 12 2 9 474 OK
Oglethorpe County ARES
KI4ARZ 80 2 12 460 GA
The Jersey Seven
KK4VR 98 2 3 450 VA
PYRO
KC7QHH 122 2 8 444 EWA
Wise Acres RC
K9GBT 34 2 5 420 WI
Lake Wales Repeater Assn
KF4YEA 10 2 23 420 WCF
University of Wyoming ARC
N7UW 344 1 6 394 WY
Joplin ARC
WØIN 46 2 7 392 MO
Delta County ARS
K8ZAS 34 2 4 336 MI
Friendship ARC
KI4FIS 35 2 4 270 NFL

2A Commercial

Xavier University Alumni RC
K8XXU (+K8WBL)
1861 2 21 5,480 OH
Drake ARC
K8UU (+WE8N)
1592 2 12 4,270 OH
WA0DX 861 2 6 2,378 IA
Ft Pierce ARC
K4RS 381 2 27 2,164 SFL
Callaway ARL
KS0B 458 2 15 1,306 MO
Tyler ARC
K5TYR (+W5ETX)
332 2 12 1,298 NTX
West Central Louisiana ARC
W5LSV 349 2 10 1,274 LA
Walker County ARC
WR4Y 696 1 42 1,242 AL
B.G. Hamsters
KC9IL (+W9GAY)
343 2 3 1,056 IL
Creston Valley ARC
VE7RCA 301 2 4 940 BC
Peaver River Radio Assn / Charlotte ARS
WX4E 136 2 25 872 WCF
Sussex/Nanticoke ARCs
K3STR 356 2 20 784 DE
Rowlett RACES
W5R 79 2 9 658 NTX
Tristate ARC
K3TSA 186 2 15 542 NNJ
East Greenbush ARA
W2EGB 270 2 16 540 ENY
Northern Chautauqua ARC
W2SB 59 2 6 540 WNY
Grundy Cty ARC
KL7EP 72 2 11 446 MO
Lawton Fort Sill ARC
W5KS 121 2 24 342 OK
Panther Lake FD Group
N2KF 67 2 4 334 WNY

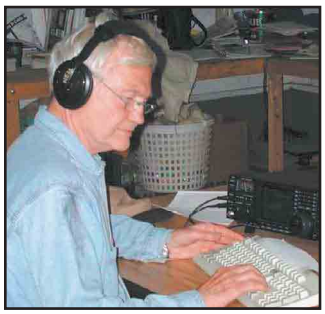
3A Battery

Fannin Cty ARC
K5R (+W5M)
694 5 23 7,205 NTX
Geezer Natomas ARC
W6AW (+N6FR)
1513 2 13 5,270 SV
Muncie Area ARC
N9RI 403 5 23 3,600 IN
Sierra ARC
WA6YBN (+W6PTH)
269 5 7 3,490 SJV
QRP is Us
W7TF 274 5 9 3,075 ID
EPA QRP Club
N3EPA 337 5 15 2,935 EPA
Stamford ARA
W1EE 226 5 34 2,535 CT
ARC of Alameda
KO6JF 203 5 5 2,430 EB
Keno ARC
K7ENO 209 5 18 2,260 OR

3A

Pikes Peak DX Group
W0GG (+W7WM)
4907 2 17 15,936 CO
Rochester DX Assn
W2RDX (+W2AN)
3937 2 35 13,146 WNY
North Shore RC
K9OR (+KK9H)
3561 2 63 12,994 IL
Sarasota Emergency RC/FL Contest Group
NJ4M (+NE4AA)
4190 2 43 12,284 WCF
Sussex County ARC
W2LV (+N2NHN)
3283 2 17 10,852 NNJ
Columbus ARC
N4WV (+KO4RR)
2300 2 39 9,470 GA
Old Barney ARC
N2OB (+N2CW)
2832 2 50 8,920 SNJ
Mitre Bedford ARC / Billerica Amateur Radio Society
W1ON (+N1HY)
2255 2 39 8,506 EMA
Rapahannock Valley ARC
K4TS (+AK1E)
2260 2 51 8,280 VA
Twin City Ham Club
W5EA 2313 2 30 8,018 LA
The Providence Radio Assn
W1OP 2304 2 21 7,906 RI
Sturdy Memorial Hospital ARC
W1SMH (+W1BRM)
2125 2 30 7,656 EMA
Castalia Island DX Assn
K4UP (+W4RMT)
2638 2 7 7,376 NC
Kishwaukee Amateur Radio Cub
WA9CJN (+KG7EV)
1726 2 20 7,256 IL
Contesters of Michigan
N8OS 2385 2 4 7,232 MI
South Orange ARA
K6SOA (+K6WO)
1943 2 95 6,750 ORG
East Bay ARC
W6CUS 1630 2 25 6,578 EB
Regina ARA
VE5NN (+VE5SJA)
1991 2 11 6,560 SK
Tar River ARC
W4DCG 1886 2 25 6,392 NC
Fauquier ARA
W4VA (+W4MOG)
1925 2 30 6,352 VA
McKinney ARC
W5MRC (+K5EEN)
1702 2 88 6,254 NTX
Davis County ARC
K7DAV (+N7CN)
1790 2 60 6,224 UT
OH-KY-IN ARS
K8SCH 2030 2 41 6,212 OH
K5SL (+K5TPG)
1792 2 25 6,190 LA
Amateur Radio Klub of the Arkansas NW
AA5AR 1747 2 10 6,188 AR
Greater Norwalk ARC
N1EV (+W1NLK)
1896 2 35 6,126 CT
Jefferson County ARC
W7JCR (+N7PL)
1515 2 57 6,122 WWA
Hernando County Amateur Radio Assn
K4BKV (+WB4NOD)
1123 2 15 6,012 NFL
Baton Rouge ARC
W5GIX (+K5LSU)
1450 2 25 5,892 LA
Kennebec ARES
W1LEE (+AA1XD)
1658 2 27 5,734 ME
Nassau ARC
K2VN (+KA2FWH)
1286 2 15 5,660 NLI
3M ARC & St Paul RC
W0MR (+K0AGF)
1393 2 40 5,656 MN
K9WJU 1182 2 18 5,598 IN
South Bay ARC / TARECT
W6SBA (+K6TOY)
1552 2 34 5,574 LAX
Medina 2 Meter Group
K8FH (+W8MFU)
1530 2 25 5,526 OH
South Fulton ARES
N4LR 2137 2 12 5,496 GA
MUARA
W9JA 1804 2 9 5,336 WI
Twin Cities Repeater Club
W0BU (+KC0JAF)
1462 2 42 5,262 MN
Bergen ARA
K2BAR 1638 2 16 5,196 NNJ
Susquehanna Valley ARC
W3VPJ 1142 2 15 5,118 EPA
Central Oregon DX Club
W7MT 1466 2 7 5,042 OR
Sterling Park ARC
W4RW (+K4NVA)
1236 2 25 5,042 VA
North Franklin ARS
NF2AR (+WA2MNC)
1135 2 15 5,002 NNY
Delta ARC
W4BS 1295 2 50 4,900 TN
Milford ARC
W8YDK 1625 2 54 4,878 MI
Albemarle ARS
NO4Y 1499 2 42 4,792 NC
Rochester ARC
W0MXW (+K0RGR)
1225 2 47 4,788 MN
Smoky Mt ARC
W4OLB (+KC4PDQ)
1451 2 44 4,764 TN
Hamfesters RC
W9AA (+KB9FQB)
1389 2 25 4,746 IL
Brandon ARS
K4TN (+W4WU)
975 2 42 4,668 WCF
Utah ARC
W7SP (+AC7GR)
1245 2 15 4,654 UT
The Moneypenny Misfits
K8MZ 1266 2 6 4,606 OH
Southern Vermont ARC
K1SV (+K2IIR)
1554 2 30 4,580 VT
Franklin Cty ARC
W4FCR 865 2 20 4,566 VA
ARROW/W8UM
W8UM (+W8PGW)
1279 2 20 4,518 MI
Sudbury ARC
VE3ZI 1219 2 13 4,478 ON
South Bay ARA
KU6S (+KG6HDR)
1034 2 50 4,474 EB
Michiana ARC
W9AB (+KB9ZRX)
1454 2 37 4,462 IN
Brightleaf ARC
W4AMC (+NC4PC)
1094 2 25 4,456 NC
South Canadian ARS
W5NOR 964 2 70 4,414 OK
Big Thunder ARC
WA9GWM 1194 2 15 4,272 IL
Minden Amateur Radio Assn
N5RD 1083 2 34 4,208 LA
BARC JR
AB0YL 1385 2 36 4,184 CO
Dial RC
K8PI 793 2 55 4,166 OH
Poughkeepsie
N2YL 1107 2 8 4,094 ENY
Stonewall Jackson ARA
K8DF 1521 2 14 4,082 WV
Central Missouri RA
K0SI (+N0EG)
1019 2 30 3,996 MO
Aero/BRATS
W3PGA 961 2 20 3,964 MDC
Yonkers ARC
W2YRC (+AB2RI)
917 2 61 3,884 ENY
Xerox ARC
KE2T (+W2XRX)
933 2 16 3,880 WNY
North Ottawa ARC
W8CSO (+N8ARY)
1039 2 35 3,820 MI
Six Meter Club of Chicago
K9ONA 1034 2 20 3,768 IL
Cowichan Valley ARS
VE7CVA 1677 2 10 3,768 BC
Lincoln ARC
K0KKV 1243 2 75 3,768 NE
Sun Parlour Retirees' ARC
VE3OW 1256 2 12 3,746 ON
San Fernando Valley ARC
W6SD 931 2 50 3,734 LAX
Grumman ARC
WA2LQO 1102 2 25 3,724 NLI
Jackson ARC
W5PFC (+W5JWX)
899 2 12 3,690 MS
Clear Lake ARC
NU5M 819 2 82 3,678 STX
West Branch ARA
W3AVK 968 2 8 3,626 EPA
Ashtabula Cty ARC
K8CY 1157 2 16 3,612 OH
Milford ARC
W8MRC 927 2 39 3,550 OH
Springhill ARC
N5II 1038 2 10 3,480 LA
Kennehoochee ARC
W4BTI 874 2 35 3,468 GA
Central Ohio ARES
K8DDG 1396 2 31 3,442 OH
K9CU 959 2 10 3,434 IL
Fredericton ARC
VE9ND 844 2 20 3,432 MAR
Goddard ARC
WA3NAN (+W3ZKI)
1078 2 15 3,416 MDC
Ole Virginia Hams ARC
W4OVH (+WC4J)
964 2 37 3,398 VA
Cumberland Plateau ARC
W4CV 999 2 22 3,368 TN
TTC-ARCH
K4TTC (+K4KEG)
806 2 43 3,362 TN
North East Georgia Amateur RC
NE4GA (+KT4Q)
1000 2 24 3,356 GA
Winterstown Contest Group
KA1VBU (+AI3W)
724 2 5 3,296 EPA
Mt Vernon ARC
K8EEN 1051 2 25 3,282 OH
Rockwall ARC
K5RN 852 2 6 3,238 NTX
Southern Pennsylvania ARC
K3IR (+AA3C)
888 2 18 3,218 EPA
Randolph ARC
NC4ZO (+KD4VGP)
566 2 67 3,170 NC
Bill Hoehl Memorial Contest Group
W4UOT (+WA4ZDS)
592 2 37 3,152 TN
Jupiter Tequesta Repeater Group
WY5I (+AG4BV)
906 2 22 3,108 SFL
Wilson ARC
WC4AR 806 2 12 3,098 TN
Hot Springs ARC
K0HS 669 2 42 3,046 SD
Chicago Suburban RA
N9BAT (+W9CHI)
803 2 30 3,032 IL
Mecklenburg ARS
W4BFB 844 2 25 3,018 NC
Bristol ARC
W4UD 758 2 28 2,956 TN
Pen Bay ARC
W1PBR 655 2 30 2,952 ME
Stillwater ARA
W0JH (+N0YW)
683 2 30 2,944 WI
South Baldwin ARC
W4INU 735 2 22 2,924 AL
QSY Society
K2QS 1024 2 75 2,804 ENY
Lagunatics
K6PD 637 2 4 2,788 SDG
Mt Magazine ARC
W5MAG (+KB5ZTU)
814 2 18 2,780 AR
Laurel Highlands VHF Society, Inc
WA3TVG 504 2 15 2,778 WPA
Long Island Mobile ARC
W2VL 627 2 14 2,748 NLI
St Charles ARC
K0WC (+KC0NLG)
613 2 35 2,746 MO
Chain O'Lakes ARC
W8COL 763 2 20 2,746 MI
Ft Meyers ARC
W4LX (+WA4DQE)
572 2 10 2,742 SFL
River City ARCS
N6NA (+WB6OVH)
758 2 21 2,740 SV
St Louis and Suburban RC, Inc
W0DCW 685 2 43 2,724 MO
Bristol County Repeater Assn
W1ACT (+KB1KLG)
371 2 18 2,686 EMA
Plattsmouth ARC
KB0SMX 556 2 11 2,682 NE
Alamo Area Radio Org
AA5RO (+NU5P)
511 2 74 2,678 STX
Bellbrook ARC
W8DGN 484 2 44 2,662 OH
Tamaqua Wireless Assn
W3CMA 522 2 16 2,650 EPA
Aroostoock ARA
K1FS 760 2 21 2,628 ME
Pacific County ARC
W7RDR 467 2 16 2,602 WWA
West Palm Beach ARC
W4HAW (+AF4OR)
625 2 97 2,600 SFL
Olympia ARS
NT7H 511 2 14 2,566 WWA
Tri-State Amateur Radio Assn
W8VA (+W8OI)
719 2 32 2,562 WV
St Mary's County ARA
K3NHK (+K3HKI)
515 2 28 2,560 MDC
Nacogdoches ARC
W5NAC 607 2 25 2,560 NTX
Butler County AR Public Service Group
K3PSG 754 2 5 2,554 WPA
Southern Counties Amateur Radio Assn
K2BR 520 2 20 2,546 SNJ
Burlington County RC
K2TD (+W2OF)
649 2 17 2,542 SNJ
McDowell ARA
W4HOG 826 2 30 2,542 NC
Society of Newfoundland Radio Amateurs
VO1AA 629 2 50 2,520 NL
Kings County RC
W2RAK 746 2 39 2,516 NLI
Amateur Radio Assn of the Tonawandas
W2SEX 353 2 40 2,512 WNY
Bill Gremillion Memorial RC
K4NRC (+K4PMR)
1220 1 10 2,494 GA
Clallam Cty ARC
W7FEL (+KE7XX)
630 2 46 2,466 WWA
Crawford ARS
W3MIE 574 2 23 2,464 WPA
Cherryville Repeater Assn
W2CRA (+W2WJO)
755 2 25 2,460 NNJ
TRI COUNTY ARC
WC5C 577 2 7 2,414 NTX
Lake Ozark ARC
N0ZS 507 2 23 2,410 MO
Jefferson Co ARC, Orange ARC and Beaumont ARC
W5SSV 477 2 10 2,372 STX
Wichita ARS, Inc
N5WF 437 2 15 2,366 NTX
Runestone ARC
W0ALX (+WB0KVG)
530 2 12 2,356 MN
Chenango Valley ARA
W2RME 462 2 11 2,344 WNY
Bloomfield ARC
W1CWA 489 2 16 2,334 CT
Royal Gorge Ham Club
NC0A 529 2 19 2,330 CO
AARC Jr
KI3DS (+K3ASK)
545 2 11 2,326 MDC
Southern Berkshire ARC
W1BAA/2 (+K1LEE)
410 2 29 2,322 ENY
64-Group
N9EE 630 2 51 2,306 WCF
Central Kansas ARC
W0CY 521 2 30 2,260 KS
Corona Police CSV Team
AC6Y 433 2 10 2,230 ORG
ManCoRad
W9DK 527 2 21 2,226 WI
AE0AA (+N0FV)
517 2 41 2,224 MO
Lower Yakima Valley ARC
KK7OE 687 2 20 2,200 EWA
Cambridge ARA
W8VP 510 2 20 2,190 OH
7-0 Kid's Group
N9OI 730 2 23 2,172 IN

Kaw Valley / NEKSUN
W0CET (+K0HAM)
457 2 58 2,170 KS
Cumberland Valley ARC
W3ACH 396 2 41 2,168 WPA
L'Anse Creuse ARC
N8LC (+K8AYZ)
756 2 25 2,168 MI
The 440 Group
N9WV 528 2 38 2,152 IN
Pioneer Amateur Radio Fellowship
W8CTT (+K8SSO)
455 2 37 2,134 OH
Atchafalaya Amateur DX Assn
WA5MC 321 2 6 2,124 LA
Virginia Appalachian Wireless Asso
W4VAW 633 2 24 2,120 VA
VE3BPQ 558 2 11 2,106 ON
Davenport Radio Amateur Club
W0BXR 468 2 45 2,098 IL
Mercer County ARC
W3LIF 367 2 18 2,096 WPA
Pine Ridge ARC
W0FLO 494 2 16 2,090 NE
Key City ARC
WX5TX 592 2 40 2,080 WTX
Pilot Knob ARC
KS0LV 325 2 22 2,072 KS
Jones Cty ARC
NN0L 567 2 27 2,068 IA
Rip Van Winkle ARS
WD2K 388 2 32 2,032 ENY
Fountain Valley RACES/West Coast ARC
W6WC (+KF6JGX)
615 2 12 2,030 ORG
Newark Amateur Radio Assn
N8ARA (+W8TNX)
649 2 34 1,998 OH
Silvercreek ARA
KI8B 688 2 12 1,996 OH
Willits ARS
W6MMM 504 2 15 1,960 SF
Skyline ARC
K2IWR 441 2 15 1,954 WNY
High Sierra FD Group
WB6W 728 2 10 1,950 SV
Winnipeg ARC
VE4BB 402 2 70 1,920 MB
Park Cty RC
AB0PC 394 2 10 1,910 MT
Lockport ARA
W2RUI 421 2 31 1,896 WNY
Gastonia Area ARC/Gaston Co ARES
K4GNC 324 2 15 1,886 NC
ARCA
NC6I (+KG6ORF)
556 2 8 1,864 SV
Crawford Cty ARC
KD5ZMO 413 2 16 1,856 AR
Ramona Outback ARS
N6AHE 373 2 30 1,804 SDG
Alhambra High School ARC
K6R 363 2 5 1,782 SB
Radio Amateur Downstate IL Org
W9GH 481 2 8 1,780 IL
The Digital Prairie Dogs
AA9UF 466 2 4 1,764 IL
Santa Barbara West County ARES
W9EC 363 2 6 1,758 SB
Ham Assn of Mesquite
WJ5J (+KD5TKO)
473 2 35 1,746 NTX
Tri State ARS
W9OG 532 2 20 1,742 IN
Skyline Tower ARC
W7DTV 627 2 18 1,734 OR
N1PP 488 2 12 1,724 NH
Denton County ARA
W5NGU 510 2 10 1,710 NTX
Shasta Cascade ARS
NC6SV 602 2 12 1,704 SV
West Marin ARS
W6RSI 465 2 8 1,700 SF
Eva ARC
KI4FDU 382 2 17 1,664 AL
Hamilton Cty ARES
K9ZX 284 2 15 1,654 IN
Katy ARS
KT5TX 427 2 13 1,650 STX
Madison-Oneida ARC
W2MO 371 2 17 1,630 WNY
Yodeling Coyote Radio Group
N7A (+KK7RX)
425 2 8 1,626 EWA
TBARC
K8PA (+N8YKG)
389 2 7 1,618 MI
Ramapo Mountain ARC
WA2SNA 414 2 10 1,610 NNJ
Radio Amateur Transmitting Society
W4PQP (+K4AAL)
352 2 33 1,608 TN
Great Bay Radio Assn
W1FZ 223 2 25 1,608 NH
Parkersburg Amateur Radio Klub
N8NBL 258 2 40 1,600 WV
Naval Post Graduate School ARC
K6LY (+W6VIK)
434 2 10 1,570 SCV
East River ARC
W8MOP 483 2 8 1,566 VA
Three River's ARC
WB0GAH 477 2 10 1,558 ND
Monessen ARC
W3CSL 338 2 18 1,554 WPA
London ARC
VE3LAC 571 2 17 1,542 ON
London ARC
VE3LON 571 2 17 1,542 ON
Black Rock Field Day Group
AE6CH 512 2 8 1,524 NV
Calhoun Cty Emergency RC
WX4O 209 2 12 1,518 AL
Martin County ARES/RACES
WX4MC 375 2 34 1,506 SFL
Club Radioamateur Laval Laurentides
VE2CRL 662 2 27 1,490 QC
Nixa ARC, Inc
N0LU 273 2 23 1,484 MO
Flinthills ARC
KB0VAC 487 2 15 1,474 KS
Brownwood ARC
K5BWD 289 2 26 1,472 NTX
Scenic City ARS
AG4HG 302 2 11 1,454 TN
Dallas ARC
W5FC 390 2 45 1,450 NTX
Nashville ARC
K4CPO 413 2 10 1,432 TN
Southeast Missouri ARA
N0A 286 2 15 1,422 MO
Radio Amateurs of Corry
W3YXE 234 2 16 1,418 WPA
Union City ARES / RACES
KV6DC 254 2 15 1,416 EB
Bradenton ARC
K4BRC 182 2 17 1,414 WCF
RECWA
WA2GUG 301 2 5 1,402 ENY
Adams County ARC, Inc
W9DU 246 2 12 1,402 WI
Independent RC
WA6IRC 245 2 20 1,398 SJV
Millbrae ARC
KB6TR 271 2 10 1,382 SCV
Chief Anderson ARC
WA9EOC 210 2 15 1,380 IN
Shenandoah Valley ARC
W4RKC 269 2 12 1,376 VA
Glades Cty/Hendry Cty ARES/RACES
KC4ZD 189 2 8 1,370 SFL
Chattanooga ARC
W4AM 301 2 15 1,366 TN
Yakima ARC
W7AQ 296 2 8 1,358 EWA
Grant Cty ARC
W9EBN 424 2 8 1,348 IN
Koomer Ridge Kontesters
W4K 307 2 5 1,334 KY
East Pasco ARS
K4EX 255 2 8 1,328 WCF
Holmesburg ARC
K3FI 240 2 12 1,326 EPA
Metropolitan ARC
K8NOW 509 2 10 1,318 MI
Fallbrook ARC
N6FQ 377 2 16 1,314 SDG
Mid Island Radio Assn
VE7MIR 300 2 14 1,308 BC
UBET ARC
K7UB 332 2 24 1,286 UT
Pocahauntas ARC
WV8ED 218 2 12 1,286 WV
Sun Country ARS
W4CW 383 2 6 1,276 NFL
Eastern Pennsylvania ARA
N3IS 267 2 15 1,276 EPA
Area Amateur Radio Operators
W9YPS 286 2 11 1,272 IL
Tri-County ARA
K6AGF 250 2 74 1,252 LAX
Sunset Empire ARC
W7BU 213 2 13 1,246 OR
Kootenai Amatuer RS
K7ID 431 2 4 1,238 ID
Juniata Valley ARC
K3DNA 255 2 7 1,238 WPA
Natchaug ARC
NA1RC 361 2 20 1,230 CT
PanoramaLand ARC
K7JAR (+KD7IBE)
309 2 20 1,230 EWA
Quality Amateur Radio Klub
KX7YT (+KD7YCU)
234 2 4 1,224 OR
Red River Valley ARC
WB5RDD (+N5FVN)
287 2 18 1,224 NTX
Tulare County ARC
WA6BAI (+AA6R)
259 2 6 1,218 SJV
WC8OH 161 2 35 1,198 OH
W7HDI 781 1 8 1,194 ID
Charles County ARC
K3SMD (+N3YRZ)
218 2 16 1,190 MDC
Columbus ARC
WV9W 233 2 23 1,186 IN
Lincoln Co Amateur Radio Assn
W4BV (+KA4WOG)
145 2 8 1,186 TN
Saratoga Cty RACES
WA2UMX 306 2 15 1,178 ENY
Deep East Texas ARC
W5IRP 312 2 18 1,176 STX



Tod, K0TO, brought more than just an IC-756 PROII. He brought decades of Field Day experience to station W0AA, the Minnesota Wireless Association FD operation.

