Official Journal of
ARRL
The national association for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

July 2003

QST reviews

ICOM IC-703
all-mode transceiver

Alinco DR-620T
dual-band mobile transceiver

How to install a beam antenna

A carrier operated relay circuit

Kids love this Radio Camp

Satellite TV dish for OSCAR 40

$4.99 U.S. $6.99 Can.
07
19260
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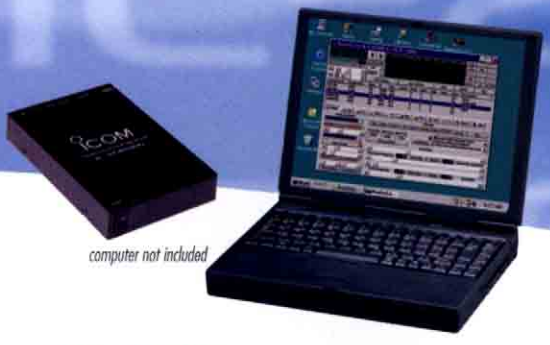
Tune in the world with Icom!



computer not included

New IC-R5

Winning performance! Compact, and packed with features!

150 kHz – 1.3 GHz* • AM, FM, WFM • 1250 Alphanumeric Memories • CTCSS/DTCS Decode • Weather Alert • Dynamic Memory Scan (DMS) • Preprogrammed TV & Shortwave • Weather Resistant • 2 AA Ni-Cds • PC Programmable

IC-R3

See & Hear all the action!

• 500 kHz – 2.45 GHz* • AM, FM, WFM, AM-TV, FM-TV • 450 Alphanumeric Memories • CTCSS with Tone Scan • 4 Level Attenuator • Telescoping Antenna with BNC Connector • 2" Color TFT Display with Video/Audio Output • Lithium Ion Power • PC Programmable

IC-R10

Advanced performance!

500 kHz – 1.3 GHz* • AM, FM, WFM, USB, LSB, CW • 1000 Alphanumeric Memories • Attenuator • Backlit Display & Key Pad • VSC (Voice Scan Control) • 7 Different Scan Modes • Beginner Mode • Band Scope • Includes AA Ni-Cds & Charger • PC Programmable

New Software IC-PCR1000 BON

Turn your PC into a wide band receiver! Compatible with most PC's and laptops, the 'PCR1000 connects externally- in minutes! Now with Bonito™ software! Updated ICOM software compatible with later versions of Windows™ OS is also now available!

• 100 kHz – 1.3 GHz* • AM, FM, WFM, USB, LSB, CW • Unlimited Memory Channels • Real Time Band Scope • IF Shift • Noise Blanker • Digital AFC • Voice Scan Control • Attenuator • Tunable Bandpass Filters • AGC Function • S Meter Squelch • CTCSS Tone Squelch • Computer Controlled DSP w/optional UT-106

download frequencies right from the web

www.icomreceivers.com

IC-R75

Pull out the weak signals!

• 30 kHz - 60.0 MHz* • AM, FM, S-AM, USB, LSB, CW, RTTY • 101 Alphanumeric Memory Channels • Twin Passband Tuning (PBT) • Commercial Grade • Synchronous AM Detection (S-AM) • Optional DSP with Noise Reduction Auto Notch Filter • Triple Conversion • Up to Two Optional Filters • Front Mounted Speaker • Large Display • Well Spaced Keys and Dials • PC Remote Control with ICOM Software for Windows® (RSR75)

IC-R8500

The experts choice!

• 100 kHz - 2.0 GHz* • AM, FM, WFM, USB, LSB, CW • 1000 Aphanumeric Memories • Commercial Grade • IF Shift • Noise Blanker • Audio Peak Filter (APF) • Selectable AGC Time Constant • Digital Direct Synthesis (DDS) • RS-232C Port for PC Remote Control with ICOM Software for Windows® (RSR8500)

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*Cellular frequencies blocked.

The Ultimate Portable QRP Rig!

Why do we call the '703 the ultimate portable QRP rig?

- **IC-706MKIIG Operations.** Anyone who has a '706 will know how to operate without the manual!
- **HF or HF & 6M only.** Icom's engineers focused on the bands that really mean the most to QRP operators.
- **Internal Antenna Tuner.** 160-10M or 160-6M, depending on the version. Internal, automatic and designed with latching relays so no current draw when the match is achieved.
- **DSP.** Thats right, Automatic Notch and Noise Reduction is included.
- **Smart Power Mode.** The '703 is one smart radio! It knows when to throttle back the current to prolong the life of your battery.
- **Low Current Consumption.** This QRP rig will rival some handheld radios, as the current drain is as low as 300mA when on 9.6VDC
- **CW Memory Keyer.** Contest QRP is so sweet with the internal CW Memory Keyer. 3 memories capable of holding 50 characters each.
- **Big Ears.** Sensitivity of 0.16uV at 10dB S/N rivals some of the big rigs. This helps compensate for antenna compromises when you're in the field!
- **Cold Hands.** Don't worry, the '703 comes with the TXCO, so your frequency will not drift when you touch the knob with cold hands. Ready for outdoors!
- **No Assembly Required.** The '703 is ready to go when you are!
- **Way Cool Optional Backpack.** A must have accessory! So cool, '706 owners will have to own one!

Call your authorized Icom dealer for details!

Why not? You deserve it!

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Hy-Gain's world famous Bell Shaped Rotator™ design is the standard that other rotators are measured against.

Its bell construction gives you total weather protection for super reliable operation. Its super heavy duty steel gear drive gives you years of superior and trouble-free performance. Many Hy-Gain rotators still provide excellent service after over 25 years of outstanding performance.

The last thing you want to fall apart is your rotator that's mounted on the top of your tower. You won't make any compromises when you buy and install high quality Hy-Gain rotators.

And we're the only manufacturer to offer a full line of rotators that are completely MADE IN THE USA.

HAM-IV, $559.95. *The heavy duty Ham-IV is the most popular rotator in the world!* It is designed for medium size antenna arrays up to 15 square feet wind load area when mounted in-tower, or 7.5 square feet when mast mounted with an optional lower mast bracket. New alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. New low temperature grease permits normal operation down to -30 degrees Fahrenheit. New wire-wound potentiometer gives reliable and precision directional indication, new ferrite beads reduce RF susceptibility, new Cinch plug connector plus 8-pin plug at control box (no screwdriver needed). Dual 98 ball bearing race for load bearing strength. Strong electric locking steel wedge brake prevents wind induced antenna movement. Easy-to-use Control Box has illuminated directional meter with North or South center of rotation scale, separate snap-action brake and rotation switches. Uses low voltage control for safe operation. Accepts masts up to $2^{1}/_{16}$ inches diameter. Rotator size is $13^{1}/_{2}$Hx8D inches.

T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to $2^{1}/_{16}$ inches diameter. Rotator size is $14^{1}/_{16}$Hx$9^{3}/_{16}$D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to $2^{1}/_{8}$ diameter. Includes light duty lower mast support, Rotator size is $17^{3}/_{8}$Hx8 D inches.

AR-40, $289.95. *Lightweight antenna rotator.* Handles smaller ham antennas and large TV/FM antennas up to 3.0 square feet windload area when mounted in-tower, or 1.5 square feet when mast mounted using the supplied lower support bracket. Dual 12 ball bearing race, disc brake system. Silent, automatic control box -- just dial and touch for desired direction. Accepts mast sizes up to $2^{1}/_{8}$ diameter. Includes light duty mast support. Rotator size is $17^{3}/_{8}$Hx8D inches.

Call your dealer for your best price!

Rotator Specifications	T2X	HAM-IV	CD-45II	AR-40
Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

HAM IV

$559.95
Suggested Retail

T-2X

$649.95
Suggested Retail

CD-45II

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AR-40

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New

DR-620T VHF/UHF Dual-Band Mobile/Base

First Amateur Twin Band Mobile To Support Optional Digital Voice Communications*

- RX-VHF 108-173.995 MHz, UHF 335-480 MHz
- TX-VHF 144-147.995 MHz, UHF 430-449.995 MHz
- Receives Airband and Wide FM
- Front control unit separation (optional EDS-9 kit required)
- Advanced 10F3 digital mode with speech compression technology (EJ-47U required)*
- 200 memory channels
- Advanced EJ-50U TNC (optional) supports digi-peat mode
- Remote control features including parameter setting and direct frequency entry through the microphone
- Dual-Band receiver with V/U, V/V, U/U capability
- CTCSS/DCS encode/decode and European Tone-bursts
- OUTPUT: H/M/L-50/10/1 watts VHF
- OUTPUT: H/M/L-35/10/1 watts UHF

DR-605TQ VHF/UHF Dual-Band Mobile/Base

Full 2 Meter/440 Performance

- 100 memory channels, + a "call" channel for each band
- CTCSS encoded+decoded and tone scan
- Cross-band repeat and full duplex capability
- 9600 bps packet ready with dedicated terminals
- Internal duplexer - one easy antenna connection
- RX-VHF 136-173.995 MHz, UHF 420-449.994 MHz
- TX-VHF 144-147.995 MHz, UHF 430-449.994 MHz
- MARS capability (permit required)
- OUTPUT H/L - 50/5 watts VHF, 35/5 watts UHF
- Time-out timer (ideal for repeater and packet operation)

DJ-V5TH VHF/UHF Dual-Band FM Transceiver

5 watts of output power, in a compact package.

- Alphanumeric Display, up to 6 characters
- TX-VHF 144-147.995 MHz, UHF 420-449.995 MHz
- 200 memory channels plus two call channels
- Full VHF + UHF Amateur Band Coverage
- Receive Range, (76 - 999MHz) includes Wide FM capability
- Up to 5 watts output, 3 output settings
- CTCSS encode+decode DTMF squelch and European Tone bursts
- 4 scan modes, 5 programmable scan banks
- MARS capability (permit required)

IronHorse®

Ask your dealer about the full line of Iron Horse antennas & accessories!

DJ-596T VHF/UHF Dual-Band HT with Digital Voice Option*

Loaded with features! The breakthrough design supports optional digital voice communications and you can easily switch the unit between analog and digital modes!

- Full 4.5 watts output VHF/4w UHF
- Powerful NiMH battery
- 100 memories in any combination of VHF or UHF channels
- Direct frequency input from keypad
- Each memory capable of "odd split" operation.
- Alphanumeric channel labels
- CTCSS/DCS encode+decode plus tone bursts
- Full 2m and 440 band coverage
- Accepts 6 to 16 VDC direct input
- Illuminated Keys and display
- Wide and narrow FM modes
- 10 autodial memories
- Theft alarm feature
- Optional EJ-40U Digital Voice Board!*
- Programming/Clone software available

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Specifications subject to change without notice or obligation. *Digital communications require at least two similarly equipped transceivers. Digital mode may not be legal in some countries. See FAQ on digital at www.alinco.com. Products intended for use by properly licensed operators. Permits required for MARS use. Specifictions subject to change without notice or obligation.

July 2003 ♦ Volume 87 Number 7

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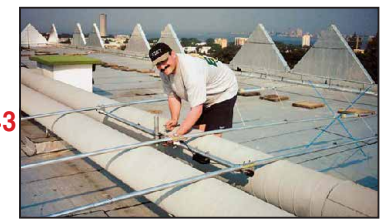

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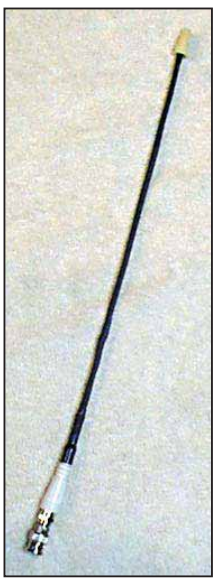

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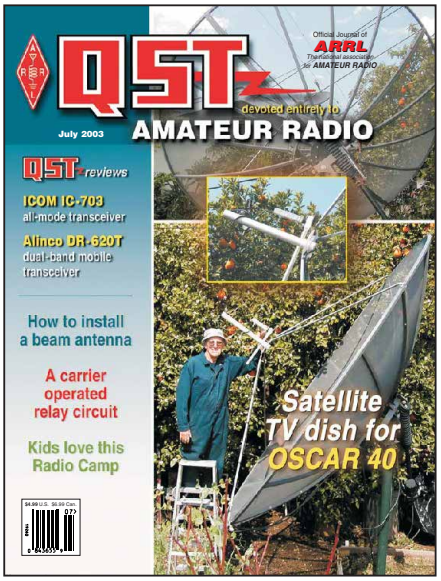

Our Cover
Clair Cessna, K6LG, found a TVRO dish a neighbor was happy to part with. After a few modifications, he was ready to work the world via OSCAR 40. Photos by Art Sutorus, KQ6HF.

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, $34. 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, $850.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

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*Payment arrangements available. Please write for details.

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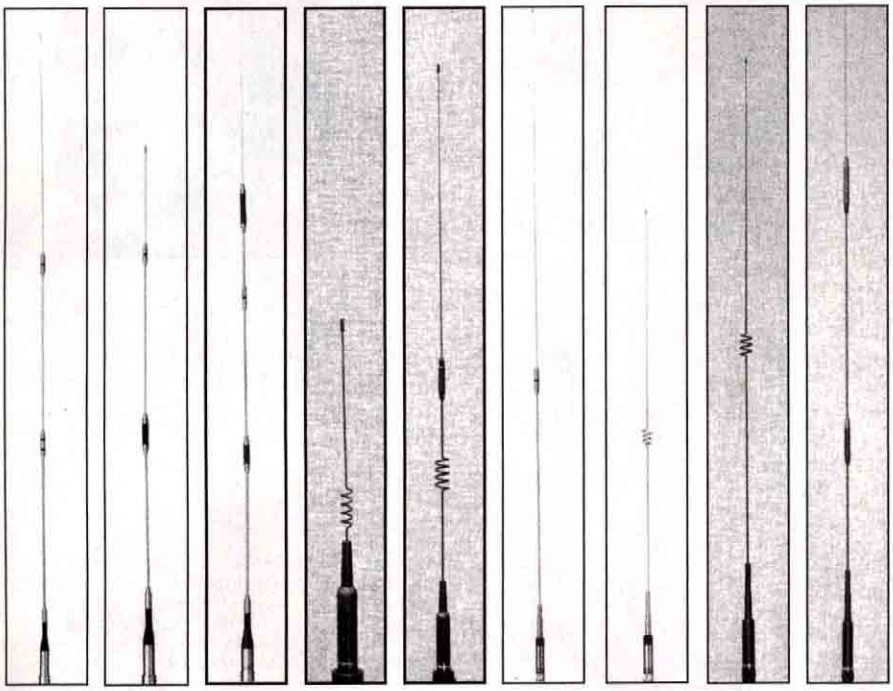


SG2000HD | SG7500A SG7500NMO | SG7900A | NR72BNMO | NR73BNMO | NR2C | NR770HA NR770HB | NR770HNMO NR770HBNMO | CR627B CR627BNMO

HV7A Mobile Antenna System

For New HF/VHF transceivers NEW!

(Such as: IC706 series and FT100)

Optional Loading Coils

HVC7	40m
HVC14	20m
HVC18	17m
HVC21	15m

Recommended Antenna Mounts: K400C or K600M

MX62M Duplexer

Specifications:
HF/6m & 2m/70cm bands
1.6-56 MHz LPF
76–470 MHz HPF
(76–120 receive only)

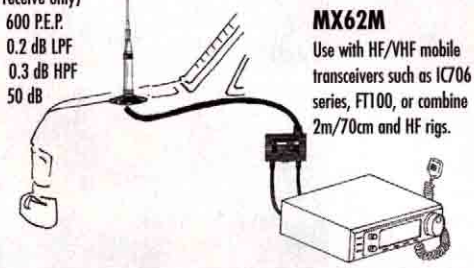
Watts:	600 P.E.P.
Loss:	0.2 dB LPF
	0.3 dB HPF
Isol.:	50 dB

The NEW HV7A has 5 band capability: 70cm, 2m, 6m, and 2 HF bands through use of loading coils. Foldover feature allows for easy access into low overhead buildings. Ideal for users of IC706 series and FT100 radios.

Bands Supplied:	10m/6m/2m/70cm
Opt. Loading Coils:	40m/20m/17m/15m
Power, P.E.P.:	HF 120w/VHF 200w
Mount Connection:	UHF
Length:	54"
SWR:	1.5:1 nominal

MX62M

Use with HF/VHF mobile transceivers such as IC706 series, FT100, or combine 2m/70cm and HF rigs.



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- Factory pre-tuned/no adjustment
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- NMO and UHF (PO) base styles
- 24 Kt gold plated connector pin
- No grounding required unless noted
- Fold-over feature on most models

FOLD-OVER

Patented One-Touch Fold-over Feature
(Not available on NR72BNMO, NR73BNMO, & NR770SA.)

MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR72BNMO*[6]	2m/70cm	100	NMO	13.8	1/4λ, 1/2λ
NR73BNMO	2m/70cm	100	NMO	33.5	1/2λ, 1-5/8λ
NR770HA[7]	2m/70cm	200	UHF	40.2	1/2λ, 2-5/8λ
NR770HNMO[8]	2m/70cm	200	NMO	38.2	1/2λ, 2-5/8λ
NR770RA	2m/70cm	200	UHF	38.6	1/2λ, 2-5/8λ
SG7000A*[6]	2m/70cm	100	UHF	18.5	1/4λ, 6/8λ
SG7500A	2m/70cm	150	UHF	40.6	1/2λ, 2-5/8λ
SG7500NMO	2m/70cm	150	NMO	41.0	1/2λ, 2-5/8λ
SG7900A*	2m/70cm	150	UHF	62.2	7/8λ, 3-5/8λ

* Not recommended for Magnet Mount
6 Grounding required.
7 NR770HB same specifications but in black finish.
8 NR770HBNMO same specifications but in black finish.
9 52-54MHz only

MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
NR2C	2m	150	UHF	55.5	1/2λ+1/4λ
SG2000HD*	2m	250	UHF	62.6	1/2λ+3/8λ
SG6000NMO*[6,9]	6m	150	NMO	39	1/4λ
CR224A*[6]	2m/1-1/4m	150	UHF	68.5	7/8λ, 2-5/8λ
CR320A*[6]	2m/1-1/4m 70cm	200 100/200	UHF	37.4	1/4λ, 1/2λ 2-5/8λ
CR627B*[6,9]	6m/2m/	120	UHF	60	1/4λ, 1/2+1/4λ/
CR627BNMO*[6,9]	70cm	120	NMO	60	2-5/8λ

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- Triband (144/220/440 MHz)
- Receives 2 frequencies simultaneously even on the same band
- 0.1~1300MHz high-frequency range RX (B band)[1]
- FM/FM-W/FM-N/AM plus SSB/CW receive
- Bar antenna for receiving AM broadcasts
- Special weather channel RX mode
- 435 memory channels, multiple scan functions
- 7.4V 1550mAh lithium-ion battery (std.) for high output[2] and extended operation
- 16-key pad plus multi-scroll key for easy operation
- Built-in charging circuitry for battery recharge while the unit operates from a DC supply
- Tough construction: meets MIL-STD 810 C/D/E standards for resistance to vibration, shock, humidity and light rain
- Large frequency display for single-band use
- Automatic simplex checker
- Wireless remote control function
- Battery indicator • Internal VOX • MCP software

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

"Specifications subject to change without notice."

NEW

TH-F6A

TRIBANDER

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True mono-band performance in a multi-band array that's fed with a single feedline!

OB2-40
Extemely compact, high efficiency 2-element mono-band 40-meter Yagi.

All models use the OptiBeam Hi-Q coil in the 40-meter elements.

Specifications (number of elements / free space gain in dBi per band)

Model	Boom	Elements	40 meters	20 meters	17 meters	15 meters	12 meters	10 meters
OB21-4	38'	21	3 / 6.87	4 / 9.43		5 / 10.16		9 /10.67
OB12-4	25'	12	2 / 5.57	3 / 7.22		3 / 7.92		4 /8.71
OB8-4M	20'	8	2 / 5.35	2 / 6.19		2 / 6.47		2 / 6.59
OB11-6	24'	11	2 / 5.52	2 / 6.29	2 / 6.68	2 / 6.98	2 / 6.27	2 / 6.95
OB2-40	18'	2	2 / 5.84					
OB2-40M	18'	2	2 / 5.31					

Additional models are available for a wide range of frequencies—and for every budget.
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"IT SEEMS TO US..."

60 Meters

Sometime this summer, for the first time since the opening of the 17-meter band on January 31, 1989, radio amateurs in the United States will gain access to additional HF spectrum. At least initially, the so-called 60-meter band (which purists will point out is closer to 55 or 56 meters and in any case should not be confused with the 60-meter tropical broadcasting band) is not a band it all. It consists of just five 2.8-kHz channels where General, Advanced, and Extra Class licensees can only use upper sideband (USB) telephony at a power output strictly limited to 50 watts effective radiated power relative to a dipole antenna. This is less than we had hoped for, but more than we have ever had, in the vicinity of 5 MHz. Even to get this far, it's been a long road.

It all began in the summer of 1990 in a hotel room in Cambridge, Massachusetts. The Administrative Council of the International Amateur Radio Union was holding a special meeting to prepare for the 1992 World Administrative Radio Conference (WARC), the agenda for which had just been set by the Council of the International Telecommunication Union. This was to be the most important such conference since 1979, with a number of potential threats to Amateur Radio allocations—including a major push for HF broadcasting expansion—on the agenda.

The IARU officers and regional representatives who gathered with selected advisors on that first weekend in July were not satisfied just to assume a defensive, reactive posture. More than a decade earlier, Amateur Radio had scored victories at WARC-79 through a carefully planned, multi-year process of defining our spectrum requirements and persuading administrations throughout the world that we deserved their support. Even with WARC-92 looming less than two years in the future, they took the time to develop a survey document entitled *Spectrum Requirements of the Amateur and Amateur-Satellite Services*. Updated annually, it remains an active working document of the Administrative Council; the most recent edition is on the Web at **www.iaru.org/ac-spec02.html**.

In the document the Administrative Council identified the following objective: "A narrow allocation, even on a shared basis, is sought in the vicinity of 5 MHz to assist the Amateur Service in overcoming a number of difficulties." Noting that WARC-79 had accepted the principle that the Amateur Service should have access to a family of frequency bands so communications can be maintained as propagation conditions change, the document said there was a need to bridge the gap between the bands at 7 and 3.5 MHz, just as there had been a need to bridge the gaps between the 7, 14, 21 and 28 MHz bands.

There was no opportunity to advance the cause of a 5-MHz amateur allocation at WARC-92. Soon thereafter, however, the Office of Spectrum Management of the National Telecommunications and Information Administration (NTIA) launched a study that culminated in the publication of *U.S. National Spectrum Requirements: Projections and Trends* in March 1995. The ARRL input to the study had identified, among other things, the need for a secondary allocation LF allocation as well as for about 50 kHz near 5 MHz, on a shared basis. NTIA concluded, "Additional allocations at 160-190 kHz, and near 5 MHz will require technical studies to determine the availability of these bands to support amateur use." A further NTIA study published in November 1996, *High Frequency (3-30 MHz Spectrum Planning Options*, stated: "A new amateur service requirement for 50 kHz of shared use around 5000 kHz appears possible at 4945-4995 kHz."

With this encouragement from NTIA, the possibility of a 5-MHz amateur allocation moved to a front burner. An ARRL spectrum occupancy study of the bands around 5 MHz concluded that it might be easier to gain access to 50 kHz somewhere between 5100 and 5450 kHz. An experimental license application for operation in that range was filed in July 1998. The license was finally issued and operation commenced in early 1999. Based in part on the results of those experimental operations, in July 2001 the ARRL petitioned for a domestic allocation on a secondary basis of 5250-5400 kHz. The rationale for a wider band than 50 kHz was that the added flexibility would make it easier for amateurs to avoid interfering with the primary fixed and mobile services.

Six weeks later, September 11 happened. It soon became apparent that federal agencies with homeland security responsibilities were developing renewed interest in HF. Still, we were optimistic when the FCC proposed in May 2002 to grant our petition. In the past, when the FCC proposed an allocation in a shared government/non-government band it generally meant that the proposal had been coordinated with the government spectrum managers. This time, that turned out not to be the case. NTIA made its opposition known in August 2002, after the deadline for public comments and reply comments.

To their credit, NTIA staff subsequently worked hard to find a way to accommodate amateur service requirements at 5 MHz. They looked at a number of alternatives, including several different 50-kHz bands, in an effort to reduce the impact on federal agencies to an acceptable level. Ultimately they were only able to identify five spot frequencies that could be made available at this time, subject to unique and rather severe constraints intended to ensure that the federal agencies can reclaim any or all of them at a moment's notice should the need arise.

The restrictions that apply to our use of these five channels will require considerable self-discipline. Still, even limited access to 5-MHz spectrum partly fulfills the objective originally expressed by the IARU Administrative Council 13 years ago. If we demonstrate that we can use them responsibly, cooperatively, and in the public interest, there is no reason we cannot seek expanded access at an appropriate time. If your personal operating practices are inconsistent with that, please do yourself and everyone else a favor and confine your operating to the traditional bands.

See you on 60!—*David Sumner, K1ZZ* QST

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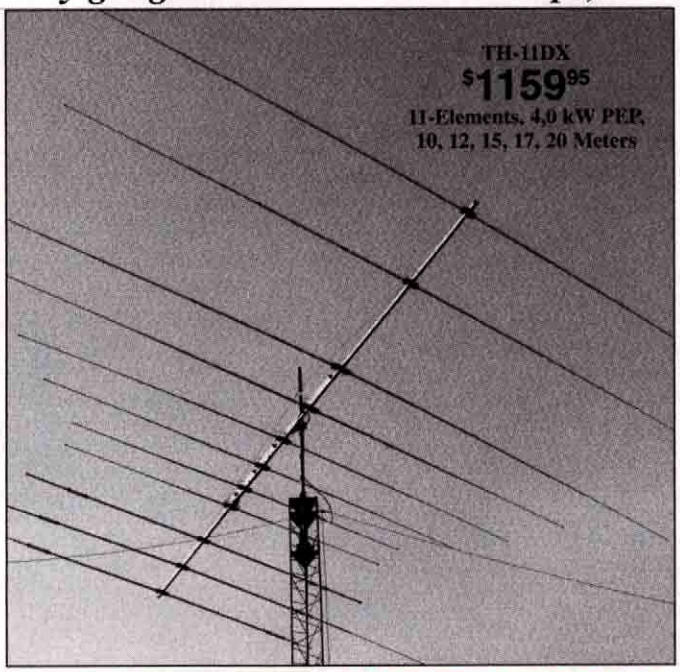

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The broadband *five element* TH5-MK2 gives you outstanding gain.

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

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You get an impressive average gain and a whopping average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

Features *Hy-Gain BetaMatch*™ for DC ground, full power *Hy-Q*™ traps, rugged boom-to-mast bracket and mounts on standard 2"O.D. mast. Stainless steel hardware. BN-86 balun recommended.

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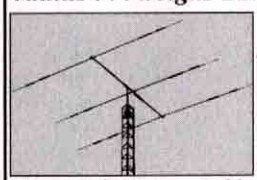

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Model No.	No. of elements	avg Gain dBd	avg F/B dB	MaxPwr watts PEP	Bands Covered	Wind sq.ft. area	Wind (mph) Survival	Boom (feet)	Longest Elem. (ft)	Turning radius(ft)	Weight (lbs.)	Mast dia O.D.(in.)	Recom. Rotator	Retail Price
TH-11DX	11	*For Gain and F/B ratio--See...*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5	• www.hy-gain.com		1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	**3**	• Hy-Gain catalog		**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3	• Call toll-free		600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	**2**	800-973-6572		**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
EXP-14	4			1500	10,15,20 (30/40)	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$599.95

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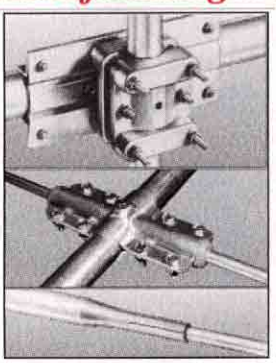
1. **Hy-Gain's** famous super strong *tooled* die cast *Boom-to-Mast Clamp*
2. ***Tooled*** *Boom-to-Element Clamp*
3. **Thick-wall** *swaged* aluminum tubing



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Durable precision injection molded parts.

Hy-Gain *antennas are stronger, lighter, have less wind surface area, better wind survival, need no adjustments, look professional and last years longer.*

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ARRL in ACTION

YOUR membership at work

By Dave Hassler, K7CCC, dhassler@arrl.org

ARRL Staffers Participate at WRC-03

Two ARRL staff members are in Geneva, Switzerland at the World Radiocommunication Conference representing the interests of Amateur Radio as members of the US delegation. ARRL Technical Relations Manager Paul Rinaldo, W4RI, and Technical Relations Specialist Jon Siverling, WB3ERA, are part of the US team that is tackling a number of international regulatory and allocations issues, several of considerable interest to radio amateurs everywhere. ARRL Chief Executive Officer David Sumner, K1ZZ, is also in Geneva as one of six members of the observer team for the International Amateur Radio Union. Another dozen or more radio amateurs are serving on their national delegations specifically to represent the amateur service, and many more are present in various professional capacities. Close to 2000 delegates and observers from nearly every country in the world will take part in the conference, which began June 9 and runs through July 4.

The serious problem of commercial shortwave broadcasters in Regions 1 and 3 overlapping into the top two-thirds of the Region 2 7-MHz amateur allocation, and much-needed expansion of the amateur band in Regions 1 and 3, is tops on the list of issues for ARRL and all IARU member-societies. IARU members are working very hard to secure a 300 kHz segment for amateurs around 7 MHz free of interference from broadcasters. In addition, international broadcasters are claiming they need additional spectrum in the 4 to 10 MHz range, which could conceivably affect the top end of 75 meters.

Other items of keen interest to hams that will be dealt with are the possible introduction of satellite-borne radar systems in the 70 cm band, additional allocations for the so-called "Little LEO" satellites, and broadband wireless devices in the 5 GHz band. Amateur issues apart from allocations include possible relaxation of international third-party traffic restrictions, the extent to which amateur licensing standards with regard to Morse code will be recognized in the international regulations, and how amateur call signs are formed.

Affiliated Clubs to Gain New On-Line Primer

ARRL Affiliated Clubs will soon have an updated resource from which to draw, with the late-summer debut of *The Active Club On-Line Primer*, said ARRL Field and Educational Support Team Supervisor Mary Lau, N1VH. The *Primer* fills in the space left by several League publications that are no longer in print. But more than a mere electronic replacement, the *Primer*, which will be located on the ARRL Affiliated Clubs Web page, will feature recruitment aids, tutorials, on-line tools and a host of useful Web links. The most pertinent information from the now out-of-print *Club President's Handbook* and the *Special Service Club Manual* will also be included.

"The goal is to enhance a club's operation by providing on-line tools so that clubs can more effectively let the public know about their group and Amateur Radio in general," Lau said. "We recognize that clubs have evolved over the years. Many have 'electronic volunteers' who engage in club activities through e-mail, reflectors and Internet chat rooms. We wanted to spotlight that and boost a participatory environment for clubs."

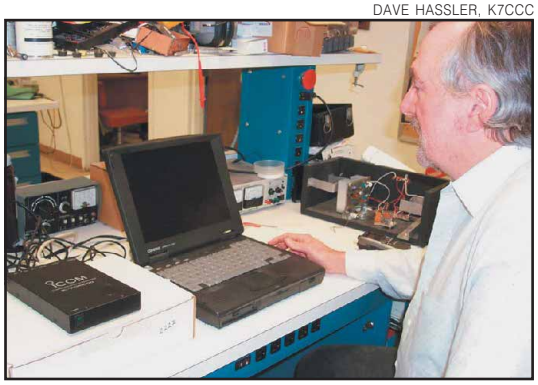
The Field and Educational Support Team is not only in the process of adding information to the Affiliated Clubs Web page at **www.arrl.org/FandES/field/club**, they're also giving the page a facelift with a number of other enhancements and renovations to make information retrieval even easier.

BPL Issue Has League's Attention

One of the greatest threats today to Amateur Radio—and all HF users—is broadband Internet connections delivered over commercial power lines, a form of power line communication called Broadband over Power Line (BPL). Several US consumer communication companies are experimenting with deploying the technology, which could produce a lot of noise across much of the HF spectrum in many areas, according to ARRL Lab Supervisor Ed Hare, W1RFI, who is collecting data on the broadband delivery system.

"It could be pretty bad in terms of noise. We—and the industry—will not know the exact effect until measurements are made," Hare said. "There are field trials [of BPL] taking place now in a number of US cities. ARRL has every intention of making measurements of these trials."

DAVE HASSLER, K7CCC



ARRL Lab Supervisor Ed Hare, W1RFI, tests out a noise measurement system made up of a donated ICOM PCR-1000 receiver and a custom sampling program in the ARRL Lab in anticipation of upcoming field tests. Broadband over Power Line noise could pose a significant problem for amateurs.

He pointed out that FCC rules currently allow a level of 30 µV/meter 30 meters from the source of emission. "Placed just inside that field, a half-wave dipole cut for 3.5 MHz will pick up as much as 15 dB over S9 noise. Many hams have a power line within 30 feet of their house," Hare said.

Amateurs are not the only users of the HF spectrum who could be affected by a wide deployment of broadband power line communication. Government agencies, military units, scientific researchers, and commercial and religious shortwave broadcasters all operate between 2 and 30 MHz. The League is keeping a close eye on the situation and working hard to build a broad level of support to protect the HF spectrum for all users. See "It Seems to Us..." in June 2003 *QST*, p 9, and visit **www.arrl.org/BPL** for more information on Broadband over Power Line.

PRB-1 and Friendly Approach Aids Santa Clara Valley SM

It goes to show how knowing the rules and amicably delivered information can achieve positive results for Amateur Radio. Working with the Milpitas, California, City Council and planning manager, Santa Clara Valley Section Manager (and Milpitas resident) Glenn Thomas, WB6W, reminded the council May 6 of the FCC rules requiring that local ordinances must make reasonable accommodation for Amateur Radio antennas and make minimum regulation to accomplish a city's legitimate purposes. The rule is commonly known as PRB-1.

Until recently, Milpitas had no antenna restrictions at all, Thomas said. "Somewhere in town, someone put a CB antenna on top of a 65-foot tower that was described, strangely enough, as 'particularly ugly.' On investigation, the city discovered it had no ordinance to order the antenna be taken down. Apparently, they were unaware of the FCC height restriction on CB antennas," he said.

The city proposed an ordinance, and a ham who happens to be on the city's telecommunications commission alerted Thomas. Invited to attend a CTC meeting, Thomas came armed with a solid knowledge of PRB-1 (codified as 47CFR §97.15(b) and copies of ARRL's *FCC Rule Book* for the commissioners and City Planning Manager Tambri Heyden. The commission was able to iron out quite a few wrinkles about antennas in the proposed ordinance that would have not met with federal regulations. "Ms Hayden and the commission were very cooperative and a pleasure to work with," Thomas said. "Tambri made a good effort to ensure that reasonable accommodation [for Amateur Radio antennas and towers] was made."

The proposed ordinance would allow for a 55-foot tower, or higher in the case of a crank-up tower that could be lowered to 55 feet when not in use; the Milpitas city attorney said the ordinance met the PRB-1 standard of reasonable accommodation, Thomas noted. The Milpitas Planning Commission later passed the ordinance and sent it to the City Council, which took a vote on it May 20. The result of the vote was unavailable at press time, but more information on the Milpitas ordinance is at **www.qsl.net/mares**. "Local folks will have a lot more influence with their elected officials than a Section Manager from out of town...," Thomas said. "In this case, this is my home town where I'm interested in local issues and where I vote."

Partnership Looks to Bolster Membership

ARRL and ICOM America unveiled a unique partnership at Dayton Hamvention in May that aims to bring more amateurs into the fold of League membership. Running through August 15, the program will give purchasers of qualifying ICOM equipment a membership application and a $15 coupon good toward membership dues.

The coupon can be used in a number of ways. New members can sign up and take advantage of the $15 savings, as well as those who have not been League members for at least one year. Current League members can put the offer to use, too, by giving the coupon and application to someone else.

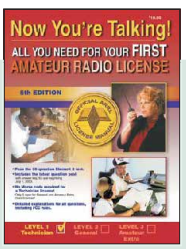
"We hope that this test program, which is vastly different from our traditional recruitment methods, will be mutually beneficial to [both] organizations," said ARRL Sales and Marketing Manager Dennis Motschenbacher, K7BV. He noted that the new program was developed in conjunction with a special ad-hoc committee created at the ARRL Board meeting in January to look at new and innovative ways to promote League membership.

ARRL membership is much more than a subscription to *QST*. As the national association for Amateur Radio, the ARRL coordinates an extensive field organization, which includes volunteers who provide technical information for radio amateurs and public service activities. In addition, ARRL represents US amateurs with the Federal Communications Commission and other government agencies in the US and abroad. ARRL also offers membership services on a personal level, such as the ARRL Volunteer Examiner Coordinator Program and the Outgoing QSL Service.

An ICOM advertisement hopes to entice former or non-League members to join ARRL.

A Gift that Keeps on Giving

San Diego (CA) Section Manager Kent Tiburski, K6FQ, has hit upon a way to help people looking to take their first steps into Amateur Radio. Tiburski purchased a number of ARRL's popular *Now You're Talking!* Technician class license manuals and, for the past year, has been providing the books to any group that teaches a Technician license class in the San Diego area. Once the class has completed its studies, the manuals are returned to Tiburski so that another group of prospective hams can learn about our fascinating hobby and get started in Amateur Radio. You can start your own roving Tech text cache by visiting **www.arrl.org/shop/** and search for item 8810.



A set of *Now You're Talking!* manuals helps prospective hams in the San Diego area get in on the fun of Amateur Radio.

Teamwork Solves Repeater Problem

ARRL members in the Pacific Northwest have been pretty busy lately helping to solve interference cases, reported Western Washington Section Manager Harry Lewis, W7JWJ, with five cases in the last two months. The following case of ham teamwork occurred in Everett, Washington:

The odd—and regular—DTMF tones on the Snohomish County Radio Club 2-meter repeater immediately alerted club vice president and technical committee member Jim Pratt, K7QI, to a problem. "Then, this person decided to start calling 911 through our repeater," Pratt said. "Luckily, our club's technical director, Jon Fortier, N7WDF, had selected several members to act as control operators well before that started, and it paid off."

JIM PRATT, K7QI

Jim Pratt, K7QI, put together a team of DFers to help solve a case of malicious repeater interference in Washington State.

While club members cut off the 911 calls, Pratt contacted the FCC and assembled a direction finding team. "This person was getting more confident and staying on longer, which really helped us. He also made the mistake of using his voice one weekend. Jon had set up a digital recorder and we now had his voice recorded."

Club president Steve Burling, KJ7YL, got an azimuth on this offending signal—now a DTMF version of "Mary Had a Little Lamb"—and, knowing the footprint of the repeater, he set off to see if he could get a strong signal on the input. Fornier and club member Frank Roff, KD7GWM, also did some DFing and they figured out which house the signal was coming from. With that accomplished, Pratt passed all the information to the FCC. Ten days later, the FCC called Pratt with the news that they had sufficiently documented the illegal activity and notified the 16-year-old violator, who had just gotten his ticket.

"It took a real team effort to bring this to a close," Pratt said. "Jon, Frank, Steve and the FCC were a great help in this investigation."

Guide to ARRL Member Services

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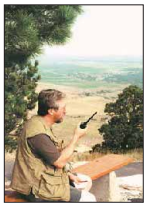



www.arrl.org/services.html/ **860-594-0200**

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**.

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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), M-F only, 8 AM to 8 PM Eastern Time.

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.

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Ameritron's *toughest* Amp

with Eimac® 3CX1200A7 tube

AL-1200

$2545

Suggested Retail *TrueLegalLimit*™

Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

Ameritron's *classic* Amp

with 2 graphite plate Amperex® 3-500ZG tubes

AL-82

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Most linears using 3-500s can't give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500 amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 18½Dx17Wx10H inches.

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with 2 Eimac® 3CX800A7 tubes

AL-800H, $2595 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1775** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

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with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

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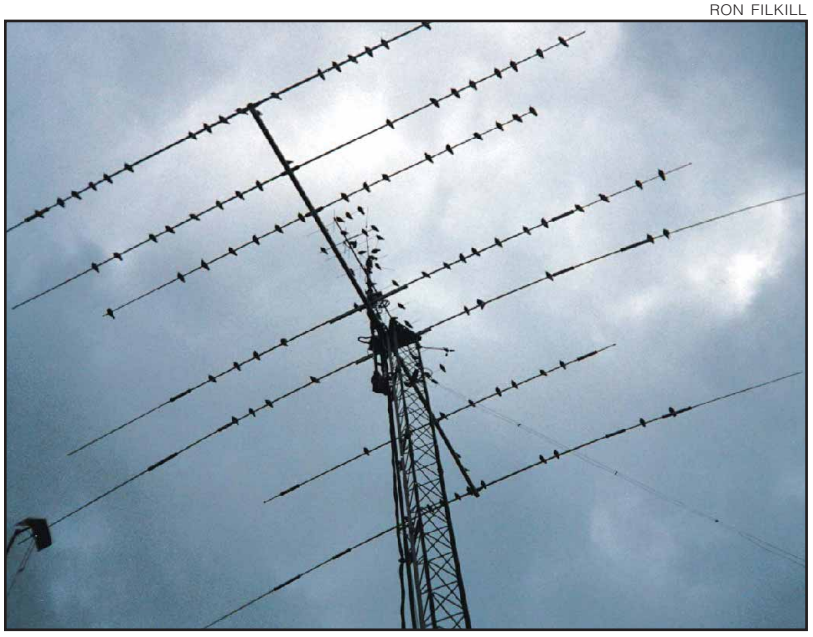
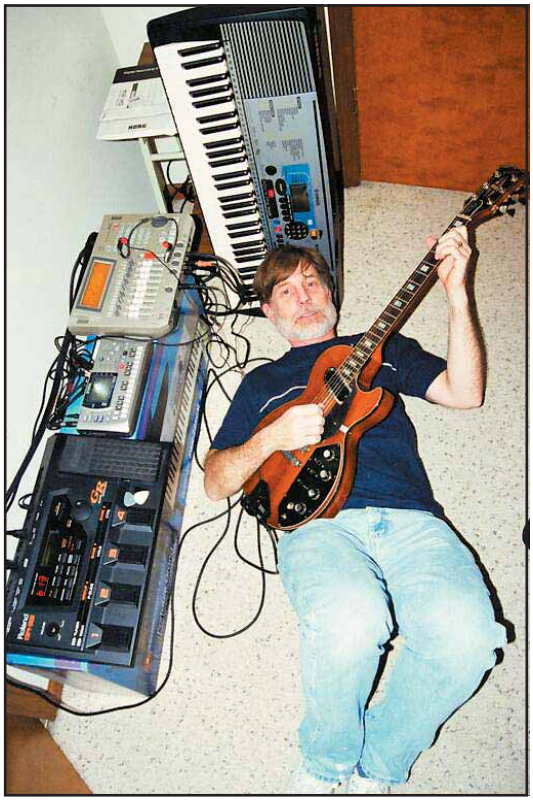


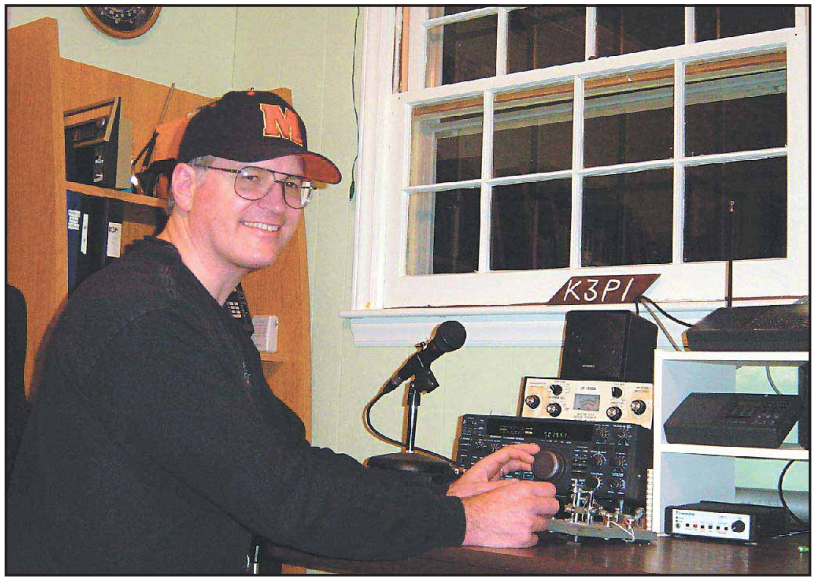
What are they trying to tell us? **We've heard of cows with letters painted on them congregating to create poetry, but these birds are apparently trying to send a message in some variant of Morse code. The aluminum farm belongs to D. Michael Cegleski, K8EHP, of Cleveland, Ohio.**

JUAN ANTONIO FERNÁNDEZ MONTAÑA, EA4CYQ

Working the EasySats portable/mobile: **This past Easter, with the assistance of my never-bored nephew (he's the one in the photo), I made 30 contacts with European hams during 6 passes of the UO-14 and AO-27 satellites from Cabañeros National Park (in southwest Spain). The transceiver was a Yaesu FT-3000M in the car.**
—Juan Antonio Fernández Montaña, EA4CYQ



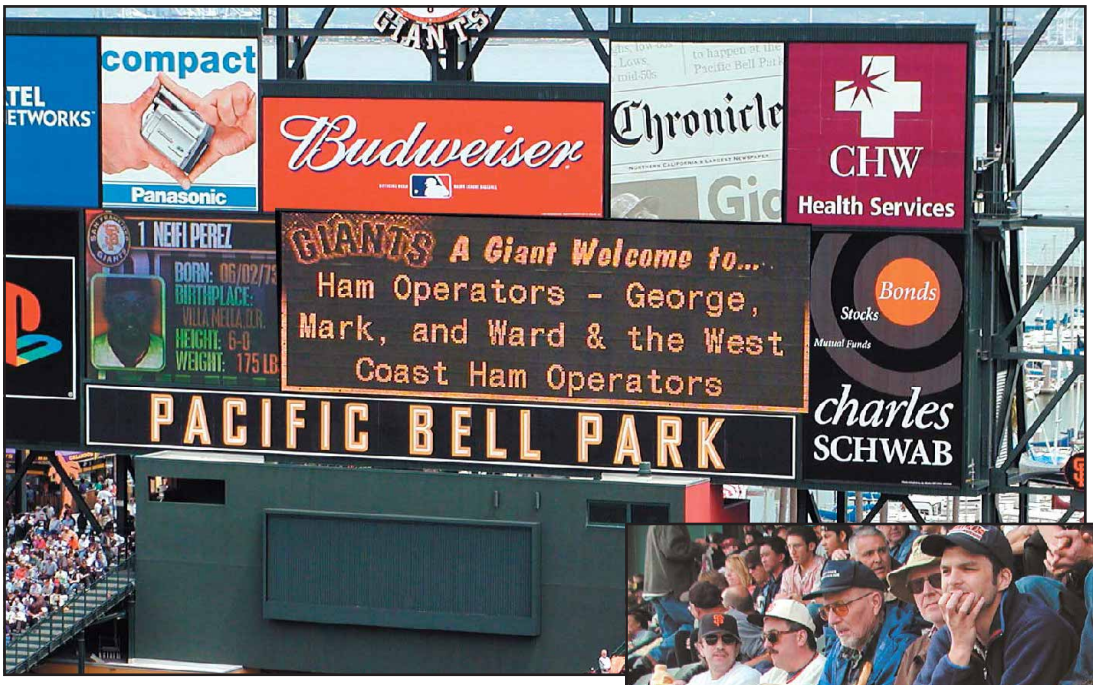
RUSS JOHNSON, K3PI



Have you heard **The QSB Song*?*** **This Amateur Radio inspired song was recently written and recorded by Hindsight. The music and vocals were performed by avid shortwave listener Rick Whitehouse (that's Rick cranking it out on guitar). The lyrics and sound effects were provided by Russ Johnson, K3PI, shown here wailing away on the trusty Vibroplex bug. To listen to this ham tune, visit www.radiointel.com and click on the QSB icon on the front page. Take a listen....how many songs you gonna hear with CW and lyrics that include "zero-beat and heterodyne"? Hindsight (k3pi@arrl.net) would love to hear your feedback.**

Any Hams in the House? You Bet!

BOB WILSON, N6TV



In case there was any question...

Enjoying the food and the game are (from left) Ramon, XE1KK; Nelida, LW8EXF; Claudio, LU7DW, and Rusty, W6OAT.

In town for the Visalia DX Convention, Trey Garlough, N5KO, wanted to take a few of his guests to Pac Bell Stadium in San Francisco, so he bought 25 tickets and invited a bunch of visiting hams who were also heading to Visalia. Taking in the game along with Trey were Claudio, LU7DW, and his wife Nelida, LW8EXF; George, W2VJN (attending his first Big League game); *QST* Contributing Editor Ward, NØAX; Mark, N7MQ, Dave, N6AN; Tom, W2SC; Rusty, W6OAT; Paolo, I2UIY; Bob, N6TV; Oli, W6NV; Glenn, W6OTC; Lloyd, KH6LC; Mark, AG9A; ARRL staffer Dave, NT1N; Tim, N4GN; Ramon, XE1KK; Northern California Contest Club President Steve, W1SRD, and ARRL Pacific Division Director Bob, W6RGG.

BOB WILSON, N6TV

Thanks, Joe!

Students at Blacksburg Middle School (K4BMS), an ARRL Education and Technology Program ("The Big Project") pilot school in southwest Virginia, recently expressed their appreciation to rock star Joe Walsh, WB6ACU (The Eagles, The James Gang and solo artist), for his generous contribution last December to The Big Project. Walsh said he hoped his donation would spur others to contribute to ARRL's Education and Technology Fund. Their teacher and mentor is Rich Beamish, K4FCP, a sixth-grade math and science teacher. ARRL Chief Development Officer Mary Hobart, K1MMH, said the significant gift through the Joseph F. Walsh Foundation permitted funding an additional eight pilot schools in the ARRL Education and Technology Program.

RICK BEAMISH, K4FCP

Students at Virginia's Blacksburg Middle School show their appreciation to rock singer/songwriter Joe Walsh, WB6ACU, whose generous contribution to The Big Project helped the school—and the others in the program—with the equipment and supplies they need to bring Amateur Radio to students in the classroom.

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- Unmatched close-in HF receiver performance on the main receiver. Very high receiver intercept points and superior dynamic range are made possible by an industry-best low phase noise synthesizer, selectable crystal roofing filters and dual 32-bit DSP processing power.
- Two receivers, with an amateur-bands-only main receiver and general coverage subreceiver. Each receiver has fully programmable AGC characteristics and 590 IF-DSP filters standard. Receivers can be used separately or in tandem for diversity reception on any frequency with no compromise in RX performance. Use both receivers on a single antenna, or both on separate antennas.
- ORION is equipped with dual antenna outputs, two linear amplifier keying outputs, two band data connections. This allows two sets of amplifiers and antennas to be connected to the radio simultaneously to take full advantage of both receivers' capabilities.
- Continuous real-time spectrum display with 5 selectable widths.
- Adaptive DSP noise reduction filtering available in 9 stages. Dual noise blankers, both DSP and 'analog' are provided.
- Optional heavy-duty internal automatic antenna tuner matches up to 10:1 SWR (8 to 600 ohms load impedance).
- Panoramic Stereo™ receive. PS receive allows signals heard through headphones to 'move' across the spectrum spatially as they are tuned across. Makes copying a single signal in the presence of multiple signals on the same frequency (like a contest or DX pileup) much easier than with 'mono' output.
- SSB audio receive and transmit controls. 18 transmit bandwidths to a maximum of 3.9 kHz are provided along with equalization on both transmit and receive. Bass and treble response can each have their own EQ setting.
- Flash-ROM update capability allows an ORION owner to instantly upgrade their radio to the latest version by downloading a file from the Internet – free of charge.

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HOW IS ORION DIFFERENT?

For the complete technical description of the ORION and/or to download the operator manual in .pdf format, visit our website at www.tentec.com.

ORION uses both crystal roofing filters and IF-DSP bandwidth filtering as part of the main receiver. The usual pitfall for top-notch performance in a modern HF receiver is the use of a 15- to 20-kHz wide roofing filter at the 1st I-F stage. This wide filter will allow unwanted signals outside of your receiver's passband to compromise receiver performance. By using crystal filters as selectable roofing filters at the 1st I-F, undesirable signals are kept out of the receiver chain and do not compromise close-in receiver performance.

Any signal that appears inside the roofing filter – even if you do not hear it in your receiver passband – will have a negative impact on receiver performance. Loud signals inside a roofing filter lead to a loss of dynamic range and receiver sensitivity. Consult any ARRL product review from the past two years and look at the difference in receiver performance numbers for 20-kHz spacing and 5-kHz spacing two-tone dynamic range and third-order intercept. The 5-kHz spacing numbers are always significantly worse than the 20-kHz numbers for our competitors transceivers – this is because of the presence of the loud test signals under their wide roofing filters. Imagine how much worse it is if you have several loud signals within 15 kHz rather than just two used for testing! The optimum receiver set up is to use high-rejection, very narrow crystal filtering up front, and brick-wall DSP filtering at the end of the chain at the 3rd I-F. No receiver system can top this! There are six crystal roofing filter positions in ORION. Three roofing filters at 6 kHz, 2.4 kHz, and 1 kHz are standard; three at 1.8 kHz, 500 Hz, and 250 Hz are optional. ORION's roofing filters are not to be confused with traditional crystal bandwidth filters – for bandwidth filtering, ORION has 590 built in DSP filters from a minimum of 100 Hz to a maximum of 6 kHz. What is the result? Receiver performance specifications that are significantly better than any other transceiver on the market to date.

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Not shown: #217-218-219 Optional Roofing Filters – $109.00

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We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

WIDESPREAD...AND SPREADING

♦ The incorrect but widespread use of "bandwidth" as a synonym for "bit rate" or "data rate" is starting to creep into the text in *QST*, unfortunately. The latest example is in the sidebar on page 28 of the May 2003 issue, in the otherwise excellent article on IRLP ["From Ether to Ethernet"].

As radio people, I hope that we hams and our publications will accurately use "bandwidth" when referring to the "width" of a portion of the spectrum, measured in hertz (Hz).

When the information or bit rate is involved, the proper unit is bits per second (b/s)—or kilobits per second, kb/s, or megabits per second, Mb/s—but not "bandwidth" and not hertz.

Depending on the type of modulation used, the bandwidth of an analog signal representing a digital data stream may be equal to the bit rate, but it may be twice, or three or four or more times the bit rate! Please keep the distinction between these two quantities understandable to the reader. —*Richard Levine, AI8N, Dallas, Texas*

H&K FOREVER!

♦ In four paragraphs, Dave Hassler, K7CCC, provided useful operating information for PSK31 while injecting just the right dash of humor ["Hints & Kinks," May 2003, p 62]. Please note that there's at least one member who always reads Hints and Kinks. As an example of its usefulness, one "Hint" in the '90s described constructing a Hamcomm modem for RTTY. Using the article as a guide, I made one and promptly became hooked on RTTY. Hints and Kinks remains an integral feature of *QST*.

In closing, thanks for a superb magazine. I've received *QST*, with lapses, since 1974, and I find myself watching the mailbox for my copy every month.—*John Sims, N7ON, Reno, Nevada*

HAM CENTRAL

♦ My wife's hobby is quilting, and she faithfully watches a show on the local PBS station called "Quilt Central." There are similar programs about home remodeling, carpentry, fishing and painting, to name a few. Has anyone at ARRL considered producing a half-hour show in which one or more knowledgeable hams discuss and demonstrate the skills, techniques and applications of Amateur Radio? It wouldn't take much imagination to outline a full year's worth of programs, from basic soldering techniques to kit construction, operating techniques, equipment reviews and even lessons for license advancement. I am a recently licensed ham and would truly benefit from such a program. I would not be surprised if it would also vastly increase interest in Amateur Radio, to the benefit of us all.—*James W. Mulholland, KCØHVE, Littleton, Colorado*

[While we at ARRL HQ do not have the resources to produce such a television show, we would like to hear from anyone involved with such a project.—*Ed.*]

REMINDER SERVICE WORKS

Thank you for reminding me to renew my ARRL membership. After I moved about 600 feet according to my GPS, from one street to another, I told the FCC by letter, but because I didn't use the correct forms, they sent me so many forms and instructions about ship to shore, aircraft radios, etc, that I threw up my hands in frustration. I put it off for a year and asked the ARRL for assistance. Well, I downloaded a form, sent it to ARRL and got my new license in about a week.

After an experience like that, you can bet your life that I will continue on as a member of ARRL.—*Ray Bell, NC2G, Delmar, New York*

GOING FOR IT

♦ Based on the advice in an e-mail I received from Perry Green of the ARRL HQ staff, I studied the information in *Now You're Talking!* (which I had bought for my son) while I was on vacation with my family. I checked the ARRL Web site upon my return home and saw that an exam was scheduled 15 minutes from my home for the next day. While I would have liked more time to review (who wouldn't?), I couldn't pass up taking the exam so close to my home while the info was fresh. The VEs were very friendly and ran a very relaxed but no nonsense exam session.

The point of this is that while I thought I had a good chance of passing the Element 2 exam, I didn't expect to get 35 out of 35 right. I just checked the FCC's ULS Web site and see that I am a General class with the new call of KC2LHX. Thank you, Perry, for your advice, thank the ARRL for the study material and thanks to the West Orange, NJ VECs on April 26. I will be rejoining the ARRL shortly.—*Jon Weston, KC2LHX, Chatham, New Jersey*

LONDON CALLING

♦ I would just like to let you know how much I enjoyed your article on London in May 2003 *QST* ["A Radio Amateur's Guide to London and the UK," pp 48-51]. I now live 400 yards from the Greenwich Meridian, and so know the place well.

Just a couple of omissions, though. You listed "Favorite Frequencies for Listening" and included several non-amateur services. It is illegal to "scan" in UK and listen to services other than broadcast and amateur stations. This can lead to a heavy fine and confiscation of equipment. The military and police channels listed in the article are particularly likely to be problematic.

All visitors should download and read "BR68" from the Radio Communications Agency Web site at **www.radio.gov.uk**—the UK equivalent of "Part 97." In particular, the band limits here are different from USA. For example, calling CQ on 146.520 MHz would be out of the amateur band and only likely to produce a "QSO" with the Metropolitan Police!

I am always happy to help Amateur Radio visitors to London and have some more information on my Web site (**www.cix.co.uk/~hdh/g8ext.htm**). I hope to talk to you on a future visit, and you will be welcome to visit us at the Cray Valley club (**www.cvrs.org**), located some 20 minutes, by train, from central London.—*Dave Howard, MØBGR/KC2DGM, London, UK*

NOW'S THE TIME TO BE INCLUSIVE

♦ As "hams" we can participate in the hobby in many ways, whether it be for an event or in cases of emergency. Some want to utilize the digital modes while others prefer voice operation. Lately it's been more in the direction of linking through the use of computers, the Internet and repeaters. Every time there has been a new innovation within the hobby, there have been those who would desire to keep things the way they are, and others who forge ahead looking for and producing new ways to do the old thing—communicate.

Progress isn't always popular with some of us.

I first learned code, and used it before being able to use any voice modes. That

was enjoyable, but then so was using voice modes. Now it's the computer and digital modes. I'm not sure I like it yet, but I know it's the way we all communicate day to day around the world, and it works. Perhaps someday I'll look back and say how I didn't want to change and then be glad I did.

As a member of ARRL and a part of the ham community, I have a sense of belonging to a prestigious group of communicators that does things. ARRL is our national supporting organization. It supports us with such things as having the spectrum to use (and free to us). It supports us in national and local situations—for whatever reason. In turn, as members we support *our* national organization with our money, and also get to stay up-to-date with our world of communications through the monthly publication *QST* and the Web site. I know that without ARRL, we would cease to exist.

I realize that this is going out to those of you who are already members of the ARRL and your local group, but what about the rest who aren't? Do you know someone who isn't a member either locally or with ARRL? Invite them in. Discover their interest(s) and let them know how you and fellow members can cross over and learn from each other.

At this time in our lives when the world seems to be approaching massive turmoil, what better time is there than now to join together to help each other. When the time comes that we are needed to help ourselves, our neighbors and our nation, are we prepared? We will need every man, woman and child that can use a radio to take action and be the best communicators we can be. Now is the time when we should all contact those we know who aren't active in the forefront and activate them. We could be called on to do more than ever before, and we will need everyone we can get to help. This may well be the largest undertaking of our lives, and we best be prepared. —*Gerald Wines, W5WIA, Austin, Texas*

AWESOME!