Limestone ARES
N4SEV (+K4TRB)
235 2 26 1,170 AL
Gateway ARC
W4KP 86 2 13 1,170 KY
Kansas-Nebraska RC
K0KSN 168 2 29 1,168 KS
Mercer Island Radio Operators
W7IAG 154 2 9 1,162 WWA
Laurel ARS
KJ4ND 272 2 20 1,160 KY
Orchard City ARC
VE7OGO (+VE7JPS)
220 2 12 1,142 BC
Rolla Regional ARS
W0GS 249 2 25 1,136 MO
Morgan Cty ARES Group
KC0LZD (+N0AYI)
81 2 18 1,112 MO
The Sunset Group
K6TSG 351 2 3 1,102 LAX
Champaign Amateur Net
WB8UCD 347 2 21 1,094 OH
Victoria & Coloto Creek ARC
W5DSC 193 2 20 1,092 STX
Top of Michigan ARC
AA8PQ 293 2 7 1,086 MI
Gladwin Area ARC
KB8ZML 288 2 25 1,076 MI
Bluestone ARC
KC8CNL 226 2 15 1,052 WV
Dauberville DX ASSN
K3TI 338 2 16 1,042 EPA
Tulsa Repeater Org
WA5LVT 170 2 67 1,040 OK
Portage ARC, Inc
KJ3O 150 2 19 1,040 OH
Rowan ARS
W4EXU 240 2 6 1,040 NC
Sweetwater ARC
WY7U 265 2 21 1,030 WY
C^5
KI7EL 131 2 3 1,024 WWA
Mystic Valley Amateur Radio Org
N1MV 85 2 25 1,020 EMA
Citrus Cty ARES
N4EK 190 2 5 1,020 NFL
Fort Armstrong Wireless Assn
K3TTK 201 2 12 1,008 WPA
KB0UAA 134 2 13 972 CO
Dirty Dawg Group
K9WJ 286 2 12 972 IN
Mile High RC
K6GUN 80 2 33 960 ORG
Fayette County Repeater Assn / ARES
W4PSZ (+W4PSZ)
133 2 20 916 GA
N7VIV (+AC7BF)
180 2 12 910 ID
Leisure World ARC
W6LY 105 2 11 910 ORG
Umpqua Valley Amateur RC
K7AZW (+KB7WDR)
205 2 5 904 OR
Dalton ARC
W4DRC (+KU4OO)
141 2 19 882 GA
Calhoun County ARA
WB4GNA 109 2 27 878 AL
Radio Amateurs of the Gorge
KC7KLB 132 2 42 864 OR
WW4M 197 2 7 814 NC
Austin Area ARC
W0AZR 213 2 9 778 MN
West Desert ARC
W7EO (+KD7FXS)
61 2 18 772 UT
Palatone PEMA
W9CJS 86 2 4 772 IL
KB1IIF 97 2 7 744 EMA
W6LDS 72 2 23 694 LAX
CDF Volunteers in Prevention
WB6FRM 122 2 4 694 SCV
Hart House ARC
VE3UOT 120 2 12 610 ON
Adams County ARES
KI0LA 99 2 10 548 CO
The Three Amigos
W2OIL 116 2 3 532 NNJ
Assn des Radioamateurs Indépendants
VE2REG 205 2 10 460 QC

3A Commercial

Southwest Dallas County ARC
W5AUY (+W5WB)
1815 2 42 7,708 NTX
Pottstown Area ARC
K3ZMC 1351 2 23 4,990 EPA
K2RF (+K2EFK)
1491 2 40 4,908 NNJ
Newton and Hesston College ARCs
N0NK (+K0HC)
1014 2 22 4,140 KS
Radio Assn of Western New York
W2PE 489 2 13 2,188 WNY
Adams County ARS
W3KGN (+K3DCS)
336 2 12 1,676 EPA
Radio Operators of South Texas ARC
W5ROS (+N5RL)
547 2 11 1,666 STX
New York City Transit RC
K2IRT 422 2 6 1,318 NLI
Hillsdale County ARC
K8HRC 333 2 31 1,224 MI
Macon County ARC
N0PR 255 2 17 938 MO
High Point ARC
W4UA 297 2 26 864 NC
Peninsula Radio Operators Society
W3PRO 145 2 26 842 MDC
Henry Cty RS of Tennessee
W4JPG 136 2 14 662 TN
Midway ARC
W0KY 155 2 10 310 NE
VE2CBF 40 2 10 80 QC
Yadkin Valley ARC
KE4YVF 38 2 6 76 NC

4A Battery

Pina Colada Contest Club
KP2AA (+NP2B)
3400 5 11 25,630 VI
Summit ARA
K3ZZ 1184 5 9 9,685 MDC
Zuni Loop Group
N6GA 900 5 7 9,035 LAX
Lockheed ARC
W5IU (+WK1C)
775 5 51 7,495 NTX
Portland ARC
W7LT 681 5 21 7,210 OR
St Louis QRP Society
NF0R 343 5 20 4,480 MO
Montachusett ARA
W1GZ (+W1SEX)
493 5 20 4,175 WMA
Boeing Employees ARS (Seattle)
K7NWS 343 5 20 3,500 WWA
Northern Virginia QRP Group
WA4MM 261 5 15 3,375 VA
DeKalb County ARC
W4GBR 248 5 13 3,235 AL
QCWA 162 WI
K9AKG 179 5 12 2,320 WI

4A

N7OS (+N7IH)
3517 2 30 11,172 WWA
Colorado Mountain Moguls
W0DZ (+W0HDD)
2717 2 21 9,618 CO
Roanoke Valley ARC
W4CA (+KK4HR)
3163 2 10 8,980 VA
Boeing Employees ARS
W0MA (+KC0QFU)
2254 2 24 8,538 MO
Cuyahoga Falls ARC
W8VPV 2531 2 31 8,322 OH
San Andreas Faultline Survivors
W6SW (+W6KC)
2651 2 15 7,584 SJV
Alford Memorial RC
W4BOC (+KF4VBR)
1518 2 50 7,522 GA
Birmingham ARC
W4CUE (+KQ4JC)
2012 2 97 7,242 AL
Westchester Em Com Assn
N2SF (+KC2GWK)
2210 2 60 6,954 ENY
Des Moines RAA/ARCS
W0AK 1761 2 58 6,846 IA
Schaumburg ARC
N9RJV (+KB9YUM)
2003 2 35 6,614 IL
Murgas ARC
K3YTL 1990 2 31 6,396 EPA
Peel ARC
VE3XR (+VE3HPC)
1681 2 25 5,942 ON
Kankakee Area RS
W9AZ (+N9FO)
1626 2 8 5,844 IL
Antelope Valley ARC
K6OX (+AE6GA)
1703 2 41 5,760 LAX

Easton ARS
K3EMD 1567 2 16 5,724 MDC
Garlic Valley ARC
W6GGF 1478 2 16 5,704 SCV
Orange County ARC
W6ZE 1792 2 35 5,666 ORG
W5DPA 1246 2 30 5,476 STX
Scottsdale/Tbird ARC
K7TR 1546 2 20 5,034 AZ
Hamilton ARC
VE3DC 1451 2 19 4,918 ON
Red Ryders
KW8G (+K8OWS)
1383 2 14 4,910 MI
Eau Claire ARC
W9EAU (+KG9RA)
1274 2 20 4,840 WI
Anne Arundel RC
W3VPR (+N3EF)
1323 2 73 4,710 MDC
Big Rapids Area ARC Inc
N8OE 1111 2 15 4,544 MI
Mid-Atlantic RC
W3NWA 1532 2 42 4,288 EPA
Albany ARA
K2CT 1103 2 38 4,262 ENY
Santa Cruz County ARC
K6BJ 945 2 23 4,120 SCV
Twin State RC
W1FN (+KU1R)
1334 2 26 4,094 NH
NQ4C (+AF4YJ)
796 2 25 4,084 KY
Salem ARC
W7SAA 1054 2 50 3,924 OR
Northwest Society of Amateur Radio
W7DU (+KD7WBP)
916 2 26 3,916 WWA
Plano ARC
K5PRK (+AD5NR)
1196 2 60 3,892 NTX
Peconic ARC
W2AMC 1048 2 23 3,714 NLI
Wireless Assn of South Hills
N3SH (+WA3SH)
860 2 30 3,692 WPA
EFFECT
N8LH 1069 2 15 3,658 MI
Alliance ARC
W8LKY 968 2 22 3,644 OH
MCARA
W5CR (+W5ACS)
805 2 34 3,614 MS
RA Of Erie
W3GV 1043 2 22 3,606 WPA
Milton ARC
W4VIY 923 2 16 3,602 NFL
Greater Vancouver Radio Group
VE7VRG 1034 2 10 3,516 BC
Hot Spicy Mustard
K4HSM (+N4RPR)
843 2 37 3,498 TN
Coquitlam & Burnaby ARC
VE7BAR 832 2 15 3,480 BC
Warminster ARC
K3DN 1015 2 33 3,476 EPA
Kent Cty ARC
W3HZW (+AA3ZH)
910 2 24 3,266 DE
Portsmouth ARC
W4POX (+W4ROB)
700 2 32 3,202 VA
Troy Amateur Radio Assn
N2TY 783 2 42 3,062 ENY
Island County ARC
W7AVM 799 2 30 3,024 WWA
Lanierland ARC
W4ABP 657 2 18 2,916 GA
Satellite ARC
W6AB 633 2 13 2,898 SB
Clay/Lowndes/Magnolia
AA5MT (+K5VVA)
836 2 27 2,876 MS
Oakland Radio Communication Assn
WW6OR 719 2 25 2,838 EB
Columbia ARC & Palmetto ARC
W4MN (+KA4TWK)
717 2 42 2,758 SC
Tri-Lakes ARC
KC0M 615 2 10 2,670 MO
Golden Triangle ARC
W6GTR (+KN6DF)
737 2 60 2,658 ORG
Metro/SPARC
W4BPH 609 2 25 2,646 WCF
Southern Pennsylvania Comms Group
K3AE 755 2 35 2,638 EPA
Lake Cty ARES/Lake ARA
N4FLA 460 2 36 2,602 NFL
Riverside Radio Amateur
KC8YXF 565 2 21 2,582 MI
Redmond ARES
W7QT (+KC7OIO)
538 2 50 2,558 WWA
Middle Georgia RA
WR4MG 843 2 25 2,556 GA
Central IL RC
W9AML 711 2 22 2,548 IL
Peoria Area ARC
W9UVI 681 2 16 2,544 IL
Nutley ARS
W2GLQ 598 2 20 2,512 NNJ
WAARCI
W0AU 856 2 15 2,512 MO
Iowa Hammers
KJ0L 755 2 12 2,512 IA
Middlesex ARS
W1EDH 623 2 16 2,496 CT
Boston ARC
W1BOS 529 2 20 2,484 EMA
Wood County Em Com
WC8EC 517 2 25 2,478 WV
Coachella Valley ARC
NR6P 398 2 71 2,468 ORG
North Bay ARA
NN6MI 394 2 49 2,332 EB
Chippewa Valley VHF Contesters
N9TTX 607 2 16 2,312 WI
Palisades ARC
W9IW 702 2 26 2,284 IL
Seneca RC
W8ID (+KF8GD)
439 2 34 2,250 OH
Hocking Valley ARC
K8LGN 409 2 50 2,234 OH
Amador County ARC
K6ARC (+N6KD)
439 2 12 2,196 SV
Poinsettia ARC
W6CEV 380 2 12 2,184 SB
Lakeway ARC
W2IQ 657 2 29 2,156 TN
MCARS / TORC
WO4C 329 2 20 2,086 AL
KZ9B Field Day
KZ9B 401 2 37 2,070 WI
PVRA
N1XG 772 2 20 2,070 CT
RAGS/Liverpool Amateur Repeater Club
W2AE 488 2 44 2,048 WNY
Broward County ARES/RACES
N4CU 522 2 35 2,046 SFL
Skyview RS
K3MJW 348 2 20 2,020 WPA
Mount Diablo ARC
W6CX 361 2 25 1,972 EB
Bridgerland ARC
W7IVM 585 2 25 1,970 UT
Hoosier Hills Ham Club
W9QYQ 376 2 17 1,962 IN
Tri-County CW ARC
W3TCW 464 2 24 1,958 WPA
Flagler Palm Coast ARC
W4FPC 377 2 29 1,952 NFL
K4KJQ 548 2 17 1,950 KY
Yolo ARS
W6EO 460 2 14 1,926 SV
BARK/MRCN
VO1BRK 252 2 10 1,920 NL
IUA Squared
W5IUA 528 2 14 1,912 NTX
Durham FM Assn
NC4FD 506 2 25 1,898 NC
Bridgerland ARC
N7RXE 585 2 20 1,870 UT
Simi Settlers ARC
W6SVS 420 2 33 1,866 SB
Jefferson County Radio Amateur Club
KC2ELX 436 2 10 1,844 NNY
Southwest Metro ARTS
N0EN 631 2 15 1,772 MN
Upper Valley ARC
K8FBN 221 2 41 1,758 OH
Barry Amateur Radio Assn
KC8VTO 316 2 25 1,748 MI
Fulton County ARC
K8BXQ 443 2 15 1,738 OH
Radio Amateur Club of Knoxville
W4BBB 347 2 48 1,724 TN
Starke County ARC
W9JOZ (+KA4HWX)
374 2 12 1,720 IN
Boeing Employees ARS (Kansas)
KC0AHN (+KC0QIE)
247 2 20 1,694 KS
Triangle East Amateur Radio Assn
WA4UQC (+W4EOT)
316 2 12 1,692 NC
Montgomery ARC
KV3B (+KB3ITA)
275 2 32 1,610 MDC
Toothless Talkers
N8IVE (+KC8TAP)
554 2 17 1,608 OH
Pahrump Amateur Radio Repeater Assn
W7NYE 294 2 16 1,604 NV
Horseshoe ARC
K3HRC 285 2 25 1,554 WPA
KB1DNI 422 2 8 1,544 CT
Laughery Valley ARC
W9CIT 513 2 8 1,526 IN
Southeast Metro ARC
W0CGM 336 2 18 1,492 MN
Pasadena RC
W6KA 344 2 67 1,488 LAX
K6LRC 288 2 16 1,410 SV
Roane Cty ARC
KE4RX 300 2 8 1,382 TN
Hoffman Estates ESDA
W9BSA (+KA9QPY)
264 2 23 1,328 IL
Fayette County ARES
AG4CM 246 2 5 1,320 KY
Russell Co Va ARC
WR4RC 309 2 25 1,290 VA
Tri-State ARC KC0ROC
AB0GL 156 2 25 1,270 NE
Hall of Science ARC
WB2JSM 376 2 15 1,252 NLI
Schoharie Co ARA/RACES
WA2ZWM 88 2 52 1,176 NNY
Riverland ARC
WR9ARC 135 2 16 1,142 WI
Whitman ARC
WA1NPO (+N1SOM)
257 2 23 1,114 EMA
Riverside San Bernardino Counties Satern
W1SAT (+AE6JM)
46 2 4 1,012 ORG
Central Mass ARA
W1BIM 230 2 7 960 WMA
Everglades ARC
W4SVI 149 2 20 914 SFL
VE6CWM 78 2 14 806 AB
Laurentain Field Day Group
W0EL 83 2 5 766 MN
Chelsea ARC, Inc
W8C 308 2 6 682 MI

4A Commercial

Anthracite Repeater Assn
W3SJI 1140 2 20 3,298 EPA
Plateau ARA/HamJones DXA
WV8T 902 2 15 3,038 WV
Richmond ARC
W4ZA (+K4RKO)
266 2 20 1,174 VA
Black Diamond ARC
W8HY 292 2 20 984 WV
TRAC
VE3RAT 408 2 10 816 ON
Quaboag Valley ARC
W1NP 96 2 9 692 WMA
LCARES, CCARES, CVRC
NV7LC 171 2 7 626 NV

5A Battery

Dickson Cty ARC
WC4DC (+NY4N)
1184 5 15 9,215 TN
Durham Region QRP Club
VE3QDR 816 5 6 8,245 ON
Indian River ARC
W4NLX (+KF4FNZ)
461 5 30 5,650 SFL
Orange County Radio Amateurs
W4EZ (+N4PRC)
642 5 21 5,135 NC
North Coast ARC
N8NC 429 5 30 2,895 OH

5A

Huntsville ARC
K4BFT (+KB3DXR)
4993 2 45 15,754 AL
Ozaukee RC
W9LO (+AA9WW)
3986 2 38 13,676 WI
Loudoun ARG
K4LRG 2834 2 35 11,078 VA
Hams of Gainesville
K4EAC (+KE4YZE)
2747 2 35 9,726 NFL
Cherryland ARC
W8TCM (+KC8UPW)
3076 2 30 9,668 MI
United Radio Amateur Club
K6AA (+KG6RRR)
3439 2 35 9,152 LAX
Vienna Wireless Society
K4HTA (+K4XY)
2205 2 96 8,738 VA
Contoocook Valley RC
K1BKE 2601 2 18 8,044 NH
Kanawha ARC
W8GK (+KB8HNN)
2248 2 15 7,954 WV
Raleigh ARS
W4DW 2590 2 31 7,682 NC
Virginia Beach ARC
W4UG (+KI4BBL)
1685 2 65 6,724 VA
Four Lakes ARC
W9JZ 1754 2 20 6,498 WI
Hoodview ARC
W7Q 2041 2 40 6,478 OR
Schenectady ARA
K2AE (+W2XM)
1755 2 60 6,394 ENY
Wichita (KS) ARC
W0SOE 1575 2 32 6,158 KS
Marshall Co ARES Club
W8CAL 1427 2 15 5,804 WV
Hannibal ARC and Western IL ARC
W0KEM 1363 2 35 5,656 MO
Burley ARC
N7IG (+W5QQQ)
1333 2 26 5,530 WWA
Fort Smith Area ARC
W5ANR 1583 2 50 4,964 AR
VE3VM 1948 2 25 4,962 ON
Butler County Amateur Radio Assn
W3UDX (+AA3YW)
1281 2 27 4,888 WPA
York Region ARC
VE3YRA 1348 2 37 4,652 ON
Northern Berkshire AM RC
N1WM 972 2 30 4,434 WMA
Kokoo Amateur RC
W9GO 987 2 30 4,422 IN
Cambridge ARC
VE3SWA 1237 2 7 4,334 ON
RF Hill ARC
W3AI 1284 2 27 4,190 EPA
Fort Wayne RC
W9TE (+KB9WWM)
1091 2 40 4,170 IN
Kant Amateur RS
K3ARS (+N3WGC)
826 2 12 4,082 MDC
Milledgeville ARC
W4PCF 806 2 19 3,746 GA
Great Plains Amateur Radio Assn
KJ0Z 1455 2 12 3,728 NE
Bellevue ARC
W0WYV 729 2 12 3,726 NE
Holland ARC
K8DAA (+N8XPQ)
1023 2 10 3,704 MI
Antietam RA
W3CWC (+W3HAM)
851 2 51 3,666 MDC
Mt Vernon ARC
K4US (+WA4GFW)
1022 2 28 3,564 VA
Monongalia Wireless Assn
W8MWA 731 2 25 3,560 WV
Midland ARC
W8KEA (+WX8KEA)
820 2 15 3,318 MI
Citrus Belt ARC
W6JBT 664 2 40 3,132 ORG
Marinette & Menominee ARC
W8PIF 1409 1 22 3,082 MI
Clark County ARC
W7AIA (+K7JAO)
580 2 13 3,082 WWA
ARC of El Cajon
WA6BGS (+WS6F)
1149 2 26 3,048 SDG
White Water Valley ARC
N9JM 1067 2 29 3,034 IN
CARS & ARCS Joint Field Day
K4S 826 2 35 3,014 GA
North Fulton Amateur Radio League
NF4GA 569 2 45 2,670 GA
Skywide ARC
VA3SKY 642 2 20 2,608 ON
Wisconsin Valley RA
W9SM 474 2 15 2,562 WI
The Northern Ohio ARS
K8KRG (+KM8B)
627 2 20 2,470 OH
Highlands Cty ARC
K4W 493 2 10 2,250 WCF
Saginaw Valley Amateur Radio Assn
K8DAC 503 2 7 2,234 MI
Chesapeake ARS
W4CAR 354 2 15 2,228 VA
Kings County Repeater Assn
KC2RA 563 2 13 2,226 NLI
Mid Ohio Valley ARC
AB8S 273 2 20 2,154 OH
Kachina ARC
W7EH 424 2 32 2,080 AZ
Triple 'A' ARA
AC3J 538 2 14 1,826 WPA
Ottawa Valley Mobile RC
VE3RAM 359 2 30 1,824 ON
Mt Shasta ARC
W6BML 458 2 10 1,816 SV
Johnston ARS
K4SWR 356 2 20 1,808 NC
AREA
W9YPC 272 2 10 1,760 IL
Calaveras ARS
WA6YGA 409 2 12 1,754 SJV
Tuolumne County AR Electronics Society
K6YV 351 2 7 1,652 SJV
Pioneer ARC
K0JFN 483 2 25 1,644 NE
K6JP 297 2 10 1,586 LAX
Toledo Mobile RA
W8HHF (+KC8TVW)
163 2 10 1,548 OH
Fort Herkimer ARA
KB2UYI 246 2 24 1,478 WNY
Otero County ARES/Arkansas Valley ARC
N0QKE 138 2 20 1,334 CO
K0BVC 275 2 5 1,100 IA