♦ CW, the "roadblock" that kept me from getting my license for so many years, is now turning me back to Amateur Radio again.

I have not been active on the ham bands for several years due to my job and other activities. I received WAC, WAS, and DXCC in the late 1980s, then I lost interest. I discovered video production and the Internet, but after a while it gets old to surf the net.

Last month, I decided to power up my Kenwood 850SAT and try a 30 W low power contact on 20 meter CW after a four-year absence! After rough sending on my part, Steve, KB3FJJ, patiently came back to me and I was hooked again!

I have been on every night since then listening and sending CQ. I have mothballed my mics and plan to work 99% low power CW to acquire WAS and DXCC with CW endorsement. I have a brand new Vibroplex iambic paddle on order and can hardly wait for that UPS truck delivery.

We have a great hobby. The Internet is a fantastic tool but there is nothing like acquiring a 339 CW signal out of the QSB and QRN and then getting that QSL. Everyone has to find their niche and go from there.

CW is awesome!—*Fred Mann, N5IVZ (ex-WD5JCX), McAllen, Texas*

"ACTION"

♦ The monthly feature, "ARRL in Action" is excellent. Hearing about specifics and seeing specific statistics about these activities should be encouraged. —*Ray Sirois, N1RY, Harrison, Maine*

♦ I think this is great—lets ARRL supporters know what has been accomplished. It should be supported with a "work in progress" note to let us know what legislation ARRL is targeting that members may be interested in or may support with letters and e-mail to legislators.—*Curtis D. Riley, KCØOZP, Wichita, Kansas*

[For a primer on how to communicate your concerns to members of Congress, see "Communicating with Congress," Apr 2003, pp 46-48. You can keep up to date on what's happening in Washington by checking the ARRLWeb at **www.arrl.org/govrelations/**].

TIME FOR PROMOTION

♦ I read with interest the article on promoting Amateur Radio in the April 2003 issue [Hagy, "Spreading the Word," pp 53-54.].

I have found a very easy method to accomplish this goal effectively. I have added an average of one new operator per year to our ranks. Imagine if only a third of us were able to accomplish this. The next hamfest that you attend, grab a bunch of those ARRL brochures you see on table, such as the one entitled, "New Horizons." I put these in a rack in the main reception area of our medical center as well as the mailroom of our building. If you know someone who works in an area of high traffic or in an office building that has a mailroom, just place a few loose brochures there. (Be sure you insert a contact person or club's name and address on the back.) That's all it takes.

We have to spread the enthusiasm... a key to any success story.

A candle loses nothing when it lights another candle!—*Bill Breuer, KE4SGV, Louisville, Kentucky* QST

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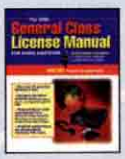

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By Clair E. Cessna, K6LG

Put a Big Dish on AO-40—"The EZ BUD"

Are you getting marginal signal levels from the OSCAR 40 satellite? Convert a surplus TVRO antenna—and relax with armchair copy!

When I began operating AO-40 using an inexpensive satellite TV (MMDS) down-converter and a surplus 3 foot barbecue dish with stock feed, it quickly became apparent that my goal should be to improve reception. Although CW was usually readable, SSB was often difficult or impossible to understand because of the poor signal-to-noise ratio (S/N). With less than ideal squint angles and at extended ranges, it was especially hard to hear my own downlink signal. [The squint angle is the angle between the axis of the satellite antenna and the observer's antenna.—*Ed.*] When I tried to increase my uplink power, a LEILA warning signal usually resulted. [LEILA is a satellite uplink power limiting warning program designed to prevent users from putting excessive signal into the satellite, hence limiting access to other users.—*Ed.*]

The Solution

I soon learned that I was not alone experiencing these S/N problems. Others heard on the bird were also working on improvements in this area. Experienced operators suggested three solutions—purchase a high-end, low-noise down-converter and/or preamp; obtain or construct a better small dish, or…go all out and obtain a BUD (Big Ugly Dish), aka TVRO (Television Receive Only) antenna. A BUD? Why not!

I located an Internet Web site by Robert Suding, WØLMD, one of my first contacts on AO-40.[1] His site is an excellent starting point for anyone looking for information relative to obtaining and converting large TVRO dishes for AO-40 reception. I was somewhat discouraged, however, at the prospect of trying to reconfigure a stock TVRO dish to an azimuth/elevation type mount with all the drive complications and heavy rotator expense that would probably be required. The heavy metal work, welding and fitting of surplus gears with extensive mechanical work would certainly make a job that was more difficult than I was prepared to undertake.

I then discovered the Bob Bruninga,

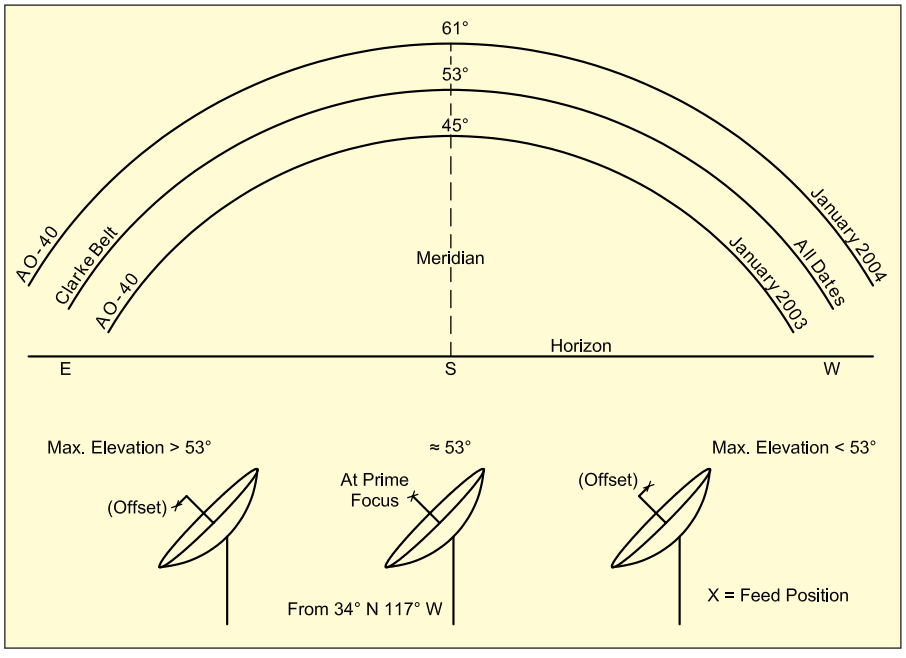


Figure 1— The arc paths of the AO-40 satellite compared to the geostationary Clarke Belt for the author's location. Note the offset feeds. These are necessary to compensate for the elevation differences compared to the Clarke Belt.

[1]Notes appear on page 32.

Figure 2—The offset feed patch feed support positioned above the dish. Note the radial arm support, which can be both rotated and offset from center to facilitate feed steering. The notch in the base plate for the N connector prime focus mount can be clearly seen. It is not used for the offset feed. The offset patch-type feed can be positioned to avoid being blocked by a strut.

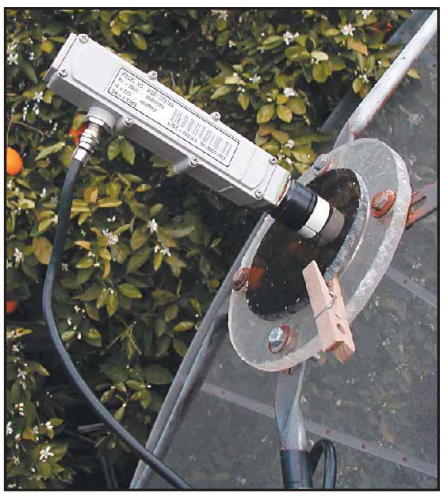


Figure 4—The prime focus feed mount showing the downconverter, adapter disk and the clothespin wedge for locking the prime focus adapter in place after it is centered.

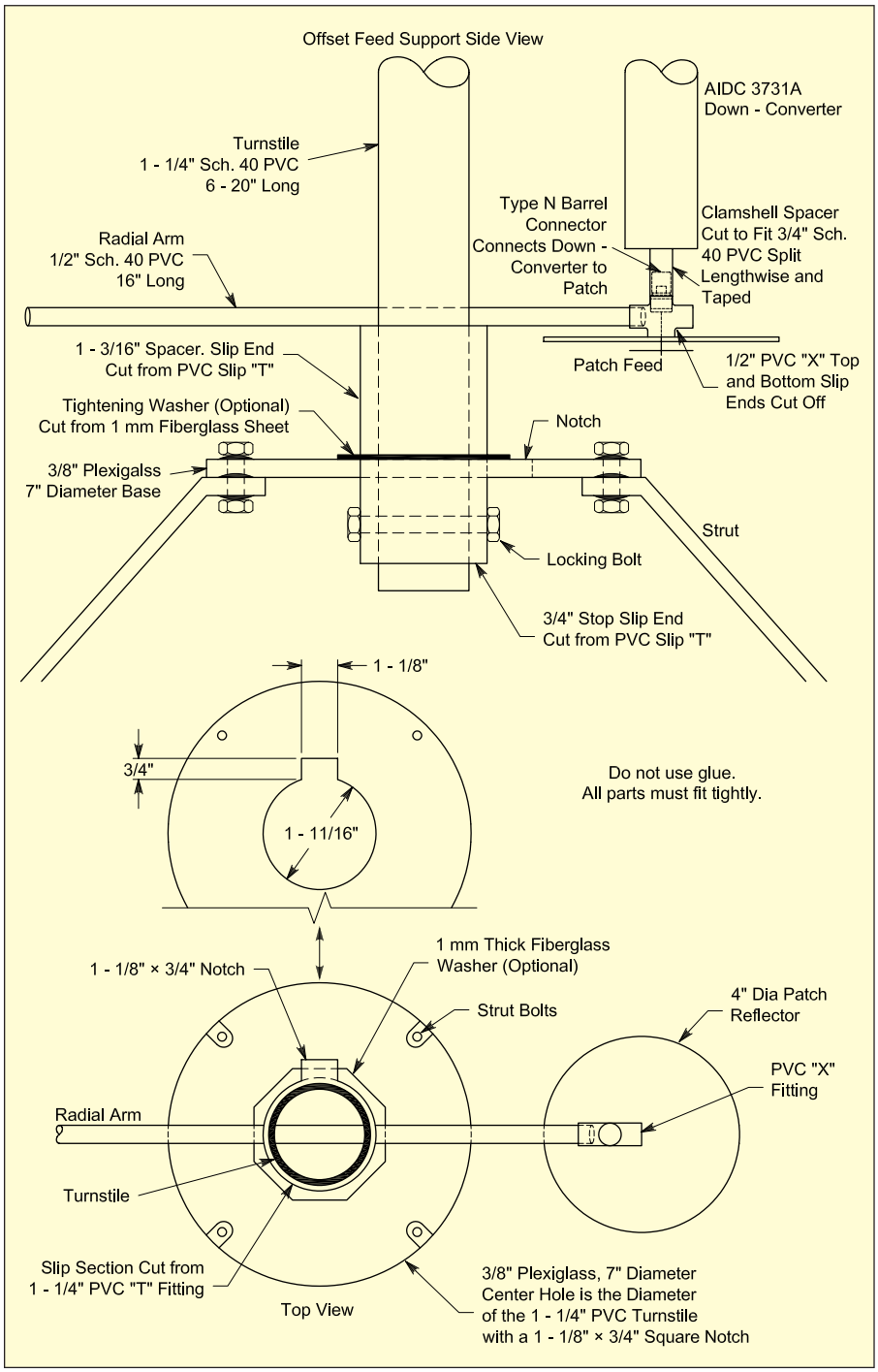


Figure 3—The offset feed support basic construction details. The notch in the base plate allows space for the offset N connector of the prime focus feed.

WB4APR Web site,[2] where it was explained that because the orbit of AO-40 has a very low inclination, its path parallels the Clarke geostationary satellite belt within a few degrees—most of the time. Bob mounted a homebrew 2.4 GHz dipole to the edge of a Chaparral feed in a C band TVRO dish and that made the dish usable for both C band TV and AO-40. It thus appeared that a stock, polar mounted TVRO dish, using offset feed, could track AO-40 with no major modifications!

Using my *Instant*Track[3] tracking program, I ran tabular data for the next 20 months and found that the arc traveled by AO-40 slowly shifted in elevation, unlike the Clarke Belt, which remained stationary. Figure 1 shows those arc paths for my latitude and longitude. Stock TVRO dish mounts aim the dish at the Clarke Belt. Since a dish's declination is often designed for a one-time adjustment, I decided to make an adjustable-feed steering mount, which would put the feed at the prime focus point or above or below it. Further research indicated that even with the greatest offset necessary for tracking AO-40, signals would not be significantly degraded when using a typical TVRO dish with a short focal length.[4]

Procurement

Having heard that TVRO dishes were readily available for the asking, I began to look for possibilities around my neighborhood. I focused on homes where, in addition to a visible TVRO dish, there were also 18 inch dishes in use for modern satellite TV. My criteria for dish selection was a 10 foot diameter dish, in

good condition, ground mounted (for ease in removal) and within a mile of home. It should preferably have a "shepherd's crook" type feed support, rather than struts, as it appeared that there would be more freedom to maneuver an offset feed using this form of support.

In a short time, I had one spotted that filled the bill…although it did have struts. When I knocked on the door, the owner enthusiastically greeted me and confirmed that he wanted to get rid of the dish. As it turned out, he actually dismantled the antenna for me; that included jack hammering the concrete foundation to remove the mounting post. He well deserved the case of his favorite beverage that I gave him!

The dish was unbolted into halves, each braced with a 12 foot 1×2 strut across its diameter, then tied to the roof luggage rack on my old station wagon and transported home, one section at a time.

Other components, including the Amplica C band receiver (nonfunctioning), polar mount, dish carriage, actuator and power supply, 100 foot umbilical cable (containing coax and control wires) and support post were all in my backyard several trips later.

Setup and Modification

The 8-foot support post (of 3½ inch black pipe) was placed in a 2-foot ground hole along with two bags of wet concrete mix, making sure the post was plumb. A few days later I slipped the polar mount onto the post. Then, on a clear night, I aligned it with Polaris and the set screws were tightened. I then reassembled the actuator, dish carriage and aluminum mesh dish to the mount.

In place of the Chaparral C-band feed, a piece of ⅜ inch plastic (Lucite or Plexiglass) with the same diameter was made and bolted to the struts. An adjustable offset feed mount was fabricated from PVC pipe and fittings to support the downconverter and the 2.4 GHz patch feed. Figures 2 and 3 show the offset feed details. The feed support mount is a turnstile with an adjustable radial arm to which the feed and downconverter may be attached. In addition, an interchangeable prime focus mount was constructed; it is shown in Figures 4 and 5.

Fortunately, the actuator and its 24 V dc power supply with switching circuits were still in working order. Two spring-loaded push-button switches to control the actuator were mounted in a 2×2×2 inch utility box for the operating table. These were connected, via a 10 foot cord, to the original switching relays in a section cut from the Amplica receiver chassis.

This actuator moved the dish in a 120° arc, meaning that it would be able to track anywhere from azimuth 120° to 240°. A horizon-to-horizon actuator would be ideal, but since this dish is ground mounted, trees, houses and other structures limit the horizon anyway, so it was not a major concern. It would still be necessary to use the azimuth/elevation roof-mounted 30×40 inch PrimeStar dish to fill in when AO-40 was at a low elevation and nearer the horizon.

Again, I turned to WØLMD's Web

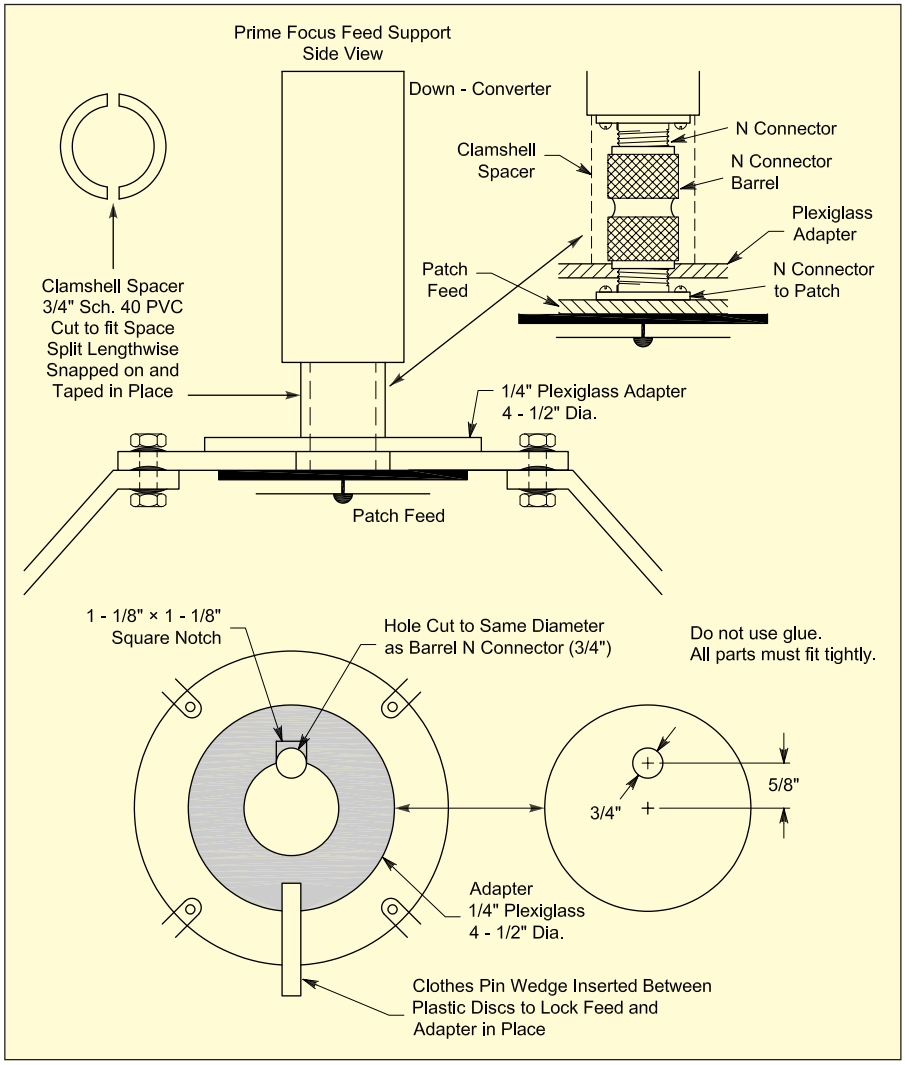


Figure 5—The prime focus feed support construction details.

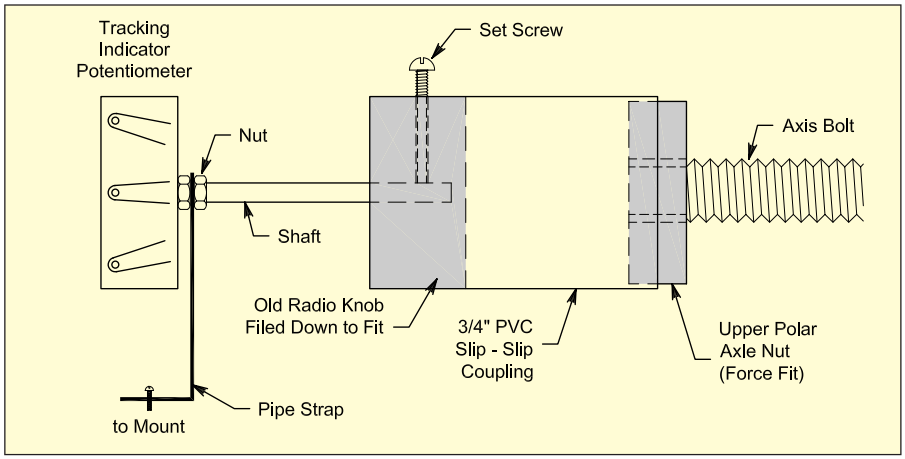


Figure 6—The tracking indicator potentiometer is coupled to a nut on the polar axis bolt through a slip joint made of a PVC coupling and an old radio knob.

site and *The ARRL UHF/Microwave Experimenter's Manual* for information before beginning construction of the feeds. Although both short helix and patch feeds are used for dishes, patch feeds are generally recommended for full illumination of short focal length TVRO dishes (this dish was F 0.377).[5]

Patch feeds are simple and fun to make. I decided to make one from an existing pattern, which I found at WØLMD's site.[6] Robert shows a number of good designs, including some made from tin cans! I built one made to the specs of his circular polarized patch pattern. The patch feed details are not shown; they can be found at the WØLMD site.

Testing

Finally, it was testing time! Up the ladder I went, with downconverter and patch in hand. The patch was moved around the dish while monitoring the beacon. The 3-dimensional "hot spot" (focus point) for AO-40's beacon signal (about the diameter of a saucer) was easy to find. At that time it was offset about 5 inches from the actual prime-focus point of the dish. When the path of AO-40 shifts nearer to or farther from the Clarke Belt path, the offset distance may be greater or less. The struts actually turned out to be an advantage, providing excellent mechanical stability while the offset adjustments were being made. The feed can always be offset to avoid blockage by a strut.

Offset adjustments are easy. Moving the radial arm in or out shifts the elevation pattern higher or lower than the Clarke Belt at which the dish is aimed. Rotating the turnstile shifts the azimuth pattern to the east or west. The distance between the patch and the prime focus is the limiting factor for azimuth shift. It is possible to get nearly a 10° increase over the azimuth limits (120°-240°) of the dish. The elevation should be checked at least monthly. I connect an outdoor speaker to the rig, tune in the beacon and adjust the feed position for maximum signal.

The only adjustment I routinely make on each pass is to turn the turnstile to the "east" or "west" favoring positions. This is accomplished by twisting the turnstile 90° or more. If it is out of reach, a fishing pole or other extender can be inserted into the end of the radial arm to turn it.

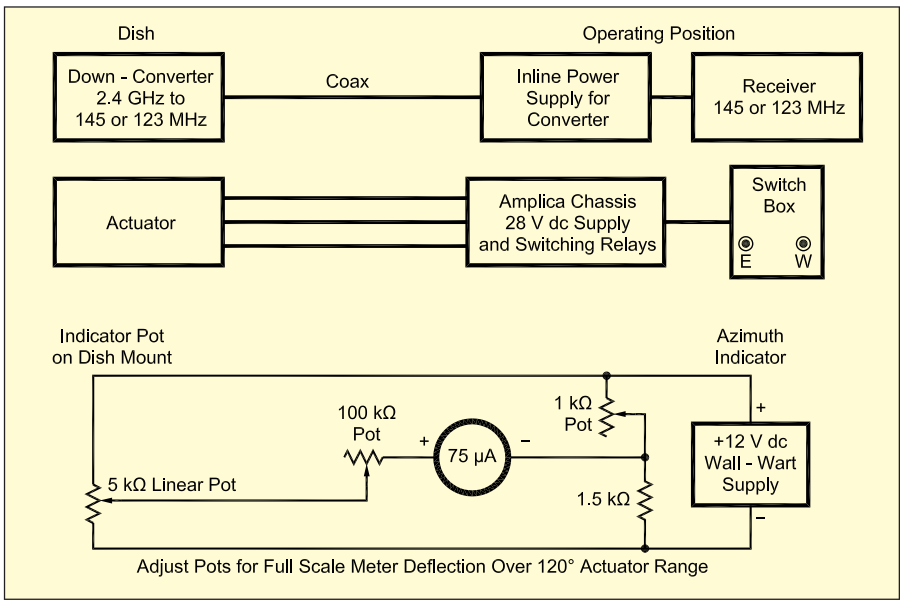


Figure 7—The umbilical connections and tracking display system arrangement. Although a tracking indicator isn't a requirement, it is useful if the dish can't be seen from the operating position.

Figure 8—This azimuth indicator and switch box reveal their junk box origins. The Yaesu rotator control positions the uplink antenna. The meter is a surplus 75 µA movement, although other low current meters can be used.

Operation

I found that aiming the dish was extremely easy. Although the theoretical beamwidth of a 10 foot dish is about 5°, with this setup the beacon was audible for over 10°. It was easy to find the bird on the "track." By pressing the east-west actuator switches and watching the S meter, the beacon can be found and the dish can be kept right on target. (My Yaesu G-5400 rotator, used for the uplink antenna, requires far more attention and adjustment.) I can point the dish in the general direction of the bird, then just sweep it and listen for the satellite. I do watch the antenna through the radio shack window (and the azimuth of the bird, as shown in my tracking program) and I must be extremely careful near the ends of the actuator travel, since it does not have limit or reverse switches. Adding these would be prudent; it would help avoid damage to the actuator.

Direction Indicator

A direction indicator is not really necessary if the dish can be viewed from the operating position. I did make up a simple potentiometer type azimuth indicator, however. The pot shaft is coupled to the top of the polar axis bolt nut through a force fit PVC coupling (see Figure 6). A small "wall-wart" power supply and a microammeter indicator in the shack connect to the pot through control wires in the umbilical cable. Since the position of the offset affects the indicated pointing direction, the calibration has only to be "in the ballpark" area. Incidentally, the coax in the umbilical, used to connect the downconverter to the receiver, provides some desirable attenuation of the high IF

output of the converter. The tracking indicator potentiometer diagram and control box are shown in Figures 7 and 8.

Although my BUD must look through power lines, tree tops, guy wires, an HF beam and tower and other assorted antennas, I have noticed little significant attenuation of the signals—except when a nearby house partially blocks it to the west.

Performance

Performance? At low squint angles the S-meter on my FT-847, with its preamp switched off, usually reads less than an S1 noise level and the beacon reads S7 or better. With its preamp on, the noise level is less than S5 and the beacon is 10 dB over S9. SSB signals are armchair copy. Signals from the bird even at relatively poor squint angles and long ranges are readable—a great improvement over the barbecue grill dish—and much easier on the ears. Cost? Nearly nothing… and AO-40 operation is now a joy!

It may be that full conversion to an azimuth-elevation mount with permanent feed placement at the prime focus of the dish might produce even better results. Additionally, placement in a clear geographic location might make its use possible at anytime the satellite is above the horizon. Nevertheless, this conversion method is well worth the time, effort and cost involved and it should make operation on AO-40 much more enjoyable.

A special thanks goes to Bob, WB4APR, for a great idea and to Robert, WØLMD, for his fine dish information site. Thanks also to Dave, WB6OVZ; Arlo, WA6UDR, and Paul, WA6DDL, for their assistance on this project and to Art, KQ6HF, who took the photos.

Figure 9—From left to right: actuator, actuator arm; polar angle adjustment; umbilical terminal wired to mount set screws, polar axis pivot bolt head and declination adjustment nut. The position-indicating potentiometer can be seen at top center, coupled to the polar axis bolt. Other than aligning the polar mount with Polaris (by sighting along the polar axis) no adjustments are made to polar or declination settings used for regular C band TV service.

Figure 10—The author adjusting the offset feed support of the modified TVRO dish.

Notes

[1]**www.ultimatecharger.com/dish.htm**. This comprehensive site also has information on sources for downconverters.

[2]**www.usna.navy.mil/~bruninga/ao40.html**.

[3]**www.amsat.org/amsat/instanttrack/**.

[4]*The ARRL UHF/Microwave Experimenter's Manual*, 1990, pp 9-28. Available from the ARRL Bookstore for $20 plus shipping. Order no. 3126, **www.arrl.org/shop/**; tel 888-277-5289 (toll-free in the US) or 860-594-0303 (elsewhere).

[5]As in optics, the dish F number is the ratio of the focal length (FL) to the diameter (D); F= FL / D. In this case, for an F number of 0.377, the focal length is 3.77 feet, as the dish diameter is 10 feet. It's equivalent to the F stop on your camera lens and although gain depends on a number of parameters, that's a fairly wide aperture (high gain) lens (antenna)!—*Ed.*

[6]See Note 1.

C. E. Cessna, K6LG, was first licensed at age 15 in 1949, as W6GZP. Clair is a retired high school science and biology teacher whose career spanned 33 years, during which he was also school Amateur Radio club sponsor and advisor. He earned the Amateur Extra class license and his present call in 1976. Clair is active in the Riverside County Amateur Radio Association and regularly operates all the HF bands, on all modes, including the satellites. He can be contacted at 3975 Madrona Rd, Riverside, CA 92504; **k6lg@arrl.net**.

By Bart Pulverman, WB6WUW

Self-Supporting Tower and Antenna Installation

Installing a self-supporting tower can be challenging and intimidating. WB6WUW, who has been through the process twice, shares his experiences to help you over the rough spots.

In 1980, I installed a triangular 38 foot heavy-duty galvanized steel self-supporting, crank-up tower, similar to a US Tower model HDX538. When I started I was totally inexperienced in handling a project of this magnitude, but with the exception of building the rebar cage and mixing the concrete, I did the whole project myself, assisted by friends. That included acquiring the building permits, breaking through a section of concrete sidewalk, digging the 6 foot deep hole, setting the forms and supervising the concrete pour. I do not recommend doing all of this yourself––you'll definitely need help.

Rule Number One: Hire a licensed contractor to do the heavy and specialized work––breaking concrete, digging the footing and building the rebar cage. A specialist who is experienced working with reinforced concrete should build the rebar cage. It is estimated that cage construction will cost between $150 and $175. The tools to cut and bend rebar will cost you more than a professionally built cage.

The pictures accompanying this article were taken in 1989 when I moved the tower to a new house and had the foundation done by professionals. The quality of the finished installation was not substantially better or worse than what I had done before, by myself, but it was a lot less painful and stressful.

Rule Number Two: If you live in a city, get a building permit, even if it is not required. For both installations, I did things by the book, and it paid off. I found that the people at the Department of Building and Safety were the best friends I had. When I applied for a permit I did not understand the documentation provided by the tower manufacturer. Critical details about the rebar cage, for example, were left out, because the manufacturer assumed that a knowledgeable contractor would be building it. The Building and Safety people explained those requirements and details in plain language and answered all of my questions. I left knowing exactly what I needed to do and the fee I was charged was well worth it. When I moved, I was advised by the local ham club not to acquire a building permit. That advice was disregarded and it prevented later problems.

When I purchased my tower, it was certified to the 1975 UBC (Universal Building Code). When I moved it to my new house in 1989, a licensed structural engineer was required to certify the tower to the 1985 UBC. This took six weeks and cost $400. The net result was that I was limited to 20 square feet of wind loading, still substantially more than my KT34A antenna presented. Additionally, the depth of the foundation or "footing" was increased to 6½ feet.