5A Commercial

Falls ARC
K9RHH 846 2 9 2,992 WI
Milwaukee Radio Amateurs Club
W9RH (+AB9CD)
515 2 36 1,616 WI
La Grange ARC
AB4GA 593 2 14 1,448 GA

6A Battery

NM FD Coalition
AA5B 1643 5 6 16,445 NM
Knightlites
WQ4RP 269 5 15 3,050 NC

6A

Western ARA
N6ME (+N6VNI)
4361 2 35 14,984 ORG
Mike and Key
K7LED (+K7OV)
4876 2 64 14,634 WWA

South Jersey Radio Assn
K2AA (+W2EA)
3976 2 74 13,852 SNJ
Central KY ARS
AA4NJ 2254 2 14 7,942 KY
Eastern CT ARA
K1MUJ (+N1MD)
2036 2 34 7,192 CT
Kalamazoo ARC
W8VY (+K8KZO)
1853 2 25 6,240 MI
K6BB 1456 2 20 5,696 ORG
DuPage ARC
W9DUP (+KC9AOP)
1957 2 26 5,668 IL
Wabash Valley ARA
W9UUU (+K9IKQ)
1319 2 58 5,316 IN
DCARA/TARC.WAARS/UAARC
N4A 1616 2 30 5,310 AL
Lake Monroe ARS
N4EH (+KL7IV)
1371 2 73 5,176 NFL
Nortown ARC
VE3NAR 1553 2 15 5,004 ON
Philmont Mobile RC
W3EM (+W3PSH)
998 2 20 4,868 EPA
Columbia-Montour ARC
WC3A (+N3IRN)
910 2 15 4,798 EPA
Orlando ARC
N4E 1139 2 47 4,572 NFL
Andrew Johnson ARC
W4WC (+W4GRV)
1140 2 31 4,346 TN
Alexandria RC
W4HFH (+N4GWT)
805 2 25 3,522 VA
Starved Rock RC
W9MKS 551 2 56 3,398 IL
W8CDZ 673 2 8 3,340 MI
Golden Empire Amateur Radio Society, Inc
W6RHC 732 2 25 3,012 SV
ARALB
W6RO (+K6CHE)
834 2 77 2,980 LAX
Waterville Area Wireless Assn
WA1WA 330 2 9 2,520 ME
Sangamon Valley RC
W9DUA 688 2 10 2,520 IL
Orange Cty (NY) ARC
W2HO 570 2 90 2,476 ENY
North Hills ARC
W3EXW 414 2 64 2,372 WPA
20/9 ARC
K8TKA 582 2 29 2,198 OH
Keuka Lake ARA
AI2U (+KB2WEY)
286 2 18 2,112 WNY
Overlook Mtn ARC
K2LF 259 2 15 1,718 ENY
Tipp City Radio Amateurs
K8ZC 254 2 11 1,494 OH

7A Battery

David Sarnoff ARC
N2RE 449 5 52 5,230 SNJ

7A

RC of Tacoma
W7DK (+W7OS)
2818 2 12 10,062 WWA
W6TRW ARC
W6TRW (+KQ6CG)
3222 2 60 9,998 LAX
Hampden County Radio Assn
W1NY (+NE1C)
3094 2 90 9,910 WMA
Lake County Amateur Radio Assn
N8BC 2570 2 17 9,364 OH
W9CEQ (+W9NE)
1755 2 47 6,606 IL
W8ZHO 1115 2 52 4,930 MI
South Pickering ARC
VE3SPC 1122 2 20 4,744 ON
SARS
W6CO (+KO6FR)
933 2 16 4,410 EB
Western Carolina ARS
W4MOE (+KG4KML)
796 2 25 3,594 NC
BEARS of Manchester
W1BRS 695 2 39 3,316 CT
Kitchener-Waterloo ARC
VE3IC 728 2 25 3,216 ON
Central NH ARC
W1JY (+W1CNH)
749 2 30 3,072 NH
Northern Kentucky ARC
K4CO (+KG4HMO)
708 2 24 3,018 KY
Mario ARC
W8GVB (+W8VDD)
611 2 35 2,982 OH
Kendall ARS
KB5TX 598 2 20 2,860 STX
Cherokee Capital ARS
K4WOC 293 2 31 2,088 GA
Sterling Rockfalls ARS
W9MEP 360 2 12 1,620 IL

8A Battery

Alameda Cty RC
N6WG 749 5 30 6,730 EB

8A

AK-SAR-BEN ARC and Heartland DX Assn
K0USA 3269 2 37 12,040 NE
Cuyahoga ARC
NO8A 1307 2 27 5,346 OH
Gwinnett ARC
W4GR 916 2 73 4,760 GA
Delco Dug/MNARC/Mobile Sixers/DCARA
N3IP 920 2 88 4,230 EPA
Mahoning Valley Amateur Radio Assn MVARA
W8QLY 786 2 35 3,480 OH
Ventura County ARC
K6MEP 120 2 11 1,704 SB

9A Battery

Delta ARS
VE7SUN 439 5 15 5,385 BC

9A

N4N FD Group / Paulding ARC
N4N (+KE4UW)
3831 2 39 12,476 GA
Gloucester County ARC
W2MMD 2132 2 22 8,816 SNJ
Mississauga ARC
VE3MIS 2116 2 21 7,884 ON
Stanislaus ARA
W6ERE (+W7LTM)
415 2 23 2,624 SJV

10A Battery

West Valley ARA
W6PIY 1081 5 16 10,240 SCV

10A

Carroll County ARC
K3PZN (+N5LBJ)
2808 2 34 8,192 MDC

11A Battery

Utica Shelby Emerg Comm Assn
K8UO 1363 5 11 12,850 MI

11A

Wheaton Community Radio Amateurs
W9CCU (+N9HDW)
2162 2 66 7,802 IL
Crawford Cty ARC
W8BAE 1289 2 48 3,784 OH
Kern County Central Valley ARC
W6LIE 739 2 75 3,608 SJV

11A Commercial

Ripley Cty Repeater Assn
NX9E 707 2 21 2,444 IN

12A

Woodbridge Wireless
W4IY (+W4ZY)
6583 2 55 21,002 VA
10-70 Repeater Assn, Inc
N2SE (+W2MLS)
1857 2 75 8,234 NNJ

14A Battery

Ventura County ARS
N6R 963 5 32 9,390 SB

14A

El Dorado Cty ARC
AG6AU 930 2 35 4,526 SV

21A

Nashua Area RC
N1FD (+N1NH)
3467 2 55 12,984 NH

50A

Potomac Valley RC and Columbia ARA
W3AO (+K3EF)
9304 2 60 32,372 MDC

1B-1 Op Battery

W4ZV 533 5 1 5,680 NC
WQ0RP 532 5 1 5,670 MN
K5WNH 501 5 1 5,160 NTX
VE3AGC 412 5 1 3,610 ON
W3TS 313 5 1 3,530 EPA
WA8REI 306 5 1 3,440 MI
N5ESE 327 5 1 3,420 STX
KE0G 328 5 1 3,380 MN
K4RDU 323 5 1 3,330 VA
K6AX 305 5 1 3,270 SCV
K7IA 280 5 1 3,100 NM
VA3DF 287 5 1 3,025 ON
WA8VNE 284 5 1 2,990 MI
KI0II 249 5 1 2,940 CO
WU0L 273 5 1 2,930 WY
W0YHE 277 5 1 2,870 MN
W3CB 207 5 1 2,770 MDC
Philips ARC
W1HP 226 5 1 2,705 AZ
N7RVD 230 5 1 2,550 EWA
K4BYF 203 5 1 2,480 WCF
N1EI 222 5 1 2,470 CT
N0FKC 176 5 1 2,410 MN
AB2AN 202 5 1 2,320 NNJ
KD6RDO 187 5 1 2,170 SB
KD2JC 203 5 1 2,130 NNJ
AA9DH 177 5 1 1,970 IL
K7ZD 165 5 1 1,900 AZ
AD7L 169 5 1 1,840 OR
AC4XO 152 5 1 1,720 VA
KF0UU 107 5 1 1,670 MN
W0RT 144 5 1 1,540 KS
W0CZ 131 5 1 1,510 ND
W3WT 101 5 1 1,325 EPA
K2KGJ 110 5 1 1,300 ENY
N4ECI 201 5 1 1,255 VA
N9GG 108 5 1 1,230 DE
AA0BQ 109 5 1 1,190 MN
K5SI 105 5 1 1,150 STX
K3TW 66 5 1 1,045 MDC
K6CU 89 5 1 1,040 ORG
WB6QZK 74 5 1 970 LAX
W1PID 60 5 1 900 NH
W7VN 78 5 1 880 OR
N8MFN 81 5 1 870 OH
WD9EWK 81 5 1 855 AZ
AA7IH 74 5 1 840 OR
XE1KK/3 134 5 1 820 DX
K0CD 91 5 1 805 WI
W3BIG 99 5 1 795 EPA
AB4VF 57 5 1 770 NFL
WB2WZC 56 5 1 750 NNJ
N0ZB 28 5 1 730 AR
K1UZM 102 5 1 710 EPA
W7KU 75 5 1 695 MO
N0DA 32 5 1 670 OR
VE3CG 35 5 1 650 ON
KC0CCR 4 5 1 640 KS
VE3FME 52 5 1 610 ON
K9SKX 59 5 1 595 IL
N4XPX 29 5 1 590 NC
N4IY 45 5 1 580 WTX
N8UW 42 5 1 570 OH
WD6BGN 11 5 1 555 MO
KC8WJE 44 5 1 550 OH
ISS Amateur Radio Station
NA1SS 53 5 1 465 DX
WB6MMQ 35 5 1 425 LAX
KB8PMY 35 5 1 425 OH
N8XMS 31 5 1 410 MI
NG5G 11 5 1 405 NTX
KC8SQC 11 5 1 360 MI
NR9T 24 5 1 340 IL
AB2KT 27 5 1 320 WMA
W0OOW 26 5 1 310 NE
KC9DEF 2 5 1 270 WI
KI0NY 11 5 1 255 CO
N3JWJ 10 5 1 250 MI
KA6FBB 14 5 1 240 ORG
KK6C 14 5 1 220 MT
ISS Amateur Radio Station
RS0ISS 3 5 1 215 DX
KG6VDI 1 5 1 205 ORG
VE3HHT 10 5 1 200 ON
AA9PW 10 5 1 200 MI
N2BWC 12 5 1 170 SDG
KC8SPQ 9 5 1 145 WV
KG6TGI 8 5 1 90 ORG
WA5ZNU 1 5 1 60 SCV

1B-1 Op

N0AT 1429 2 1 6,250 MN
WA1LNP 1045 2 1 4,280 NH
K7MI 1093 2 1 3,554 OR
K3ONW 795 2 1 3,280 EPA
N4UF 559 2 1 2,336 NFL
W4AWM 867 2 1 2,284 VA
WR2G 338 2 1 2,034 NNJ
WB8EJN 406 2 1 2,022 MO
K6SB/7 425 2 1 1,958 NV
WA8RC 375 2 1 1,900 MI
AI1D 342 2 1 1,718 CT
KV2X 350 2 1 1,466 NNY
W6MTC (WM6J, op)
177 2 1 1,408 ORG
N7VVL 409 2 1 1,268 AR
KE9GM 270 2 1 1,180 IN
K3HH 286 2 1 1,156 MDC
KU4MH 224 2 1 1,060 VA
K0HW 448 2 1 1,046 SD
N7ICK 201 2 1 1,004 OR
W1QK 435 2 1 970 NH
WB6FDY 281 2 1 934 UT
KC7PK 322 2 1 894 NV
W0XR 367 2 1 888 CO
WS2N 176 2 1 874 NLI
VO2/K2FRD 177 2 1 858 NL
W8OHR 146 2 2 684 MI
KB2EBL 202 2 1 656 VT
WB6BMV 249 2 1 648 SDG
K0RFD 151 2 1 552 CO
K0HCV 147 2 1 544 KS
K6WX 153 2 1 506 NM
K6AIA 173 2 1 496 SV
WA6WPG 57 2 1 494 SB
K0NR 118 2 1 490 IN
N7CFO 118 2 1 436 EWA
W7HD 114 2 1 428 AZ
WA7O 130 2 1 410 EWA
KH6/K4IQJ 79 2 1 406 PAC
VE2FQH 135 2 2 370 QC
VA2DA 33 2 1 366 QC
K2HVE 68 2 1 336 NNJ
W9TQV 68 2 1 336 WI
KC0MWM 41 2 1 332 NE
WA4UF 23 2 1 296 WCF
N0BHT 71 2 1 292 CO
P4/WA3ELQ 32 2 1 264 DX
KX7DX 78 2 1 256 EWA
KG6TDX 31 2 1 212 SV
N8HZL 61 2 1 172 MI
VE3EDX 34 2 1 168 ON
W0KIE 23 2 1 146 OK
VE3BKZ 21 2 1 142 ON
WA7TPB 2 2 1 104 WWA

1B-1 Op

K2FA 586 2 1 2,596 WNY
VE5ZX 472 2 1 1,912 SK
N4NTO 323 2 1 1,542 NC
KB9VNO 216 2 1 582 IL
KB0YTO 148 2 1 496 NE
K1PDY 65 2 1 310 NH
AF5Q 23 2 1 296 OK
KF7HB 43 2 1 222 WI
K0VG 17 2 1 116 MN
K7UIR 43 2 1 94 WWA
KG6NEI 11 2 1 72 LAX
KC2KIS 8 2 1 66 ENY
KG6VMI 4 2 1 58 LAX

2B-1 Op Battery

KG6SKD 12 5 1 360 ORG

2B-1 Op

N8KD 775 2 1 3,050 MI

3B-1 Op Battery

KW8N 723 5 1 7,515 OH

1B-2 Op Battery

W8DL (+W8HRQ)
954 5 2 9,840 WV
W5YA 896 5 2 9,335 NM
W9HB (+KF9D)
679 5 2 7,390 WI
N7XJ (+W7DHH)
525 5 2 5,775 UT
K7QD 453 5 2 4,780 ID
K9OM 407 5 2 4,270 WI
WW5R 382 5 2 3,060 NTX
W3ANX 272 5 2 2,970 WPA
VE3EQP 369 5 2 2,735 ON
K4MUT 228 5 2 2,715 MDC
W0AZ 231 5 2 2,655 CO
WA8AEG 262 5 2 2,380 MI
K5WX 185 5 2 2,040 STX
W7IS (+K7WQ)
162 5 2 1,720 EWA
K9PO 102 5 2 1,565 IL
VA7MM 126 5 2 1,435 BC
K2QR 37 5 2 1,020 WNY
W0IS/VE3 65 5 2 725 ON
KB7LJP 43 5 2 680 OR
KT6MM (+KD6RMS)
105 5 1 625 LAX
WA6ARA 24 5 2 400 SJV
KB9UTO 37 5 2 235 IN

1B-2 Op

W8TK (+K4LT)
1660 2 2 7,340 OH
K8MP 1809 2 2 6,276 OH
KF9T 1021 2 2 4,208 IL
K8RYU 1040 2 2 4,014 OH
K9ZA 903 2 2 3,826 IL
VE6KC 867 2 2 3,618 AB
W9MU (+N9BX)
735 2 2 3,040 WI
AD5OJ 1206 2 2 2,662 WTX
W4DEX 1031 2 2 2,412 NC
K7GGG 569 2 2 1,488 AZ
KU9Z 370 2 2 1,424 IN
KS3H 418 2 2 1,410 VA
K4RET 294 2 2 1,388 VA
W3SW (+KB2ZWZ)
533 2 2 1,316 WNY
WT7X (+N7BCP)
171 5 2 1,130 WWA
WB5LYJ 222 2 2 1,120 NM
N0EW 279 2 2 1,108 MO
WR1B 92 2 2 944 RI
N4GG 236 2 2 882 SFL
K0CPN (+K0CQ)
228 2 2 870 MO
N2WDS (+N2XPG)
194 2 2 688 WNY
WA6HXM 138 2 2 626 UT
K8YN 87 2 2 592 OH
W8JGC (+W8JGB)
190 2 2 580 MI
N3EHY 180 2 2 568 EPA
KB0ORU 51 2 2 502 IA
KG6USN 62 2 2 496 SB
K3IDE 214 2 2 482 EPA
WD8MQN 148 2 2 482 VA
K5NLX (+KD5SQT)
33 2 2 466 AR
KU4UV 80 2 2 410 KY
W4BUS 222 1 2 372 NFL
AB6CU 12 2 2 274 OK
WA2YCJ 69 1 2 269 NNJ
AF4MS 50 2 2 250 TN
KA4UDH 10 2 2 220 NV
KJ6JO 57 2 2 214 SJV

1B-2 Op

W3RV (+N2EY)
346 2 2 1,420 EPA
KA0ZPP 175 2 2 550 ND

2B-2 Op Battery

W7MRG 512 5 2 5,600 WWA
NJ2YL 381 5 2 4,105 NNJ
N8EFO (+N8MPF)
361 5 2 3,470 OH
AC3V (+N3XXP)
375 5 2 3,435 EPA
NZ5A (+KD5EUL)
311 5 2 3,010 STX
N2CX 229 5 2 2,640 MDC
N6MBY (+K6RHB)
289 5 2 1,945 SB
WT7X 171 5 2 1,230 WWA
KK7UV (+KE7NO)
105 5 2 1,035 MT
K0PRO 93 5 2 715 KS

WD6CLZ (+KR6AI)					
	68	5	2	640	SV
W6MPB (+KA6TTV)					
	65	5	2	625	LAX
K5PAV	38	5	2	495	NTX
N2LWL	14	5	2	490	CO

2B-2 Op

KE1IU (+KB1FUO)					
	489	2	2	2,074	CT
WO9K	443	2	2	1,932	IL
K4CMD (+KC4IUP)					
	509	2	2	1,218	VA
AB8TD	140	2	2	980	OH
AB7PG	173	2	2	962	EWA
AE6FD	272	2	2	894	SJV
KØJJM (+KCØIUY)					
	327	2	2	854	KS
KB3IRR	155	2	2	774	EPA
KD5EUM	166	2	2	700	STX
KB7MLK	227	2	2	654	UT
WØKQX	37	2	2	574	NE
VA3GVP (+VE3IGM)					
	75	2	2	550	ON
AD5MQ	20	2	2	530	NM
KCØDEB	198	2	2	502	MO
KC7DMF	60	2	2	420	OR
VE3LEG	35	2	2	320	ON

2B-2 Op

WA5PMO	418	2	2	1,380	STX

6B-2 Op

K6Z	94	2	2	1,390	ORG

Mobile Stations

1C

AA6DP	915	2	4	3,374	LAX
N8LXR	667	2	1	2,480	EPA
WD7Y	142	5	3	1,420	EB
K1KI	320	2	1	1,280	CT
WX7G	312	2	2	1,248	LAX
N9TO	81	5	5	810	IL
W8VCK/MM	384	2	2	768	OH
K2NV	160	2	1	640	ON
VE2AWR	161	2	1	608	QC
W9XS	162	2	1	606	IL
K4VIZ	147	2	2	588	NFL
K7CN	58	5	1	580	OR
VE3WMB	57	5	1	570	ON
WO8L	137	2	1	540	NC
WØMRM	250	2	6	500	MO
K8TL	115	2	2	438	OH
KK7SM	196	2	2	428	STX
KF4JG	178	2	1	356	VA
K5VHH	175	2	1	350	STX
KA5FQA	164	2	2	328	SV
NØLD	162	2	1	324	IA
N7DLV	130	2	1	260	WWA
AD7AN	81	2	1	244	ID
K9VIC	60	2	1	180	IL
NØCQI	87	2	1	174	NE
KI6CG/7	87	2	1	174	MT
K1DS	65	2	1	172	EPA
K7UWR	84	2	1	168	WY
K7BFL	36	2	1	144	ID
W9BNO	54	2	1	140	CO
W9KHH	32	2	1	128	UT
KCØOFZ	63	2	2	126	SD
WØLPG	47	2	1	124	MN
WW4LL	59	2	1	118	IN
N9ANA	59	2	1	118	NM
W7ON	54	2	4	108	AZ
N3AWS	20	5	1	100	NFL
NS7F	49	2	1	100	AZ
N8XA	41	2	1	82	OH
N1XXU	38	2	1	78	CT
N5UJG	32	2	1	64	NM
K2HUN	19	2	1	64	NH
KA3KSP	21	2	1	42	WPA
N2GKM	19	2	1	38	NNJ
K7RA	12	2	1	34	WWA
KN3C	30	2	1	30	EPA
K3SFP	11	2	1	22	VA
KL7JFU	10	2	6	20	AK
WB6YZC	8	2	1	16	ORG
KC9AEC	6	2	2	12	IL
N2YHK	6	2	1	12	WMA
W1CGS	6	2	1	12	NH
KJ9C/M	2	2	1	8	IN
KB1KST	3	2	1	6	CT
N9SX	2	2	1	4	WWA
KG6EAD	2	2	1	4	LAX
KB5EKX	2	2	1	4	AR

2C

K7FD	326	2	4	774	OR
KA1SVW/MM	310	2	3	620	RI
W7SAW	181	2	1	362	WWA
WA5FRF	131	2	2	292	STX
AD6TN	5	2	1	10	ORG

3C

N1JJ	92	2	2	358	MN
WB8TCT	58	2	5	116	OH

Home Stations Commercial Power

1D

NN2W	1365	2	3	3,832	NLI
N5AN	1684	1	6	2,833	LA
K9WWT	576	2	1	2,304	IN
VA3BZ	499	2	1	1,996	ON
N5PO	984	1	1	1,968	NTX
NE7I	505	2	1	1,960	IN
K5ZD	564	2	1	1,826	WMA
VE2JCW	442	2	1	1,768	QC
W4ARM	926	1	1	1,544	SFL
NP2I	740	2	1	1,480	VI
W9TS	365	2	1	1,460	IL
VE2GB	351	2	1	1,404	QC
VE6AO	1319	1	2	1,373	AB
NU5C	335	2	1	1,340	AR
N1NK	334	2	1	1,332	RI
VA7ST	324	2	1	1,296	BC
KB8UMD	320	2	1	1,280	MI
NE8J	496	2	1	1,166	MI
N7QH	1156	1	1	1,158	AZ
WO4O	390	2	1	1,156	TN
KF4AAF	284	2	1	1,132	NFL
W6VM	267	2	1	1,068	SB
WA6BOB	227	2	1	908	LAX
W6IM	450	2	2	900	SDG
W1OOW	210	2	1	840	CT
K5SF	221	2	1	836	NTX
PY2NY	302	2	1	824	DX
VE3XD	201	2	1	804	ON
N5NXS	366	2	1	732	STX
W2LHL	180	2	1	720	NNJ
K3CQ	177	2	1	708	TN
VE3MGY	350	2	1	700	ON
AE4Y	168	2	1	672	GA
KI4FDF	167	2	1	668	VA
AA3VA	159	2	1	636	TN
W3PT	302	2	1	604	EPA
TI3TLS	150	2	1	600	DX
W9ZJX	147	2	1	588	IL
KI4EGT	147	2	1	588	GA
KØLWV	152	2	1	582	MO
K6CSL	146	2	1	552	SJV
NS4DX	199	2	1	550	VA
NO6X	269	1	1	538	EB
KØVM	269	2	1	538	IA
KJ7NO	133	2	1	532	UT
N7BF	261	1	1	522	WWA
NN4H	149	2	1	516	IN
K2MK	126	2	1	504	SNJ
WR2E	126	2	1	504	NNJ
N4NC	126	2	1	504	NC
NM4K	502	1	1	502	KY
K4GM	153	2	1	486	VA
WO6M	121	2	1	484	LAX
W9HR	120	2	1	480	WI
K9GDF	119	2	1	476	WI
K9UQN	237	1	1	474	IL
K8CPA	117	2	1	460	MI
KU5S	115	2	1	460	WTX
KC8YZP	224	2	1	448	MI
K7VI	307	1	1	448	WWA
N4XR	111	2	1	444	CT
WØVHV	124	2	1	444	MO
WA8SDA	110	2	1	440	WV
KØVX	109	2	1	436	ND
WO2N	106	2	1	424	NLI
KC9DKQ	210	2	1	420	WI
N4DXI	143	2	1	418	NFL
WS7R	207	2	1	414	AZ
VE2WNF	206	2	1	412	QC
N4SG	100	2	1	400	TN
N3KN	239	1	1	395	EPA
KP2D	194	2	1	392	VI
WA8MGD	111	2	1	386	OH
KB7HDX	192	2	1	384	EWA
KZ2G	94	2	1	376	NLI
WA2BMH	99	2	1	366	NNJ
KR2F	143	2	1	366	ENY
W5ALL	101	2	1	364	NM
W6AFA	355	1	1	355	LAX
KI6OY	103	2	3	354	EB
K6UCI	174	2	3	352	ORG
W2LRO	104	2	1	348	NNJ
K6DGW	90	2	1	338	SV
AA7MY	153	2	2	336	AZ
K4YJ	93	2	1	328	GA
KB2QQM	164	2	1	328	WI
KF3CV	79	2	1	316	MDC
NE1B	154	2	1	308	NH
NC4MI	148	2	1	296	NC
W1DYJ	124	2	1	284	EMA
NT0F	141	2	1	282	IA
N1DC	75	2	1	280	EMA
W6AEA	172	1	1	280	EWA
W5KL	146	1	1	279	VA
KC7UWQ	78	2	1	278	EWA
KD7LEE	88	2	1	276	AZ
N2EZY	135	2	2	274	WNY
N9OX	129	2	1	258	WI
WB4LEQ	127	2	1	254	NFL
WA9DBJ	120	2	2	240	IL
N2QJN	120	2	1	240	NNJ
VE2FAB	120	2	1	240	QC
N8MU	87	2	1	236	VA
WA0IAF	58	2	1	232	IA
KA9OKT	112	2	1	224	IN
N7XW	108	2	2	218	WWA
NT4D	78	2	3	216	NC
KC5KQM	107	2	1	214	NTX
KCØCQD	106	2	1	212	MO
KGØZZ	211	1	1	211	KS
W5YF	105	2	1	210	NTX
AK1Q	102	2	1	204	EMA
WA5TGK	100	2	1	200	NTX
W1ZMU	100	2	1	200	AZ
W1WIU	199	1	1	199	RI
N2GT	98	2	1	196	NNJ
W6CBA	97	2	1	194	LAX
K5Z	48	2	1	192	STX
KB9STQ	96	2	1	192	IN
KGØCJ	95	2	1	190	KY
WD5CNC	94	2	1	188	AR
WA1JHW	93	2	1	186	EMA
N4OWG	91	2	1	182	NE
NC4AR	90	2	6	180	NC
K7EMS	88	2	1	176	WY
K5FSB	86	2	2	172	NM
WA7YNU	82	2	1	168	MT
WV7T	45	2	2	166	CO
W9OA	41	2	1	164	IL
K7DJJ	82	2	1	164	WWA
KJ1J	41	2	1	164	NH
AC7KV	40	2	1	160	AZ
K3EYL	80	2	2	160	NTX
W8KNO	79	2	1	158	OH
KB8UUZ	79	2	1	158	OH
W2NVW	79	2	2	158	NNY
OK1CZ	79	1	1	158	DX
KA9LCP	75	2	1	154	WV
KB4XE	76	2	1	152	SFL
KG4KFV	74	2	2	148	SC
KA9NBU	38	2	1	144	WI
N9BGC	72	2	1	144	IA
W5TOB	43	2	3	142	STX
N7IWB	70	2	1	140	MT
W6NRM	68	2	1	136	LAX
N3FP	68	2	2	136	GA
KF4RCY	67	2	1	134	AL
KØPJG	133	1	1	133	NC
N1NN	33	2	1	132	EMA
L2OE (LU5EVK,op)					
	66	2	1	132	DX
KA5SIG	65	2	1	130	OK
KD5QDF	64	2	1	128	STX
AC5VF	61	2	1	122	STX
WJ4E	30	2	1	120	SC
KB9AFW	60	2	1	120	MI
K2ECQ	58	2	2	116	WNY
KC2LYQ	49	2	1	110	NLI
W6YQQ	40	2	2	110	SF
AB8IR	52	2	1	104	WV
K3JQH	52	2	1	104	EPA
W1DAD	51	2	3	102	NH
AL9A	50	2	1	100	AK
WN2A	33	2	1	96	NNJ
WA8MWA	24	2	1	96	OH
NØXAS	48	2	1	96	NE
NØICV	47	2	1	94	IL
N2LQQ	46	2	1	92	WNY
AC7PB	46	2	1	92	WWA
KB4ULE	44	2	1	88	CO
K7RB	44	2	1	88	AR
AB1AW	22	2	1	86	EMA
KS4JB	43	2	1	86	VA
KD5WZB	42	2	1	84	NTX
WØJLF	42	2	1	84	MN
K6JEY	42	2	1	84	LAX
AE6CW	41	2	1	82	SCV
KCØW	20	2	1	80	MN
W9TO	24	2	1	80	IL
VA3KSF	20	2	1	80	ON
N2WV	38	2	1	76	AR
WA9LAY	37	2	1	74	IL
KG6AZV	37	2	1	74	ORG
K5PAX	18	2	1	72	NM
KCØCIO	35	2	1	70	KS
KA2SJG	17	2	1	68	NNY
W7STT	33	2	1	66	AZ
KG6SYQ	31	2	1	62	EB
WA5YNE	62	1	1	62	OK
K4DAW	31	2	1	62	NC
KC8YKQ	28	2	1	62	OH
WE5ET	31	2	1	62	STX
W2PKG	30	2	1	60	NLI
KG4MWO	15	2	1	60	NFL
WA2VQV	14	2	1	56	SNJ
KB9YXH	28	2	1	56	IL
K3ESS	27	2	1	54	WCF
WBØVVK	26	2	1	52	IA
KB9Q	26	2	1	52	WI
WA3YTI	25	2	1	50	SDG
KS6CW	23	2	1	50	ORG
N3ZOC	12	2	1	48	MDC
WB9FJO	23	2	1	46	MI
WAØOTV	25	1	1	46	MO
W9CTJ	23	2	1	46	VA
N4JN	23	2	1	46	TN
KCØDZJ	22	2	1	44	NE
WB4MCB	43	1	1	43	AL
W7UY	20	2	1	40	WY
WB3CTP	20	2	1	40	EPA
N5DTT	20	2	1	40	STX
N1ND	20	2	1	40	CT
KE4QOJ	19	2	1	38	VA
W2LID	10	2	1	38	SNJ
KG4VKQ	19	2	1	38	NC
KG6NCD	19	2	1	38	SCV
KI7JA	37	1	1	38	OR
NØQFV	17	2	1	34	STX
K9UTC	17	2	1	34	WI
KG9BEI	16	2	1	32	SF
KA1RWY	14	2	1	28	CT
K6III	28	1	1	28	SCV
KD4HHU	14	2	1	28	AL
KCØQEH	14	2	1	28	MN
W2PXW	13	2	1	26	ENY
W6GB	6	2	1	24	SCV
N3MPS	12	2	1	24	MDC
AC7MC	10	2	1	20	AZ
KA9RBI	6	2	1	20	IL
N1KN	8	2	1	16	CT
N2KYP	8	2	1	16	NLI
VK2CZ	8	2	1	16	DX
KC2MHU	7	2	1	14	WNY
KØUSN	5	2	5	10	CO
W1CRK	5	2	1	10	EMA
AJ3M	5	2	1	10	MDC
VE3SPW	3	2	1	8	ON
K6OTT	4	2	1	8	SCV
AA6PB	2	2	1	4	EB
KG6HUM	2	2	1	4	SCV

2D

K6VR	761	2	4	2,670	SJV
W9G	2113	2	27	2,426	WI
N8GQ	1151	2	25	2,356	MI
K4RRC	1057	2	4	2,114	NC
W1AW	655	2	4	1,678	CT
N1YF	434	2	2	1,434	ME
W5DAR	417	2	11	1,094	NM
N1RY	760	1	4	925	ME
KK4BQ	307	2	4	614	SC
K3CAL	222	2	6	600	MDC
WI2T	161	2	5	486	MDC
K3IEC	187	2	7	374	EPA
WA5JEC	100	2	5	296	STX
AA3W	147	2	10	294	MDC
NE0RC	122	2	6	244	NE
VE7CRM	107	2	9	214	MAR
VE9CRM	107	2	9	214	MAR
AL4K	129	1	5	129	AK
W8YX	39	1	2	39	OH

3D

AF4NP	2234	2	11	4,468	AL
W8BAP	422	2	23	846	OH
W1ORS	115	2	5	230	CT

4D

KG6AR	770	2	8	2,400	EB
W7EK	254	1	10	273	WWA
KØMIK	97	2	6	194	CO

5D

K2OQ	141	2	22	348	WNY

6D

VE3ORC	327	2	15	718	ON

Home Stations Emergency Power

1E

N4PN	2714	2	1	6,890	GA
W6JTI	681	5	1	6,810	SF
K7NJ	626	5	3	6,260	UT
VE7RG	1697	2	4	6,216	BC
AA3B	1412	2	1	5,648	EPA
K3WW	540	5	1	5,400	EPA
KC4D	1251	2	2	5,004	VA
VE5MX	1247	2	6	4,080	SK
KE0UI	404	5	1	4,005	MN
W5SH	1110	2	6	3,964	NTX
K5UV	391	5	1	3,910	OK
NY1S	1005	2	1	3,550	ME
N5PA	1699	2	7	3,406	MS
W4MJT	284	5	1	2,840	NC
K1EEE	282	5	2	2,750	NH
N7WS	1357	2	1	2,714	AZ
K4AQ	276	5	1	2,670	GA
NU7T	261	5	1	2,610	NV
K4KSR	253	5	1	2,530	VA
W3HGT	1001	2	5	2,526	WPA
KØLR	251	5	1	2,510	MN
N6YEU	937	2	2	2,502	SF
K7HP	607	2	1	2,428	AZ
WØUY	620	2	2	2,354	KS
K9MMS	231	5	1	2,310	IL
NØTW	617	2	1	2,268	OH
KA3WMJ	221	5	1	2,210	EPA
W6PRI	216	5	1	2,100	SCV
KD9GY	1036	2	3	2,072	IL
KB8U	251	5	1	2,035	MI
W5ORM	202	5	1	2,020	OK
AD4S	200	5	1	2,000	GA
W5WTM	537	2	3	1,906	STX
KC2LTT	540	2	2	1,900	WNY
K4YTZ	818	2	8	1,868	SC
N6NF	629	2	1	1,848	STX
N7VMR	868	2	1	1,736	MT
N3HBX	847	2	1	1,694	MDC
WX8J	167	5	1	1,670	OH
KI6VC	583	2	1	1,652	SJV
AE6N	163	5	1	1,630	AZ
KC7NUP	401	2	1	1,564	NV
AB4EL	156	5	1	1,560	NC
K2NT	154	5	1	1,525	NNJ
NO6B	225	5	1	1,480	LAX
W5ZO	403	2	1	1,468	WTX
AG4V	710	2	1	1,420	TN
W1NQ	138	5	1	1,380	WMA
N7ZN	328	2	1	1,312	ID
AA4FU	328	2	1	1,312	NC
WR4I	125	5	1	1,250	VA
K8GNZ	140	5	1	1,220	NC
AA2GS	127	5	1	1,180	KY
KQ6MU	559	2	1	1,118	NV
K6UF	341	2	1	1,114	SCV
KØKL	325	2	1	1,098	MO
W1MVY	108	5	1	1,070	SCV
W3LL	527	2	1	1,054	MDC
WA4FOM	102	5	1	1,020	NNJ
K5EEE	509	2	1	1,018	SFL
NKØE	101	5	1	1,010	CO
K4DZR	111	5	1	1,005	TN
KS4YX	91	5	1	900	SC
N7DM	250	2	1	898	WWA
N2MTG	438	2	1	876	ENY
VE4ZOO	256	2	1	866	MB
W3DP	82	5	1	820	EPA
K4BQP	205	2	1	820	AL
KØGEO	200	2	1	794	STX
KDØG	79	5	3	790	KS
WY4Y	780	1	1	780	GA
W5TTE	77	5	1	770	NM

KV8X	191	2	1	764	MI
KM1Z	194	2	1	764	VT
KA1MM	231	2	2	760	WMA
K1RFD	65	5	1	650	CT
W2CVW	65	5	1	650	NNJ
W7GB	160	2	1	638	EWA
KZ1O	164	2	1	634	NH
W6HG	161	2	1	628	ORG
WB9DLC	314	2	1	628	IN
K7VGW	155	2	1	620	ID
VE5JZ	66	5	1	610	SK
W0ZW	60	5	1	600	NM
NN9X	146	2	2	584	IN
N5KJ	116	5	1	580	STX
W8PT	173	2	6	576	MDC
WA1VKO	280	2	1	560	NH
KB6CC	276	2	1	552	CO
XE1/W7CD	55	5	1	550	DX
KA3PCX	272	2	1	544	EPA
K5DL	124	2	1	496	STX
KA3UOL	248	2	3	496	WPA
KB5ENP	127	2	2	492	MO
K6HRT	134	2	1	480	ID
KE4UKY	120	2	4	480	VA
N5GLR	47	5	1	470	NTX
KU9RK	107	2	1	428	IN
KD0ZS	211	2	1	422	WY
N5LXI	81	5	1	405	NTX
N3FZX	177	2	3	404	MDC
N0RQ	100	2	4	400	NTX
W5GAI	50	5	1	390	STX
KB2PLW	38	5	1	380	WNY
N7CEE	38	5	1	380	AZ
WC9C	105	2	1	374	IN
WB2KLD	179	2	1	358	NNY
KW1K	87	2	1	348	CT
W2UXL	33	5	1	330	SFL
N8TP	162	2	1	328	GA
K9NU	212	1	1	321	IL
KI7RO	150	2	4	300	ID
KC8PAR	30	5	1	300	WV
VE3OZ	136	2	1	272	ON
W5/VE2AHH	65	2	1	256	NM
AL7N	63	2	1	252	AK
WA9STI	50	5	1	250	LAX
N5IAC	121	2	1	242	NM
KE3TJ	117	2	2	234	WPA
VE3OGP	112	2	1	226	ON
AC7IB	108	2	2	216	OR
KB0RQE	107	2	1	214	MO
KJ4YM	42	5	1	210	GA
KD5DFM	105	2	1	210	LA
K4ZRP	101	2	1	202	TN
WB4QNG	100	2	1	200	KY
WB0MZI	99	2	1	198	CO
WD0BMS	86	2	1	172	SD
N3HQD	83	2	3	166	WPA
VE5KC	78	2	1	156	SK
W6PAP	15	5	1	150	SV
AI9D	73	2	1	146	IN
WA8SSQ	72	2	1	144	OH
W1JAB	68	2	1	136	NH
KE4QXJ	68	2	1	136	SFL
KF4VXJ	64	2	1	134	NC
N1WCL	26	5	1	130	CT
W3MGL	64	2	1	128	VA
K2HT	34	2	1	110	MO
W3KJ	53	2	1	106	EPA
N9NDS	28	2	1	102	IN
KL1HB	50	2	2	100	AK
KG6GMT	48	2	1	96	MN
WD0BMR	48	2	1	96	SD
W4KJD	92	1	1	94	NC
KB9WAC	40	2	1	92	IN
N1XQ	43	2	1	90	RI
KC2ELS	45	2	1	90	EB
N1GF	43	2	1	86	EB
WO3X	43	2	1	86	OH
NE1RD	39	2	1	82	EMA
AE6EO	39	2	1	80	SCV
W2TI	8	5	1	80	NNJ
WD8LQB	27	2	1	70	OH
K4GSX	27	2	1	66	GA
NX1Q	21	2	1	60	CT
KA2IBN	30	2	1	60	ENY
N0EBN	30	2	1	60	IA
KI5JF	27	2	1	58	STX
W1KMH	9	5	1	55	VT
VA3UV	26	2	1	52	ON
KF3BN	25	2	1	50	MDC
K7RQN	23	2	1	46	AZ
N6TNM	21	2	1	42	ORG
WA3WUL	20	2	1	40	DE
AB5FS	18	2	1	36	OK
KC8UR	13	2	1	34	OH
W1ORO	17	2	2	34	KY
AA6DX	15	2	1	30	SF
WB2VAJ	13	2	2	26	ENY
N3WDZ	8	2	1	16	WPA
WD6AWP	8	2	1	16	ORG
WB6NJA	7	2	1	14	SDG
N3KMZ	11	1	1	11	WPA
N9CJT	1	5	1	10	IN
K3LL/6	1	5	1	5	LAX

2E

KQ2F	2197	2	3	6,858	NLI
K5GH	2229	2	6	6,550	NTX
W4DXA	2261	2	17	6,096	NC
N2BJ	2023	2	2	5,364	IL
W8UE	501	5	1	5,010	MI
W5ROK	1549	2	7	4,244	NTX
K9YHB	465	5	5	3,940	IL
K7SEL	1116	2	8	3,894	ID
WA3PAY	363	5	3	2,285	STX
VE6FI	2185	1	8	2,185	AB
W8NI	536	2	5	2,000	MI
W5ES	865	2	30	1,730	WTX
N9AKR	649	2	5	1,372	IL
AA6SD	525	2	12	1,172	ORG
WW2DEM	290	2	3	1,126	ENY
KC4KFC	492	2	3	988	TN
K6TY	209	2	3	548	LAX
WX4J	150	2	2	410	NFL
KC2IYY	107	2	25	226	NNJ
KC9EEL	20	2	2	40	WI

3E

K5HLA	2704	2	20	8,850	STX
N5YA	1865	2	3	5,186	NTX
K5WPH	984	2	30	2,200	WTX
W3KWH	886	2	19	2,104	WPA
WI7J	660	2	7	1,328	LAX
K4YNZ	312	2	3	800	AL
VE7UBC	179	2	10	358	BC