Figure 1—The rebar cage is centered in the excavation. Each leg rests on a 3 inch high preformed concrete pier (not visible).

Another issue cited by the structural engineer[1] was the close proximity of the tower footing to a swimming pool. Luckily, our soil did not pose a problem in that regard. An engineer will be able to determine if shoring up your hole will be necessary to prevent the hole's collapse. If you do not know the correct way to shore up an excavation, hire someone who does. This is a very important safety issue. Your life could depend on it!

A Solid Foundation

The easy way to dig the hole is to hire a backhoe…if you have enough clearance at the site. If you choose to save money by digging your own hole by hand, be prepared for backbreaking work. My first hole in compacted clay took me three weeks to dig. One of the biggest problems for someone with limited digging experience is keeping the sides straight and digging vertically in a cramped space. I found a post-hole digger very handy. At the new house, digging the hole by hand took an experienced crew only one day! Which would you prefer?

Manufacturer specifications and building codes require that the footing concrete be reinforced with a rebar cage to provide tensional strength. Concrete is very strong when compressed, but is surprisingly weak under tension. Steel, on the other hand, is very strong under tension. The

[1]Notes appear on page 37.

Figure 2—Everything is ready for the concrete pour. Note the tower base-mount J-bolts secured in the base mount for proper alignment.

two materials work together to provide the necessary strength to withstand the forces exerted by the tower, which is basically a very long lever. In high wind or earthquakes the tower can exert thousands of pounds of stress upon the footing.

The rebar cage (Figure 1), constructed to UBC and local building code requirements, was welded but local codes may allow the members to be wired together. Lower the cage on 3 inch cement piers or blocks, so that the bottom of the cage will be completely embedded within the concrete. The rebar cage must be embedded at least 3 inches inside the concrete on all sides. The dimensions of my cage were 2½ feet × 2½ feet × 6 feet to allow the necessary clearance in a 3 foot × 3 foot × 6½ foot hole. The vertical spacing of the horizontal members is specified in local building codes and may differ from the UBC standards in some jurisdictions. Verify the rebar requirements with your local building department.

Once the rebar cage is in position, frame the edges of the footing with wooden planks. We had some pool deck concrete poured at the same time, so I had the contractor frame a 1 foot × 1 foot box where my cables and ground strap exit the house. This allowed placement of ground rods close to the rig and affords their maintenance and possible replacement in a concrete-free area.

After framing, suspend the 36 inch × 1 inch diameter tower base-mounting J-bolts in the footing hole. Be sure not to inadvertently mount the bolts so the tower hinges in the wrong direction! The alignment of the J-bolts is critical and must be maintained until the concrete sets or the hinged base will not fit.

The first time I installed my tower, I positioned a wooden template provided by the tower manufacturer over the hole. I nailed it to the framing to hold it in position and suspended the J-bolts in positioning holes in the template. For the second installation, the contractor supported the hinged base over the hole on two-by-fours with the J-bolts attached (Figure 2). This method reduces the chance of an alignment error.

The last step in preparation for the concrete pour was burying two PVC conduits. A 1 inch conduit is used for drip irrigation of the ground rod box to keep the soil moist and more conductive. A 3 inch diameter conduit goes from the ground rod box to a 90° elbow at the base of the tower and then extends vertically out of the footing. This conduit was added to protect the coax and allow neater routing between the wall feed-through tubes and the tower base. A 180° "U" will block rain and snow in cold or wet climates.

You are now ready to call the Building Inspector. This is the most important inspection point because it is the last chance to verify that everything is correct before the concrete is poured. If you bypass this requirement and pour concrete before the "forms inspection" is signed off, you can be required to start over in many jurisdictions.

Although some hams mix and pour the concrete in small batches, this is not a good idea. For maximum strength, it is important for the concrete to be uniform throughout the footing. The way to ensure that is to pour it from a single lot of known quality; that is, from a ready mixed concrete truck. My tower footing specifications called for a five-bag mix of concrete. That means five bags of portland cement per cubic yard of concrete, the remainder of the cubic yard being sand and gravel. By specifying a six-bag mix, substantial strength can be added for a very small additional cost.[2]

Some jurisdictions require that a sample of the wet concrete be sent to a lab to verify its compression strength. This is an exacting process and should be done by a knowledgeable professional. If the sample is taken incorrectly or becomes contaminated, the test results may not be accurate. Even if your footing is ultimately found to be sound, the cost of additional testing can be substantial.

Because it is cheaper to buy ready mixed concrete by the truckload, doing additional concrete work at the same time can result in increased savings from the contractor and the concrete company.

As the concrete is pumped or poured into the hole, it is necessary to probe it while wet to break down air pockets and ensure that the concrete fills every part of the footing. Shovels and long 2×4s make good probes. An electric or gasoline powered concrete vibrator is probably not required. When the footing is filled, trowel the surface. Also slope the surface so that water will drain away from the tower mounting.

Once you are satisfied with the surface, proper curing is critical to ensuring that the concrete attains its highest possible strength. After concrete is poured, it increases in strength rapidly for the first three to seven days. Although it may seem hard the day after it is poured, it actually hardens over time through a chemical reaction (not water evaporation). As a rule of thumb, concrete reaches 50% of its final strength after three days, 65% after seven days, 85% after 14 days and nearly 100% (design strength) at 28 days. Moist-cured concrete is about 50% stronger after seven days. To moist-cure concrete, keep the surface wet around the clock for the first few days after the pour. It is not a good idea to install the tower until the concrete has cured for three to four weeks to avoid the risk of cracking the footing, or even worse, structural failure.

Erecting the Tower

When I moved my tower to the new

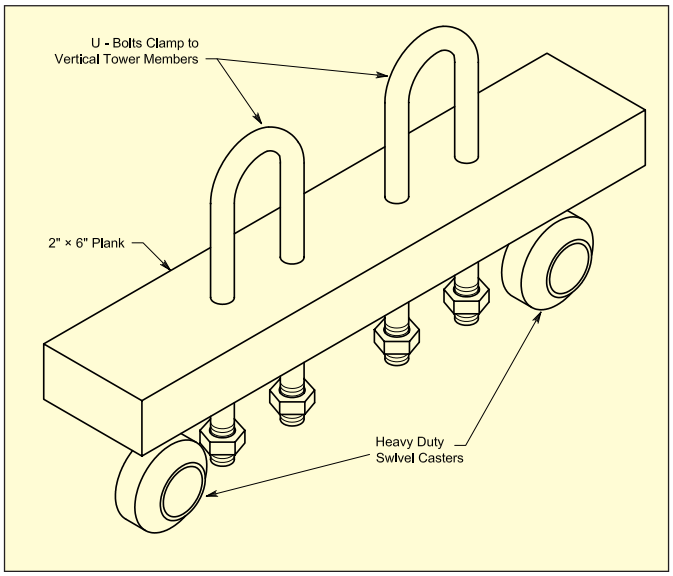


Figure 3—The homemade tower wheel set assemblies. These aid maneuverability while the tower is down.

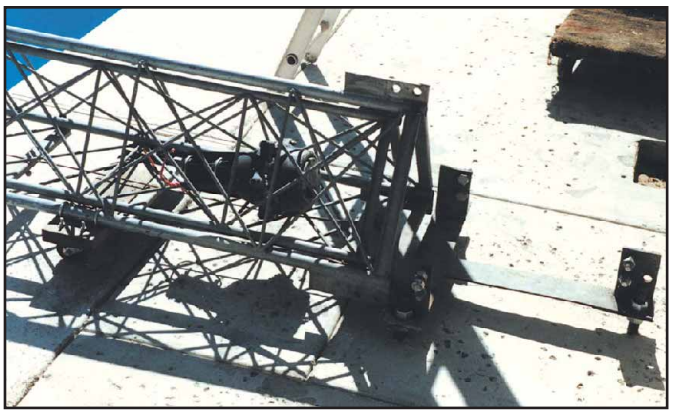


Figure 4—The tower is positioned before attachment to the hinge. The rotator is positioned inside the tower's bottom and is ready to be maneuvered to the other end. Just left of the rotator, one of the two wheel sets support the tower.

house, I planned to store it until I had the new footing built. To move it to the footing, I built two wheel assemblies, as shown in Figure 3. Each consists of a pair of heavy-duty swivel wheels bolted to a 2×6. I attached the wheel assemblies to the tower with U-bolts while the tower was still in the vertical position so the tower could be lowered onto the wheels.

After allowing the concrete to cure for a full four weeks, I was ready to install the tower. The wheels allowed me to move it into position by myself and attach it to the hinged base. Install the thrust bearing, mast and rotator while the tower is down. You may not be able to install the mast if the extra length will encounter obstacles. I had to defer inserting the mast until the tower was raised. In order to fit the rotator inside the tower it was necessary to push it in through the tower's bottom (Figure 4) and secure it temporarily.

Since steel towers are very heavy, it takes a tower raising party to erect them. Using a 5600 pound test nylon rope attached to the top of the tower, three husky guys standing on my roof pulled the tower into a vertical position while two of us helped to get things started on the ground. The first few feet are the most difficult, since you must start by lifting half the weight of the tower. The rope does not help much until the tower reaches an angle of about 20°. As the angle increases, a greater percentage of the weight is shifted to the base and lifting becomes easier (Figure 5). For very heavy towers a tow-truck's cable can be substituted for "people-power."

After the tower is up, the remaining base bolts must be installed and tightened. Because of flexing of the hinged base, it is necessary to use a drift pin to hold the holes in alignment. Once all of the bolts are installed and tightened, tower erection is complete. Because of the effects of temperature and vibration, be sure to retighten the bolts at 1 month intervals for the first 3 months, and semi-annually after that.

Installing the Antenna

At this point, if you live in a populated area where television interference is possible, I strongly urge you to curtail any high profile activities on your tower for a month. Three weeks after I raised my tower a representative of the city rang our doorbell. He explained that he was investigating a neighbor's interference complaint and that the neighbor wanted the city to make me take down my tower. My wife said that he had trouble keeping a straight face because, as he told her, he saw there was no antenna on the tower. After she showed him the signed-off building permit he said he would tell the neighbor that I could not possibly be the cause of TVI and that the city had no authority to intercede.

Before you install the antenna on the tower, review all safety rules, including the obvious. Climbing a tower is dangerous and it can be physically stressful. If you have not had instruction in safety procedures, you suffer from acrophobia or you do not have the proper safety equipment, hire a professional! You must have the following equipment to climb and work on a tower safely: a properly

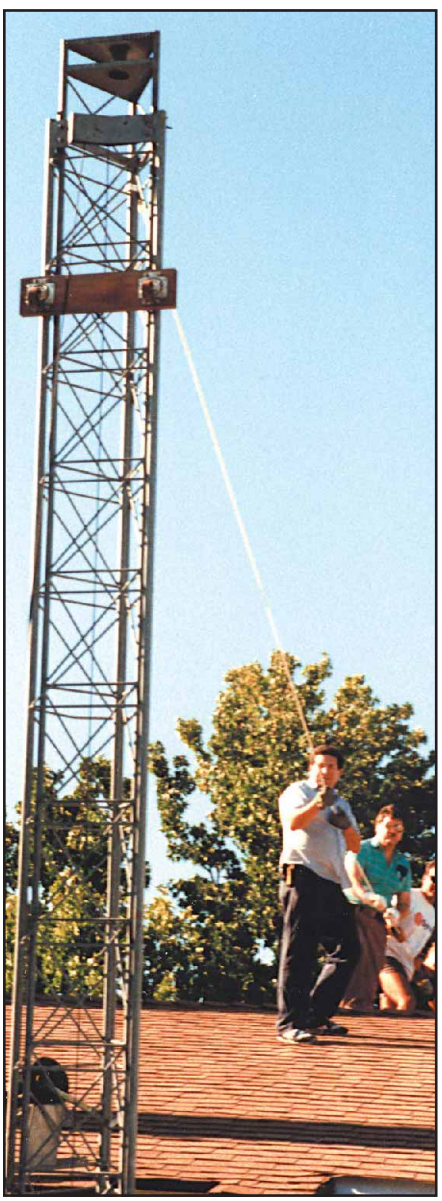


Figure 5—The author and helper crew pull on the rope to raise the tower.

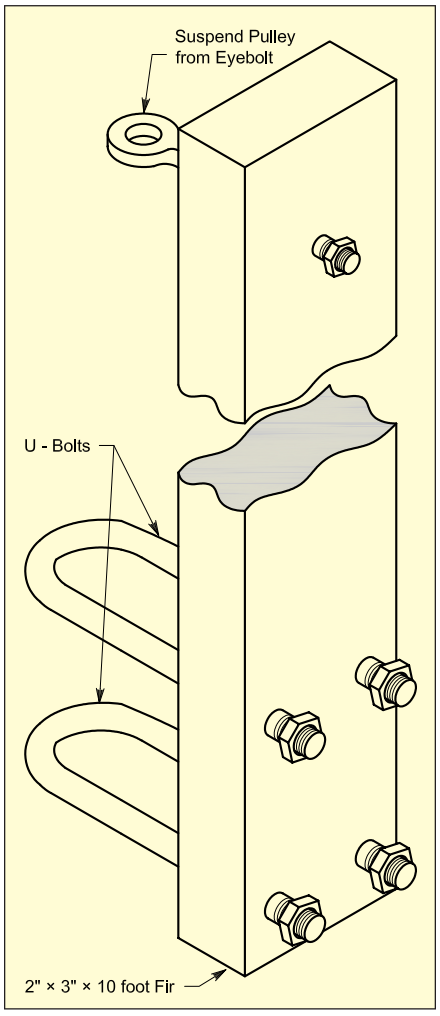


Figure 6—A ginpole made of wood. Ginpoles don't have to be expensive, just strong.

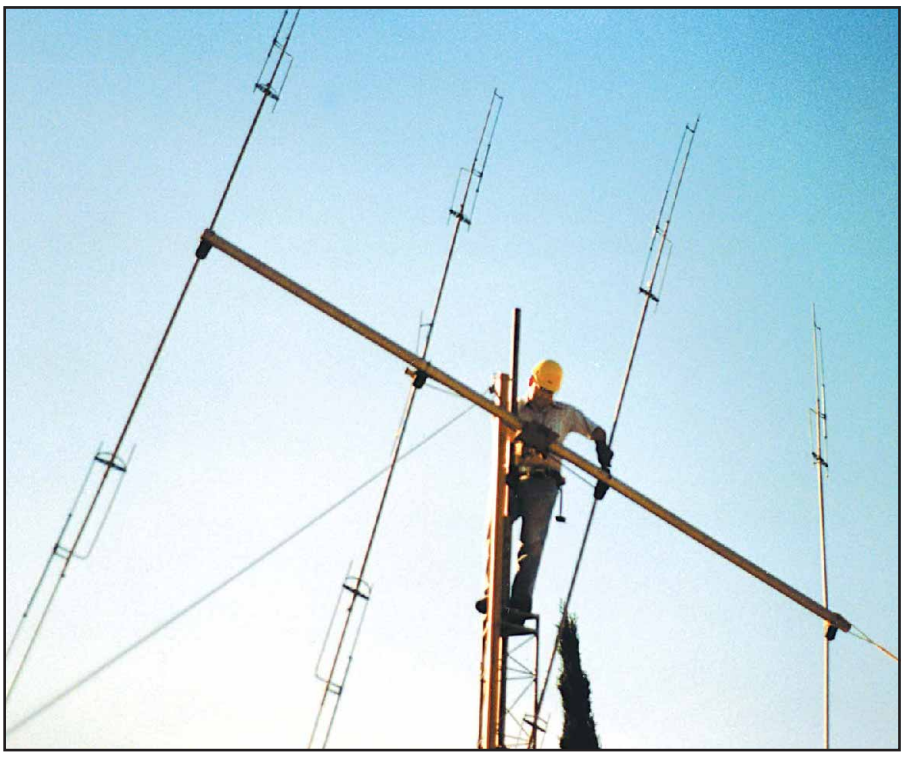


Figure 7—Notice how the antenna is supported by the ginpole while the author maneuvers it into position to slide it onto the mast. The ginpole rope is being held by assistants on the roof of the house. A second rope off the right side of the boom is used by other assistants to help steady the antenna. The author is belted to the mast and is standing on the tower's top plate.

fitted OSHA-approved safety belt and pole strap, hard hat, leather gloves and boots (preferably with steel shanks). Inspect your equipment, following the manufacturer's recommendation before each use. Know the location of possible overhead hazards and power lines. Never climb a tower in windy conditions, as the additional wind loading of your body could over-stress the structure. Always maintain three points of contact—both hands and one foot or one hand and both feet—on the tower at all times. If you are unsure, do not climb.

Before installing the rotator on my tower, it was necessary to crank up the tower so the upper (inner) section was two horizontal rungs above the top of the lower (outer) section. For safety, I put a 2×4 through the inside of the tower across the horizontal rungs just below the bottom of the upper (inner) section. I then winched the tower down so the tension was off the winch cable and the weight of the top section was resting on the 2×4. It was now safe to climb. [Avoid climbing an elevated tower section, if at all possible. If you must climb an elevated section, set it to the minimum height necessary and insert a steel angle iron (with $^1/_4$ inch wall,) rated to at least the upper section weight, horizontally into the tower. This is preferred to the wooden 2×4 chuck.—*Ed.*]

After pulling the rotator through the tower's center and securing it, the rotator mounting plate was maneuvered between the rungs and mounted on top of horizontal rungs; two rungs below the top plate. The rotator was then bolted to the mounting plate. Avoid installations where the rotator is mounted on the tower's top plate as any rotator's abilities to sustain heavy side loading are limited.

A ginpole must be mounted near the top of the tower to raise the mast and antenna. A ginpole is a type of hand-operated crane. The two most common varieties that hams will encounter are the A-frame types used to raise large towers and the type attached to the tower itself to raise and lower antennas and other objects. I made my own for about $15. My ginpole consists of a 2 inch × 3 inch × 10 foot fir stud with two U-bolts to attach it to a tower leg. A pulley is attached to an eyebolt at the top (Figure 6). To install the ginpole, hoist it with a rope and then attach the U-bolts. [To avoid having to lift the antenna on to the mast, the ginpole must extend at least 1 foot above the top of the antenna mast.—*Ed.*] Assistance on the ground will be needed to handle the rope.

When you first find out the price of an antenna mast, the first reaction is inevitably to go to a plumbing supply store and buy water pipe for one-tenth the cost. That is a very bad idea unless your antenna will be mounted directly at the top of the rotator or tower. Antenna masts must not only support the weight of the antenna, but also the bending forces of wind and possibly your own weight. Masts supplied by tower manufacturers are double or triple-walled high-strength alloys, while conventional plumbing pipe is not rated for structural use. Pull the mast to the top of the ginpole and then position it vertically over the mast hole in the tower's top plate. It can then be lowered into the rotator and bolted in place.

Installing the antenna is the trickiest and most dangerous part of the process. Before starting, gather the crew together and explain what you will be doing. Be

Figure 8—The completed tower and beam present a beautiful sight...ready to snag that elusive DX!

sure that everyone understands the climber's signals. For everyone's safety, the climber must be in charge.

Install the antenna's boom-to-mast U-bolts loosely enough to allow them to slip easily over the top of the mast. The ginpole rope is attached to the top of the boom to mast plate. Don't tie it to one of the U-bolts. A guide rope is tied to one end of the boom. Lean the antenna against the tower with the boom in a vertical position. One or two people should handle the ginpole rope while one person controls the guide rope. Lift and maneuver the antenna into position for attachment to the mast (Figure 7). Position the antenna on the mast and tighten the remaining hardware.

Coax arms secure the coax to the tower and prevent cable damage when the tower is cranked up and down. Be sure to leave a service loop in the coax between the top coax arm and the antenna so that the cable does not get pulled as the antenna is rotated. Be sure to moisture seal the coax connector at the feedpoint.

Remove the ginpole and clear all ropes and the 2×4 safety block. Slowly crank up your tower and verify that everything is in order. Figure 8 shows the completed tower and antenna installation.

After the Tower is Up

Set up a schedule for periodic inspection of your tower. This should include checking and tightening, when necessary, the bolts on the hinged mounting, visual inspection from top to bottom (a pair of binoculars is helpful), greasing the winch mechanism and checking for wear on the winch cable.

After connecting the coax, the rotator cables and all the grounds, you will be ready to go. The work of the installation did not end until the day the DX started rolling in. Was it worth it? You bet it was!

Notes

[1]A civil engineer should be consulted to answer questions about soil characteristics and strength.

[2]For more information about concrete, the National Ready Mixed Concrete Association has an informative Web site: **www.nrmca.org/concrete_basics/ready_mixed_concrete.html**.

All photos by the author.

B. Pulverman, WB6WUW, has been a ham since 1967 and presently holds an Advanced Class license. He has a BA degree from California State University, Fullerton and received electronics training at Control Data Institute from which he graduated as a computer technician. Bart has been a quality assurance manager for various electronics companies and is now a consultant, helping companies attain ISO 9000 registration. Active principally on 10, 15 and 20 meter SSB, he strives to add to his DXCC total, making good use of his tri-band antenna and tower. Bart is an ARRL life member and can be contacted at **www.wb6wuw.com** *or at* **bart@teahouse.com**. QST

NEW PRODUCTS

TACTICAL COMMUNICATIONS BRIDGE FROM LINK COMMUNICATIONS

◊ Link Communications has introduced the TCB-1, a product for Amateur Radio Emergency Services (ARES) search and rescue operations and portable repeaters where setup times can be critical. The TCB-1 performs as the connection point between two radio systems. Its features include simplex and duplex repeater operation, interoperability between different protocol radios, radio link extender and cross-band repeater operation. The TCB-1 offers two full-duplex radio ports, RS-232 programming and control port and seven output control lines. There are two minutes of digital voice storage per radio port for simplex repeater operation, along with an additional two minutes for IDs and user messages.

For more information, contact Link Communications, Inc at 1035 Cerise Rd, Billings, MT 59101; tel 800-610-4085; fax 406-245-4889; **info@linkcomm.com**; **www.linkcomm.com**. $499.95.

MALDOL HVU-8 HF/VHF/UHF COMPACT ANTENNA

◊ The Maldol HVU-8 is a compact, omnidirectional HF, VHF and UHF antenna intended for limited-space installations such as apartments and condominiums, or for portable use. At less than 9 feet in height, the HVU-8 can be installed in many locations. Each band has its own independently tuned radiator and radial element. SWR bandwidths on all HF bands are 50 kHz or less. Power rating is 200 W PEP on HF; 150 W continuous on 6 meters through 70 cm. $349.95. For more information contact NCG Company, 1275 N Grove St, Anaheim, CA 92806-2114; tel 800-962-2611; **www.natcommgroup.com/**.

MFJ-4105 1.5-12 V PORTABLE POWER SUPPLY

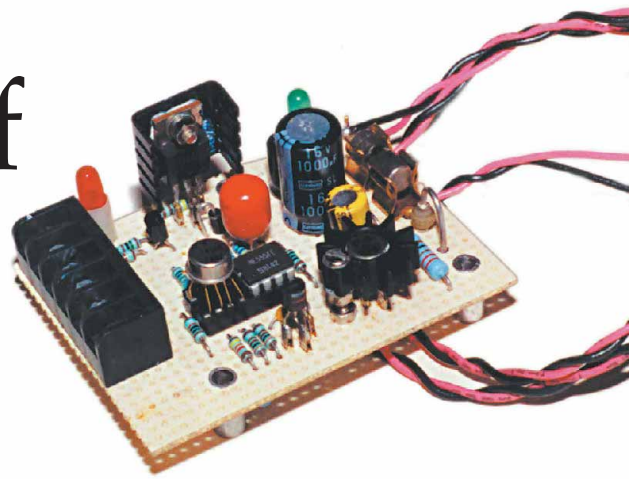
◊ MFJ has introduced a portable 500 mA power supply. The MFJ-4105 is outfitted with a 16 V power adapter, which accepts 120 V ac. There are two regulated outputs, one fixed at 5 V dc and one variable from 1.5-12 V dc.

Price: $79.95. For more information, contact MFJ Enterprises, 300 Industrial Park Rd, Starkville, MS 39759; order tel 800-647-1800; inquiry tel 662-323-5869; **www.mfjenterprises.com**.

By Glen Thome, N8AKS

Delayed Turnoff Fan Control

Keep your equipment cool...but not at your power supply's expense!



Proper ventilation of electronic equipment and enclosures has been a design issue for professional engineers and the Amateur Radio community for many years. Adequate cooling has become even more important since the advent of solid-state devices and the resultant miniaturization of equipment. Both original equipment manufacturers and homebrew builders have increasingly turned to forced-air cooling methods to remove heat from radios, repeaters, computers and a host of other solid-state equipment. Where natural convection proves to be inadequate in relation to basic equipment size, the use of fans or blowers often provides the solution for cooling problems.

Of course, each solution carries its own disadvantages. In the case of forced-air cooling, the introduction of an electromechanical device (fan) adds audible noise, increased power consumption and decreased MTBF (mean time between failures). This is because mechanical devices fail more frequently than semiconductor and passive devices do.

The fan control circuit described here was designed and built to minimize some of the disadvantages of forced-air cooling in a repeater application. Although increased audible noise was not a consideration, increasing the expected life of the fan and the minimization of power consumption were important issues. The repeater is located at a remote site that cannot always be accessed. Of more significance is the total drain from the standby battery power system, since the fan used is a brushless 12 V dc unit. Every watt diverted from the radios and controllers during a commercial power failure decreases the time that emergency communications can be provided. While equipment cooling is absolutely necessary, turning the fan off during repeater idle times was a major design objective.

This fan controller uses small components so the entire unit can be built in a compact package. That package is amendable to various construction techniques and installation requirements. A VOX circuit that appeared in the 1981 edition of *The Radio Amateur's Handbook* inspired some of the features of this controller.[1]

Theory of Operation

This fan controller circuit, shown in Figure 1, consists of a retriggerable monostable oscillator (one-shot) controlled by an op-amp used as a comparator that senses the state of the push-to-talk (PTT) signal generated by the repeater controller.[2] The output of the one-shot gates a power MOSFET into conduction or cutoff, which, in turn, applies or removes power to the fan. An internal power supply provides filtered and regulated voltages for the various active devices. Two LEDs are included to provide POWER ON and FAN RUNNING indication.

During repeater idle times, the PTT signal applied to the positive input of comparator U1 is of higher voltage than the reference voltage (approximately 3 V) applied to its negative input. Under this condition, the output of U1 is a logical high of about the same value as V_{cc}. This signal, applied to pin 2 of 555 timer U2, maintains the output (pin 3) at a logic low level, which gates power MOSFET Q4 off. The fan is turned off under this condition.

When the repeater is keyed, the PTT signal becomes a logic low, at approximately ground potential. Since the negative input of U1 is now of higher potential than its positive input, the output of U1 changes state from high to low. Timer U2 responds to this input signal by changing its output state from a low to a high, approaching the value of V_{cc}. This output gates MOSFET Q4 into conduction which allows the fan to run. During the time that the transmitter is keyed and the output of U1 is low, transistor Q2 is biased into conduction which prevents timing capacitor C10 from charging. This continuously retriggers U2, preventing it from starting and completing its time-out cycle, which results in the fan running without interruption throughout the transmitter key-down period.

When the transmitter is unkeyed and the output of U1 reverts to its logic high level, transistor Q2 is biased off, which allows capacitor C10 to begin charging through resistors R8 and R9. The values of these components were chosen to allow a time period of 4 to 5 minutes to elapse before the voltage at pins 6 and 7 of U2 reaches $^2/_3$ V_{cc}. When C10 charges to this value, the output of U2 changes state from a logical high to a logical low which gates Q4 off, thus turning off the fan and returning the circuit to its initial state.

For more precise control over the time-out period, capacitor C10 has been specified as a tantalum type rather than aluminum. The tantalum capacitor, although more costly, offers better tolerance of specified value and exhibits much lower leakage than does an aluminum capacitor of equivalent ratings. Additionally, 1% tolerance metal film resistors were used for R8 and R9 for a more precise timeout.

The internal power supply of this fan controller consists of a Zener stabilized voltage source (D2 and Q1) providing regulated 10 V as V_{cc} for U1, U2 and Q3. Input fuse F1 protects against catastrophic failure and diode D1 protects the fan controller circuit from reverse polarity input voltage. The green LED, D4, connected in series with Zener diode D2,

[1]Notes appear on page 40.

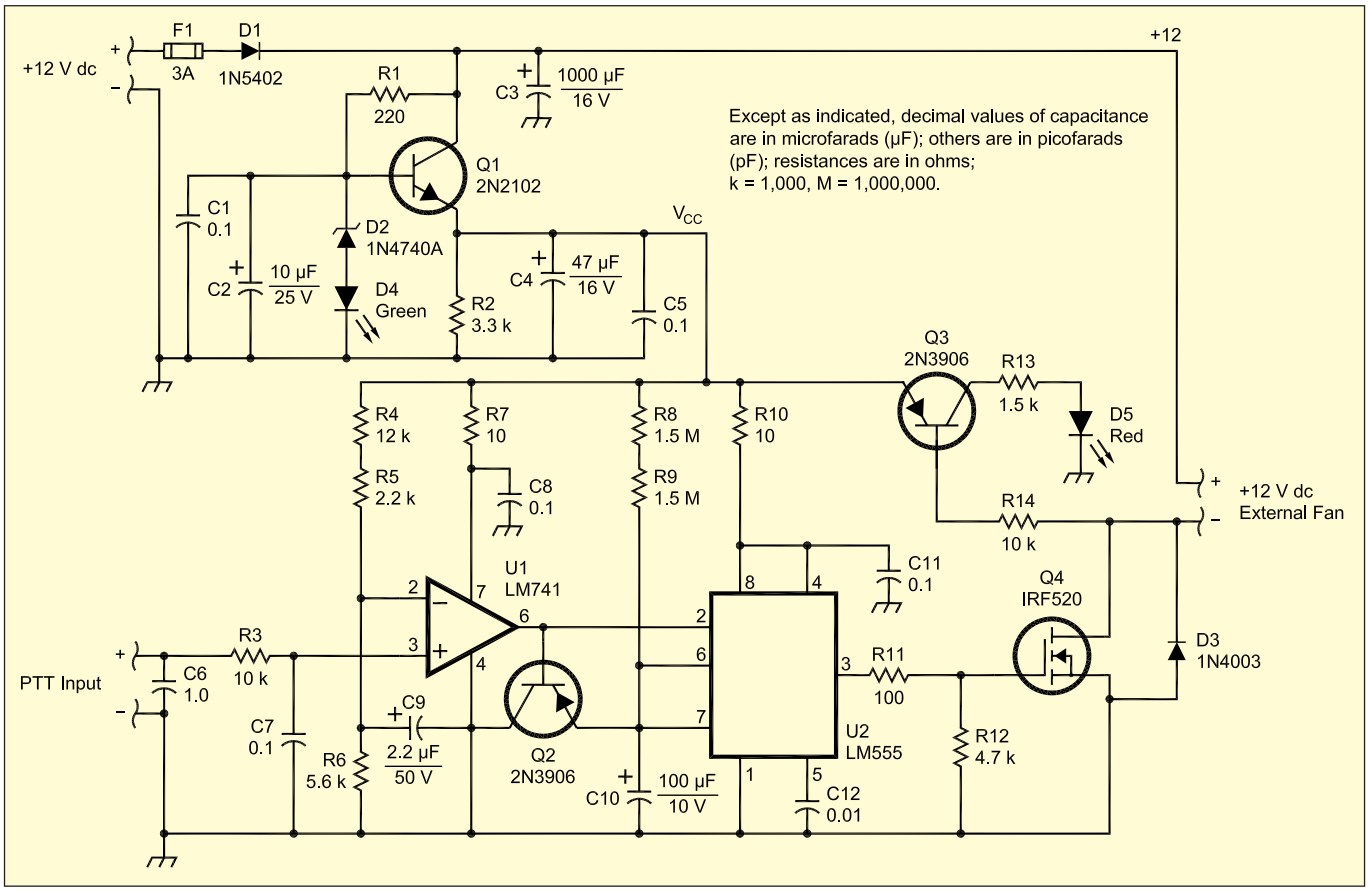


Figure 1—The delayed fan controller schematic. Parts are available from several sources, including Mouser Electronics, 1000 N Main St, Mansfield, TX 76063; tel 800 346-6873; www.mouser.com and Ocean State Electronics, 6 Industrial Dr, Westerly, RI 02891; tel 800 866-6626; www.oselectronics.com. Part numbers shown in parentheses are Mouser. Resistors are universally available from many sources, including RadioShack; www.radioshack.com.

C1, C5, C7, C8, C11—Capacitor, 0.1 µF, 50 V ceramic, Z5U, 20% (80-C410C104M5U).
C2—Capacitor, 10 µF, 25 V, electrolytic (75-515D25V10).
C3—Capacitor, 1000 µF, 16 V, electrolytic (75-515D16V1000).
C4—Capacitor, 47 µF, 16 V, electrolytic (75-515D16V47).
C6—Capacitor, 1.0 µF, 50 V, ceramic (80-C430C105M5U).
C9—Capacitor, 2.2 µF, 50 V, electrolytic (75-515D50V2.2).
C10—Capacitor, 100 µF, 10 V, 10%, tantalum electrolytic (80-T354J107K010).
C12—Capacitor, 0.01 µF, 50 V ceramic (80-C410C103M5U).
D1—Diode, 1N5402 (625-1N5402).
D2—Diode, Zener, 1N4740A (625-1N4740A).
D3—Diode, 1N4003 (625-1N4003).
D4—LED, T-1¾ size, green (604-L53GD).
D5—LED, T-1¾ size, red (604-L53HD).
F1—Fuse, 3 A, 125 V (5765-35003).
Q1—Transistor, 2N2102 (511-2N2102).
Q2, Q3—Transistor, 2N3906 (625-2N3906).
Q4—Transistor, IRF520 MOSFET (511-IRF520).
R1—220 Ω, ½ W.
R2—3.3 kΩ, ¼ W.
R3, R14—10 kΩ, ¼ W.
R4—12 kΩ, ¼ W.
R5—2.2 kΩ, ¼ W.
R6—5.6 kΩ, ¼ W.
R7, R10—10 Ω, ¼ W.
R8, R9—1.5 MΩ, 1% metal film.
R11—100 Ω, ¼ W.
R12—4.7 kΩ, ¼ W.
R13—1.5 kΩ, ¼ W.
U1—IC, LM741CN op amp, 8 pin DIP (512-LM741CN).
U2—IC, LM555CN timer, 8 pin DIP (512-LM555CN).
XF1—Fuse clip, PC mount for 5 mm fuse (534-3517).

provides a POWER ON indication. Liberal use of various filter capacitors, both electrolytic and monolithic ceramic types, has been included to minimize low and high frequency noise that may otherwise affect circuit operation. Additionally, most of the small ceramic capacitors used in the circuit have been included as RF bypass devices to minimize potentially harmful effects of stray RF fields that may occur within a radio installation.

A red LED, D5, has been included as a FAN RUNNING indicator and it is useful when a fan is located some distance from the control circuit. This LED can also serve as a functional status indicator for the control circuit and can be helpful as a troubleshooting aid. Whenever the fan is running, the drain terminal of MOSFET Q4 is pulled to ground potential. This biases Q3 into conduction, which allows D5 to light. When Q4 is gated off and the fan is not running, the voltage at the drain terminal of Q4 approaches 12 V, which biases Q3 off, extinguishing D5.

Construction

The layout is not critical since no high frequency circuits are involved. The original prototype was built using a piece of 0.10 inch grid Vectorboard measuring approximately 3¼×2½ inches. This size was chosen to fit within the space available in a repeater controller chassis. No separate enclosure was used, since the Vectorboard assembly was adequately protected after installation. Other builders may find that a separate enclosure may be more suitable for their installations. Although heat sinks were used on two of the transistors in the original model, they may not be necessary. For my repeater application, the ambient air temperature sometimes exceeds 30°C, so heat

sinks were included as an added safety factor.

Transistor Q1 dissipates a small amount of power and the power dissipated by MOSFET Q4 should be minuscule in nearly all cases. The drain-to-source resistance of this device in its ON state is about 0.25 Ω or less. Even if a 12 W fan drawing 1 A were used, the maximum power dissipated across Q4 ($P=I^2R$) would only be 0.25 W. With a specified case-to-ambient thermal resistance of 62.5°C/W, the expected temperature rise of Q4 under these conditions without a heat sink would be about 16°C. For applications running at normal room temperature of about 20°-25°C, with an input voltage not exceeding 13.8 V, heat sinks on Q1 and Q4 should not be required. Each installation site should be evaluated for its own environment. If in doubt, install heat sinks to ensure trouble-free operation. [If you do need a bit more power handling capability without a heat sink, use the IRF530 rather than the IRF520. Its $R_{ds(on)}$ resistance is only 0.16 Ω.—*Ed.*]

Normal safeguards against electrostatic discharge (ESD) should be used during construction of the controller. Although all semiconductor devices can be affected by ESD, power MOSFET transistors are sensitive to static discharges and can be easily destroyed. [It's a good idea to wrap and crimp a shorting wire around the MOSFET device leads (all 3) prior to installation (#18-20 tinned solid wire works well). This will clamp the gate-source voltage. Make sure you're grounded and remove the wire after soldering in the device. Once installed, power MOSFETs are quite robust and ESD shouldn't be a problem.—*Ed.*]

For this reason, circuits containing MOSFET devices should be constructed on a workbench with a grounded metal surface. Personnel handling MOSFET devices should wear a grounded wrist strap. Soldering irons should be ac isolated and grounded. Such precautions are necessary to drain away static charges, thereby minimizing the chances that semiconductors will be damaged by ESD.[3] The power MOSFET transistor should be the last device installed and soldered into place.

Installation and Connection

During installation of the completed fan controller, the fan leads should be connected first, followed by the 12 V power source. The final connections made should be to the PTT input wiring, with the ground side of the circuit connected first. When the power connection is made, the fan may start and run spontaneously; however, a short time delay circuit containing capacitor C9 has been included at the input of U1 to minimize this possibility. If the fan does start and run, it should turn off automatically after a timeout period of 4 or 5 minutes.

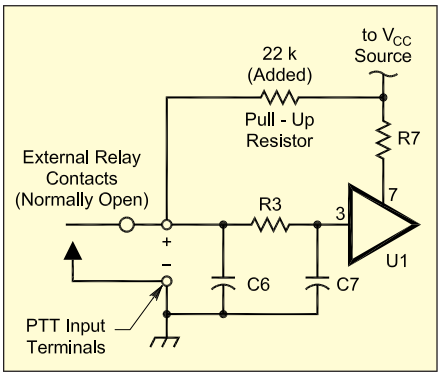


Figure 2—If external (dry, no voltage) relay contacts are used for PTT operation, a 22 kΩ pull-up resistor must be added, as shown.

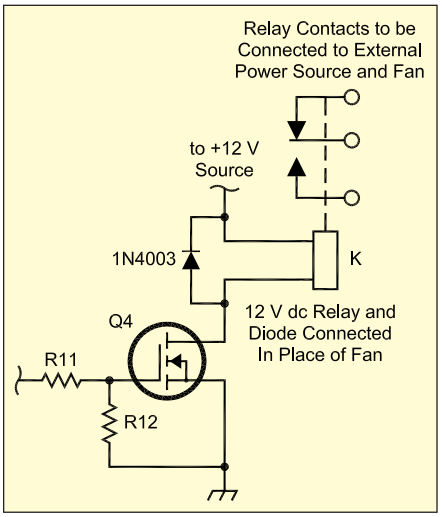


Figure 3—If the fan motor is not a 12 V dc type, a relay may be used to switch an external fan motor, as shown.

Input and Output Circuit Variations

The input circuit to comparator U1 was originally designed for a PTT signal generated by a repeater controller. That voltage varies between 3 to 8 V in the unkeyed state. During transmit, the PTT signal becomes less than 3 V, pulled very nearly to ground. When the fan controller is used in other applications, the only signal available for the PTT input may be a set of auxiliary relay contacts from a transceiver. In that case, a 22 kΩ pull-up resistor should be connected from V_{cc} to the PTT input as shown in Figure 2. The relay contacts should be connected as shown and must be normally open during receive and closed during transmit. Most transmitters or transceivers have auxiliary relay contacts available for control of external equipment.

The fan originally used was a 12 V unit. The repeater is powered from a 12 V dc power supply and uses a standby battery for emergency power. Some applications may not require a 12 V fan and the coil of a 12 V relay may be connected in place of the fan motor as shown in Figure 3. The contacts of this relay could then be used to switch power to an external fan motor as desired. If such an option is used, the builder should include a snubber diode connected across the relay coil, as shown. Additionally, the relay contacts must be adequately rated. A suggested relay is the Magnecraft type W78CSX-2 (Mouser cat. no. 528-7810-2) with coil ratings of 12 V dc, 160 Ω and 4PDT contact ratings of 3 A. If this or an equivalent relay with the same coil ratings is used, a smaller MOSFET for Q4 may be used. Suggested substitutes are types IRFD110 or BS170 (Mouser cat. no. 570-IRFD110 or 625-BS170, respectively).

Conclusion

Although amateurs have used continuous forced-air cooling in tube equipment for years, the ventilation requirements for solid-state equipment are somewhat different. In many cases, the cooling requirements of modern equipment make continuous airflow either unnecessary or undesirable. Hopefully, readers will find the methods and circuits described here useful in their own stations where effective equipment cooling, low noise, power conservation and extended fan life are requirements.

Notes

[1]*The 1981 Radio Amateur's Handbook* (Newington: ARRL), 1980, p 12-23.

[2]This controller makes use of the 555 timer and 741 op-amp we talked about in "Hands-On Radio" in April and June 2003 *QST*.

[3]International Rectifier has a good application note that covers the ESD issue. "Protecting IGBTs and MOSFETs from ESD," IR Application Note AN-955. International Rectifier, 233 Kansas St, El Segundo, CA 90245; **www.irf.com**.—*Ed.*

G. Thome, N8AKS, has been licensed since 1978 and now holds an Amateur Extra class ticket. Glen has been both a technical writer and an equipment designer, principally in the telecommunications power conversion and distribution field. Interested in electronics since age 12, he earned a degree in Electronics Technology following service with the US Coast Guard as an electronics technician. You can reach him at 917 Delaware Ave, Elyria, OH 44035 or **glen055@yahoo.com**.

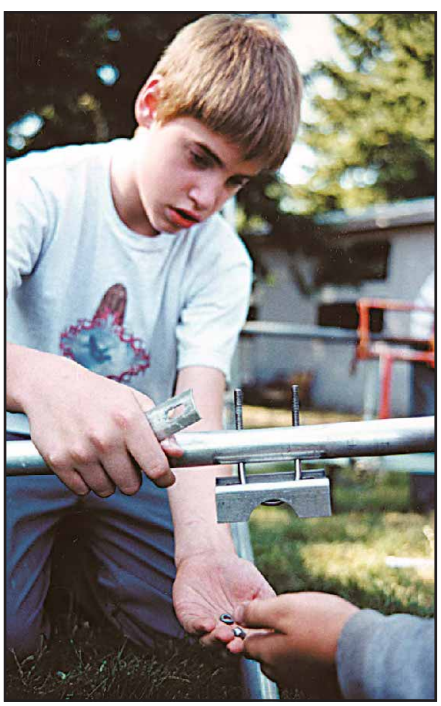
By Reed Nightingale, KD7MNN

Radio Camp

Who would think that a bunch of kids, most total strangers, would all share a common interest, and care about it enough to spend a whole week out of their summer vacation to learn about it?

For five days last summer, 9 to 4 every day, 19 kids determined to be hams went to "Radio Camp." Lee Chambers, KI7SS, teaches Radio Camp in a large classroom at his home. His classroom is different than any other classroom, anywhere. First, the chairs are not chairs at all—seating is in comfortable couches with lots of legroom! There were five TVs scattered around, so wherever anyone sat they had a great view of a TV. There is a really great stereo for the sound that comes with the many videotaped training sessions. There is also an overhead projector and huge paper sheets for writing explanations.

Lee is an Extra Class ham who has put on several Radio Camps for both kids and adults. By putting on these camps he gets to have fun, build up the community of hams and train them so that they can help provide communications for the local area. At camp, the students (all in the age range 11 to 17) listened to Lee explain what ham radio is about. Then Lee gave a complete description of what was going to happen during the next five days.



Stephan Muller seems determined to get that U-bolt nice and tight. Radio Camp provides students with plenty of hands-on instruction—including assembling this three-element Yagi.

That's Entertainment

The first two and a half days' class activities were watching a variety of different instructional videos. Lee uses several videotapes to explain ham radio. He teaches using the ARRL Technician videotapes. One good technique is anytime someone doesn't understand a part of a video, or whenever he thinks the videos don't give a good enough explanation of the issue, Lee stops it and explains the matter in his own entertaining style. Sometimes he tells a story that illustrates the point, and these can be very funny!

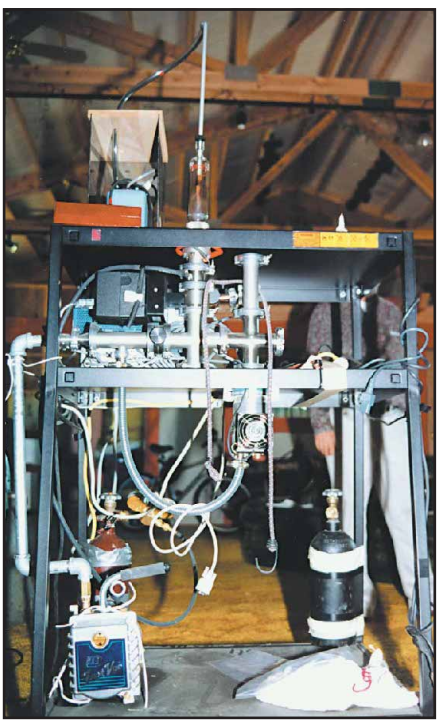
About every 45 minutes comes a much-anticipated recess. Some kids would go outside to swing on a unique swing that lets you twirl as you are pushed in a large circle. Lee explained that the bearing that makes the twirling possible is actually an antenna "thrust bearing"—it figures! Other kids would stay inside and talk or play a card game, while still others might just sit in their seats. After 10 or 15 minutes, Lee called everyone back inside to continue with the lessons.

By late morning on the first day, this lessons-recess-lessons-recess pattern was getting to be second nature, when a giant sub sandwich was delivered to the classroom. Lunch was here! All the kids quickly formed a line and ate with cans of soda from a large cooler in the corner to wash the food down. About half an hour later, the class was back inside watching the videos again. A little bit before 4 o'clock, Lee dismissed the class, and we went home.

The next day's schedule was similar, with lessons taught by videos and extra presentations by Lee. The stories, recesses, food, swinging and pop were again the highlights of the day. The only differences were the subjects taught and pizza instead of sub sandwiches. That all changed the following day.

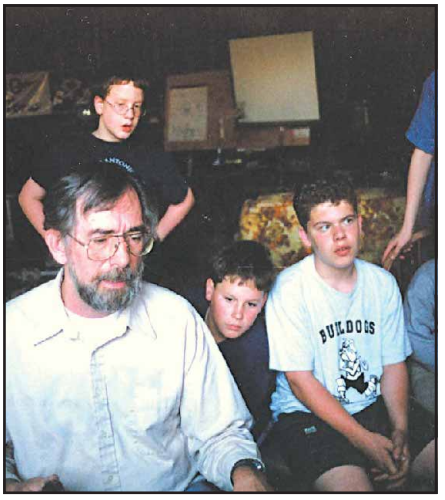
Multimeters for All

Wednesday afternoon the videos stopped. Lee gave each of us a "multimeter" and taught us how to use it safely. With their new multimeters, the kids had to then figure out what type of electrical component was hidden in a dozen or so cardboard boxes. Each box had a letter to identify it, as well as two leads on the



How *do* you make a transistor, anyway? Why, obviously…with a transistor-making machine. Radio Camp instructor Steve Ward, WC7I, provided the demo.

Looks as though the Yagi is coming together nicely.



Radio Camp instructor Lee Chambers, KI7SS, checks out the assembled antenna. It worked!

outside for the multimeters to attach to. Hidden components inside included resistors, capacitors, diodes, an old battery (voltage about 1.1 V), and a short and an open circuit. This was tough! Some kids decided to work alone, while most worked with their friends. Lee walked around the classroom to help anyone who was having trouble figuring out the components in the boxes.

After part of the mystery box activity, it was lunchtime. Subs again, but no one was complaining—there was plenty to eat. At the end of lunch and a little more mystery box checking, Lee switched to an expanded discussion of how antennas work. And we thought we'd heard that topic in the video! At the end of his antenna explanation it was time to go home. Everyone left, taking with them their new multimeters!

Thursday's schedule included both morning demonstrations and afternoon field trips to two special ham locations. The first demonstration was about electrical safety taught by Dan, KC7DFL. Dan wanted to make sure we understood electrical safety, and he talked about building grounds, transformers and power lines. Next came a very entertaining demonstration of how electricity is created, how tubes work (with a thorough discussion of vacuum issues) and how to create a real transistor. The instructor, Steve Ward, WC7I, brought his working transistor-manufacturing machine to the class, and we watched as the vacuum was created as air was pumped out, and the special gases were let in. Steve then explained "sputtering." He then re-taught us about diodes and PNP and NPN transistors. He went over how they work and some problems in attaching the transistor leads to the transistor itself without using dangerous acids.

We Get on the Air!

Then came a demonstration on soldering, including safety and precautions to take, and the uses of different soldering tools. Fred Baker, W7SIX, taught this module. Fred brought everything needed to solder from the simplest iron to the very latest in surface-mount soldering equipment. After a pizza lunch the class split into two groups and set out to either a contest station set up by Ron Hill, W7NN, or to the headquarters of the Olympia RACES and ARES, called the EOC (Emergency Operations Center). At Ron's station, everyone got to talk on the radio. We made contact with a ham in Italy and all the kids talked with him. An hour after arrival, the two groups switched locations and we went to the EOC, where we were shown around by the director. After an hour, we returned to Radio Camp, where we got to burn off the rest of the time playing on the swing.

While traveling between field trip destinations I asked Jeffery Meader (one of the students) why he would give up one of the last weeks of his summer vacation to learn about ham radio, and what he liked about the hobby. His replies were that ham radio is fun, and that there are no "minute" worries and no telephone calls to make. What was he going to do in the ham radio world? Talk and make new friends.

The last day was Friday. We did a review of all the tough parts—the frequency list, for example—and went over the question pool and locations where tests are given. Then Lee brought out a disassembled tri-bander, a three element Yagi antenna. It was the students' job to assemble the antenna, and connect it to a portable trailer tower that belongs to the local radio club, the Olympia Amateur Radio Society. Lee raised the tower using a hand winch and we tested the antenna, checking the SWR with an antenna analyzer. It worked! To wrap up the day, Lee gave everyone who attended the class every day a holographic certificate of completion.

Epilogue: It is now late September and I have had time to see how well Radio Camp worked by looking at the number of kids who have passed the Technician test, and by listening to some of them—those I know from scouting—talk about the class. It's a little difficult, but as near as I can tell all but one have taken the test and passed, which I think is an exceptional record. I see Lee at scout meetings sometimes and he says that he has been contacted by enough people that he may run *three* Radio Camps this summer! If he does, I know those kids will have a great time and will be new hams and on the air as soon as they take the test! This is a great way to get started with ham radio.

Reed Nightingale, KD7MNN, just finished 8th grade at Washington Middle School in Olympia, Washington. He is 14 and a Boy Scout in Troop 266, where his rank is currently Life. He has a goal of Eagle by the fall of 2003. A Technician class licensee, his favorite ham things to do are to go camping with his 2-meter radio and to check in to the Youth Net. His troop has over 20 scouts with ham licenses (of 85 in the troop), so when they go somewhere there are a lot of radios along! Reed also enjoys soccer and video games. He can be reached at 2423 Woodfield Loop SE, Olympia, WA 98501-7513; **night@cco.net**.

By Núria Font, EA3WL and Josep Gibert, EA3BT

An African Adventure to the Congo

Two Spanish hams who mounted a DXpedition last year to TN, a much-needed DXCC entity, found that traveling to a troubled Third World nation can present its share of challenges.

Figure 1—The Republic of the Congo is often called Brazzaville (its capital) to set it apart from its neighbor, the Democratic Republic of the Congo (Kinshasa).

The Republic of the Congo has about 2.6 million inhabitants, most of them concentrated in the south, along the railway that joins Brazzaville, the capital, with the coastal city of Pointe Noire. Pointe Noire, where the valuable oil fields are located, is an important Atlantic port. The Congo won its independence from France in 1960, and since then, as with many other African former colonies, it has had a turbulent history.

There was a period of decolonization—first with a socialist government and later a Marxist-Leninist one proclaiming the Popular Republic with the support of the Soviet Union. After several changes and coups d'etat, and with the fall of the Soviet Union, a new government was formed in the '90s, but the instability was still present.

In 1997, and after a short but bloody civil war, President Sassou-Nguesso was back in power. Since then, different guerrilla groups like the *Ninjas* and the *Cobras* have battled against government troops, creating hundreds of thousands of refugees and untold casualties. Fighting in the capital, Brazzaville, has displaced more than 200,000 people from their homes. Many fled east into the Democratic Republic of Congo (Zaire), which was engaged in its own civil war.

While the situation is still very pessimistic, there have been some hopeful signs in recent years. A cease-fire between the rebels and the government was signed in 1999. The only railway between Brazzaville and Pointe Noire, the entrance point for the majority of goods to the capital, was reopened in August 2000. In April 2001, a public ceremony was held in Brazzaville where guns were destroyed to symbolize the desire for peace among the Congolese people. And in March 2002, presidential elections took place in which President Sassou-Nguesso was elected president by 90% of the voters.

This improvement of political prospects encouraged us to make a serious radio operation from this country, which climbed in the ranks of most-wanted countries. The Congo has a lot of things against it and very few in its favor.

Against

- Its great political instability and several recent bloody civil wars, although the situation seemed to be improving.
- A nearly nonexistent infrastructure, both in transportation and in accommodations. There are a few scheduled flights from Europe to the coastal city of Pointe Noire. There is also a railway line that links Pointe Noire and Brazzaville, although it is often cut by attacks by guerrilla forces. There are virtually no hotels, as few remained standing after the civil wars and few hotel chains decided to reopen due to the existing insecurity.

In Favor

There hasn't been any important Amateur Radio activity from the Congo since

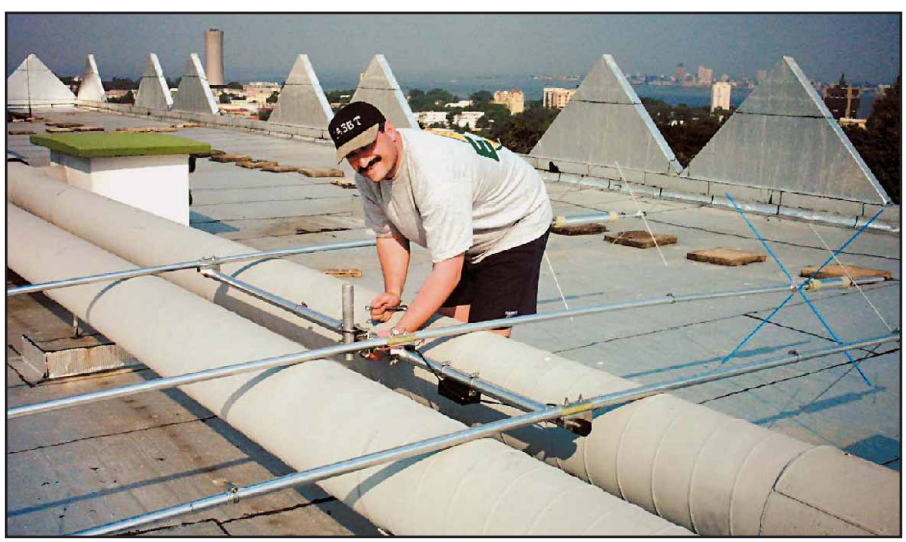


Figure 2—Josep, EA3BT, assembling the Cushcraft MA5B beam on the roof the Meridien Hotel in Brazzaville.

1997. That's why the demand for this DXCC entity has increased, becoming number 38 on the *Most Needed DXCC Countries* list, published by the ARRL in September 2000 (no more recent list available). This made it very attractive for attempting a high-level operation.

Planning

Analyzing all these facts, we decided that this would be our next DX destination. After a number of telephone calls and faxes, we were able to determine all the requirements to obtain licenses. We also managed to find a hotel from which to operate.

While the days passed, we finalized our DXpedition and, when everything was ready, we made it public. Many people supported our project, so we expected to be able to achieve our goals: (1) To give the "new one" to the maximum number of different stations, and (2) to work the maximum possible number of stations.

To do this, we were going to install two complete stations, and they were going to be on the air as much as possible. The first station (high power) would include a Yaesu FT-900 AT transceiver; Cushcraft MA5B Yagi for 10, 12, 15, 17 and 20 meters; Ameritron AL-811 (800 W) amplifier; switching power supply, and laptop PC.

The second station (low power) would be equipped with ICOM IC-706MKIIG transceiver; Hy-Gain TH3 Jr Yagi for 10, 15 and 20 meters; Kantronics KAM controller for RTTY; Timewave 599ZX DSP filter; switching power supply; laptop PC; home-made 3-element beams for 50 MHz, and wire dipoles for 40 and 80 meters.

There were also more than 100 meters of coaxial cable, telescopic masts for the beams, ropes, anchors and tools for installing all the stations. We had to carry more than 300 pounds of material between two people.

We had everything ready for departure, and we knew that the political situation was improving because of the celebration of presidential elections at the end of March 2002. But an event happened that made us think about the possibility of canceling the operation. Just two weeks after the elections, and less than a month before our departure date, violence flared once again when the *Ninjas* rebels attacked a train, which caused two casualties. This was the first important attack since the cease-fire was signed in 1999. The army answered with a short but overwhelming military operation in the southern section of Brazzaville where opposition forces are concentrated. Tens of thousands of terrified people left the city, but most returned a day later.

This tragic turn made us doubt the security of our operation. Before making a decision, we called our Spanish embassy in Kinshasa (Democratic Republic of Congo), the only diplomatic representation in the zone. After a long and pleasant conversation, they told us that nothing serious was happening. But they recommended that we not move from the city and not go out of the hotel at night.

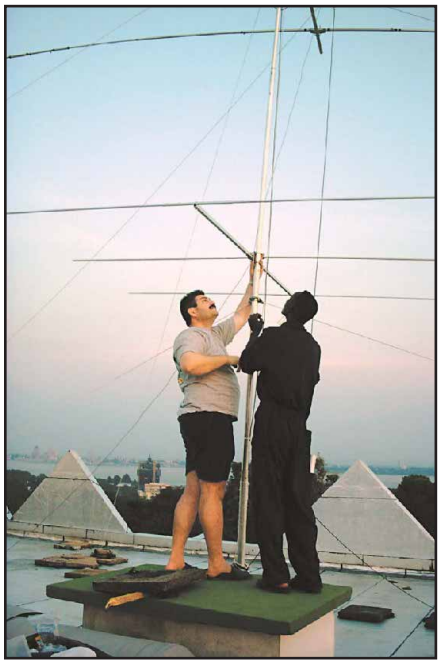


Figure 3—Josep and a Congolese assembling the 6 meter beam.

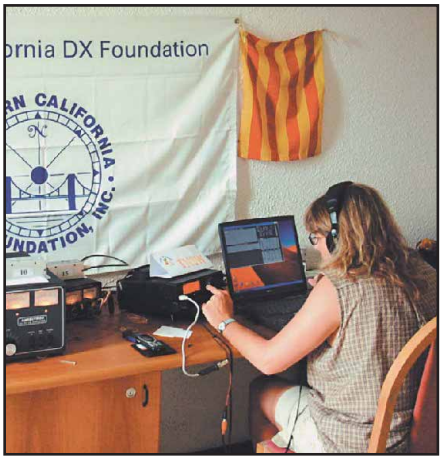


Figure 4—Núria, EA3WL, operating the pileup as TN3W.

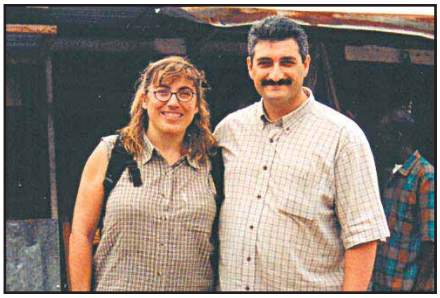


Figure 5—Josep and Núria, TN3B and TN3W, look pleased with the outcome, despite the challenges they faced during their DXpedition to the Congo.