4E

KF6ZB	43	2	1	86	ORG

5E

W0NT	3171	2	18	9,202	CO
K6H	1171	5	10	8,940	LAX
W8FT	503	2	23	1,136	OH

EOC Stations

1F

Montgomery County RACES
W3CF 1674 2 4 3,498 EPA

Platinum Coast ARS
W4MLB 879 2 11 2,590 SFL

New Providence ARC
WK2I 623 2 20 1,910 NNJ

Yellowstone RC
W7NWS 414 2 18 1,838 MT

West Essex ARC
W2EF 368 2 6 1,828 NNJ

Clermont County RACES/ARES
K8JI 359 2 15 1,522 OH

Hamilton Cty AR Public Service Corps
K8YOJ 372 2 7 1,444 OH

Benicia ARC
KB6EOC 344 2 10 1,338 EB

Big Bend ARC
KA5NJA 489 2 4 978 WTX

CO ARES D-15
W0NZ 182 2 6 964 CO

Douglas County Aux Communications Team
KC0RDX 114 2 4 878 KS

Marshall ARC
KC5AV 153 2 25 856 NTX

Sierra Nevada ARS, Inc
W7TA 234 2 11 838 NV

Terrace ARC
VE7NWZ 122 2 20 810 BC
N9ZD 258 2 4 716 IL

Yakima County Radio Amateurs
WA7EOC 165 2 8 680 EWA

Arkansas Diamond
KC5RED 60 2 2 670 AR

CA Dept of Forestry—SCU—VIP'S
W6HUL 56 2 13 662 SCV

Com Support Group / Colorado EOC
WC0AAX 355 1 5 655 CO

Burlington ARC
W1KOO 152 2 6 604 VT

Hancock ARA
KY4HC 201 2 14 602 KY

Elkhart County EMA
KC9ALY 106 2 5 562 IN

Sanibel Amateur Radio Volunteer Team
W4SBL 87 2 10 474 SFL

Shoreline ARC
W1BCG 120 2 12 440 CT

Will Cty Emergency Management
N9WYS 184 1 2 384 IL

Auxillary Em Com
W7EOC (+AC7AI)
85 2 6 370 WWA

Clarke County ARES
N4ZRA 62 2 4 324 GA

Iowa RACES
KC0EEC 198 1 16 248 IA

EMROG
KD5HAL 39 2 8 178 STX

Paret
KA7EOC 62 2 8 124 WWA

2F

West Jersey DX Group
W2EN (+W2KN)
2501 2 12 8,246 NNJ

Lake Cty ARES/RACES
K9IQP 1031 2 25 4,494 IL

McHenry County IL ESDA RACES/ARES
K9ESV 1077 2 25 3,784 IL

Williamson County, TN ARES
N4FR 844 2 50 3,610 TN

Metro Amateur Club
W9FO (+KC9ARR)
796 2 33 3,570 IL

Okeechobee Cty EOC
K4OKE 761 2 25 3,388 SFL

Sioux Empire ARC
W0ZWY (+KA0DEZ)
778 2 20 3,178 SD

Chester County ARES/RACES
W3EOC 553 2 25 3,156 EPA

Heart of America ARC
W0RR 721 2 7 3,084 MO

Alameda County Sheriff's Comms Team
W6VOM 609 2 10 3,060 EB

Wells Gray & Thompson River ARC
VA7TRS 518 2 21 2,894 BC

Rainbow Canyons ARC
N7BO 708 2 15 2,848 UT

City of Peoria RACES
N9SJ 615 2 9 2,670 IL

Alamance ARC
K4EG (+W4VGZ)
607 2 12 2,554 NC

Quad City ARC
N3QC 444 2 6 2,546 WPA

Waterbury ARC
W1LAS 734 2 18 2,286 CT

Madison Cty ARC
KE8RV 436 2 12 2,194 OH

Madison County ARC
W9VCF 588 2 11 2,124 IN

Anchorage ARC
KL7AA (+KL7G)
774 1 34 2,084 AK

Metchosin Em Com Group
VE7MEP 545 2 5 2,070 BC

Tippah ARA
K5KIR 375 2 15 1,958 MS

OIDAR
KD5MTT 435 2 14 1,932 OK

ARA of the Southern Tier
W2ZJ (+KA2LIM)
416 2 42 1,912 WNY

Cabarrus ARS
K4CEB (+KA4ATT)
381 2 27 1,898 NC

Garden State Amateur Radio Assn
W2GSA 581 2 22 1,648 NNJ

Leominster Emergency Mgmnt Agency
WC1LEO 481 2 2 1,566 WMA

EOC Station Support Team
KB3HEV 313 2 11 1,526 DE

So Oklahoma ARES
W5BLW 400 2 15 1,500 OK

Macon-Bibb EMA ARG
WX4EMA 439 2 16 1,478 GA

South Mountain Repeater Assn
N3TWT (+W3ROQ)
165 2 12 1,464 EPA

Picorams
K9IYP 355 2 10 1,460 IL

Yarmouth ARC
VE1YAR 169 2 10 1,250 MAR

Mason Cty ARC
K8DXF 206 2 16 1,222 MI

RS of Tucson
K7RST (+KD7LSD)
327 2 18 1,212 AZ

Ellis County ARC
WD5DDH 315 2 22 1,130 NTX

Piscataquis ARC
K1PQ 123 2 16 1,112 ME

Polk County Volunteer Communicators
WC4PEM 134 2 16 1,060 WCF

Shawnee ARA
W9RMN 165 2 14 1,030 IL

A-G-S-T RACES
WC1SW 123 2 11 998 WMA

Oregon State ARES Unit
W7OEM 134 2 5 992 OR

Rhode Island SATERN
N2NCL 102 2 9 954 RI

ARES & Convair/220 Club
W6UUS 273 2 10 946 SDG

Belmont Cty ARES Group
W8TPY 122 2 5 940 OH

Crystal RC
W2DMC 221 2 3 926 ENY

Sandoval Cty ARES
W5SCA 218 2 8 862 NM

Henry County ARC
N8WB 72 2 8 794 IN

Faulker Cty ARC
W5AUU 384 2 15 768 AR

National Trail ARC
K9UXZ 155 2 12 712 IL

Oakland TN Police EOC
KI4FYE 201 2 7 702 TN

Union Co ARS / ARES
NC4UC 115 2 7 692 NC

Bonneville Cty RACES
AC7GD 124 2 5 648 ID

Hazlet Twp NJ RACES
WC2ADQ 69 2 3 638 NNJ

DMAT OK-1
ND5MS 170 2 5 492 OK

Carteret Emergency Management Volunteers
K2ZV 59 2 4 442 NNJ

Ukiah Area RC
WA6ESM 53 2 5 406 SF

Insurance City Repeater Club
WA1ARC 30 2 5 260 CT

3F

Tippecanoe Amateur Radio Assn
W9REG 369 5 9 4,475 IN

Houston Echo Society
W5ECO 970 2 8 4,020 STX

FEMA
NF3EMA 1753 2 12 3,806 VA

Tri Town ARC
W9VT (+N9WDG)
846 2 29 3,438 IL

Racine Megacycle Club
W9UDU (+AB9FA)
705 2 48 3,182 WI

Great South Bay ARC/ Town of Babylon ARES/ RACES
W2GSB 675 2 31 3,106 NLI

Teton Cty ARES—RACES
W7OID 938 2 4 3,052 WY

Winchester Center Fire House CQ RC
K1BCI 620 2 15 2,534 CT

GCEC-LETARC
N5REO 948 2 25 2,496 NTX

Tuscola Cty ARC
KC8CNN 479 2 15 2,420 MI

Scott County ARES
KF4NTQ 517 2 13 2,246 KY

Grand Strand ARC
W4GS 657 2 32 2,064 SC

Middle East Tennessee Emergency Radio Service, Inc
KG4NLF (+KI4DIW)
356 2 30 1,994 TN

Gwinnett Amateur Radio Emergency Service
WX4NET 243 2 35 1,766 GA

Otsego Cty ARA
NC2C (+KW2U)
212 2 16 1,698 WNY

San Jose City Communications/RACES
W6SJC 273 2 10 1,658 SCV

Huron Cty ARS
KC8WIT 293 2 20 1,600 OH

Disaster Communications Services
K4DCS 71 2 10 1,492 SFL

Orleans County ARC
WA2DQL 198 2 10 1,210 WNY

Raritan Bay Radio Amateurs/Manalapan NJ RACES
K2GE 95 2 10 1,096 NNJ

Wayne Emergency Management—ARC
WX4JES 170 2 18 1,090 GA

Branch County ARC, Inc
WD8KAF 244 2 22 984 MI

Wild Horse Desert Hams ARC
K5WHD 97 2 5 774 STX

Galveston Cty Em Com Group
WR5GC 41 2 8 682 STX

Quispamsis
VE9LC 253 2 15 618 MAR

4F

Van Wert ARC
W8FY 2029 2 17 6,236 OH

Texas Emergency Amateur Communicators
W5SI 792 2 64 3,482 STX

East Alabama Amateur Radio
W4LEE (+K4LRW)
692 2 41 3,218 AL

Amateur Radio Assn of Southwest Florida
K4YHB 1136 2 22 2,892 SFL
W8WE 533 2 28 2,868 OH

Orange County Florida ARES/RACES
W4MCO (+N4ARC)
471 2 29 2,696 NFL

Osceola ARES/Skywarn
K4OSC 522 2 31 2,426 SFL

Maricopa Cty Dept of Emergency Mgmnt
KE7ATY 550 2 28 2,334 AZ

Coastline ARA
N1EG 567 2 15 2,204 CT

Cross County ARC
WA5CC 268 2 26 1,974 AR

Vernon County ARES/RACES
WT9M 359 2 12 1,918 WI

Metroplex ARC
W2MPX 242 2 30 1,360 NNJ

Salvation Army Team Emergency Radio Network
NV7SA 48 2 5 698 NV

Orange County RACES
W6KRW 38 2 12 440 ORG

5F

Palomar ARC
W6NWG (+AC6V)
3086 2 60 10,582 SDG

Forsyth County (GA) ARES
W4E 1931 2 25 6,630 GA

Southern MI ARS
W8DF 1710 2 42 6,030 MI

K4ORE (+W4CHM)
785 2 10 3,986 TN

Shelby County ARC
W4SHL (+WH6BDR)
823 2 45 3,136 AL

Zion Benton ARC
N9IM 686 2 12 2,908 IL

Kinston ARS, INC
W4OIX 248 2 35 1,558 NC
VO1CRC 115 2 8 1,282 NL

6F

Queen City Emergency Net
W8VND 2324 2 23 7,608 OH

Worcester Em Com Team
WE1CT (+WB1ARZ)
990 2 18 3,264 WMA

8F

Stanford ARC
W6YX (+K6SU)
7183 2 35 22,694 SCV

9F

Arlington ARC
W4WVP 234 2 10 2,100 VA

11F

Yuma Auxiliary Communications Service
N7ACS (+KF6OWZ)
250 2 11 1,260 AZ

12F

HREG
K2K 618 2 17 3,340 NFL

QST

By Rick Rosen K1DS

Results, 2004 ARRL June VHF QSO Party

What were your expectations?

Experience is a great teacher; each of us usually considers a strategy to fulfill our expectations in VHF contesting and communication based on our past experiences. Whether you are a single or multi-op, high or low power, fixed or movable, between the collective wisdom of past activities, and the plans for managing a new contest challenge, lots of thought and preparation go into station design, operating procedures, condition and band monitoring,

When the final QSO of the contest is in the log, and the rigs are starting to cool down, do each of us consider—were our expectations met? Was it catching some DX, like ZF1DC, whose Cayman Island team including W4WA and K4BI, provided a new country and grid for many on 6 meters? Beating your previous record of QSO points, grids, bands, or total score? Having all the equipment work as planned for the entire weekend? Perhaps it was some casual operating, gladly giving out "points" to the more competitive operators? Seeking a listing in the *QST* tables, or a scoring certificate?

Conditions for the most part were average for this contest on the down-slope of the solar cycle. Weather was not much of a factor; there were scattered rains in the Ohio Valley area that seemed to move and dissipate as the weekend progressed; there were other smaller precipitation centers in the Deep South and upper Pacific Northwest.

Gene, NØDQS/R, encountered golf-ball sized hail (again!) as he moved his rover through grids in Nebraska, sustaining a cracked windshield and multiple dents on the SUV, as well as plenty of dings to the loop antennas. Passersby thought for sure he was a storm-chaser. Gary, N7IR, SO portable, found high winds on the Mogollon Rim in DM44 at 7900 feet that almost ended his on-the-air operation.

It was into the fray with the current well-known rules for over 1050 participants who submitted 763 logs for the event. The increased use of digital communications modes—*WSJT* and meteor scatter—has upped the ante for serious competitors. Despite these relatively flat conditions, grid totals continue to grow. Plenty of scatter QSOs were reported on 6 and 2 with rather short skeds, a testament to the skill and setup of the ops, and to the presence of plenty of that magic meteor dust that makes it possible.

The June contest scoring has been criticized as discriminating to the microwave frequencies. Indeed, if there are no E_s 6 meter openings or unique 2 meter conditions, the total scores turned in can be limited. There were a total of 117,000 QSOs reported on bands 50 MHz through 432 MHz and another 7463 QSOs reported on bands 902 MHz and above.

Learning and Sharing Information—VHF Conferences

The regional VHF conferences have been great venues for sharing both technical and practical operating information, and learning more about how others contest. In addition, they are opportunities to buy, sell and test gear and learn from others' experiences.

For example, at this year's Eastern VHF conference in April, sponsored by the New England Weak Signal Group, talks by high scoring VHF contesters, revealed some of the operations, radios, towers, antennas and methods that they use to produce their prodigious contest results. Dick, WA2AAU, described the development of equipment for and mentoring of the W2SZ/1 rovers.

The K3EAR "South Mountain" operation in FM19, was presented in a multimedia format. K1TEO gave us insight into his VHF contesting development and

Being the ARRL First Vice President doesn't leave Joel, W5ZN, much time to operate. But for this event Joel was able to rack up enough points to lead the Delta Division in the Single Operator High Power category, just missing an overall Top Ten finish by about 10 k.

Third place overall was snared by the ops at W3SO, including (back row, left to right) W3PAW, W3YOZ, W3TEF, W3BTX, K4VV and AI3M (front row, left to right) K3IXD, WR3Z and W3SF.

Top Ten

Single Operator, Low Power

K2DRH	235,470
WB1GQR (W1SJ, op)	119,714
W4SHG	87,768
K9MU	77,688
KB8U	77,250
AF1T	76,032
WQ5W	71,068
NJ2F	66,048
K8MR	64,092
W6OAL	54,766

Single Operator, High Power

K1TEO	624,921
K1RZ	321,525
KMØT	255,210
WB9Z	193,802
K3DNE	175,536
K0GU	137,600
NW5E	135,790
W9GA	129,926
N3HBX	126,846
K1GX	124,800

Single Operator Portable

N7IR	17,088
N8XA	7,747
KQ6EE	3,850
WB2AMU	3,071
K7EH	2,850
W8CM	1,320
KH6WZ	1,185
VE7AAO	522
K9FOH	300
KG6TGI	88

Limited Multioperator

K8GP	740,037
K9NS	583,041
W3SO	310,464
K3YTL	309,260
W3DOG	295,868
W4IY	277,911
AA4ZZ	232,878
K5TR	205,273
K8CC	187,616
K2BAR	143,969

Multioperator

W2SZ	1,959,675
W3CCX	991,935
K3EAR	986,250
W2FU	424,888
N2PA	363,424
W4NH	267,972
W6FM	226,080
K7CW	203,451
N2NK	163,312
K1MUJ	126,300

Rover

N6NB	1,292,382
N6VI	1,156,760
N6MU	1,131,156
W3IY	318,159
N6TEB	195,132
N6DN	184,640
WØAMT	86,496
VE3NPB	75,096
KØPG	73,108
K9ILT	72,520

efforts from his FN31 QTH in central CT.

Just Average Conditions

Although there were complaints from ops on both coastal extremes that 6 meters just never opened enough to make enormous scores this time, the ops in the middle of the country and Florida had a ball on this band. The LM crew at K5TR managed to top the 6 meter multiplier list and capture 187 6-meter grids. There were 33 other entries with over 100 grids on 6m, and another 101 entrants who racked up at least 50 grids on that band. Many stations mentioned rather short periods of enhanced propagation, with distant grids heard popping in and out sporadically during the weekend. The peak E_s started about 2100Z on Saturday, lasting about 4 hours, and again on Sunday from 1300Z-1800Z.

ZF1DC found their way into 488 logs in 120 grids across the US, adding the excitement of some exotic DX to the delight of many participants. Station 4C2X, with operators N6XQ, W6YLZ, XE2ED, XE1KK, XE2K, XE1UN, XE1NTT, XE1NK also added their call to 238 other logs across 67 grids.

Two-meter conditions were rather average, with no reported major openings. K8GP, whose "Grid Pirates" netted 75 grids on 2 meters, and 9 other multi-op teams and one single-op managed over 50 grids on this work-horse band. VE3SMA reported that his 10 W to a 6 element Yagi at 30 feet raised a response across 800 km from NG4C. Perhaps a burst of airplane scatter?

Single-Operator

K2DRH, Bob, continued his winning streak using 7 bands from IL in the Single Operator Low Power category, with 235 k points—up from his recent January top score of 162 k. He was able to add 2304 to his line-up after smoking two transverter receivers in the remote tower-mounted scheme just before the contest. Operating WB1GQR, Mitch, W1SJ, placed second with 119 k from VT, using only bands ABCD. Steve, W4SHG above sea level in VA set a Roanoke Division scoring record of 87,768 adding 3456 MHz gear this year as his 8th band, more than doubling the division's previous high score. Impressive, considering a QTH only 63 feet. Justin, K9MU, a self-admitted "6 meter addict" in WI, with 77,688 won 4th by a nose, while Russ, KB8U, of MI captured 5th place with 77,250.

Jeff, K1TEO, set another all-time scoring record for Single Operator High Power in CT and the NE Division by scoring 624 k. He surpassed his old record by 143 k points, despite little E_s opportunity to run up a big grid count on 6 meters. With his new 5 GHz station, available for the first time in a June contest, that band was used to advantage, adding 16 QSOs and 11 grids. Jeff credits the ability to track rovers and quickly run the bands, in addition to his QTH in the midst of the NE and Atlantic Divisions, antennas above the treetop levels, as well as the support of his family for his ongoing success. He missed the all-time national SOHP record by less than 1%, a target he's aiming at for the future. Following in second place, Dave, K1RZ, operating in MDC, put up a score of 321 k, well balanced across 10 bands, including 20 QSOs on 10 GHz—the top number for a single-op on this band. Mike, KMØT, had an 11 band total of 255 k for 3rd place, while Jerry, WB9Z, with his massive antenna farm took 4th with 193 k in a 5 band effort. Rounding out the top 5 was Ed, K3DNE, with 175 k, a VHF contest regular performer operating on 7 bands.

The Single Operator Portable category has many openings for those who have a penchant for grabbing a rig and hiking or driving up to a good high spot. Gary, N7IR, took top honors in this category with a 17 k score. Phil, N8XA, used a multiband setup from 50-2304 MHz +10 GHz in the OH section to win top honors in SOP. With this relatively new VHF contest category, there were only 10 participant logs received, and 3 of them set new scoring records in their sections.

Multioperator

Continuing in their domination of the Multi-op Unlimited class, the Mount Greylock Expeditionary Force, W2SZ/1, doubled the score of their nearest competitor with 1.9 million points. They captured some of the best opportunities from this eastern QTH on 6 meters with a grid count of 92 and had a combined microwave total of 622 QSOs. Their microwave expertise also gave them 7 QSOs on the exotic frequency of 47 GHz in 7 grids.

With an intensive effort to move up in the June results, the Packrats of the Mt Airy VHF Club scored almost a million points and edged past K3EAR team to capture second place. They credit their success to improved planning, the addition of computer networking to pass contacts, rather than an intercom system, and having all bands ready to go from the opening minutes of the contest. With their large mountaintop installation, the K3EAR "South Mountain Group" gave the Packrats a run, but wound up in 3rd place. Although they compiled more QSOs and multipliers on 50, 144 and 222, the Packrats passed them by with more contacts and grids on the higher bands. W2FU captured 4th place in WNY, with a 12 band performance, they had a 4 band advantage in topping the 5th place N2PA team in the same section, with the teams scoring a substantial 363 k and 267 k, respectively.

The Limited Multi-op scores were led by K8GP, amassing 740 k from their roost in FM08. This is a hard-driving team of long-term experienced VHF ops that really enjoys maximizing its equipment's potential. K9NS in IL was second with 583 k, a tribute to all the VHF activity building up in the Central Division. W3SO, with 10 ops covering the 4 band setup, on top of Wopsononock Mountain in the Allegheny Mountains at 2500 feet came in 3rd with 310 k. Atlantic Division teams of K3 Yellow Traffic Light (K3YTL) and W3DOG captured the next two spots. The TAPMARC team, using

Affiliated Club Competition

Club	*Entries*	*Score*
Medium Category		
Potomac Valley Radio Club	28	2,528,697
Society of Midwest Contesters	27	1,402,294
Mt Airy VHF Radio Club	5	1,135,203
North East Weak Signal Group	13	1,011,920
Northern Lights Radio Society	22	773,762
Rochester VHF Group	6	636,052
Pacific Northwest VHF Society	31	553,153
Florida Contest Group	8	530,381
Badger Contesters	11	338,556
Western States Weak Signal Society	12	266,519
Mad River Radio Club	3	260,092
Carolina DX Assn	3	242,272
Northern California Contest Club	12	178,757
Yankee Clipper Contest Club	10	103,952
Central Texas DX and Contest Club	3	94,232
Grand Mesa Contesters of Colorado	6	60,822
Contest Club Ontario	8	30,011
Tennessee Contest Group	7	11,197
South East Contest Club	7	3,908
Local Category		
CT RI Contest Group	3	113,922
Delaware Valley VHF Society	4	52,931
Dominion DX Group	6	38,417
Medina 2 Meter Group	3	29,859
North Texas Microwave Society	4	16,932
Dauberville DX Assn	4	15,291

the W3DOG call, with 295 k set a new June ML scoring record for DE.

Rover

The rovers have been credited with enabling all other contest stations to increase their totals, adding some excitement to the less densely populated areas of the country, and creating a unique competition among themselves. Grid circling by rovers remains a controversial practice, but the team of N6NB/R, N6VI/R, and N6MU/R each broke the existing June rover record by compiling over a million points each in their well planned and rehearsed rove on the open plains. Although their route and schedule was set to maximize opportunities at 4 grid intersections, at each stop and while in transit, they worked as hard as they could to contact other stations, especially on the lower four bands. As a result, 2.4% of their total contacts were with others.

The W3IY/R (+ON4IY) team of Bill and Christophe managed their coastal Atlantic route well, finishing on the high spots in FM08 and turned in a fabulous 4th place score of 318 k. Other teams out in the sparsely populated states helped keep the airways hopping; KIØSK and NØBAF teamed up to rove 12 grids in the middle of the country while N6ZE/R with a Yaesu FT-817 transceiver and minimal antennas activated seven grids on the Atlantic and the Pacific coasts, flying coast-to-coast and operating several grids at each stop.

Club Competition

This is the second year that the June contest has had the opportunity for club entries. This year's top score list is similar to last year's. Although some of the top scores were lower this time, largely due to the change in 6 m conditions. In the Medium category, the Potomac Valley Radio Club held first place again with 28 logs and 2.5 million points, followed by the Society of Midwest Contesters sporting 27 logs and 1.4 million points. The Packrats of the Mt Airy VHF Radio Club edged into 3rd place, followed by the Northeast Weak Signal Group, a few points back. In the local category there were 6 entries, topped by the CT-RI Contest Group. Most importantly, club entries are often the stimulus for regional activity, with lots of peer encouragement to be active in the VHF contests.

Regional Highlights

There were logs from 47 states plus PR, 5 Canadian Provinces and 4 DX stations (missing HI, AK and WY). The 4C2X multi-op team of 2 Californians and 6 XE ops found another nice spot in Baja, pointed their antennas northward and operated on ABCDEI, providing a new country for some on 1296, and submitted the top DX score with 86 k. Dave, ZF1DC, along with operators Charles, W4WA, and Jim, K4BI, kept 6 meters hopping from Grand Cayman, with 800 W to a Yagi at 70 feet and caused huge pileups for the East Coast stations. The T49C contest team in Cuba also had a nice 6 meter operation, with a third place DX score of 21 k. Detailed listings of all scores can be found on the Web report at **www.arrl.org/contests/results** as well as extended soapbox comments from participants.

Northeast

Activity was high in this portion of the country, owing to the number of large multi-ops, and the great density of VHF operators, combined with a relatively pleasant and warm weekend. Dale, AF1T got a bunch of bands on the air from NH for 6th place in SOLP. K1GX scored 124 k in CT, to round out 10th place in SOHP. There were also more than 25 rovers across the Mid-Atlantic and Northeast. QRM can be fierce when several portable and rover ops arrive simultaneously on the same popular mountaintop. Not only are there station proximities and the same popular band activities, but also QRM due to the common use of 144 MHz as the IF for most of the microwave bands.

It was nice to see RI active on some microwave frequencies, with Chris, WB2VVV, relocating there from NJ, and putting bands ABCD9EF on the air. I'm sorry I missed him as we operated for a few hours from Watch Hill as we roved through RI. Mike, N1JEZ, lit up the microwaves with gear through 47 GHz on Mt Washington in FN44, but missed the log submission deadline. Mark, K2AXX, got his station on the air after being released from the hospital to continue treatment at the home QTH. Hanging his IV meds on a 6 foot high radio rack, he managed to operate 10 bands for 14 hours of air time. Speedy recovery!