We decided to go on with our plans. The truth is that while we stayed in the country, we didn't notice that anything wrong was happening. Although during those days there was a shortage of petrol and food that had to come from Pointe Noire, they told us that it was due to problems with the railway.

There was also a strong military presence in the streets, but we thought that this was due to the parliamentary elections that were going to be held. It wasn't until we returned to Spain that we learned of the real events that had occurred. The rebels had cut the railway once again, causing the shortage of supplies, and they had approached the borders of the capital. Just 15 days after our return, rebels attacked the Brazzaville airport and during the battle with government troops, nearly 100 died, some of them civilians.

The Journey Begins

With all the planning behind us, we started our journey on May 16. The plane took us from Barcelona to Paris and then directly to Brazzaville, the capital of the Republic of Congo.

The trip was perfect, without any problems. But after landing, we had to face our first obstacle: some of our luggage had been left in Paris and would not arrive until the following Monday. It was Thursday and we were going to lose at least four precious days of operation.

There we were, in an unknown remote city, with the only clothes that we had on and our antennas (they were the only luggage that had arrived)—in addition to the equipment we had carried as hand luggage. But we didn't have cables to connect the rigs, antennas and power supplies, so we couldn't do anything.

We went to the hotel and expected that the next day, with daylight, we were going to view things another way and perhaps find a solution.

Antennas, Shopping...and a Surprise

The next day, we decided to optimize our time. First we investigated our planned antenna site. We asked permission to get onto the hotel roof. The maintenance chief accompanied us and suggested some locations for the antennas.

The hotel was separated into two wings, one of them freely accessible and the other closed. The closed wing was used for storage.

The Meridien hotel is the highest building in the city, and all the cellular phone repeaters, airport antennas, police anten-

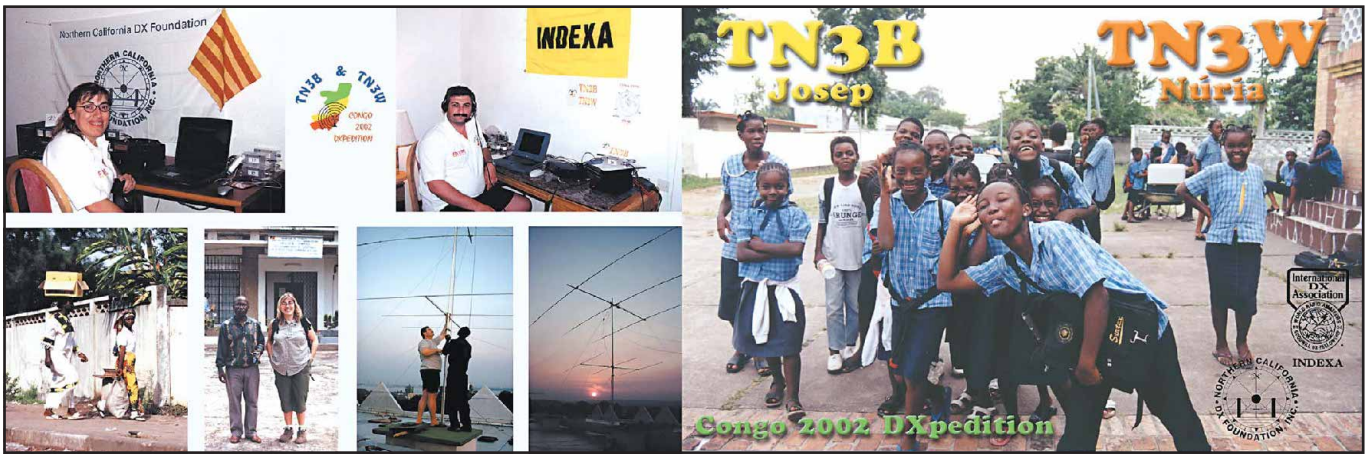


Figure 6—The operation used this colorful double QSL card.

nas and several satellite TV antennas are placed on it. Most of them were situated on the roof of the free-access wing, so there was little opportunity for new antennas. The roof of the closed wing was wide open, but inaccessible from below—at least not without permission.

The maintenance chief told us we could install our antennas on the roof of the closed wing, but we would have to ask permission every time we wanted to turn the beams or make any other antenna changes. We decided the inconvenience was worth the value of having somewhere to erect our antennas.

Our next stop was at the communications authority office to secure our licenses. After paying all the necessary fees, the call signs TN3B and TN3W were issued to us.

With tickets in hand, we went to the market to buy some clothes and basic things to get us by until our belongings arrived from Paris. We were surprised to see that we were able to find all that we wanted, from T-shirts to soldering irons.

After doing a bit of shopping, we went back to the hotel, where a great surprise awaited us. Someone had called from the airport—our remaining suitcases had arrived with another flight from Paris via Libreville (Gabon) and then Brazzaville! The catch was that we had to get to the airport to claim them before 1 PM.

We looked at the clock and noticed that it was noon, so we grabbed a taxi and rushed to the airport. We arrived to discover that the person in charge of the luggage area had locked up and left because no more international flights were expected that day. No one else could give us the suitcases! Upset, we decided to come back the next day at 9 AM.

Back at the hotel, we made good use of the daylight hours left and started building the beams. We borrowed a wrench and screwdriver from the technicians and worked until dark. At 9 o'clock the next morning we went back to the airport, but we couldn't find any trace of the mysterious "luggage chief." They didn't expect him until noon.

With weary calm, we came back to the hotel and continued working with the antennas under a burning sun. At midday we went to the airport for third time and finally located the chief, who gave us our precious items. Happy, we went "home" and continued with the installation.

On the Air

On Sunday at 7 AM, Willy, our guide, picked us up and we all went to Mass. After an interesting service, in which we enjoyed fantastic African hospitality, we went back to the hotel and finished the preparations.

Finally, at 11:48, Josep fired up on 10 meters and made his first CQ as TN3B. Immediately there was a huge pileup. After a while, Núria jumped on 12 meters with a CQ as TN3W and another huge pileup sounded in her headphones. TN3B and TN3W were finally on the air with just one and a half days of delay. We spent all afternoon without changing frequency, just making short stops for water. After more than 8 hours of continuous operating without a rest, we finally decided to stop and go to dinner (we hadn't eaten anything since breakfast). After a comforting meal, we went back to *work* and continued until nearly dawn.

And this is how the days went on, between huge and inexhaustible pileups. We awoke at about 7 or 8 AM, local time, and started with the radios. The demand was so tremendous that we didn't stop for breakfast or lunch. We took 10-minute breaks from time to time, just to recover our strength.

80 and 40 Meters

The days went on, and the QSOs increased. Josep alternated between CW and RTTY and was on the air in one of these modes at least once per day. Of course, people asked us for different bands and modes, but our main aim was to give the "new one" to the maximum number of different stations.

We thought of trying 40 and 80 meters, but we couldn't find spare time for mounting the antennas. As mentioned previously, we had to ask for permission to access the roof and then make several trips while adjusting the antennas. Every time nightfall arrived, we would realize that it was too late to go to the roof!

We finally were able to mount the 40 and 80-meter wire dipoles on Thursday afternoon. The 40-meter dipole worked perfectly, but it was impossible to fix the 80-meter one. Unfortunately, a tropical storm struck that night and obliged us to shut down. We decided to try it again the next night, but the 80-meter dipole still didn't work. On Saturday morning, we noticed that the balun had apparently suffered lightning damage. After repairing it, we finally got on 80.

6 Meters

Many people were asking us to try 6 meters and we were happy to oblige. We took a break Wednesday afternoon and assembled the 3-element beam. The antenna performed perfectly, but propagation wouldn't cooperate that day. Our only 6-meter contact was with Patrick, 9Q1A, located on the other side of the river!

The next day, we enjoyed some good openings to southern Europe. Josep continued trying 6 meters every day between 1800 and 1900 UTC. Thanks to his effort, we eventually added 242 QSOs to the 6-meter log—the first 6-meter operation from the Congo.

Time to Leave

Monday, May 27 arrived too soon—it was time for our departure. We were on the air until 1330 UTC when TN3B and TN3W finally went off the air. Exhausted,

we started to dismantle all the equipment. Almost 26,000 QSOs were logged during 7 days. We were very satisfied with the way things had gone, although we thought it could have been better.

Our adventure wasn't over yet. Under a blazing sun we went to the roof and started to take down the antennas. We decided to pack just the essential items because we didn't want to pay excess-luggage fees. We just packed the equipment and the antennas, and left behind the wires, ropes, anchors, the 6-meter beam, the dipoles and more. Despite this, the luggage was still too heavy.

We went to the airport in the afternoon and began our last exhausting battle against the local bureaucracy. Along with our luggage, we were carrying a huge wooden giraffe (about a meter high) a souvenir for our son Marc. We named it "Willy," in honor of our interpreter. The fact is that the exportation of wooden items is forbidden in the Congo. No one had bothered to warn us, of course!

If you wanted to take the wood out of the country, you had to pay the "tax." After a hard negotiation for the final amount to pay, we reached an agreement and could finally board.

But this was not going to be the last problem with our beloved Willy. When we arrived at Paris, we were delayed because of the new airport security rules. All our luggage—and Willy—had to be inspected by Air France security staff.

Because of this delay, there was a chance that we were going to miss our connecting flight to Barcelona. When approaching Paris, we were told that the plane would be held for us—if we hurried. A young man met us as soon as we stepped off the plane. He took us running through the airport corridors. At passport control, the policeman said, "I'm sorry, but you cannot continue because there are some problems with your passports."

"That's impossible!" we exclaimed. We explained that we had used our passports several times in many countries and nobody had noticed anything wrong, but he still wouldn't allow us to pass. The young man who had accompanied us was starting to get nervous and tried to convince the policeman that a plane was waiting. After a while, the officer finally allowed us to continue.

Willy is Blunt

We went on running through more corridors and reached the hand-luggage control point. "I'm sorry, but you cannot continue with this object," another man said, pointing to Willy. We couldn't believe it! They were saying that the wooden giraffe could be considered a blunt weapon that we might use to hijack the plane. Astonishing!

They had to ask the pilot if he would allow us to board with it. Our escort rushed aboard the aircraft to speak with the captain. Soon we heard a voice over the PA calling, "Last call for passengers Gibert and Font. Please proceed to board!" We had no time! But the pilot was a good man and allowed us to board with Willy, between the smiles of the flight attendants when they glimpsed our "blunt weapon."

After these adventures, we finally arrived at home safe and sound. Congo 2002 was a great success. We deeply appreciated the hundreds of congratulatory e-mails.

DXpedition Summary

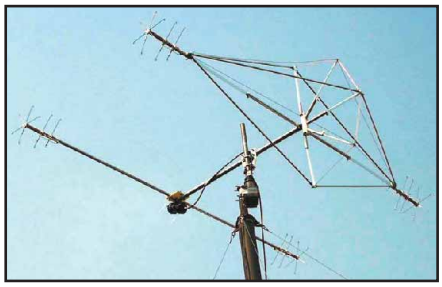
Call signs used: TN3B and TN3W
QSL information: Via EA3BT
Total QSOs: 25,970
Days of operation: 7
Modes: SSB, RTTY and CW
Bands in meters (QSOs): 6 (242), 10 (6358), 12 (5531), 15 (6248), 17 (3875), 20 (3343) and 40 (373)

Although active in the ham radio world for just under 10 years, Núria Font's life as a ham has been very intense. After obtaining her first license, she started contesting in the CQ WW DX SSB, CQ WPX SSB and in the RTTY contests. In 1996, she started going on DXpeditions, activating the following DXCC entities, always with her husband, Josep, EA3BT: 8Q7OK (Maldives), XF3/EA3AOK (Mexico), FM/EA3WL, TO8B (Martinique), EA3WL/EA8 (Canary Islands), VP2MGL (Montserrat) and D68WL (Comoros). Josep Gibert, EA3BT, first licensed in 1980, is an avid contester and has taken part in the same DXpeditions listed above. Both have earned many awards. You can contact the authors at Col-legi 1, 08800 Vilanova i la Geltrú, Spain; **ea3bt@ea3bt.com**. *Their Web site is at* **www.ea3bt.com**.

NEW PRODUCTS

TGM COMMUNICATIONS INTRODUCES NEW HYBRID QUAD ANTENNAS

◊ TGM Communications has introduced two new antenna designs for 14-54 MHz. The MQ-24SR (below) provides coverage on 6, 10, 15 and 20 meters, while the MQ-26SR (shown at right) provides these bands plus 12 and 17 meters. Both two-element antennas have a 4½-ft boom and elements under 12 feet long. The boom length does not include the reflector extension, which measures another 26 inches. The weight is 19 pounds for the '24SR and 23 pounds for the '26SR.



Price: MQ-24SR, $309.95; MQ-26SR, $399.95. Contact TGM Communications, 121 Devon St, Stratford, ON N5A 2Z8, Canada; tel and fax 519-271-5928; **tgmc@sympatico.ca**; **www3.sympatico.ca/tgmc/index.html**.

INTERNAL ANTENNA TUNER FOR THE TEN-TEC PEGASUS

◊ LDG Electronics has released a new internal antenna tuner for the Ten-Tec Pegasus HF Transceiver, the PT-11P. The PT-11P mounts internally into the Pegasus radio and receives commands from the user's radio control software running on their Windows-based PC. The PT-11P is user installable with 8 solder connections in approximately 30 minutes.

The PT-11P features 240 memories. Supporting software recognizes previously tuned frequency ranges and will recall tuner settings. The tuner is specified for a maximum SWR of 10:1 and 100 W.

Price: $199 plus shipping. For more information contact LDG Electronics, 1445 Parran Rd, St Leonard, MD 20685; tel 410-586-2177; fax 410-586-8475; **ldg@ ldgelectronics.com**; **www.ldgelectronics.com**.

STRAYS

QST congratulates...

◊ Shirley Wilkerson Jr, W4BTU, of Henderson, Kentucky, who was recently commissioned a Colonel in the Honorable Order of Kentucky Colonels by Governor Paul E. Patton for his 50 years of promoting Amateur Radio in Kentucky.—*Tom Webb, W4YOK, Plano, Texas*

By Dave Hassler, K7CCC

Observing the Official Observers

Although not exactly the stuff of spy novels, the ARRL Official Observer Program maintains a vigilant, behind-the-scenes watch as a part of Amateur Radio's long tradition of self-policing.

DAVE HASSLER, K7CCC

Listen, rather than transmit, is the prime directive of an ARRL Official Observer. It's the OO's job to monitor the amateur bands for operating that either falls outside of good amateur practice or demonstrates exemplary operating. The upshot? A simple, friendly postcard from the OO to the operator in question.

They perform their function by the simplest of dictates: listen, rather than transmit. Their mission: help a fellow ham. And after a job is done, the only artifact left to speak of their presence is a small postcard. They are ARRL Official Observers, working behind the scenes to help maintain the traditional high standards of Amateur Radio.

In a spirit of friendliness and cooperation, the OO monitors the amateur bands, keeping an ear and eye out for transmissions that do not fall within good engineering or operating practice.

The OO just sends out a helpful postcard—an Official Observer Advisory Notice—outlining the observed problem. Maybe it's a key click or chirp, or perhaps an overly broad or overmodulated signal. Maybe it's something more serious, like frequency instability. Hopefully, it's not something worse, such as a case of malicious interference.

Consistent with the friendly and helpful spirit on which the whole program is based, the OO Advisory Notice cites the appropriate element of Part 97 rules and asks that the recipient "please take a few minutes to determine what equipment factors or operating practice" might have caused the problem. There's a "thank you" and room at the bottom for the OO to sign and add a personal 73. No reply is necessary, although some recipients do choose to respond—see the sidebar.

Helping hams help themselves is what it's all about. FCC Special Counsel for Amateur Radio Enforcement Riley Hollingsworth, K4ZDH, said that as the main element and backbone of the Amateur Auxiliary to the FCC Enforcement Bureau, the ARRL Official Observer program has proven invaluable and is greatly appreciated. "It's one of the methods by which Amateur Radio is self-policing. Amateur Radio is a lot better off for them as they help other Amateur Radio licensees not take their operating privileges for granted," he said.

A Friendly Reminder

"I once sent a card to a station who keeps a regular schedule with his father in Africa," recalled Georgia Official Observer Coordinator Mike Swiderski, K4HBI. "He had some splatter and a wide signal that was interfering with others. He sent back a very apologetic e-mail that thanked me and explained how he was late for the sked and didn't tune up properly. He said he attached the [advisory] card to the front of his amp as a reminder to always tune up, no matter how late he gets to the radio."

Eastern Massachusetts OOC Mike Goldberg, K1LJN, passed along this example of a typical incident that might get him, or one of his OOs, to send out an advisory card: "In the excitement of a contest you hear a call from a place you've

been trying to work for a long time. You spot right on it, call and make a contact. Sometime later, a little card comes in the mail with a reminder that the other station was legally transmitting in his country, but you were out of band. A check of the log confirms it. It's not the kind of problem that changes the world, but a goof. 'Well, I won't do *that* again soon!' you think."

And that's the end of it. It's a minor matter that's a one-time occurrence, a simple accident, Goldberg said. The types of problems that get an OO's major attention and many hours of his time are those that are repeated and show a willful disregard for the rules.

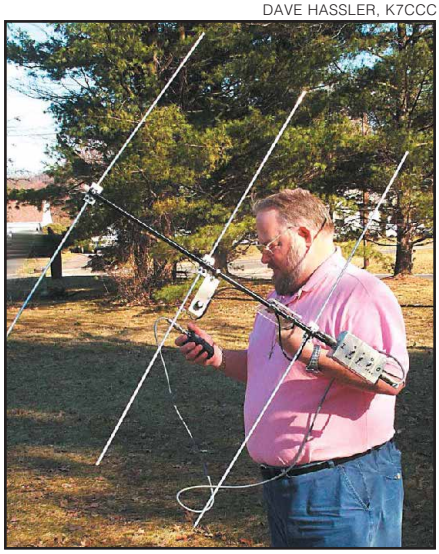
ARRL Field and Regulatory Correspondent Chuck Skolaut, KØBOG, said that once a problem is identified as persistent, malicious and/or intentional, Official Observers collect evidence of the problem—typically in the form of audio recordings, but with other methods of documentation, as well—and send it in to him at ARRL Headquarters. Skolaut verifies the data and circumstances of the problem and then forwards it on to the FCC for enforcement. He added that OOs themselves never embark on any kind of enforcement activity.

"This program is supposed to be a friendly way to bring a technical problem or a poor operating practice to a ham's attention," Skolaut said. "You really have to be doing something intentionally bad before it gets to my office. It's not isolated things that get this far—it's those who repeatedly violate the rules, the habitual offenders."

Tools of the Trade

The equipment an OO uses varies from station to station, but in addition to a solid transceiver at home, many Official Observers employ mobile transceivers, scanners, time-difference-of-arrival (TDOA) DF gear, GPS units, portable monitoring-recording equipment, audio signal intercept and analysis units, various attenuators and filters, and APRS. There are other vital tools a successful Official Observer must carry, Skolaut said. "To be a good OO you need to have the desire to help fellow amateurs in a friendly manner, use common sense, be able to accept criticism and know your reward comes from helping others," he said.

DAVE HASSLER, K7CCC



***QST* Senior Assistant Technical Editor Bob Schetgen, KU7G, demonstrates VHF direction finding techniques with a 2 meter Yagi, attenuator control and a handheld FM transceiver.**

All that equipment definitely comes in handy. Michigan section OOC Donald Sefcik, N8NJE, said that the OO's documenting process can include a little field work at times. That's when the direction finding equipment comes into play. "In one situation up here, we had a problem with a kerchunker keying up a repeater and sometimes making transmissions without IDing," Sefcik said. "We had a local OO listen and then DF him. Once he was pinpointed, the OO sent word that essentially said, 'We suspect you are the one doing this, it's not cool and please stop.' That was it and it was apparently enough, because we never heard that problem again. The ham in question realized the situation and it ended there."

The Goofy and the Good

Sometimes, however, the problems an OO observes are truly off the 'scope. Swiderski shared this nugget from the Peach State:

"Recently, I was alerted to a questionable call sign and, using the info provided by the alerting station and research by myself and Chuck [Skolaut] at ARRL Headquarters, I had to agree that something was amiss geographically," he said. "I got in touch with the operator of the station in question and it turns out he had been using an inactive relative's call sign for over 15 years. But it has a good ending, as he is now a legally licensed Amateur Radio operator."

OOs also observe a lot of good operating on the amateur bands. When an operator's signals and manner are exemplary, the OO can send out a special "Good Operator Report." The card makes note of the time, frequency and mode of the transmission, and thanks the ham for the "excellent example of good amateur practice for others in the Amateur Radio Service."

Duane Traver, WV2B, the OOC for the Western New York Section, said a surprised and very pleased recipient of a Good Operator Report e-mailed him back some interesting comments. The operator said he'd lived in fear for 28 years of getting an FCC pink slip or a card from an OO. "Imagine my surprise when noticing my card from an OO was a *good* thing," wrote "Murph" Murphy, WA1VKO. "[It] will be in the forefront of my mind while operating that people are listening and we're making an impression on them. It's up to us whether it is a positive or negative one. Thanks for taking the time to do this important work for our hobby."

Origins of a Tradition

The Official Observer program maintains the same philosophy today as it did from its beginnings in the 1920s. "Newcomers have entered our ranks. Reports have it that they are operating off wavelength using long, drawn-out calls and signing at infrequent intervals," states an article in the October 1925 issue of *QST*. "One of the most powerful agents in improving individual operating is individual, friendly, and constructive criticism.... A form postal card has been devised with instructions that the [SMs] appoint Official Observers.... Observers are instructed to use the postals conscientiously and make observations carefully."

Official Observers had to pass a frequency measuring test to prove the accu-

OFFICIAL OBSERVER ADVISORY NOTICE

Radio: _____, your call was heard calling / working _____ at _____ UTC.

Date: _____ 20___ Frequency: _____ MHz. Mode: _____. Your RST: _____.

The following is noted in the interest of maintaining Amateur Radio's reputa[illegible] for good operating and technical practices: 1 ☐ FREQUENCY INSTABILITY 2 ☐ CHIRP 3 ☐ SPURIOUS 4 ☐ HA[illegible]IC 5 ☐ HUM
6 ☐ KEY CLICKS 7 ☐ BROAD SIGNAL 8 ☐ DISTORTED AUDIO 9 [illegible]OVERDEV[illegible]TION 10 ☐ OUT OF BAND
11 ☐ IMPROPER ID 12 ☐ LANGUAGE 13 ☐ CAUSING INT[illegible]RE[illegible]E 15 ☐ C[illegible] 20 ☐ OTHER

Remarks: _____

Please refer to [illegible]C Regulatio[illegible] Part 97.[illegible]. Please take a few minutes to determine what equipment factors [illegible]operating practices might have contributed to this apparent departure from the rule or the good amateur practice standard. The intent of this notice is to alert you to the above noted operating condition. NO REPLY IS NECE[illegible]ARY. The undersigned ARRL Official Observer has fulfilled this helping role by simply alerting you, and is not *required* to reply to any correspondence. Thank you for your attention and any cooperative efforts to enhance the high standards of the Amateur Radio Service which we all share with pride.

FSD-213(7/01) Signature _____ Call _____

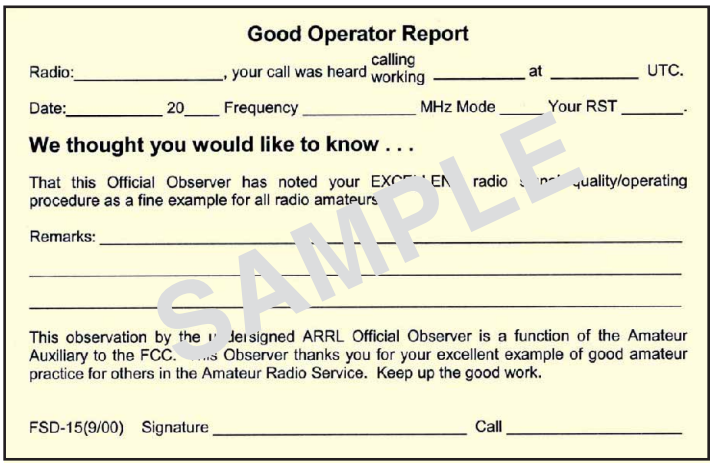
Hopefully, this is the only time a ham will have a chance to see an Official Observer Advisory Notice.

In the Proper Spirit

Western New York OOC Duane Traver, WV2B, passed along a couple of e-mails he's received from Advisory Notice recipients. Although no response was necessary, Duane was pleased to receive them. Traver said they were ideal responses to getting a card.

♦ Thanks for the note.... The JW5 station was a rare multiplier (to say the least!) and I admit to pouncing on the packet spot without looking carefully at the frequency. I'll bet you wrote a lot of cards to USA stations that day! Thanks for the reminder and thanks for watching out for our bands. I will be more careful in the future. —*Jim, W3*

♦ I got your card today for out-of-band phone operation. I feel like such a dummy for being so careless.... I just wanted to let you know that I took your card in the spirit in which it was intended. You guys do a great job helping to keep the bands clean. I never want to be part of the problem and could kick myself for not paying better attention. Hope to QSO someday.—*Glen, K2*



Good Operator Report

Radio:_____, your call was heard calling working _____ at _____ UTC.

Date:_____ 20____ Frequency _____ MHz Mode _____ Your RST _____.

We thought you would like to know . . .

That this Official Observer has noted your EXCELLENT radio signal quality/operating procedure as a fine example for all radio amateurs.

Remarks: _____

This observation by the undersigned ARRL Official Observer is a function of the Amateur Auxiliary to the FCC. This Observer thanks you for your excellent example of good amateur practice for others in the Amateur Radio Service. Keep up the good work.

FSD-15(9/00) Signature _____ Call _____

When a particularly fine example of operating strikes the ear, an Official Observer sends out a Good Operator Report to commend the ham for being an excellent example to fellow radio amateurs.

racy of their own measuring equipment. The September 1934 issue of *QST* lists the 142 OO stations one could call upon "when you need to ask QRG?" or who might send a card to a ham about "a.c. notes, ripple, broad spacing, violations of good practice," or other malady. The program grew to have separate Morse and phone observers and eventually had five different classes. The 1980s saw a streamlining of the program and the number of observer classes reduced to one.

ARRL and the FCC Field Operations Bureau (now the Enforcement Bureau) entered into a formal Memorandum of Understanding in a joint effort to improve compliance of the Amateur Service with FCC rules. That MOU created the Amateur Auxiliary to the FOB under the regulations of the Communications Amendments Act of 1982. Hollingsworth noted that the scope of the Official Observer program has been slowly broadening over the years. He said a two-way street has now developed to the point that the FCC sometimes calls upon Official Observers, through ARRL HQ, to perform specific monitoring duties, collect information and document over-the-air violations in their capacity as the Amateur Auxiliary.

Getting Involved as an OO

The qualifications of an Official Observer are relatively straightforward. An OO candidate must have held a Technician or higher class amateur license for at least four years and be recommended by the Section Manager. In addition, to be a part of the Amateur Auxiliary, a course of study must be completed, along with successful completion of an examination.

San Joaquin Valley OOC Victor Magana, N1VM, points out that the Official Observer program is not for every ham. "If a person's motivational interest is to wear a police officer's badge of authority, or to engage in confrontations on the air, they should just save themselves the embarrassment of their participation," he stated. "The program does not have a place for amateurs who want to be band cops." Magana added that the OO's job is to monitor without prejudice and courteously advise a fellow amateur through the post cards at his disposal. And the job ends there—enforcement is solely the job of the FCC.

For those with a genuine love for Amateur Radio and a true desire to help others, the OO program is a perfect place to be of service to the amateur community. Skolaut said the place to start is by contacting one's Section Manager and asking for information. Also, he noted that the application is available on-line at the ARRL Web site. Point your browser to **www.arrl.org/FandES/field/forms/fsd187/form.html** to start the application process. Once it has been submitted, ARRL HQ staff will review the application and send it to the appropriate Section Manager for a recommendation. Additional information on the program can be found on the ARRL Web site at **www.arrl.org/FandES/field/org/oo.html**.

Dave Hassler, K7CCC, is the Assistant News Editor for QST *and the ARRL Web site. He can be reached by e-mail at* **k7ccc@arrl.org**, *or by telephone at 860-594-0240.* QST

NEW PRODUCTS

WATTS UNLIMITED HIGH VOLTAGE SWITCHING POWER SUPPLY

◊ Watts Unlimited has introduced the PS-2500A high voltage switching power supply, designed to be an embedded or out-boarded device for powering such tubes as the 3-500Z, 8873, 3CX800A7, 3CX1200A7 and others.

The initial prototype leading to the PS-2500A first appeared as the cover article of the February 1991 issue of *QEX*. It has been refined into a modern, high-voltage, high-power power supply. Claimed specifications 2500 V dc under full load of 1.1 A or 3000 V dc at about 250 mA. Input is 240 V ac 50/60 Hz at 13 A full load.

Price: $698 assembled and tested, $585 as a kit. Contact: Watts Unlimited, 886 Brandon Ln, Schwenksville, PA 19473; tel 610-764-9514; **wattsunlimited@aol.com**; **www.wattsunlimited.com**.

US Amateur Bands

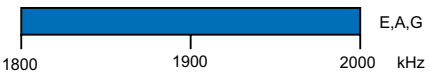
ARRL The national association for AMATEUR RADIO

June 1, 2003

Novice, Advanced and Technician Plus Allocations

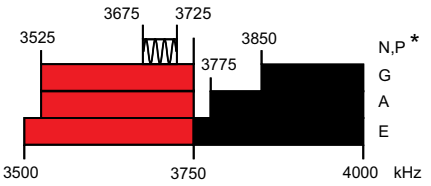
New Novice, Advanced and Technician Plus licenses are no longer being issued, but *existing* Novice, Technician Plus and Advanced class licenses are unchanged. Amateurs can continue to renew these licenses. Technicians who pass the 5 wpm Morse code exam *after* that date have Technician Plus privileges, although their license says Technician. They must retain the 5 wpm Certificate of Successful Completion of Examination (CSCE) as proof. The CSCE is valid indefinitely for operating authorization, but is valid only for 365 days for upgrade credit.

160 METERS



Amateur stations operating at 1900-2000 kHz must not cause harmful interference to the radiolocation service and are afforded no protection from radiolocation operations.