Southeast

With the ongoing participation of several well established home stations and club groups, activity continues to grow. Mainstay group W4IY, operating from Flag Pole Knob, VA at 4300 feet scaled back their operation a bit in terms of preamps and power and placed 6th overall. AA4ZZ landed in 7th place in the LM category, and the 4-landers VHF-UHF Contest team, W4NH came in 6th in the MU category. Florida was enjoying a nice 6 meter E_s session, as Jeff, NJ2F, in SFL placed 8th in SOLP, while Gary, NW5E, in NFL managed to catch the 7th spot in SOHP. KE8FD single-handedly found 107 grid mults on 6 meters from SC in his 7-band quest. Frank, W4FAL, with his FT-847 and dreams of getting that tower up, did manage to capture the two island stations on 6 meters with just a dipole, and added several grids on 2 and 432 with low mounted verticals. Hal, N4GG/4, on vacation in FL put up a 6 meter dipole from scrap, 6 feet off the ground on the condo railing and managed 55 contacts in 34 grids. Just goes to show you that you can do a lot with a little on VHF. KØXXX in Arkansas scrambled to get his 6 and 2 meter antennas set up for the contest on a temporary fence-post. To his surprise found out his daughter ran over the coax with the lawnmower, then a fast moving thunderstorm had the array at a 45° tilt. Despite all of this, he caught the 6 m E_s and filled his log.

Central

Jim, K8MR, scored 64 k for top honors in OH and 9th place nationwide in SOLP and Ken, W9GA, topped the previous WI record by scoring 129 k in 8th place, SOHP. The K8CC team was in the 9th LM spot, riding the 6 m openings, but was somewhat shorthanded for ops the first day, limiting the time spent on 144, 222 and 432. Rovers seemed to be very active and contact productive in this part of the country with John, WØAMT/R, in 7th place, Murray, VE3NPB/R, in 8th, and the family team of Tim, KØPG/R, 9th and Patricia, K9ILT/R, 10th, lauded by other base stations for their ability to make "clean sweeps" with contacts on all their rover bands.

Midwest

With the pack-rovers previously mentioned, W6OAL was this region's top SOLP scorer with 54 k, in 10th place overall nationally for this category. KØGU was the top SOHP entry, in 6th place overall. LaVonne, KCØRAD, is a relative newcomer to hamming, VHF and contesting. She took over the family station as the OM, NØTTW, was away, and with a few antennas on the apartment roof, an FT-100D transceiver and brick amps had some great contest operating enjoyment from IA. Stations operating in AZ, TX, NM, CO and OK caught the best of the 6 meter E_s openings. K5TR with 205 k was 8th overall in LM, and top LM in STX. Charles, W5PR, using only 6 meters, worked 687/178 for a 122 k score and top SOHP in STX. The multi-op team at WØLSD gets the "high" (altitude) award for their 3 band operation at 9000 feet atop Mt Princeton, DM68 in CO.

West Coast

The popular entry class seemed to be Single Op Portable in CA, with Hon,

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
WB1GQR (W1SJ, op)	119,714	A	W4SHG	87,768	A	K2DRH	235,470	A	WQ5W	71,068	A	NU6S	37,184	A
			NJ2F	66,048	A	K9MU	77,688	A	W6OAL	54,766	A	VE7XF	37,149	A
AF1T	76,032	A	W4BP	51,528	A	KB8U	77,250	A	NØLL	53,301	A	WB6AAG	32,100	A
AI3Z	38,493	A												
K1TEO	624,921	B	NW5E	135,790	B	WB9Z	193,802	B	KMØT	255,210	B	AF6O	95,976	B
K1RZ	321,525	B	N4IS	123,546	B	W9GA	129,926	B	KØGU	137,600	B	K7RAT (N6TR, op)	71,040	B
K3DNE	175,536	B	W5ZN	114,289	B	K8MD	105,984	B	W5PR	122,286	B	AA7A	59,094	B
WB2AMU	3,071	Q				N8XA	7,747	Q	W8CM	1,320	Q	N7IR	17,088	Q
						K9FOH	300	Q				KQ6EE	3,850	Q
												K7EH	2,850	Q
W3SO	310,464	L	K8GP	740,037	L	K9NS	583,041	L	K5TR	205,273	L	AD6IJ	43,092	L
K3YTL	309,260	L	W4IY	277,911	L	K8CC	187,616	L	W5KFT	81,672	L	W6DTA	22,542	L
W3DOG	295,868	L	AA4ZZ	232,878	L	N8ZM	32,100	L	WØLSD	18,905	L	K7MWD	16,362	L
W2SZ	1,959,675	M	W4NH	267,972	M	W9RVG	58,575	M	K5QE	117,192	M	W6FM	226,080	M
W3CCX	991,935	M	N4HB	105,099	M				WØEEA	91,168	M	K7CW	203,451	M
K3EAR	986,250	M	AG4V	35,088	M				KFØQ	51,972	M	WA7JTM	34,524	M
K2QO	43,127	R	W3IY	318,159	R	VE3NPB	75,096	R	N6NB	1,292,382	R	N6TEB	195,132	R
WA2IID	36,801	R	N5KDA (+K5MQ)	36,360	R	KØPG	73,108	R	N6VI	1,156,760	R	N6DN	184,640	R
N1XKT	35,003	R	N4OFA	34,768	R	K9ILT	72,520	R	N6MU	1,131,156	R	K3UHF	57,772	R

KQ6EE, in LAX, Wayne, KH6WZ, and Val, KG6TI, in ORG in 2nd, 6th and 9th places, respectively. Hon hiked up to Mt Baden Powell (9399 feet) in 3 hours, the second highest peak in Los Angeles area, with a backpack full of radio gear. The Sierra Nevada range seems to attract folks to pack their gear and head for the hills. W6FM multiop team posted a nice score of 226 k from SB. The K7CW group in EWA topped their last year's scoring record to set a new high-water mark of 203 k for that section. At 6300 feet in the Cascades, they had a height advantage and found openings on 6 m intermittently, which complemented their microwave QSOs to achieve their success. Mother Nature got them again this year with snow, sleet, rain and gusting winds. They persevered, and survived, thanks to KE7V's warm RV. Notable rovers Dave, N6TEB/R, operating with Glenn, KE6HPZ, scored 5th nationally in this category, and Paul, N6DN/R, captured the 6th spot, while being first and second respectively in their region. Ron, AF6O, turned in an impressive 95 k effort from ORG across bands ABCD9E, including 100 grids on 6 meters.

The "Bread and Butter" of the Contest

Let's focus for a while on those stations and operators that supply the "bread and butter" in this contest—those with more limited stations, perhaps a newer multiband rig with VHF added bands, low power and a small antenna. The airways would be a lot quieter without their participation, and although geography may limit their capabilities, or other obligations limit their operating time, they add the excitement for all involved as they respond to the endless CQing of the big guns, and are sought after by those prowling the bands when they send out a CQ of their own. Chuck, KE4OAR, and his buddy Mike operated for a few hours from Chuck's truck with an IC-706MK2 and some loops for bands ABD. As a casual team with 18 QSOs and 11 band/grid multipliers for this contest, they managed to work everyone they could hear, and are already planning improved antenna mounts and a potential rove for the future. Dan, N8IE, was a June VHF newbie and admits that he had fun dabbling on 6 and 2 meters, while George, W1EBI, with just a few contacts on 6 meters sent this newsflash, "HF contester enters first VHF contest...and survives!" Ed, KØRPT, made his debut in VHF contesting, after several years devoted to local communication and repeater operation.

As indicated in many Web postings, VHF contesting is more fun when there are more participants. Perhaps it's time to reconsider my suggestion that a bonus score be added for contacts with VHF contest first-time ops, or that newcomers take a "getting started" score multiplier? There are plenty of opportunities to get on the VHF bands to talk around town, find an E_s opening, try a digital mode, or operate a VHF contest this coming year. There is a lot of new and used VHF equipment available and information from the VHF and microwave columns in *QST* and *QEX* in addition to support from VHF clubs. If you haven't already, try it—you may find yourself enjoying a new phase of Amateur Radio.

You have about six months to plot your strategy for the 2005 ARRL June VHF QSO Party, which is scheduled for the weekend of June 11-13. Set your expectations high, and then reach them. You will enjoy the fun!

You can reach the author at **rick1ds@hotmail.com**.

VHF/UHF CENTURY CLUB AWARDS

Compiled by Eileen Sapko Awards Manager

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs are the assigned award numbers. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from August 7 to October 8, 2004.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. If you have questions relating to VUCC, send an e-mail to **vucc@arrl.org**.

50 MHz

100

1395	N5OHL
1396	KG4JSZ
1397	WA5TKU
1398	K3EGE
1399	VE3XN
1400	WB3IAL
1401	N5TEY
1402	K4MIJ
1403	WB9CIF
1404	N7YY
1405	W3TEF
1406	K9CS
1407	WB8RVK
1408	N2NB
V31MD	150
KØIP	450
WA0FQK	275
K1ACL	175
WA1NYV	250
W1PX	250
K1BD	225
K3ZO	625
W3SO	200
KD4MYE	300
KE4HOA	300
N4MM	875
W5WVO	250
AA5XE	725
N6JV	575
K7NN	400
AA7A	700
K7SAM	150
W7KNT	675
K7AWB	225
WO9S	400

144 MHz

100

636	K5GMX
637	K1LPS
N4MM	150
N9LR	325
WO9S	125

222 MHz

50

N9LR	130

432 MHz

50

309	WO9S
N9LR	130

1296

25

143	K9SM

5.7 GHz

5

49	W1AIM
50	VE2PIJ
51	VE2JWH

10 GHz

5

153	K5RHR/5
154	KA1ZD

24 GHz

5

27	K5RHR/5

Satellite

100

W6ZQ	500

2005 ARRL January VHF Sweepstakes Announcement

1900 UTC January 22-0400 UTC January 24

How to participate: Any amateur station on any band above 50 MHz may be worked. The entry classes for Single Operator are high power, low power or portable. A Limited Multioperator station may either use four bands or less. A Multioperator Unlimited uses more than four bands. A Rover is a 1 or 2 person station that operates from two or more grid squares. Any station may be worked once per band, regardless of the mode. You may rework a rover station each time they move to a new grid square. Use of a spotting network makes your station a Multioperator entry. DX stations may only work W/VE stations for credit.

What to say: All stations give their call sign and 4 digit grid square locator (such as W1AW FN31). Information on how to determine your grid square is found on page 86 of the April 1994 *QST* or on-line at **www.arrl.org/locate/gridinfo.html**.

Special interest: If the solar flux index is high, be sure to check out activity on 50 MHz. Also, if you live in a coastal region, watch for some coastal tropospheric propagation. It won't be as prevalent as in the summer months, but if it occurs, you can get some great conditions for operating.

Quirks: Location and weather greatly impact this event. The higher the concentration of amateurs in a region the larger pool of potential QSOs. A severe winter storm in an area will keep Rovers at home and will reduce other activity. A Single Operator Portable station operates from a single location away from home and must use a portable power supply, portable station and a maximum of 10 W PEP output.

Rule changes this year: None.

Best reason to participate: This contest is a good way to build up totals for the ARRL VHF/UHF operating awards such as VUCC. A band opening on 50 MHz could also present the opportunities to find new states for an ARRL Worked All States award or add countries to a DXCC total.

Relative challenge: VHF/UHF/Microwave operation presents unique challenges that test the best equipped operators, but it is also possible for someone to participate in this event with modest stations. You will get better results utilizing SSB or CW instead of FM. The more bands you are able to utilize the better your results.

Scoring: QSOs count one point each on 50 and 144 MHz, two points on 222 and 432 MHz, four points on 902 and 1296 MHz and eight points each on 2.3 GHz and higher. On each band, every time you work a different grid square, you receive a multiplier. Your multiplier total is the sum of grids you worked per band. The final score is your QSO point total × your multiplier total.

How to report your score: You must send in your entry by February 22, 2005. E-mail Cabrillo format log to **JanuaryVHF@arrl.org** or send paper logs and complete summary sheet to January VHF SS, ARRL, 225 Main St, Newington, CT 06111. Scores may also be submitted using the new Web-based applet at **www.b4h.net/cabforms**.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands above 50 MHz (VHF) and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with 2 units of postage to January VHF SS Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0232. QST

2005 ARRL International DX Contest Announcement

CW—0000 UTC February 19-2359 UTC February 20

Phone—0000 UTC March 5-2359 UTC March 6

How to participate: W/VE amateurs work as many amateurs in as many DXCC entities as possible on 160, 80, 40, 20, 15 and 10 meters. Single Operators may participate as all-band High power, Low power or QRP, Single Band (with no power differentiation) or Assisted (with no power differentiation). Multioperator categories are Single, Two or Unlimited transmitters (with no power differentiation).

What to say: US and Canadian stations send a signal report and their state or province/territory. DX stations send a signal report and a number indicating their transmitter output power. If you use standard abbreviations and phonetics, you will find yourself being asked for fewer repeats.

Special interest: Operators will travel to many interesting DX locations—who wouldn't rather be on a warm Caribbean island in mid-February instead of the frozen tundra of the upper US Midwest? Many DX newsletters and mailing lists publish an extensive list of DXpeditions to look for the week before each mode of the contest. The weekly DX bulletin from W1AW also has a good list of reported stations. Be on the lookout for some great opportunities.

Quirks: Remember that the ARRL Multioperator Single Transmitter category does not allow a second transmitter that only works mults: it is a true Single Transmitter category. Multi Singles and Multi-Two stations must remember the six-band change per hour rule for each transmitter.

Rule changes this year: None.

Best reason to participate: It is possible to work enough countries to complete a DXCC in a weekend. In fact, many stations may work enough stations to work a DXCC on more than one band. Activity is always high with lots of stations to work. Any station that completes a minimum of 100 QSOs during either weekend is eligible to purchase an attractive 2004 DX Contest Pin commemorating their accomplishment.

Relative challenge: You don't have to have the fanciest equipment or the biggest station to make plenty of contacts in this contest. The exchange is simple, and there is always propagation to somewhere. Heading toward the bottom of the sunspot cycle will put more emphasis on the lower bands, so good operating practices and courtesy are even more important as some bands become more crowded.

Scoring: Each completed non-duplicate QSO counts three points. For W/VE stations, each DXCC entity worked counts as a multiplier once per band. For DX participants, each US state (except KH6 and KL7), the District of Columbia and Canadian province or territory counts as a multiplier once per band. Your final score is QSO points × total Multipliers worked.

How to report your score: For CW, you must send in your entry by March 21, 2005. For Phone, you must submit your entry by April 5, 2005. E-mail Cabrillo format log for CW to **dxcw@arrl.org** and Phone to **dxphone@arrl.org**. Send paper logs and complete summary sheet to DX CW Contest (or DX Phone Contest), ARRL, 225 Main St, Newington, CT 06111.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF) and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with 2 units of postage to ARRL International DX Contest Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0295. QST

DX 'Test Pins

Once again the ARRL is pleased to offer participation pins for the 2005 International DX Contest. Just make 100 contacts and you are eligible. The cost is $7 for US participants and $10 for non-US entries. If you use a paper log, simply attach a note ordering a pin along with the payment to your entry summary sheet. If you submit the entry electronically, simply send a copy of the first page of your Cabrillo log file (which shows your header information) along with payment. We can only guarantee orders postmarked by April 5, 2005. Orders may be sent to ARRL DX Contest Pins, 225 Main St, Newington, CT 06111. You may also phone 860-594-0295 with a credit card to place your order.

2005 ARRL Straight Key Night Announcement

Let's journey back to years gone by when an aspiring young amateur was being coaxed by his Elmer to "go ahead, put your hand on the key and try sending a few letters." As the youngster gathered his courage, he gets the feel of the key. "You don't literally have to 'pound' brass to send code," the Elmer admonishes after the death grip the kid has on the keyer nearly forces it through the desktop. "Relax; take it easy. You know the letters in your mind. Now let your fist transfer the characters to the key."

With a little practice the kid is finally ready to try a QSO on the air, under the watchful tutelage of the faithful Elmer. With a "cheat sheet" in hand—the text of what the young operator will send carefully written out—the painfully slow first letters—"C" "Q" are transmitted. The sidetone of the radio mesmerizes the new operator as he realizes "*Wow*… I just sent my first CQ…." And the kid was hooked….

We tap the code out in our licensing classes as we learn "dits and dahs." While sitting in traffic, we translate the words on billboards or the letters on license plates into Morse. The short and long sounds become easy to distinguish at slower speeds, with some practice. As we gain some confidence in our skill to copy, we speed up. And the music of the key becomes our anthem. We tune across the bottom 50 kHz or so of any of our HF bands. Like the rhythmic cadence of drums in the distance, the almost ominous sound of a weak CW signal beckons those who love "the code."

In this era of digital communication, keyboarding, FM and electronic keys, once a year many excellent operators bring the past to the present and participate in the annual ARRL Straight Key Night. The object of this friendly event is to enjoy some good, old-fashioned QSO fun, using straight keys. The emphasis is on ragchewing rather than fast contest-type exchanges. SKN 2005 begins at 7 PM EST December 31 and runs for 24 hours through 7 PM EST January 1 (0000-2400 UTC January 1, 2005).

In many circles SKN has been expanded to encompass vintage radio equipment as well. Reminiscing about their early days in our hobby, many operators use SKN as the "excuse" to refurbish their old Viking, Heathkit or Scout. You will hear as many vintage radios on the air during SKN as you will variety of keys. And you will hear signals generated using old-fashioned bugs, a variation of the straight key. SKN is the time Amateur Radio recalls the past, transporting it to the present.

When participating in SKN 2005, instead of sending RST before sending the signal report send the letters SKN, to indicate your participation, and to clue in passersby who may be listening that SKN is going strong. After SKN, send the Contest Branch a list of stations worked, plus your vote for the best fist you heard (it doesn't have to be one you worked). Also, include your vote for the most interesting QSO you had or monitored.

Don't forget to post your comments and interesting photographs from your SKN adventure to the ARRL Contest On-line Soapbox at **www.arrl.org/contests/soapbox**. Entries should be e-mailed to the Contest Branch at **StraightKey@arrl.org** or may be sent via postal mail to SKN, ARRL, 225 Main St, Newington, CT 06111. The Soapbox becomes an on-line album of stories and photographs to share with others.

Entries for SKN 2005 must be received by January 31, 2005. Votes for "Best Fist" and "Most Interesting QSO" will be tabulated and included in the April 2005 issue of *QST*. If you have questions about SKN, please visit the Contest Branch Web Page at **www.arrl.org/contests** or contact **contests@arrl.org**.

Last year we had 227 entries submitted for SKN—the most ever for Straight Key Night. Why not dust off the key, clean the contacts and light up the ether with the beautiful melody of hand-created CW? Sweeter music is hard to find. QST

2005 ARRL RTTY Roundup Announcement

1800 UTC January 8-2400 UTC January 9

How to participate: Amateurs worldwide complete QSOs with each other on 80, 40, 20, 15 and 10 meter bands using Baudot RTTY, PSK31, Packet (attended operation only) and other digital modes. You may enter as either High or Low power in either a Single Operator or Multioperator Single transmitter category. Use of spotting assistance makes your entry Multioperator. You may work a station once per band (regardless of mode).

What to transmit: US and Canadian stations send a signal report and their State or Province. Other stations send a signal report and a consecutive serial number (starting with 001).

Special interest: The ARRL RTTY Roundup is one of the premier worldwide digital contests. The highest score in each category in each ARRL Division or DXCC entity is eligible for a beautiful plaque. There are plenty of opportunities to sponsor plaques for the Roundup. Contact Kathy Allison, KA1RWY, at **kallison@arrl.org** or phone 860-594-0295.

Quirks: You may operate a total of 24 hours of the contest period. Your six hours of off-time must be taken in no more than two blocks (if you operate the full 24 hour period). Be sure to look for activity in the Novice/Technician sub-band of 28.1 to 28.3 MHz, with PSK31 activity at 28.120 MHz. Remember that total power output in the Novice sub-band may not exceed 200 W for US stations. On 40 meters, don't forget to look for European activity between 7.030 and 7.040 MHz.

Rule changes this year: None for 2005.

Best reason to participate: The RTTY Roundup brings out the premier digital operators across the US and around the world. It is a great way to either get started on a digital WAS or DXCC award, or to add to your existing totals. It is also a great chance to try out some of the newer digital modes, such as PSK31 or MFSK or some of the modes you may not have tried, such as Hellschrieber.

Relative challenge: Today's advances in computer interfaces, sound cards and software make it relatively easy for anyone with basic digital operation experience and skills to excel. The bands are almost always packed with stations to work during the Roundup.

Scoring: Count each completed nonduplicate QSO one point. Each US state (except KH6 and KL7), the District of Columbia, Canadian province or territory and each DXCC entity (other than W and VE) count as a multiplier. Multipliers count only once (not once per band). Your final score is QSO points × total Multipliers worked.

How to report your score: You must send in your entry by February 8, 2005. E-mail Cabrillo format log to **RTTYRU@arrl.org** or send paper logs and complete summary sheet to RTTY Roundup, ARRL, 225 Main St, Newington, CT 06111. Submissions may also be made using the Web-based applet at **www.b4h.net/cabforms**.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms** where you will also find links to the General Rules for all ARRL Contests, General Rules for ARRL Contests on bands below 30 MHz (HF) and other forms and operating aids, log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending a self-addressed, stamped envelope with 2 units of postage to ARRL RTTY Roundup Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0295. QST

STRAYS

QST congratulates...

◊ ARRL HQ staff member Robert Lincoln, who will soon celebrate his 90th birthday. Bob has run the ARRL HQ in-house print shop for 25 years—after retiring in 1979 at normal retirement age from a Hartford-area print shop.