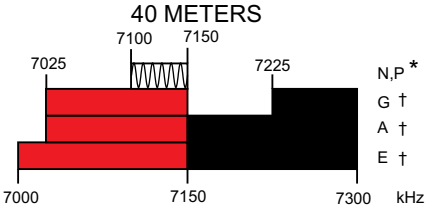
80 METERS



60 METERS

General, Advanced, and Amateur Extra licensees may use the following five channels on a secondary basis with a maximum effective radiated power of 50 W PEP relative to a half wave dipole. Only upper sideband suppressed carrier voice transmissions may be used. The frequencies are 5330.5, 5346.5, 5366.5, 5371.5 and 5403.5 kHz. The occupied bandwidth is limited to 2.8 kHz centered on 5332, 5348, 5368, 5373, and 5405 kHz respectively. Effective date to be announced.

40 METERS

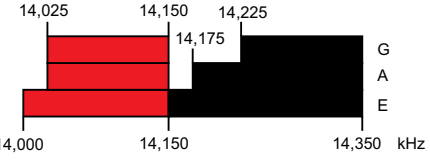


† Phone and Image modes are permitted between 7075 and 7100 kHz for FCC licensed stations in ITU Regions 1 and 3 and by FCC licensed stations in ITU Region 2 West of 130 degrees West longitude or South of 20 degrees North latitude. See Sections 97.305(c) and 97.307(f)(11). Novice and Technician Plus licensees outside ITU Region 2 may use CW only between 7050 and 7075 kHz. See Section 97.301(e). These exemptions do not apply to stations in the continental US.

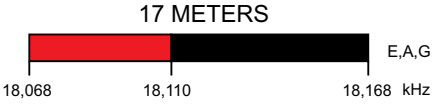
30 METERS

Maximum power on 30 meters is 200 watts PEP output. Amateurs must avoid interference to the fixed service outside the US.

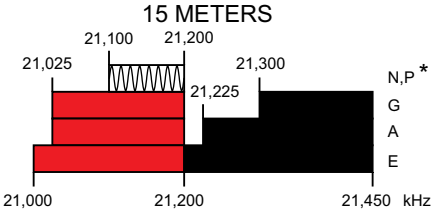
20 METERS



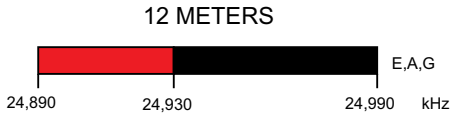
17 METERS



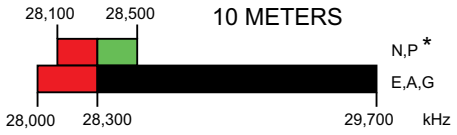
15 METERS



12 METERS

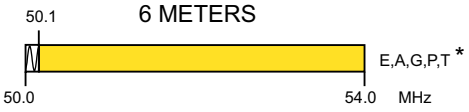


10 METERS

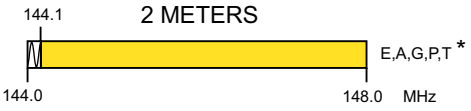


Novices and Technician Plus Licensees are limited to 200 watts PEP output on 10 meters.

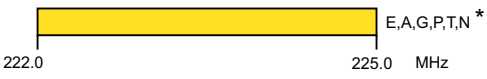
6 METERS



2 METERS

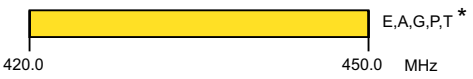


1.25 METERS ***



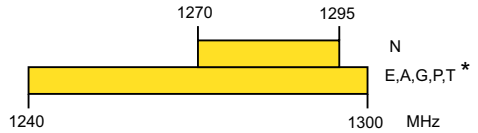
Novices are limited to 25 watts PEP output from 222 to 225 MHz.

70 CENTIMETERS **



33 CENTIMETERS **

23 CENTIMETERS **



Novices are limited to 5 watts PEP output from 1270 to 1295 MHz.

US AMATEUR POWER LIMITS

At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Unless otherwise stated, the maximum power output is 1500 W. Power for all license classes is limited to 200 W in the 10,100-10,150 kHz band and in all Novice subbands below 28,100 kHz. Novices and Technicians are restricted to 200 W in the 28,100-28,500 kHz subbands. In addition, Novices are restricted to 25 W in the 222-225 MHz band and 5 W in the 1270-1295 MHz subband.

KEY

- = CW, RTTY and data
- = CW, RTTY, data, MCW, test, phone and image
- = CW, phone and image
- = CW and SSB phone
- = CW, RTTY, data, phone, and image
- = CW only

E = AMATEUR EXTRA
A = ADVANCED
G = GENERAL
P = TECHNICIAN PLUS
T = TECHNICIAN
N = NOVICE

* Technicians who have passed the 5 wpm Morse code exam are indicated as "P".

** Geographical and power restrictions apply to all bands with frequencies above 420 MHz. See *The ARRL's FCC Rule Book* for more information about your area.

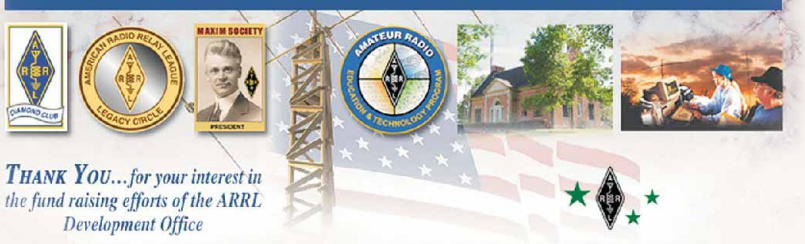
*** 219-220 MHz allocated to amateurs on a secondary basis for fixed digital message forwarding systems only and can be operated by all licensees except Novices.

All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz
2390-2450 MHz
3300-3500 MHz
5650-5925 MHz
10.0-10.5 GHz
24.0-24.25 GHz
47.0-47.2 GHz
75.5-76.0, 77.0-81.0 GHz
119.98-120.02 GHz
142-149 GHz
241-250 GHz
All above 300 GHz

Support Amateur Radio and ARRL

Welcome to the Development Office



The American Radio Relay League is proud to honor those individuals and organizations whose 2002 contributions support projects not funded by member dues, including participation in The ARRL Diamond Club, The ARRL Maxim Society, the Spectrum Defense Fund, the Education & Technology Fund, and the W1AW Endowment, as well as Memorial and other unrestricted contributions.

James A. Allen, W6IQH

Raymond C. Anderson, W9NI

Brandenburg Life Foundation,
David Brandenburg, K5RQ*

John S. Burningham, WB8PUF

Frank Butler, W4RH

Randy Bynum, NR6CA

Joseph G. Chaet, W1RGH
and Carla M. Chaet, N7OPU

Alan M. Cohen and Nancy E. Bloom

Thomas W. Comstock, N5TC

Corporation for National
& Community Service

Kay Craigie, N3KN*
and Carter Craigie, N3AO*

Lawrence J. De George, W1ISV

Robert V.C. Dickinson,
W3HJ / Ebenezer Fund

James A. Dicso, K2SZ*

Frank Donovan, W3LPL

Kenneth A. Fath, N4KF

Ted F. Goldthorpe Jr., W4VHF
and Itice R. Goldthorpe, K4LVV

The Gryphon Fund

James C. Hessler, K8JH

George R. Isely, W9GIG

Andrew C. John, MD, JD, AD5FX

Glenn D. Kaufman, KA3GLY

Greg Lande, N3QEP,
Brenda Lande, N3QEQ,
and Galen Lande, N3USZ

Bill Leahy, KØMP

Libertyville and Mundelein
Amateur Radio Society

Don Lisle, K6IPV

Robert F. Loll, WA6UPX

Bruce S. Marcus, N1XG

J. Dalton McCrary, W4PJV

Robert S. McDorman, AE4FU

Judith S. Merrill, KA5PDD,
and Barry Merrill, W5GN

Tod Olson, KØTO

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Portland Repeater, Inc.

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Michael M. Raskin, W4UM

RFI Services,
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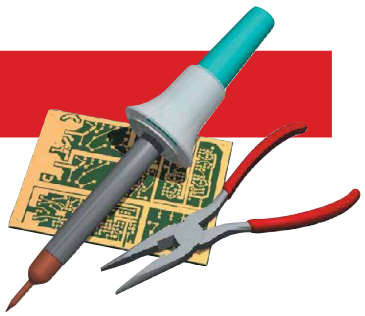


The Doctor is IN

Q Steve, AD4E, of Tallahassee, Florida has a question for our Product Review engineer: For HF radio product reviews, the ARRL publishes a graphical depiction of "worst-case composite-noise" while the radio is in the transmit mode. Is composite-noise synonymous with "phase-noise?"

Although I know how a transmitter with a "dirty" local-oscillator (high phase-noise) can affect nearby receivers, is this measurement indicative of the radio-under-test's received phase-noise, too? Is there a correlation between composite-noise and minimum discernible signal (MDS)? After comparing the MDS of several radios, that correlation is not readily evident.

A To answer your second question first, the two are not related. MDS (noise floor) depends on the gain of the receiver and the noise components of the amplification stages in the receiver. Phase noise is the noise (combination of changes in amplitude and shifts in frequency—also effectively a shift in phase, hence the name) of the receiver's local oscillator only. Also, the MDS is measured in a narrow pass-band, so the bandwidth of the contributing noise is small, whereas phase noise and transmitted composite noise are typically measured over a wide frequency range.

The transmitted composite noise is usually a good indicator of phase noise because phase noise makes up most of it. However, as the transmitter also has amplification, some additional noise is added, so it can't really be called phase noise.

It is possible to measure receiver phase noise more accurately than can be done using a transmit test, but it is more difficult and time consuming. However, you can be sure that, in a transceiver with a common or related oscillator, when transmit composite noise is high, the receiver phase noise is also high.

Q Lou, KB6JLI, asks: The other day a ham asked me a question with regard to baluns and I could not give him a decent answer, so I thought I would ask you the question and relay it to him. What is the difference between a 1:1 and a 4:1 balun and what is the difference between current and voltage types. How much power can be applied to the voltage type? I have seen it advertised up to 300 W.

A The term "balun" means *bal*anced to *un*balanced. It is an impedance transformer that is designed to convert a balanced or unbalanced system to a balanced or unbalanced line. This question was covered in great detail in *The Antenna Compendium*, Volume 1, in an article by Roy Lewallen, W7EL.[1] In a post to the Usenet newsgroup **rec.radio.amateur.antenna**, Roy excerpted six points from his paper, saying:

1. The purpose of a balun used in feeding an antenna is to prevent common-mode feed line current, and therefore feed line radiation.

2. Common-mode feed line current is the vector sum of the two conductor currents (or half this value depending on your definition), so common-mode current is zero only when the conductor currents are equal and opposite.

3. The "current" balun (a term I coined in that article) is one that forces the conductor currents to be equal and opposite, which is what a balun needs to do when used with an antenna. A current balun can also be appropriately called a choke balun or common-mode choke.

4. A "voltage" balun (also coined in that article) is one that forces the conductor voltages to be equal and opposite relative to the "cold" side of the balun input.

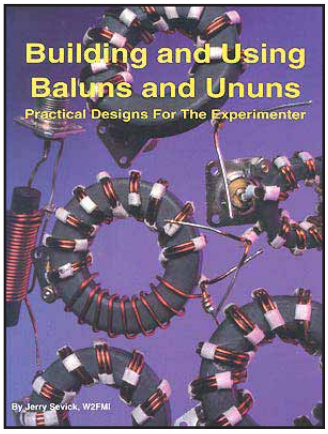


Figure 1—Another reference for learning more about the theory and art of building and using baluns is this volume by Jerry Sevick, W2FMI. It is available from ARRL.

5. If the antenna is entirely symmetrical with respect to ground, the third winding in a 1:1 voltage balun conducts no current. It can then be disconnected with no effect. The result is identical to a two-winding 1:1 current balun.

6. If the antenna isn't entirely symmetrical with respect to ground, a voltage balun will *cause* common mode current to flow by attempting to balance the conductor voltages. So at best, a voltage balun will work as well as a current balun. At worst, it will increase feed line radiation. At the time that article was written, nearly all the commercial baluns were voltage baluns. I'm glad to report that this has changed. I'd like to note that there is a place for voltage baluns, in feeding voltage driven push-pull amplifiers, for example. But they're not the thing to use for feeding antennas. I highly recommend the analysis of balun operation at **fermi.la.asu.edu/w9cf/articles/balun/index.html**.

Another good reference on the topic of baluns and transmission line transformers, both balanced and unbalanced, of various ratios and impedances, is *Building and Using Baluns and Ununs* by Jerry Sevick, W2FMI.[2] Its cover is shown in Figure 1.

To answer your question about the differences between a 1:1 and 4:1 balun we've got to talk about impedance. The 1:1 balun is designed to transform an unbalanced coaxial line to a balanced line of the same impedance. Let's say we wanted to connect a 50 Ω or 75 Ω coaxial cable to a dipole antenna. That dipole ideally wants to see a balanced transmission line and

[1]R. Lewallen, W7EL, "Baluns: What They Do and How They Do It," *The ARRL Antenna Compendium*, Vol 1 (Newington: ARRL), 1985, pp 157-164.

[2]Available from the ARRL Bookstore for $19.95 plus shipping. Order no. 7644, tel 888-277-5289 (toll-free in the US), 860-594-0355 (elsewhere); **www.arrl.org/shop/**.

the coax is unbalanced, so… enter the 1:1 balun. Placed right at the junction of the coax and the antenna, it will transform (remember, it's a transformer) the unbalanced impedance of the feed line to the balanced feed point of the dipole. A 4:1 balun simply transforms that impedance using a different ratio. In this case it will transform a 50 Ω or 75 Ω unbalanced coaxial line to either 200 Ω or 300 Ω balanced output, respectively.

If you're feeding a folded dipole antenna (made of 300 Ω line) with 75 Ω coaxial cable, you'd use a 4:1 balun to transform the balanced antenna impedance of 300 Ω to an unbalanced feed impedance of 75 Ω. The circuits that are interior to the balun are different and depend on the impedance transformation ratios. To be sure, baluns are not only used for antennas, they can be used anywhere RF signals need to be converted from balanced to unbalanced levels, as in interstage coupling or the driver to push-pull amplifier situation described above. Modern baluns are usually wound on ferrite cores in order to make it easier to achieve their required inductance while keeping them small. Choke baluns are also frequently used at antenna feed points and on transmission lines to keep unbalanced RF from traveling down the outside of a coaxial line and back toward the transmitter.

As far as the power handling capability of a balun is concerned, that depends on a number of factors. If they are ferrite wound, the core material and size will affect the core saturation level and hence the balun's power handling capability. The complex impedance and any reactance that the balun "sees" will also affect its ability to handle power. The manufacturer will almost always state the power handling capability of the balun, but remember, that implies a matched transmission line/antenna system (essentially resistive) with an SWR of 1:1. Antenna systems that are reactive at certain frequencies will limit the balun's power capacity. A good example is the G5RV antenna, which uses a length of 300 Ω or 450 Ω balanced line as a matching section connected directly between the antenna and an unbalanced coaxial line. Because the matching section will frequently be reactive on various bands (except at 14 MHz, the antenna's design frequency) a balun is *not* recommended here as its power handling capability will be compromised due to the high SWR on bands other than 20 meters. Excessive power through a ferrite wound balun usually manifests itself as heating and eventual destruction of the core.

The best advice the Doctor can give is to remember that a balun is not a magic cure-all for all antenna problems. Use it wisely and understand what it does to transform balanced voltages or currents to unbalanced ones. Above all, if you do use it for an antenna, make sure that system is properly designed to present the proper impedances to the balun and the transmission line.

Q From George, VK5KGC: I have two different HF transceivers, made by two different manufacturers. After carefully setting all the necessary controls for the microphone gain, compression, etc, to ensure that the units are not being overdriven, the power meters in the transceivers do not show full power during normal speech/SSB. When I speak with a normal voice, the FT-1000D power meter shows 150 W and the IC-781 indicates 100 W. The specifications for the rigs are 200 W for the FT-1000D and 150 W for the IC-781. I also have an external power meter that indicates power output in *excess* of the tranceiver's specifications! I do not understand how this can be.

A In the July 2002 issue of *QST*, we had a Product Review on a number of popular peak-reading wattmeters (**www.arrl.org/members-only/prodrev/pdf/pr0207.pdf**). During testing, the ARRL Lab found inaccuracies in displaying peak-envelope power (PEP) under voice modulation. The reason for this has to do with their designs relative to reading peak signals. Those are often merely based upon the addition of a capacitor in the meter circuit—resulting in a displayed value much closer to average power rather than true PEP for some signals.

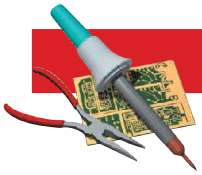
Figure 2—Hams have lots of wattmeters to choose from. These were reviewed in the July 2002 Product Review column.

As to the differences between meters and referring to the same Product Review, note that most power meters have a basic accuracy of ±10-15%. One would expect, therefore, that any two meters would certainly disagree, perhaps by as much as 30%. Figure 2 shows the power meters that were reviewed in the July 2002 issue of *QST*. And, as can be seen from that Review, the accuracy can be even worse for some meters.

Bird Electronics (**www.bird-electronic.com**) makes a very popular line of wattmeters. These use plug-in measuring elements specific to different frequency ranges and power levels. Their specified accuracy is ±5% of full scale for CW signals and, for those models that have a peak-reading function, ±8% for PEP measurements. Given even that accuracy, the meter cost is still several hundred dollars. Achieving better accuracy would require a better wattmeter, perhaps built to laboratory standards. Accurate commercial or laboratory instrumentation could cost more than most amateur HF transceivers, so most hams are content with the accuracy of amateur test equipment.

See if you can get either transceiver to put out full rated power on CW or on SSB with a loud sound of constant level (such as a whistle, several seconds long). You can then be reasonably certain that it is also producing the same PEP on voice peaks (assuming they are equally loud), regardless of the meter reading.

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/. Add your comments: "The Doctor is On-line" at www.arrl.org/members-only/qst/doctor/. QST



By Klaus Spies, WB9YBM

An Automatic COR Circuit—Which Radio *was* That?

This useful COR (carrier operated relay) circuit can make all the difference in getting emergency traffic channeled correctly and quickly.

Do you have multiple VHF/UHF transceivers operating simultaneously in a club or an emergency facility? How often have you gotten a call on one of your VHF or UHF transceivers and you didn't notice which rig had received it? Which microphone do you reach for? It only takes a few seconds of turning your back on the operating table to miss the radio whose squelch was broken and lose potentially critical time trying to get to the right frequency.

It's not always possible to stay glued to the operating position. Additionally, emergency traffic facilities frequently have several pieces of VHF and UHF equipment monitoring various frequencies concurrently. I needed a way to keep track of which radio received that last call, which led me to develop the circuit shown in Figure 1.

The heart of this circuit is the latch circuitry, U1 and U2. When a signal is received at any of the COR inputs (any positive-going signal in your receiver, like the green LED indicator that illuminates when a signal is received) the latch will "grab" the signal from the indicator and remember it even when the transceiver toggles back to "standby" mode. After that signal has been latched, a couple of things happen at once—one of the four LEDs lights up, indicating which one of up to four radios has just received the signal and all other latches are given a "reset" signal, to clear the previous circuit state.

If all you want or need for your application is an indicator, you need not build any more than the U1 and U2 circuitry, through the LEDs. In my application I went one step further. I wanted to get rid of the "rat's nest" of multiple microphones and tangled cords. This led me to add U3 and U4. U3 is an analog/digital switch that, when driven by U1 and U2, will switch a single microphone's mic output to the last transceiver that received a signal. U4 handles the PTT switching; each gate is enabled by U1 and U2, with activation of the PTT requiring an input from both this circuitry as well as the microphone's PTT switch (active high logic). If you do use a single microphone, parallel all the audio inputs of U3 (pins 1, 4, 8, 11) to the single microphone's output line and all the PTT inputs of U4 (pins 2, 6, 9, 13) to the single microphone's PTT line.

To avoid having the circuit switch to another radio during a QSO, the other transceivers can either be turned off or selector switches can be added to the COR lines to disable inputs from the other transceivers. This can also be accomplished automatically with additional circuitry, which is not shown here.

In the event that the circuit should come up in an undesired state on initial power-up, a reset switch, S1, is also included. Although S1 is not needed during operation (the radios will update the state of the circuit automatically) there may be times when the user may not want to wait, so the circuit can be reset manually after use.

For assembly, I recommend installing the circuit in a grounded metal enclosure and bypassing all input and output leads. Use shielded cable whenever practical, and—especially if you'll be operating with a bit of power—place ferrite beads on all incoming and outgoing leads. I've noticed that even the medium impedance levels of certain microphones can pick up stray RF, causing problems. Additionally, remember to connect the circuit ground to the radio ground for proper input and output signal references. The 13.8 V dc can be gotten from one of the radios—the circuit draws negligible current.

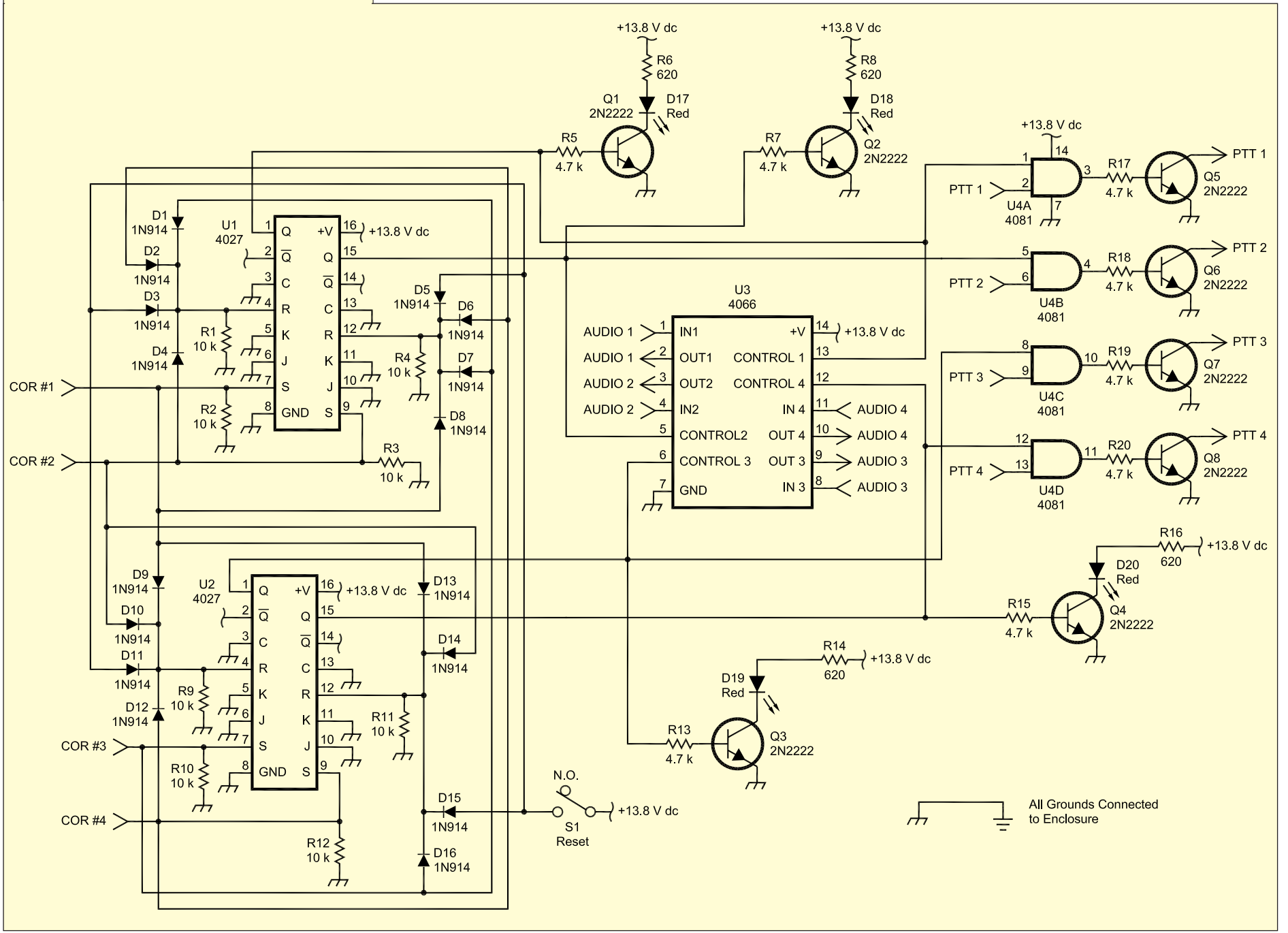
Sit back, relax, do other things… this COR circuit will do all the remembering for you and make sure you or your club responds on the right frequency when that emergency call comes through.

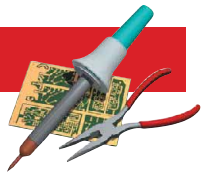
Klaus Spies, WB9YBM, has been a ham since 1975. He has worked as a technician and technical writer and has published articles in several technical journals, including QST. *Klaus has an Associate's Degree in electronic engineering technology and an FCC Commercial license, in addition to his amateur ticket. He can be reached at 815 Woodland Heights Blvd, Streamwood, IL 60107 or at* **wb9ybm@juno.com**.

Figure 1—The COR (carrier operated relay) circuit. It uses four low power CMOS ICs, together with four open-collector output transistors, a few LEDs and some switching diodes. The current drain is negligible and power may be obtained from one of the transceivers.

Parts are obtainable from a number of sources, including Digi-Key, 701 Brooks Ave S, Thief River Falls, MN 56701; tel 800 344-4539; www.digikey.com, and Mouser Electronics, 1000 N Main St, Mansfield, TX 76063; tel 800 346-6873; www.mouser.com.

D1-D16—Switching diode, 1N914, 1N4148 or equivalent.
D17-D20—LED, red.
Q1-Q8—Transistor, switching, 2N2222.
R1-R4, R9-R12—Resistor, 10 kΩ, ¼ W.
R5, R7, R13, R15, R17-R20—Resistor, 4.7 kΩ, ¼ W.
R6, R8, R14, R16—Resistor, 620 Ω, ¼ W.
S1—Switch, SPDT, NO pushbutton.
U1, U2—IC, CD4027 dual JK master-slave flip-flop.
U3—IC, CD4066 quad analog switch.
U4—IC, CD4081 quad 2-input AND gate.
Misc
Ferrite beads, 0.001 µF ceramic disk capacitors (bypass) (see text).


+13.8 V dc
R6
620
Q1
2N2222
D17
Red
R5
4.7 k
R8
620
D18
Red
R7
4.7 k
Q2
2N2222
U1
4027
D1
1N914
D2
1N914
D3
1N914
D4
1N914
R1
10 k
R2
10 k
R4
10 k
R3
10 k
D5
1N914
D6
1N914
D7
1N914
D8
1N914
COR #1
COR #2
U3
4066
AUDIO 1
AUDIO 1
AUDIO 2
AUDIO 2
IN1
OUT1
OUT2
IN2
CONTROL2
CONTROL 3
GND
CONTROL 1
CONTROL 4
IN 4
OUT 4
OUT 3
IN 3
AUDIO 4
AUDIO 4
AUDIO 3
AUDIO 3
U4A
4081
U4B
4081
U4C
4081
U4D
4081
PTT 1
PTT 2
PTT 3
PTT 4
R17
4.7 k
R18
4.7 k
R19
4.7 k
R20
4.7 k
Q5
2N2222
Q6
2N2222
Q7
2N2222
Q8
2N2222
U2
4027
D9
1N914
D10
1N914
D11
1N914
D12
1N914
D13
1N914
D14
1N914
D15
1N914
D16
1N914
R9
10 k
R10
10 k
R11
10 k
R12
10 k
COR #3
COR #4
N.O.
S1
Reset
R16
620
D20
Red
R15
4.7 k
Q4
2N2222
R14
620
D19
Red
R13
4.7 k
Q3
2N2222
All Grounds Connected
to Enclosure



Electronic Snap Circuits

By Fred "Sparks" Blechman, K6UGT
7217 Bernadine Ave, West Hills, CA 91307
fblechman@juno.com

Finally, here's a simple way to learn basic electronics without soldering or pushing wires and tiny components into a multi-hole "breadboard." Elenco's Electronic Snap Circuits is intended for those who are eager to learn the mysteries of how simple electronic parts can be snapped together to do completely different things. This is ideal for children, with small and inexperienced hands, to have an introduction to electronics in a fun way.

If you're reading *QST*, you probably are too advanced to need much coaching in basic electronics—and maybe too advanced to teach it to someone else. But how about getting your children or grandchildren interested in electronics and hamming? This could be the door opener.

These days it's difficult for a child—or even an adult—to learn the basics of electronics. In the "old days," the basic electronic components were resistors, capacitors (we called them "condensers" then), inductors and vacuum tubes. Then selenium and silicon rectifiers came along. But today, with the advent of a bewildering array of transistors, integrated circuits, microprocessors and microcontrollers, it is more a matter of properly arranging and interconnecting modular parts to form complete devices.

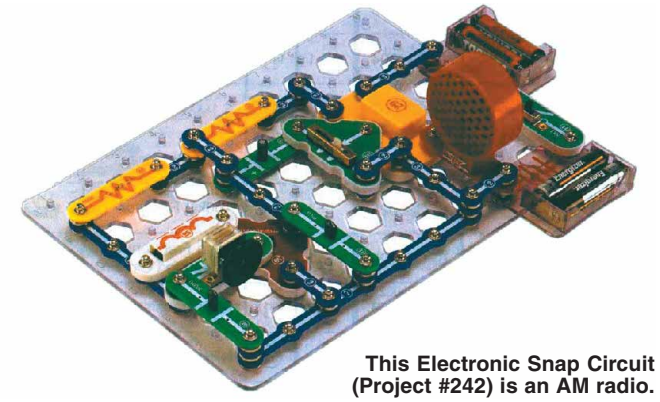
While various breadboard devices allow circuits to be assembled, they require the use of individual components, some of which are very small and difficult to handle. Jumper wires have to be cut and the insulation trimmed from the ends. Sometimes soldering is involved.

The Snap Solution

And so it is not surprising that Electronic Snap Circuits have now become available. These kits use building blocks that snap onto a plastic base and then snap together to form complete electrical and electronic circuits. No tools are needed, and no soldering is involved. Each block has a switch, resistor, capacitor, inductor, diode, transistor, integrated circuit, lamp socket, microphone, motor or speaker—or may be a jumper for connecting between parts. The blocks are in different colors and have numbers on them so they are easily identified. The connecting blocks come in different lengths. Some circuits use supplied alligator-clip jumper wires to make unusual connections.