◊ ARRL member Andrew M. Headrick, KG4WJU, of Maryville, Tennessee, who recently received his Eagle Scout rank. Andrew holds a General class license and has demonstrated Amateur Radio to many youngsters. —*Lee Wilkinson, WA4QXC*

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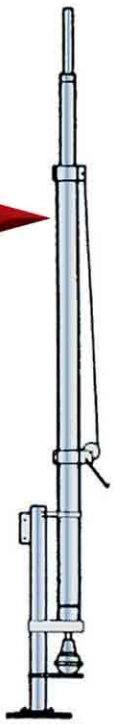

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- Alphanumeric backlit display
- VSC (Voice Scan Control)
- 7 different scan modes
- Beginner mode
- Band scope
- Includes Ni-Cds & charger

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Winning Performance

- 150 kHz–3.3 GHz**
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- Dual watch
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Turn Your Computer into a Wide Band Receiver

- 100 kHz–1.3 GHz**
- AM, FM, WFM, USB, LSB, CW
- Unlimited memory channels
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- IF shift
- Noise blanker
- Digital AFC
- Voice scan control
- Attenuator
- Tunable bandpass filters

computer not included

Bonito software (included) adds:

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- Remote control head
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- Auto antenna tuner

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*706MKIIG not included

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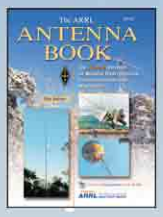

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IC-V8 Quality, simplicity, anywhere. (left) The polycarbonate and die-cast aluminum 144MHz, FM, 5.5W V8 offers 100 memories and standard CTCSS/DTCS and DTMF. 2.13"w x 5.19"h x 1.38"d, 12.3 oz **$114.99***

IC-T7H Powerful output, ample receive audio. (mid-left) A 6W amp circuit provides superior transmit on VHF/UHF when 13.5 V DC is supplied. In addition, 500mW of AF is output. Separate CTCSS tone encoder and enc/decoder standard. This 2M/440 MHz meets MIL SPEC. 2.25"w x 4.34"h x 1.06"d, 10 oz. **$169.99***

IC-T2H SPORT More than enough power. (mid-right) The 6W T2H Sport meets MIL SPEC for shock and vibration and is more than enough for long distance communications. The 2M handheld boasts tone squelch, customizable keys, DTMF encode, 40 memories, 10 weather channels and cloning. 2.3"w x 5.5"h x 1.3"d, 14.8 oz. **$95.99**

IC-W32A User-friendly, independent band controls. (right) The 5W, 2M/440 W32A meets novice or experienced demands: simple use, advanced features. Simultaneous receive, 200 mem. 2.25"w x 5.41"h x 1.31"d, 1 lb **$239.99***

IC-V8000 75W of "base" power. Also offers 25/10/5W. With clear, operator-facing speaker, the 2M features CTCSS/DTCS, DTMF encode and 207 mem. 5.9"w x 1.97"h x 5.9"d, 2.22 lbs **$165.99***

IC-2720H Twice the versatility, twice the fun! The 2M/440MHz, 50/35W 2720H offers simultaneous rx capability, independent band controls, and DMS with 212 mem. Also has CTCSS/DTCS, wide rx, auto repeat, remote mic and remote control head (mnt. opt.). 5.5"w x 1.56"h x 7.38"d, 3 lbs **$349.99***

IC-2100H-25N Durable 2M rig with superior RX IMD, performance. The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. Remote controlled using backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz **$149.99***

IC-2200H 65W and new digital features. With a familiar 2100H interface, the 2M 2200H adds optional digital capability providing modulated and demodulated clear voice and data. Also offers 207 memories with DMS, standard CTCSS/DTCS en/decode, weather channel/alert, and FM narrow. 5.5"w x 1.56"h x 5.75"d, 2.75 lbs ... **$209.99***

IC-706MKIIG Base features, mobile size. The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. Tone squelch, DSP, auto repeater and 107 memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz ..... FREE RMK706 **CALL**

IC-718 Origin of HF. With the performance of the HF all-band 718, such as wide dynamic range, high S/N ratio, and full duty operation, making distant contacts is easy. 9.44"w x 3.75"h x 9.41"d, 8 lbs, 6 oz ..... FREE UT106 **$534.99***

IC-703 For QRP enthusiasts. The 160-10M 703 is capable of 5/10W and focuses on QRP. A portable HF unit featuring relay-type antenna tuner, low current consumption, DSP, memory keyer and 105 memories. 6.56"w x 2.28"h x 4.88"d, 4.4 lbs ..... Closeout **$429.99**

IC-703PLUS The 703, plus 6M **$549.99**

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IC-T90A Compact, full featured. 50/144/440MHz T90A offers wideband rx with 5W. Features 555 memories with DMS scanning. Also provides DTCS/CTCSS, DTMF encode, PC programmability and weather resistance. 2.53"w x 3.44"h x 1.16"d, 8.47 oz **$239.99***

IC-208H High power, wideband. This 2M/70cm mobile provides 55/50W, plus reduced power for local. The 208H covers 118-173, 230-549 and 810-999MHz (cell blocked) rx as standard. With improved DMS, detachable front, and 500 memories. 5.56"w x 1.56"h x 7.31"d, 2.65 lbs..... **$279.99***

IC-910H 100/75W stable output. 2M/440MHz base provides 9600bps, satellite support. 9.5"w x 3.69"h x 9.4"d, 9.9 lbs **$1269.99**

IC-746PRO 32-bit DSP takes you higher. 100W, 102 memories, and a multi-function LCD command the HF/50/144 MHz 746PRO. 24-bit AD/DA converter and digital noise reduction. 11.3"w x 4.7"h x 12.5"d, 19 lbs, 13 oz.. FREE PS-125 © **$1299.99**

IC-756PROII Digital leap. All-mode, HF, 50MHz PROII offers 32-bit floating DSP, 24-bit AD/DA converter, selectable IF shape, and adjustable noise blanker. 13.38"w x 4.38"h x 11.2"d, 21 lbs, 1 oz ..... FREE PS-125 © Closeout **$2199.99**

IC-756PROIII Same as the PROII with improved 3rd order intercept, better roofing filter, improved DSP for tx audio, less distortion on receive, mini scope and more **$2999.99**

IC-7800 The big honcho! The hottest rig with the most bells and whistles. The 200W, HF/50MHz 7800 is a fusion of 40 years of analog design expertise with digital technology. Built-in supply and auto antenna tuner, four 32-bit floating DSPs, TWO identical receivers! 16.6"w x 5.9"h x 17.1"d, 55 lbs .. **$10599.99**

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TH-K2AT A triumph of advanced engineering. (mid-left) This 2M 5W HT is equipped with internal VOX, weather alert/RX, auto simplex checker, auto repeater offset and multiple scans. The K2AT also offers built-in CTCSS, DCS and 1750Hz tone burst. The K2AT meets MIL-STD-810 for resistance to rain, vibration, shock, humidity. 2.44"w x 4.38"h x 1.13"d, 12.5 oz .....© **$144.99**

TH-G71A The brighter side of handy communications. (right) This FM, 144/440MHz boasts illuminated keypad and LCD, high-performance antenna, and ergonomic design. The 5W G71A also offers convenience with menu mode, PC compatible and 200 memories. 2.31"w x 4.44"h x 1.44"d, 11.6 oz .....© **$224.99**

TH-F6A Head-scratching, unique features. (left) The FM 144/220/440MHz F6A offers dual-channel RX capability, 16-key pad, multi-scroll key, 5W, and 435 memories. Other attractive features include built-in ferrite bar antenna for AM, backlit LCD, lithium-ion battery, and a MIL-STD design. 2.3"w x 3.44"h x 1.18"d, 8.8 oz.....© **$324.99**

TH-D7A(G) Explore APRS opportunities with an HT built for the future. (mid-right) This 5W FM dualband (2M, 440MHz) is equipped with a TNC and provides a range of data communications options. Along with simple packet, use the D7A(G) with APRS and GPS to send positioning data to a friend, who can pinpoint the location. 4.75"h x 2.25"w x 1.5"d, 12 oz .....© **$354.99**

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TM-D700A Harnessing APRS®, GPS and SSTV. FM 144/440MHz mobile featuring built-in TNC, including simple packet. The brightest spot of the 50/35W D700A is its ability to enable APRS® without a PC. Also has 200 memories and built-in CTCSS/DCS. 5.5"w x 1.58"h x 7.68"d, 3 lbs...© **$514.99**

TM-271A All-terrain performance. On or off road, the 144MHz, 60W 271A delivers powerful mobile performance and other features such as multiple scan functions, 200 memories, NOAA weather, and CTCSS/DCS. This MIL-STD transceiver also provides high quality audio, illuminated keys and large LCD .....© **$179.99**

TM-G707A The essence of ease. From the extra-large panel to Kenwood's Easy Operation mode, the G707A is extraordinarily user-friendly. In addition to its regular profile, it can store four others for instant recall. This 50W/35W, FM dualband (144/440MHz) offers 180 multi-function memories with name function to identify each. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs **$269.99**

TM-V7A Cool Blue: The look of mobile communication. The V7A 144/440MHz FM transceiver marks a departure in ergonomic design with its easy-to-operate control panel and reversible LCD. The "5-in-1" programmable memory, 50/35W, DTSS and pager functions, and dual receive on one band make it a pace-setter. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs.....© Closeout **$349.99**

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TS-480SAT New compact all-mode. This 100W HF/50MHz can operate on DC 13.8V and offers two power terminals. The 480SAT also features AF DSP, RX dynamic range, separate LCD control panel with speaker, 100 memories and antenna tuner. Can be controlled from a PC, PSK31 compatible ..© **$939.99**

TS-480HX 200W, without tuner .© **$1039.99**

TM-461A Fully equiped, supremely user-friendly 440MHz mobile. The 35/10/5W 461A offers a built-in CTCSS encoder, tone scan and wireless cloning function. For quick access, essential data can be stored in 61 "memory name function" memory channels. Other features include DTSS selective calling, multi-scan capability, and a case built to MIL-STD. 5.5"w x 1.5"h x 6.3"d, 2.2 lbs.....Closeout **$439.99**

TS-570D(G) Affordable DSP. High-end technology doesn't mean high-end budget. With 16-bit DSP, untouchable filtering, tuner and central frequency control, the 570D(G) provides powerful 160-10M use. 10.63"w x 3.75"h x 11"d, 15 lbs.....© **$909.99**

TS-570S(G) Above, plus 6M.....© **$1049.99**

TS-870S DSP at the IF stage. The all-mode, HF 870S incorporates DSP with a full range of features including 100 memories, built-in keyer, interactive menu function, 4-stage attenuator, noise blanker, automatic antenna tuner and 100W power. 13"w x 4.75"h x 13.13"d, 25.35 lbs.....Closeout **$1999.99**

TS-2000 Distinctive design, packed for performance. The all-mode, HF, 2M, 6M, 70cm 2000's advanced digital technology converts analog into digital. The 2000 also features dual channel receive, IF-DSP combined with AF-DSP, built-in TCXO and auto antenna tuner, IF auto notch, built-in 1200/9600bps TNC, 300 memory channels and DX cluster tune. 10.6"w x 3.8"h x 12.5"d .....© **$1599.99**

TS-2000X Same as the 2000 with the addition of 1.2GHz .....© **$2199.99**

TS-B2000 2000 with PC software. 10.63"w x 3.75"h x 12.5"d .....© **$1399.99**

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Wrap It Up For the Holidays

VX-2R Smallest HT dualband! (left) This 1.5/1W dualband (144/440MHz) handheld offers VHF, UHF, shortwave, marine and aircraft bands, or WIRES™ linking. The 2R's wide band receive includes the AM broadcast band, continuous HF shortwave, VHF/UHF up to 729MHz, plus 800-960MHz (cell blocked). It also includes over one thousand memories (20 groups), CTCSS/DCS encode/decode and auto repeater shift. 1.9"w x 3.2"h x 0.9"d....© **$149.99**

VX-5R/VX-5RS Setting water resistance standards. Offering 5W (4.5 on 430MHz), the units cover 50/144/430MHz while providing short to microwave receive. Great for outdoors (opt. barometric pressure unit). Black or silver. 2.3"w x 3.4"h x 1.1"d, 8.9 oz... **$219.99**

VX-7R/VX-7RB The first submersible amateur HTs. (right) Water protected, the 50/144/430MHz, 5W 7R/7RB are rated for 3', 30-minute submersions. Magnesium bodies make them ideal for outdoors. Include dual/wide-band rx, status strobe, and WIRES™ key. Silver or black. 2.4"w x 3.5"h x 1.1"d, 9.2 oz.....© **$299.99**

YAESU

VX-150 Performs under difficult conditions. (right) This 2M 5W HT provides exceptional receive performance with clean, clear transmit. Built to withstand outdoor use, it is also outfitted with commercial-grade speaker and Omni-Glow™ keypad. 4.3"h x 2.3"w x 1"d, 11.5 oz.... **$119.99**

FT-60R The new generation dualband HT. (left) The 144/430MHz, 5W, FM, FT-60R offers extensive receive frequency coverage, providing versatile 2-way along with unmatched monitoring. New-generation Emergency Automatic ID (EAI) feature, for search-and-rescue, is also introduced in the 60R. 1000+ alphanumeric mem., CTCSS/DCS, NOAA. 2.3"w x 4.3"h x 1.2"d, 13 oz.... **$199.99**

FT-7800R Get "back to basics." This FM, 144/430MHz mobile boasts 50 and 40 Watts output and 1000 memories. It also offers one-touch hyper memories, full-featured CTCSS/DCS, WIRES™ internet linking and wide receiver coverage. The 7800R has a large LCD and NOAA weather alert. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs.....© **$235.99**

FT-817ND Self-contained, battery-powered, multi-mode portable. The 5W 817ND is designed for operation on HF, plus 6M, 2M, and 70cm. Whether you perfer SSB, CW, AM, FM, packet, or SSB-based digital modes, it is ready for your next hiking, camping, or search-and-rescue adventure. Includes 1400mAh NiMH battery and charger. 5.3"w x 1.5"h x 6.5"d, 2.6 lbs.....© **$589.99**

FT-2800M Cool and quiet 65W operation. The most rugged 2M transceiver ever provides 65/25/10/5W with an extensive 221 memories, alphanumerics and CTCSS/DCS. The 2800M also features NOAA with weather alert, WIRES™ access, SmartSearch™, and excellent receive performance. With a bullet-proof front end and direct keypad entry, it's a dream come true. 6.3"w x 2"h x 7.3"d, 4 lbs..... **$154.99**

FT-8900R Leading the way in FM mobile design. The 29/50/144/440MHz 8900R has no peer among mobiles. This quad bander offers leading edge features like VHF/UHF full duplex, cross band repeat, independent operation on two bands, and six "Hyper Memory" keys to store configurations. The 8900R also provides 50W (35 on 440MHz), access to internet linking systems, over 800 memories, CTCSS/DCS, and built-in duplexer. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs..... **$419.99**

FT-8800R Easy operation, ultimate dualband. This 144/430MHz 50/35W mobile offers simultaneous monitoring of one band while operating the other. Besides extended receive, the 8800R provides 1000 memories, cross band repeat, versatile scan and CTCSS/DCS. Looks similar to the FT-8900R above. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs.....© **$339.99**

FT-897D All-in-one portable base. The all-mode, multi-band 897D features high output 100W (HF/6M), 50W (2M), 20W (70cm), rugged construction, 200 memories, TCXO and optional internal supply and external antenna tuner. 7.87"w x 3.15"h x 10.3"d, 8.6 lbs© **$839.99**

FT-1000MP MK V Improving the 1000 series Elite-Class. Building on the success of the 1000 series, the HF, all-mode, 200W Mark V offers Class-A PA (75W) operation, interlocked digital bandwidth tracking system and a variable RF front-end filter. 16"w x 5.3"h x 13.7"d, 31 lbs..... **$2049.99**

MK V FIELD Reach the HF Summit! The technology of the 1000D and Mark V in a 100W, self-contained design. This HF all-mode features Class-A (25W) PA operation, interlocked digital bandwidth tracking and a variable RF front-end filter along with an auto antenna tuner and internal switching supply. 16"w x 5.3"h x 13.7"d, 33 lbs **$1739.99**

FT-840 Performance forward. Blending high performance digital frequency techniques with operating convenience, the 840 is a base station that beginners and seasoned operators will appreciate. In addtion to 100W on 160-10M, it adds a choice of 2 optional remote auto antenna tuners. 9.4"w x 3.7"h x 9.6"d, 12 lbs **$579.99**

FT-847 Masterpiece of high-tech design! Ready for action on SSB, CW, HSCW, AM, FM, Packet, SSTV, and RTTY, the 847 expands operating horizons to 6M, 2M and 70cm, featuring DSP and full-duplex satellite. Advanced DSP. 10.2"w x 3.4"h x 10.6"d, 14.4 lbs **$1399.99**

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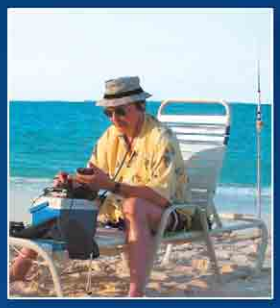

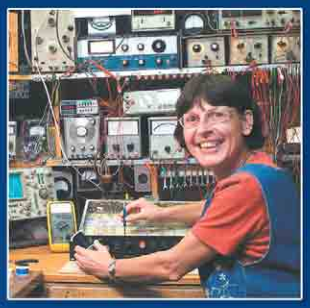

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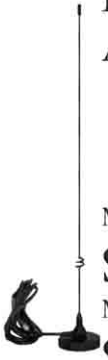

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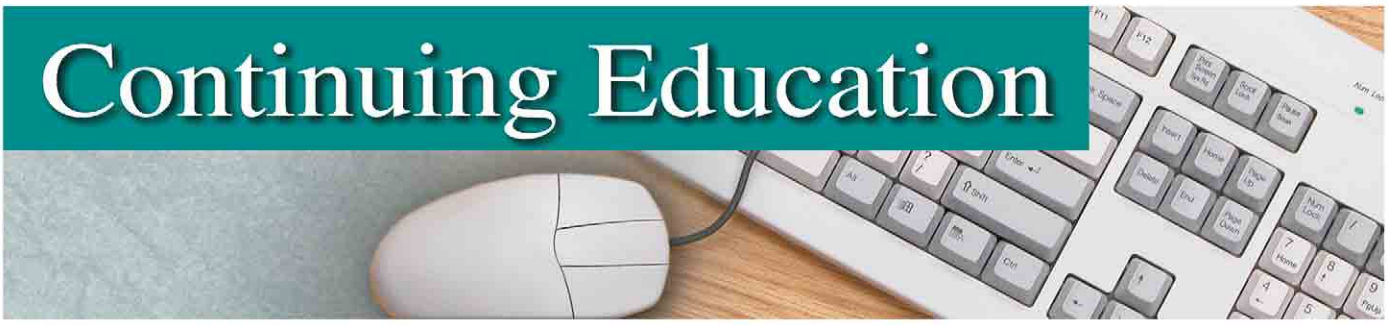

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Member: $65 / Non-member: $95

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Online courses are produced by American Radio Relay League, Inc. and are available through ARRL's partnership with the Connecticut Distance Learning Consortium (CTDLC), a nonprofit organization that specializes in developing on-line courses for Connecticut colleges and universities. Continuing Education Units (CEUs) are available for all ARRL Certification and Continuing Education courses. The ARRL Certification and Continuing Education Program is funded in part by course fees from interested hams who support public service and quality continuing education. For further information, e-mail your questions to **cce@arrl.org**, or write to **ARRL C-CE, 225 Main Street, Newington, CT 06111**.

VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$159.95

VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$109.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$79.95
PM-30UV
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PM-30, $79.95, for 1.8 to 60 MHz.
Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.

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PM-30UVN, $89.95, N connectors.
PM-30UVB, $89.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $74.95
100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $79.95** has N connectors.

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Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. 1.5 kW.

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The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

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B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

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B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $45. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

FCC Type Accepted

6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps

11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $289**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W. In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $139*	*MastMount, $195*
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50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Commercial Amps, $159 to $429

Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $439**, 82W PEP out/2W in. (without sync compression).

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

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10 models -- 20-220 Watts out for 2-50W in, $169-$739.

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MFJ-993

$259.95 **New!**

The MFJ-993 *IntelliTuner*™ lets you tune any antenna *automatically* balanced or unbalanced -- *ultra fast*.

It's an automatic antenna tuning *console* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJs exclusive *IntelliTuner*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you *ultra fast* automatic tuning with over 2000 *non-volatile* revolving memories.

You get a highly efficient L-network, wide 6-1600 ohm matching at *full* 300 Watts SSB/150 Watts CW, 1.8-30 MHz coverage, Cross-Needle and *digital* meters, aural SWR meter, *backlit* LCD display, remote control port, radio interface, heavy-duty 16 amp/1000 volt relays and more.

It learns while you're having fun

As you're ragchewing, contesting or DXing, *your MFJ-993 is learning!*

When you transmit, the MFJ-993 automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!*

Each of two antennas can learn and remember over a thousand frequencies and tuner settings. They are safely stored in *non-volatile* revolving memory.

Highly Intelligent ultra fast tuning

MFJ *InstantRecall*™ first checks its memory to see if you have operated this frequency before. If so, tuning is instantaneous and you're ready to operate.

If not, MFJ's *IntelliTuner*™ algorithm - - based on MFJ's famous SWR Analyzer technology - - kicks in. It *measures* the complex impedance of your antenna. Next, it *calculates* the components it needs and instantly *snaps* them in. Then, it fine tunes to minimize SWR -- you're ready to operate. It's all done in a *fraction* of a second.

When the impedance is within its measurement range, the MFJ-993 is the *fastest automatic antenna tuner in the world.*

If it can't accurately determine impedance, MFJ's *AdaptiveSearch*™ algorithm goes into action. Frequency is measured and relevant components values are determined. Only those values are searched for ultra-fast tuning.

For even faster searches, you can set the target SWR to 2 (settable 1.0 to 2.0).

You can manually tune when you can't transmit (for listening out of ham bands).

Cross Needle and Digital Meters

Lighted Cross-Needle and *digital* SWR/Wattmeters lets you accurately read SWR, forward and reflected power at a glance.

An *aural* SWR meter lets you *hear* the tuned SWR when you can't see or read the meters.

Turn on a highly visible, instant response SWR LCD bargraph when you need it.

Backlit LCD Display

An easy-to-read *backlit* LCD displays SWR, forward/reflected power, frequency, antenna 1 or 2, L and C tuner values, on/off indicators and other information.

Remote Control Port

Plug in the **MFJ-990RC, $39.95**, remote control and put your tuner at your antenna or elsewhere and control it remotely.

The MFJ-993 supports radio tuner interfaces such as the ICOM 706 series. *Interface cables are available.*

The MFJ-993 is a compact 10Wx2¾ Hx9D inches. Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $19.95**.

Tune any Antenna

You can tune any antenna -- dipoles, verticals, beams, phased arrays, inverted vees, quads, random wires, mobile antennas, limited space antennas -- any antenna.

A 4:1 true current balun lets you tune any *balanced* antenna -- horizontal loops, vertical loops, multi-band doublets, quads, folded dipoles, Zepps.

150 Watt Automatic Tuner

New!

MFJ-991, **$219.95**

MFJ-991, *150 Watt IntelliTuner*™ automatic antenna tuner. Similar to MFJ-993 but handles 150 Watts SSB/100 Watts CW, matches 6-3200 Ohms. Does not have digital SWR/Wattmeter/LCD display, aural SWR meter/audio feedback, antenna switch or 4:1 current balun for balanced lines.

600 Watt MFJ Automatic Tuner

MFJ-994, **$359.95** **New!**

MFJ-994, *600 Watt IntelliTuner*™ automatic antenna tuner. Similar to MFJ-993 but handles 600 Watts SSB/300 Watts CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display, aural SWR meter/audio feedback, antenna switch or 4:1 current balun for balanced lines. Tuning must be done at low transceiver power with the amplifier bypassed.

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MFJ tiny Travel Tuner

Tiny 4½x2¼x3 inch tuner handles full 150 Watts! Covers 80-10 Meters, has tuner bypass switch, tunes nearly anything!

MFJ brings you the *world's smallest* full power 150 Watt 80-10 Meter Antenna Tuner. Extra wide matching range lets you tune nearly any antenna.

It's no toy, its got guts! Built with real *air* variable capacitors (600 Volt, 322 pF) and *three* stacked powder iron toroids to handle real power -- not just QRP. Bypass switch lets you bypass tuner when you don't need it.

You can use nearly any transceiver at full power with nearly any coax fed or random wire antenna for portable, home or mobile operation.

It's perfect for compact rigs like Icom IC-706MKIIG, Yaesu FT-100D, Kenwood TS-50, QRP rigs and others with a built-in SWR meter.

Operate anywhere, anytime with a quick easy set-up! Tune out SWR on your mobile whip from inside your car. Operate in your apartment with a wall-to-wall antenna or from a motel room with a wire dropped from a window or from a mountain top with a wire over a tree limb. Great for DXpeditions or field day. Be prepared for emergencies.

MFJ-902 is so small and handy, you'll rely on it wherever you go! It's easy to pack away in your briefcase, suitcase, backpack, glove compartment or desk drawer. It's tiny enough to slide in your back hip pocket! 4½Wx2¼Hx3D in.

MFJ-902
$79.95 **New!**

Tiny Travel Tuner with 4:1 Balun

MFJ-902H
$99.95

MFJ-902H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun* for balanced lines and 5-way binding posts for balanced lines and random wire. 5¾Wx2¼Hx 2¾D inches.

Tiny Travel Tuner with Cross-Needle SWR/Wattmeter

MFJ-904
$109.95

MFJ-904, same as MFJ-902 *Tiny Travel Tuner* but has *Cross-Needle SWR/Wattmeter.* Read SWR, forward and re-flected power all at a glance in 300/60 and 30/6 Watt ranges. 7¼Hx2¼Hx2¾D in.

ALL-in-one *Tiny Travel Tuner* with 4:1 Balun *and* SWR/Wattmeter

MFJ-904H
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ALL-in-one! MFJ-904H, same as MFJ-902 *Tiny Travel Tuner* but has *4:1 balun for balanced lines* and Cross-Needle SWR Wattmeter. Read SWR, forward and reflected power all at a glance in 300/60 and 30/6 Watt ranges. Has 5-way binding posts for balanced lines and random wire. 7¼Hx2¼Hx2¾D inches.

Long 10/12 foot Telescoping Whips

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10 Feet

MFJ-1956
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12 Feet

10 foot extended, 19 inches collapsed, MFJ-1954, $19.95. 12 foot extended, 22.5 inches collapsed. MFJ-1956, $29.95. Standard 3/8 inch by 24 threaded stud for use with all standard mounts. Durable 1/2 inch diameter plated brass. Telescopes for full 1/4 wave operation 2 to 12/15 Meters. Cover 17, 20, 30, 40, 60, 80, 160 Meters with loading coil. Use two for multi-band dipoles. Replace screwdriver antenna whip for highly efficient *fixed* mobile operation.

MFJ RF Isolator

MFJ-915 *RF Isolator*

MFJ-915
$29.95

prevents unwanted RF from traveling on the outside of your coax shield into your transceiver. This unwanted stray RF can cause painful RF "bites" when you touch your microphone or volume control, cause your display or settings to go crazy, lock up your transceiver or turn off your power supply. In mobile installations, stray RF could cause your car to do funny things even blow your car computer. Clear up these problems, plug an MFJ-915 between your antenna and transceiver. *Don't operate without one!* 5x1½ inches. For 1.8 to 30 MHz.

Portable Collapsible Antenna Tri-Pod

MFJ-1918
$39.95

Holds 66 pounds of antenna steady. Black *steel* base forms strong braced equilateral triangle 40 inches on a side. Non-skid feet. One inch diameter steel mast extends height to six feet. Strong base and mast locks. Easily add antenna mount or mast extension for greater heights. Collapses to 38 inches by 4 inch diameter. 6¾ pounds.

1500 Watt Lightning Surge Protector

MFJ-272
$39.95

Protect your expensive transceiver from static electricity and lightning induced surges with an ultra-fast gas discharge tube. Plug between rig and antenna, attach ground. DC to 1000 MHz. SO-239s.

All-Band G5RV Antenna

MFJ-1778
$39.95

Cover all bands, 160-10M with tuner. 102 ft. long, 1.5kW. Custom fiberglass insulator stress relieves 450 Ohm ladder line. Use horizontally, as inverted vee or sloper. Marconi on 160M.

40-10M G5RV Junior
MFJ-1778M, $34.95.
Half-size 52 foot *G5RV Jr* 40-10 Meters, 1500 Watts.

Glazed Ceramic Antenna Insulator

MFJ-16C06
$3.95
Package of six. (69 cents each)

Authentic *glazed ceramic* antenna insulator. Extra-strong -- will not break with long antennas and will not arc over or melt even under full legal power. Molded ridges give extra-long high voltage path to prevent high-voltage breakdown. Smooth wire holes prevent wire damage. Use as center or end insulator for dipoles, doublets, G5RVs, guy wires and others.

Current Balun/Center Insulator

MFJ-918
$24.95

True *1:1 Current Balun/Center Insulator* forces equal currents into dipole halves to reduce coax feedline radiation and field pattern distortion. Reduces TVI, RFI and RF hot spots in your shack. 50 ferrite beads on *Teflon*® coax. 1.5kW, 1.8-30 MHz. Stainless steel hardware. *Direct* antenna connection. 5x1½ in.

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RG-213+	Top quality, 97% shield, IIA jacket	47¢/40¢
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RG-8X 100' 2 molded-on PL-259 $19.95

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#14 FlexWeave	168-strand, bare copper	17¢
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Ladder-Line	Stranded #14 conductors	34¢/29¢
1/2" Tinned Copper Braid Ground Strap, any length		65¢
LadderLock	Center insulator for ladder-line	$13.50

Pulleys - for antenna support rope. Highest quality, sailboat-type. Small, lightweight, for fibrous rope. For 3/16" rope @ $13.95 and for 5/16" rope @ $15.95

RFI Quick Fix

Built-in ground strap
Breaks up ground loops
Ends RF feedback problems

For really tough RFI problems, the new T-4G is the ultimate fix, shunting stray RF on your coax directly to ground. Stray RF and coax radiation doesn't have a chance. "It solved all my RF feedback problems in my 2nd floor shack." (W4THU) Don't be misled by $100+ or other imitations.

Antenna Support Line

Dacron® Antenna Support Line, BLACK, single braid, sun resistant, 3/16" 750# test 100' hank **$9** **1000' $75**

Kevlar - Dacron Jacket for sun protection, 500# test, for guying vertical booms, etc. .075" 200' spool **$16.95**

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For 18 years, The RADIO WORKS has brought you the best made, best performing wire antennas. No warmed over handbook designs - just performance engineered antennas.

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Same performance but, smaller, better. Matching unit and Line Isolator are ¼ the size of the standard units. Perfect for stealth, QRP, portable, emergency and DX'peditions. 600 w PEP. Optimized for a support height of 35'. #16 wire

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MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974H is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974H is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974H gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

The MFJ-974H tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

Excellent Balance, Excellent Design

The MFJ-974H is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to unbalanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

MFJ-974H **$199.95**

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

MFJ-974 **$179.95**

MFJ-974, $179.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $49.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ *High Current* DC Multi-Outlet Strips

Choose super versatile 5-way binding posts AND/OR Anderson PowerPole® connectors

Anderson PowerPole® is a registered trademark of Anderson Power Products.

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost*. *RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost*.

Versatile 5-Way Binding Posts

MFJ-1118 **$74.95** **Power** two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128 **$99.95** ***12 outlets, each fused, 40 Amps total.*** Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126 **$79.95** ***8 outlets. each fused, 40 Amps total.*** Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129 **$109.95** *The best of both worlds!* ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124 **$59.95**

6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

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MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).

***MFJ AirCore*™ Roller Inductor**

gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

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MFJ will repair or replace your unit *(at our option)* for 1 year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 **$329.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D **$269.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$199.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/ Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3½Hx10⅝Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

MFJ-941E **$119.95**

The most for your money! Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/ Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E **$109.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

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MFJ-971 **$99.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ in.

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MFJ-901B **$79.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

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Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

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MFJ-921/924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 in. Simple 2-knob tuning for mobile or base.

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Tiny 4x2½x1¼" tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

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MFJ *1.8-170 MHz* SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

New MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!

The world's most popular SWR analyzer just got incredibly better and gives you more value than ever!

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

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Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1312D, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

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MFJ-219B, $99.95. UHF ***SWR Analyzer***™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312D, $14.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

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MFJ-29C, $24.95. Tote your MFJ-259B 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-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

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MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

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MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

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$169.95

"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, $19.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $58.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

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MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434
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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 play back five natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed.

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-434 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.

It's easy to use -- just plug in your 8 pin mic and plug the MFJ-434 cable into your transceiver. Internal jumpers let you set it to your rig. Use your mic or its built-in mic for recording.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $14.95. 6½Wx2½Hx6½D in.

MFJ-73, $29.95. MFJ-434 Remote Control with cable.

60 dB Null *wipes out* noise and interference

MFJ-1026
$179.95

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, $14.95. 6½x1½x6¼ in.

MFJ-1025, $159.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

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MFJ-784B
$249.95

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.

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No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

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No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

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These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

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Low Ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

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They are fully protected with Over Voltage and Over Current protection circuits.

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MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

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Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

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It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

MFJ-4035MV
$149.95

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

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Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

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MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

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The **AT-100Pro** is a full featured, frequency sensing, memory autotuner designed for today's HF radios. It features dual antenna connectors with over 2000 memories for each. Latching relays reduce power consumption and hold the match even with DC power removed. Tunes with SSB. Just pick up the mic, speak, and it tunes!

The **AT-100Pro** uses LDG's standard high efficiency, microprocessor controlled, switched "L" network and works with dipoles, verticals, inverted Vees and other coax fed antennas. Use with the optional 4:1 or 1:1 external baluns for long wires or ladder line fed antennas. Optional interface cables provide DC power and control from most Icom, Alinco, Kenwood and Yaesu radios.

AT-100Pro Memory Tuner — $219

- 1 to 125 watts
- 160 to 6 meters
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- Perfect for remote installation

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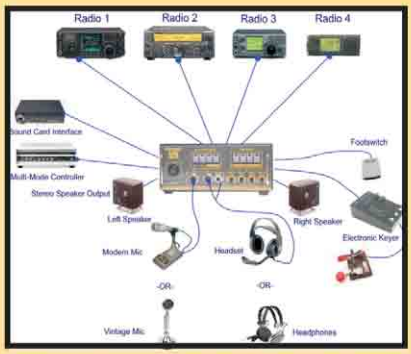

NCS-3240 Typical Application

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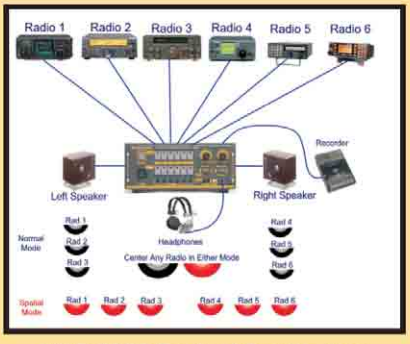

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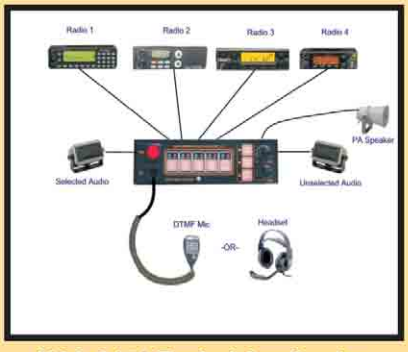

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TECH TALK

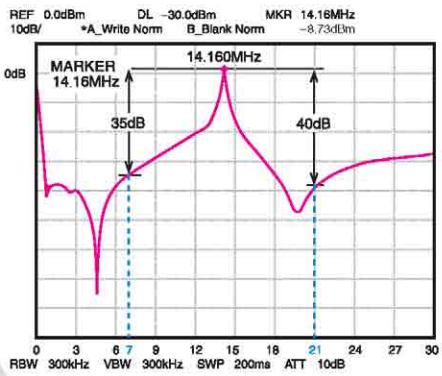
IC-7800 Digi-Sel: State-of-the-art preselector

Top-band enthusiasts and multi-multi contest station operators place incredible demands on their receivers. On 160 meters, amateurs who live in urban areas often have one or more local 50-kilowatt AM broadcast transmitters operating just below 1.8MHz. On any band, multi-multi contest stations may have as many as six full-legal-limit transmitters operating simultaneously, with antennas located very close to each other. If undesired out-of-band signals saturate the first mixer stage, the receiver will be useless for weak-signal DXing or contesting. Even a receiver with a +40dBm Third Order Intercept (TOI) can be overloaded under these extreme conditions!

External bandpass and band-reject filters are one way to battle strong out-of-band signals. Another device that's very useful for out-of-band signal rejection is a receiver preselector. Several popular radios of the 1970s had receiver preselectors that worked very well, but required manual adjustment whenever you changed frequency by more than a few dozen kHz. Although they improved receiver performance when adjusted correctly, they could seriously degrade receiver performance if you changed frequency and forgot to "tweak" the preselector control.

The ideal preselector adds selectivity to the receiver front end while automatically tracking the tuning control. Enter the IC-7800 Digi-Sel tracking preselector! The IC-7800's microcontroller tunes the Digi-Sel preselector automatically so that its response peak is always centered on your operating frequency. The following diagram shows the actual measured response of the Digi-Sel tracking preselector when the IC-7800 is receiving in the 20 meter SSB band (14.160MHz). Notice that the preselector suppresses signals on 40 meters (7MHz) by 35dB and signals on 15 meters (21MHz) by 40dB!

DIGI-SEL Characteristics in the 14MHz band



The IC-7800 tunes the Digi-Sel preselector by adding and subtracting inductance and capacitance from a tuned circuit. Icom's engineers designed the preselector for absolute maximum immunity from strong-signal overload and for absolute minimum distortion by using state-of-the-art ultra-miniature relays instead of switching diodes. A preselector that uses switching diodes can introduce in-band spurious signals in the presence of very strong out-of-band signals — a preselector that uses relays and passive components (inductors and capacitors) cannot.

How could we make Digi-Sel even more useful? By including one in each of the front ends of both receivers in the IC-7800! Imagine using dual-watch on the same or different bands with two identical, independent receivers, both of which have a tracking preselector in the front end!

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3/8"EE / EJ Turnbuckle	$11/12
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1/2"x12"EE / EJ Turnbuckle	$21/22
3/16" / 1/4" Big Grips	$5/6

PLEASE CALL FOR MORE HARDWARE.

HIGH CARBON STEEL MASTS

5 FT x .12" / 5 FT x .18"	$35/59
10 FT x .18" / 11 FT x .12"	$129/80
16 FT x .18" / 14 FT x .12"	$179/109
19 FT x .12" / 21 FT x .18"	$129/235
22 FT x .25" / 24 FT x .25"	$349/379

GAP ANTENNAS

Challenger DX	$289
Challenger Counterpoise	$29
Challenger Guy Kit	$19
Eagle DX	$299
Eagle Guy Kit	$29
Titan DX	$329
Titan Guy Kit	$29
Voyager DX	$409
Voyager Counterpoise	$49
Voyager Guy Kit	$45

PLEASE CALL FOR DELIVERY INFO.

LAKEVIEW HAMSTICKS

9106	6m	9115	15m	9130	30m
9110	10m	9117	17m	9140	40m
9112	12m	9120	20m	9175	75m

All handle 600W, 7' approximate length, 2:1 typical VSWR .$24.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/199
G6-270R, 2m/70cm Vertical	$169
G6-144B/G7-144B	$109/179

HUSTLER RESONATORS IN STOCK.

ANTENNA ROTATORS

M2 OR-2800P	$1249
Yaesu G-450A	$249
Yaesu G-800SA/DXA	$329/409
Yaesu G-1000DXA	$499
Yaesu G-2800SDX	$1089
Yaesu G-550/G-5500	$299/599

ROTATOR CABLE

R62 (#18)	$.32/ft.
R81/82	$.25/ft./.39/ft.
R84	$.85/ft

PHILLYSTRAN GUY CABLE

HPTG1200I	$.45/ft
HPTG2100I	$.59/ft
PLP2738 Big Grip (2100)	$6.00
HPTG4000I	$.89/ft
PLP2739 Big Grip (4000)	$8.50
HPTG6700I	$1.29/ft
PLP2755 Big Grip (6700)	$12.00
HPTG11200	$1.89/ft
PLP2758 Big Grip (11200)	$18.00

PLEASE CALL FOR HELP SELECTING THE PHILLYSTRAN SIZE FOR YOUR PROJECT.

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The Icom IC-756PROII is an all mode HF and 6m transceiver featuring 32-bit digital signal processing, auto antenna tuner, 100 watts RF output, digital twin PBT, 5" multifunction color TFT LCD display with band scope function, built-in CW and SSB memory keyers, and more. Supplied with hand mic and DC power cord.

PW-1..... In Stock!
The Icom PW-1 is a 1000 watt solid state linear amplifier for HF and 6m operation, featuring a high power automatic antenna tuner, built-in power supply, and a removable front control panel, and more.

IC-746PRO..... In Stock!
The Icom IC-746PRO is an all mode HF/6m/2m XCVR with 32-bit IF level DSP. The radio features a built-in auto tuner, built-in RTTY demodulator and decoder (reads out on the radio's LCD display), auto notch, digital twin PBT, and more. Supplied hand mic and DC power cord.

IC-910H..... In Stock!
All-mode 2m/70cm dual band transceiver, featuring dual data inputs, CTCSS encode/decode, CW keyer, satellite mode, scan, sweep display function, optional 23cm module, optional DSP, and more. Supplied with hand mic and DC power cord.

FT-1000MP-V..... Yaesu Special!
Competition class HF DSP transceiver with automatic antenna tuner, digital signal processing, 200 Watts RF output, and more! With external AC power supply.

FT-1000MP-V Field..... Special!
Lower power (100W) version of the FT-1000MP-V, with built-in power supply.

Quadra System..... In Stock!
Solid state, no tune linear amplifier, offers 1000 Watts RF output on 160-15m (easy user mod adds 10/12m operation) and 500 Watts RF output on 6m.

FT-897D..... In Stock!
"Backpack" all-mode HF/6m/2m/70cm XCVR offering 100 watts of output power! The radio can be run from optional internal batteries with reduced output of 20 watts, or an optional internal power supply can be installed instead. An optional bolt-on external auto tuner is also available. The FT-897 is a truly self-contained portable!

FT-847..... Yaesu Special!
Great all-mode XCVR covering HF/6m/2m/70cm! The radio is perfect for satellite operation, and features DSP, CTCSS tone encode/decode, and more. Supplied with microphone and DC power cord.

IC-703..... New, In Stock!
IC-703PLUS..... New, In Stock!
The Icom IC-703 is a compact HF XCVR, with built-in auto tuner, DSP, and more! The IC-703PLUS adds 6m coverage.

IC-706MK2G..... Icom Special!
The Icom IC-706MK2G is a compact HF/6m/2m/70cm all mode XCVR with DSP, CW keyer, built-in CTCSS encode/decode/scan, 107 memoriess and more. A detachable front panel offers convenient mounting, even in compact vehicles.

IC-718..... New Lower Price!

IC-2720H..... New!
Dual band 2m/70cm FM XCVR. Features remote control panel, CTCSS tone encode/decode/scan, cross band repeat, data jack, dual RX, extended RX, 212 memories, and more. Supplied with a DTMF hand mic, separation cable, mounting brackets, and a fused DC power cord.

IC-V8000..... In Stock!
Great 75W 2m mobile XCVR. Features CTCSS tone encode/decode/scan, 207 memories, front panel mounted speaker, and more. Supplied with a DTMF hand mic, mounting bracket, and DC cord.

FT-8900R..... In Stock!
Quad band mobile XCVR covers 10m/6m/2m/70cm, with cross-band repeat.

FT-8800R..... New, In Stock!
Great 2m/70cm dual band mobile, 45/35 Watts, removable front panel, and more!

FT-7800R..... New, Please Call!
New, 2m/70cm dual band mobile XCVR.

FT-2800M..... In Stock!
Rugged, 50W 2m mobile transceiver.

FT-857D..... Now In Stock!
Ultra-compact all mode XCVR for HF/6m/2m/70cm. Features CW memory keyer, CTCSS encode/decode, 200 memories, optional DSP, and more. Supplied with a hand microphone, a fused DC power cord and mounting bracket.

FT-817ND..... In Stock!
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IC-T2H Sport.... Great Low Price!
IC-T7H..... Icom Special!
IC-V8..... Great Low Price!
IC-W32A..... Now In Stock!
IC-T90A..... New, In Stock!
IC-R20-06..... New, Please Call!

IC-208H..... Great Low Price!
A great 2m/70cm dual band mobile XCVR, featuring CTCSS tone encode/decode, 500 memories, removable control panel, and more. With a back-lit DTMF hand mic, mounting bracket, and a DC power cord.

IC-2100H..... Great Low Price!
Rugged 2m mobile XCVR with CTCSS tone encode/decode/scan, DTMF paging/squelch, 113 memories, and more.

IC-PCR1000..... In Stock!
IC-R8500/R75..... In Stock!
IC-R3/R5-06..... In Stock!

G-2800DXA..... $1089
Heavy duty antenna rotator handles 34 sq. ft. of antenna load, and features 450° rotation, preset and variable speed.

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G-800SA/DXA..... $329/409
G-450A..... $249
G-5500..... $599
G-550..... $299

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VR-120D..... In Stock!
VR-500..... In Stock!
VX-2R..... Great Low Price!
VX-5R..... In Stock!
VX-7R..... In Stock!
VX-150..... Great Low Price!

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