An included large clear plastic base grid has evenly spaced posts for the different blocks to snap onto. To help in assembly, the base has rows labeled A-G, and columns labeled 1-20, to agree with the clear, colored diagrams provided for each project. The diagrams also indicate at which "level" a block is placed, since blocks can snap above each other. Level 1 blocks go on the grid first, then Level 2 parts snap onto Level 1 parts, then Level 3, etc. It's really very simple and easy to follow from the excellent project diagrams. Two AA batteries power each project.

For example, Project #1 when snapped together shows how electricity is turned on and off with a switch. The clear illustrations in the manual show the grid locations, the identifying number of each block, and the sequence of assembly onto the plastic grid. Small children who can read letters and numbers can snap these parts together correctly after very little help.



This Electronic Snap Circuit (Project #242) is an AM radio.

In this project, Number 19 Battery Holder, Number 18 Lamp Socket, Number 14 Switch and Number 3 Snap Conductor are snapped onto the grid first. Then four Number 2 Snap Conductors are snapped on the already installed parts, and the circuit is complete. Add the batteries in the holder, screw the supplied bulb into the lamp socket and close the switch. Current flows from the batteries through the switch and the bulb in this "closed" circuit, and the bulb lights. Turn the switch off and the light goes off because the circuit is now "open."

Increasing Challenge Levels

Of course, the projects get more complex and more interesting. Project #3 produces a sound activated switch. A Music IC plays music through the speaker when the Whistle Chip is tapped or activated by sound. Project #10 is a space war alarm combo. This combines the sounds from the Space War IC and the Alarm IC. Project #47 is an OR digital logic circuit. Just by following the colorful diagrams in the instruction manuals you can build an AM radio, various types of alarms and motorized toys, flashing lights, doorbells, logic circuits, games and much more.

Although no schematics of the circuits are provided, each project illustration shows the parts almost like a schematic. There is some "mystery" about how the solid-state integrated circuit blocks work, since no functions are described for the various snap points. Also, the explanations of circuit operation are brief.

Children and adults age 8 to 108 can enjoy hours of educational fun while learning about basic electricity and electronics. Electronic Snap Circuits could become important tools in the ARRL Education and Technology Program to attract new, young, amateurs. Clubs and individual Elmers can make good use of these kits as well.

Manufacturer: Elenco Electronics, distributed by C&S Sales, 150 W Carpenter Ave, Wheeling, IL 60090; tel 800-292-7711; **www.cs-sales.com**. *A kit of 30 parts (Model SC-100) with an instruction manual to build over 100 projects sells for $29.95. A larger kit, with 60 parts (Model SC-300) and two instruction manuals for 300 projects sells for $59.95.* QST

Experiment #6—Rectifiers and Zener References

Background

This month begins a three-part series of experiments on power supply circuits. We'll start with a basic rectifier and a Zener diode voltage reference. In the second step we'll experiment with some voltage multipliers. Finally, we'll design a linear voltage regulator.

Terms to Learn

- *Anode*—diode electrode into which current flows.[1]
- *Cathode*—diode electrode out of which current flows.
- *Half-wave or Full-wave*—rectification during one-half of or an entire ac cycle, respectively.
- *Peak Inverse or Reverse Voltage (PIV or PRV)*—the maximum voltage from cathode to anode a diode can safely withstand.
- *Avalanche Breakdown / Conduction*—current flow from cathode to anode when a diode's PIV or Zener voltage is exceeded.

The Basic Rectifier

The term *rectifier* can refer to either a semiconductor device (a diode) or to a circuit. Both convert alternating current (ac) into direct current (dc). The diode performs no other function besides controlling current flow, while the rectifier circuit may include several other functions. For this experiment, the term *rectifier* will refer to the circuit.

For a diode to be used in a power rectifier, we need to know two basic things about it: its PIV and its average forward current ratings. Diodes convert ac to dc by preventing current flow from cathode to anode. If ac is applied to a diode, current will flow only during the half-cycle in which the voltage from anode to cathode is positive.

During the non-conducting half-cycle, the diode blocks current flow as long as the voltage from cathode to anode does not exceed the PIV rating. At higher voltages, the diode will begin to conduct in its reverse mode and may suffer damage.

The diode's average current rating specifies how much power the diode can dissipate while conducting current without overheating. When conducting, a regular P-N silicon diode will have about 0.7 V *forward voltage drop* from anode to cathode[2] and will dissipate a power of ($0.7\ V \times I_{avg}$) W.

Now let's go on to the rectifier. Figure 1 shows three types of diode-based rectifier circuits—a half-wave, a full-wave center-tapped and a full-wave bridge. In our experiments, we'll use a function generator as an ac signal source, but the principles are the same for a transformer in a real power supply. We'll use 1 kHz (1000 Hz) as our ac frequency (because it's convenient and the filter components are smaller)—a transformer in a real power supply will usually be operating at the ac power line frequency of 60 Hz (as commonly used in the Western Hemisphere). Resistor R_L is the load.

The half-wave rectifier with its single diode can only supply current to the load during one-half of each applied ac cycle—thus the term *half-wave*. The full-wave center-tapped requires two out-of-phase voltage sources with a common center connection, such as a transformer's center-tapped secondary winding. Each source supplies current to the load on opposite half-cycles—thus the term *full-wave*—and doubling the output voltage.

The full-wave bridge achieves full-wave rectification by using an extra pair of diodes. On the first half-cycle, the full-wave bridge conducts through D1 and D3. On the next half-cycle, D1 and D3 are *reverse-biased* and don't conduct current, while D2 and D4 are *forward-biased* and supply current to the load.

[1]Notes appear on page 58.

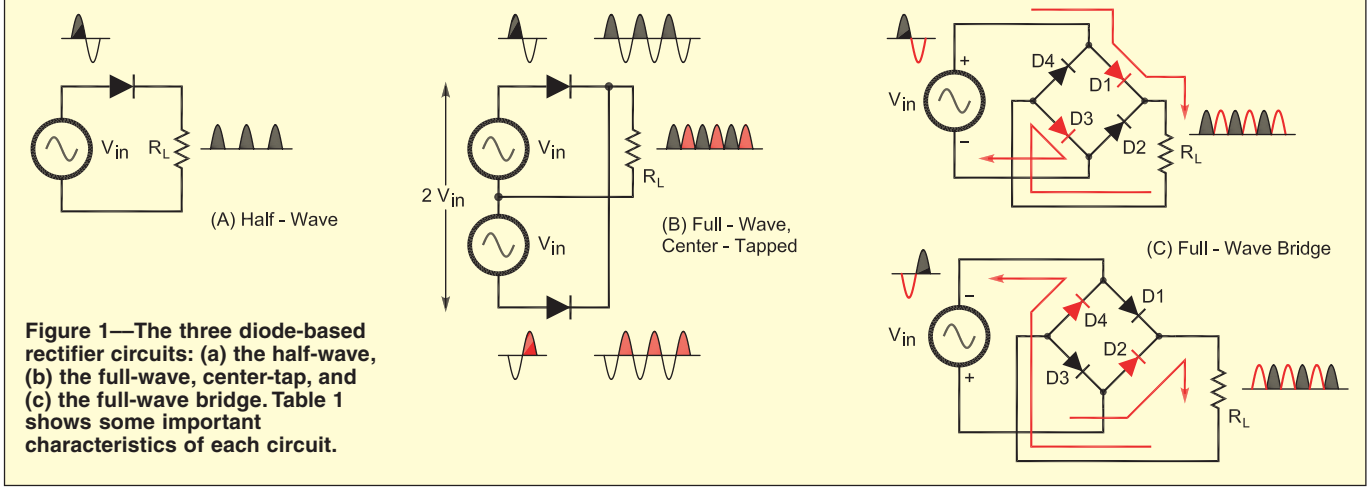


Figure 1—The three diode-based rectifier circuits: (a) the half-wave, (b) the full-wave, center-tap, and (c) the full-wave bridge. Table 1 shows some important characteristics of each circuit.

Table 1

Important Characteristics of Rectifier Circuits (V_{in} is the input RMS voltage and I_{avg} is the average load current)

Rectifier Type	*Number of Diodes*	*Average Output Voltage*	*Power Loss*	*Diode PIV Required*
Half-Wave	1	$0.45\ V_{in}$	$0.7 \times I_{avg}$	$2.8\ V_{in}$
Full-Wave, Center-Tap	2	$0.9\ V_{in}$	$0.7 \times I_{avg}$	$2.8\ V_{in}$
Full-Wave Bridge	4	$0.9\ V_{in}$	$2 \times 0.7 \times I_{avg}$	$1.4\ V_{in}$

H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

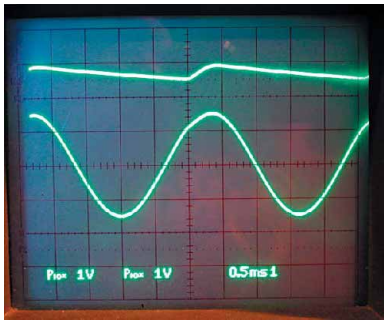


Figure 2—The bottom trace in this photograph shows the sine wave input from the signal generator. The upper trace shows the voltage across the load with a 1 µF capacitor. Note that the charging peaks in the upper trace correspond to the positive peaks of the input voltage.

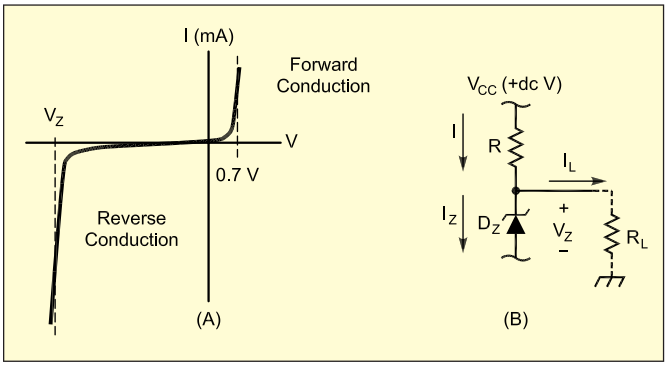


Figure 3 (A)—The Zener diode's current-voltage characteristics. Current from anode to cathode is considered to be positive or forward current and voltage from anode to cathode is positive. (B)—A common circuit for making a voltage reference with a Zener diode.

Testing the Half-Wave Rectifier

• Because function generator outputs usually have a ground-referenced output, we will only test the half-wave rectifier. Build the half-wave circuit of Figure 1a using a 1N4148 diode and a 3.9 kΩ load resistor.

• Set the function generator to output a sine wave of 5 V_{peak} (3.5 V_{rms} on the DMM's ac scale) at 1 kHz. The DMM will show about 1.3 V dc across the load resistor. An oscilloscope will show the load voltage pulsing on every positive half-cycle of the input sine wave. Note that the diode doesn't conduct for exactly one-half cycle because of the 0.7 V forward drop.

• Connect a 1 µF capacitor with at least a 10 V rating in parallel with the resistor. The DMM will show a load voltage of about 3.6 V dc because the capacitor stores energy during the non-conducting half-cycles. The 'scope will show the load voltage as a series of short ramps (as the capacitor charges through the diode) followed by long ramps (as the capacitor discharges through the resistor). This can be seen in Figure 2.

• Experiment by trying different input voltages, load resistors, and capacitors. Try different input waveforms—square and triangle waves, for example. Observe the shape of the charging ramp as you try different waveforms. If you have a function generator with a ground-independent (or *floating*) output, try building the full-wave bridge rectifier.

Rectifier Characteristics

Why would one select a particular rectifier circuit over another? There are certain differences, or *trade-offs*, in the characteristics of each that make them suitable in various circumstances, as shown in Table 1.

The full-wave bridge, because it has two diodes in the current path, is dissipating twice the power of the half-wave and full-wave center-tapped rectifiers. The benefit of the full-wave bridge is that each diode needs only one-half the PIV rating of a full-wave, center-tapped circuit. The other two circuits have fewer diodes and less power dissipation, but they require higher diode PIV ratings.

Zener Diodes

Another important power supply component is the Zener diode, named after American physicist Dr Clarence M. Zener. If an ordinary diode's PIV rating is exceeded, the diode enters avalanche conduction, but the Zener is designed to conduct in the reverse direction at a low, but stable voltage. In the normal, forward direction, the Zener looks like an ordinary diode.

The Zener is a very useful voltage reference. Figure 3 shows that even though the reverse current through the Zener may change substantially, the voltage across the diode changes very little. In the circuit of Figure 3, if enough current (I_Z) is supplied to the diode through R, small amounts may be drawn by R_L without affecting the Zener voltage.

Using a Zener diode as a voltage reference requires several simple design steps:

1) Add up the currents that will be used by the load—this is I_L.
2) Determine the supply voltage, V_{cc}, and the Zener's power rating, P_z.
3) Select a current I_z so that $P_z = V_z \times I_z$ is, at most, less than one-half of the Zener's rated power—this is for safety and to keep the Zener voltage from changing with temperature.
4) Find I by adding I_L and I_z. Use Ohm's Law to find R.
   $R = (\text{minimum } V_{cc} - V_z) / I$

By using this procedure, R is set so that even at the minimum value of supply voltage, there is enough current to supply the Zener and the loading circuitry. Give it a try!

Testing a Voltage Reference

• Use a 12 V supply voltage (V_{cc} minimum is 12 V) and a 5.1 V 1N4733A 1 W Zener diode. (The letter following the Zener type number usually refers to the Zener's voltage tolerance, "A" being ±10%, "B" being ±5% and no following letter being ±20%.) Assume that the circuitry loading the voltage will draw 1 mA.

• Follow the design procedure, limiting the Zener's power dissipation to 100 mW.

$5.1 \text{ V} \times I_z = 100 \text{ mW}$, so $I_z = 19.6$ mA. Now, I = 19.6 + 1 mA = 20.6 mA and R = (12 – 5.1 V) / 20.6 mA = 335 Ω; use a 330 Ω resistor.

For the load, use a 5.1 kΩ resistor connected from the Zener's cathode to ground.

• Connect the components as in Figure 3B and verify the Zener voltage is close to 5.1 V. Vary the supply voltage up and down while watching the Zener voltage on a DMM—it should remain stable until V_{cc} falls below $V_z + (I \times R)$.

Suggested Reading

• Chapters 8 (diodes) and 11 (rectifier circuits) of *The ARRL Handbook* go into great detail about rectifier circuits as do sections 1.25 through 1.28 of *The Art of Electronics*. The Web site for our series is: **www.arrl.org/tis/info/html/hands-on-radio/**.

Shopping List

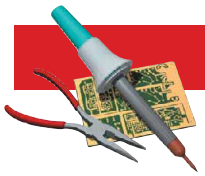
• 1N4733A Zener (RadioShack 276-565) and 1N4148 signal diodes (RadioShack 276-1122)
• 1 µF, 16 V capacitor
• 330 Ω, 3.9 kΩ, 5.1 kΩ ¼ W resistors

Next month we'll learn about the voltage multiplier. From tiny diodes and capacitors, mighty voltages come!

Notes

[1]Electronics texts typically use "conventional current" or the flow of positive charge. The actual flow of electrons or "electronic current," is in the opposite direction.

[2]Other types of diodes, such as PIN, Schottky, or those made from germanium have different forward voltage drops when conducting.



HINTS & KINKS

HANG WIRES FROM TREES FLEXIBLY

◊ I have several Beverage antennas and elevated radial wires in old woods surrounding my home. "Old woods" means there are many dead branches that frequently land on my wires and break them. The following scheme prevents the wires from breaking and makes repairs easier when they are necessary.

For those unfamiliar with Beverages, they are receiving antennas that are typically suspended 6 to 10 feet above the ground, running in a straight line toward the desired direction from which they are to receive. My European Beverage is 550 feet long, running through the woods and supported by trees along the way.

My 32 elevated radials are on a four-square antenna for 80 meters. The four-square is a phased array of four λ/4 vertical wires, suspended in trees, with eight wire radials sloping up from the base of each vertical to a height of 6 or 7 feet above the ground. Each radial is λ/4 long, or about 66 feet. Trees along the way support the elevated radials.

If the Beverage or radial wires were simply stapled to trees and a branch was to fall on them, they would likely break. If the staple is left loose so the wire can move, the tree eventually grows around the staple (if it's up long enough), making it tight. Then when a branch lands on the wire it breaks. After years of playing with wires in the woods, I found the following to work pretty well. (All of my wires are #14 or #12 AWG insulated stranded wire.)

I put a galvanized fence staple in the tree where I want to support the wire. [Figure 1 shows the arrangement with a tree-friendly rope loop in place of the staple.—*Ed.*] I then use an 8-inch piece of solid #14 AWG insulated wire to secure the antenna to the staple. Pass the wire through the staple and wrap 4 inches on each side of the staple tightly around the wire to be supported, with four or five turns on each side. Now, when a branch falls on the wires, the antenna wire pulls out of the wrap. All I need do to fix the damage is clear a fallen branch and refasten securing wire. This sure beats bringing the torch out to the woods or using split-bolt connectors to splice broken wires!—*Jack Schuster, W1WEF, 408 Thompson St, Glastonbury, CT 06033;* **w1wef@arrl.net**

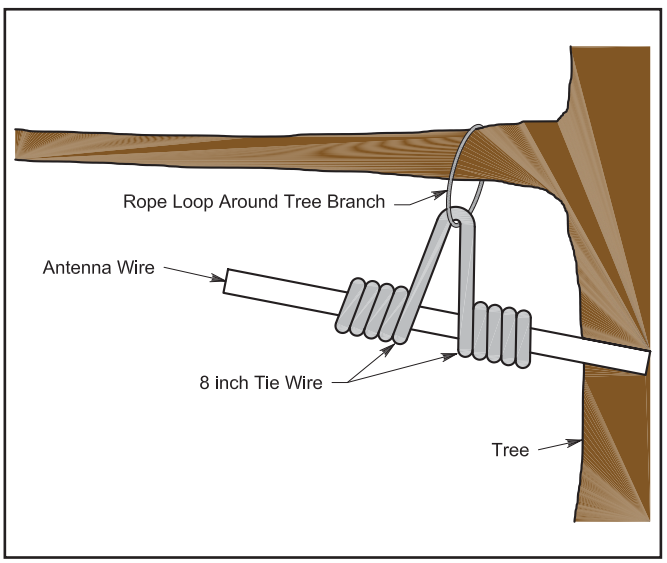


Figure 1—W1WEF uses a wire wrap when hanging wires in trees. When a deadfall strikes the antenna, the wrap can unravel, releasing the antenna wire before it breaks. It is then simple to repair the antenna by replacing the wrap.

AVIATION HEADSETS WITH AMATEUR RADIO EQUIPMENT

◊ Hams who fly might like to use their aviation headsets with their Amateur Radio sets. The earphones are no problem; they terminate in a 1/4-inch plug and the ordinary ham transceiver phones or external speaker output will easily drive them. Some headsets come with a stereo plug, in which case there may be a switch on the headset to connect the two earphones for mono.

The microphone is compatible with airplane radios made for a carbon microphone. An amplifier built into the headset raises the level of the dynamic or electret microphone to a level appropriate for a carbon mic. The amplifier is powered by what would be the dc supply for the carbon mike. The output of a carbon mike is far too high for the average ham transmitter. Most are designed to use a dynamic mike with no amplifier.

A little step-down transformer accomplishes both output reduction and application of the dc supply to the headset. Some headsets may include a push-to-talk switch; others do not.

The mating jack for the small-diameter microphone plug is a Switchcraft C12B or S12B. The RadioShack #273-1380 is a suitable transformer. My transceiver has an 8-V dc supply available at the microphone connector. This proved adequate to run the microphone amplifier. If your transceiver lacks this supply, use a 9-V battery instead. The RadioShack #274-025 microphone connector fits many amateur transceivers. I have omitted pin numbers since they may vary from one make/model to another.—*Jim Haynes W6JVE, 1535 W Cleveland, Fayetteville, AR 72701;* **w6jve@arrl.net**

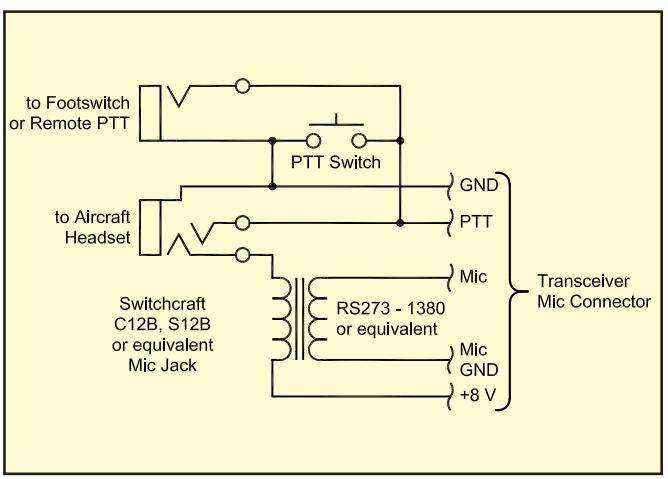


Figure 2—W6JVE uses this circuit to connect his aviation headset to his home transceiver. See the text for part numbers and descriptions.

Bob Schetgen, KU7G ♦ Senior Assistant Technical Editor ♦ h&k@arrl.org

BATTERY CHARGING SUPPLIES

◊ A hint of mine about 14-V battery systems was printed in the June 2001 column. I have more comments about the article that followed mine on 14-V batteries, which discussed ways of selectively paralleling batteries (in parallel for charging, separate for discharge). This is a situation I have dealt with on my boat (as have many other maritime mobiles). I've tried diode isolators, and although there weren't any diode failures, there were several problems.

The first problem had to do with heat—with a 120-A alternator, they get *hot*! None of them ever failed, but I did burn myself once—and I never like having things run that hot. I even put a fan on them!

The second, more serious problem was that diodes are not "perfect" with regard to their junction drop. At very small currents (typical 1-A to 2-A maintenance-charge rates on a fully charged battery), the voltage drop across them would decrease to 0.2 to 0.3 V. Yet a diode passing the majority of the current would have more than 0.6-V drop (typically 0.9 to 1.1 V). This results in overcharging of the already-full batteries in the system. In my boat, I have three batteries, one for keeping house, one for the navigation radios and one for starting. I was "boiling out" the start battery every year!

So I converted to West Marine "Battery Combiners." Each of these has a 100% duty-cycle relay or contactor and a small voltage sensor to drive it. In use, you attach the charging device(s) to one battery. When it begins to charge and the voltage rises, the relay closes, connecting the batteries in parallel. After the charger is switched off, the battery voltage drops and the connections open. Obviously, a good ham could build such a thing, but for those who don't want to do so, West Marine sells the package! They have two models: a 50-A model (#143268, $69.99) and a 150-A model (#128293, $179.99). They are rated at that amperage for continuous duty, with a closing-current rating of 200 A and 400 A, respectively, and a "five minute" rating of 100 A and 200 A. They both are rated as drawing 250 mA when on, and only microamperes when off. There is a terminal that allows you to force them on (or off), and they have a small LED indicator. West Marine also has a continuous-duty 12-V dc solenoid rated at 80 A continuous (750 A make, 100 A break, #289407, $22.99).

West Marine (**www.westmarine.com**; 1-800-262-8464) has a nice big catalog ($5, refundable on first purchase), with lots of goodies that may be of interest to hams, even those who are landlocked!

Those who deal with dc wiring, particularly at high amperages, may also want to acquire a catalog from Spectro Wire & Cable (2208 Pole Rd, Moore, OK 73153; 1-800-255-6371; **wire@aol.com**; **www.spectrowireandcable.com/**). They are a great source for heavy-duty wire, lugs, fittings and tools—I've used them for more than 10 years, and they are a very high-quality supplier. They have a Battery Terminal Anti-Corrosion Protection chemical (4 oz #50095, $4) that is the best I've ever seen for preventing corrosion on battery terminals! They do have a $25 minimum order.—*Hartley Gardner, W1OQ, 3602 N 31st St, Phoenix, AZ 85016-7009;* **w1oq@arrl.net**

A MIGHTY DUCK FOR EMERGENCIES

◊ Even if it hasn't yet happened to you, it still can. The rubber duck for your handheld goes AWOL, gets kinked or loses the lock on its BNC—right as you're getting ready for a big public-service event. It happened to me when the one for my 222-MHz radio disappeared the night before the Marine Corps Marathon here in Arlington, Virginia.

But help is at hand, right behind your VCR if not in your coax collection: a 4-foot RG-6 video patch cable. That, plus an F-female-to-BNC-male adapter and some heat-shrink tubing will put you back in business (The RadioShack part numbers are #15-1550 and #278-251, respectively.)

This example will use dimensions for 222 MHz, but adjusting the radiator portion will easily yield 2-meter and 440-MHz versions. (A 2-meter might take a different complement of shrink tube for the needed rigidity.)

First, cut the RG-6 at 13 1/2 inches above the bulge for its F-connector. Strip off the outer cover by slitting it lengthwise down to 1 inch above the bulge. (That last inch is important for rigidity.) Then remove the silver shield down to the same point, being careful not to cut the foam dielectric beneath. That will yield 12 1/2 inches of effective—but rather floppy—radiator.

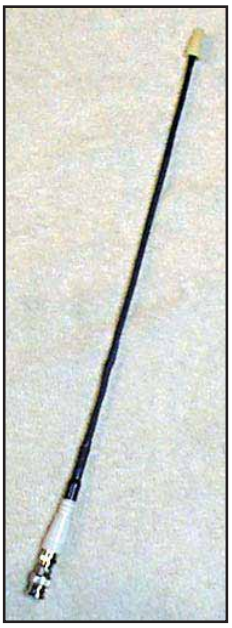


Figure 3—KO4ALA's homebrew flexible antenna for emergencies. See text for construction details.

Now gather three pieces of shrink tube. First, get a 13 1/2-inch section small enough to fit snugly on the radiator portion and down to the remaining coax cover/shield braid. Second, get 2 inches of somewhat larger-diameter tube to fit over the first layer at the same point. Third, get 3 inches of some with a still larger-diameter that will fit over the 2-inch layer and down past the bottom of the white covering to where the F-connector's bulge begins.

For a finishing touch, screw a wire-nut onto the end of the radiator. Then attach the adapter and you're back on the air.

I did not have an SWR meter that could deal with 222 MHz, so I contented myself with the 12 1/2-inch dimension from an antenna chart. [That's okay; handhelds must tolerate moderate SWR with the stock antenna.—*Ed.*] If you have the right meter, you could start with a 14 1/2-inch piece of cable and have plenty to trim for tuning. But, from the "git-go," mine enabled me to hit all the repeaters that the original duck could.—*Alan Bosch, KO4ALA, 5832 20th St N, Arlington, VA 22205-3306;* **ko4ala@arrl.net**

YOU MAY ALREADY HAVE A 6-METER MOBILE ANTENNA!

◊ As an avid 6-meter operator and repeater owner, I am often informing owners of the new multiband HF/VHF multimode rigs about antennas. Common 2-meter 5/8-λ base loaded (and other types) as well as 54-inch HF-mobile antenna masts (dependent on the attached resonators and such) are 1/4-λ antennas for 6-meter operation. So, if you have a rig with 6 meters and no antenna in use, you may be all set. Depending on the make and model of the radio, a software menu selection of antenna port or the addition of a diplexer may be all that is needed to get in on the excitement of 6 meter SSB or FM while mobile.—*Steve Hajducek, N2CKH, PO Box 117, Howell, NJ 07731-0117;* **n2ckh@arrl.net**

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

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

ICOM IC-703 HF Transceiver

Reviewed by Brennan Price, N4QX
Assistant Technical Editor

We should establish one thing about the IC-703 right up front. Yes, operating a 10-W radio can be a very satisfying experience. Almost invariably, after we review an HF offering that produces less than 50 W output, we receive correspondence asking whether low-wattage signals really get out. As any QRP enthusiast will tell you, the answer is an enthusiastic yes. Whether one operates low power in order to minimize RF exposure or simply for the challenge of doing more with less, an effective antenna will allow the operator to be heard. As ARRL Laboratory Manager and resident QRP guru Ed Hare, W1RFI, says, "Ten watts is a lot of power."

And 10 W is exactly the lot of power that one gets when operating the IC-703. The radio looks and acts very much like the higher-power ICOM IC-706MkIIG, reviewed in the July 1999 issue of *QST*. It differs from the MkIIG in two important respects. The first is its output power; the second is that it is lacks VHF and UHF capability. Due to a printing error on the boxes and on the manuals, there is an indication that the '703 has 6-meter capability. This is not the case, and ICOM makes that clear right up front with a note attached to the box. Six meters is available on the recently released IC-703 Plus, however.

QRP Ready to Go

So what has ICOM included in the '703 in order to make up for the 90 W and three bands it gives up? Quite a bit, actually. Foremost is the standard internal automatic antenna tuner, pictured in Figure 4. I was able to connect the IC-703 directly to the G5RV I have creatively supported on my apartment building's balcony and operate on all bands (except 160 and 30 meters, which are not typically compatible with a G5RV) at the touch of a button. The automatic tuner was put through its paces in the ARRL Lab, using the same methodology used in our January roundup of external antenna tuners. Our criteria for determining whether a match was obtained was whether the SWR indicated on the rig's bar graph meter was 1.5:1 or less, resulting in no output power reduction. While ICOM recommends that the unmatched antenna should have an SWR of less than 3:1, the internal tuner successfully match loads up to an 8:1 SWR on all bands tested (160, 80, 20, and 10 meters). At an SWR of 10:1, no match was found, and the tuner turned itself off.

Conveniently, the first time the IC-703's tuner matches a particular frequency pair, the tuner settings are memorized. When the user returns to the frequency and the internal tuner is enabled, the proper settings spring to life. The can be overridden after an antenna change either by clearing the tuner memories or forcing the internal tuner to match again.

This feature should be of interest to portable station enthusiasts who seek a complete station in one lightweight box. No external antenna tuners need be carried; an antenna, a power source, and the '703 are all that such an operator will need to go out and have fun. The added weight of the tuner is more than offset by the removal of the 100-W power amplifier and VHF/UHF modules from the old MkIIG. Even though the two models have the same dimensions, the '703 weighs in 4.3 pounds, down more than a pound from the latest '706 model.

The '703 is friendlier on batteries than the '706MkIIG was found to be. The power requirement in Table 1 indicates that less than 3 A is drawn when transmitting at the full 10-W capacity. On the receiver side, typical current draw at maximum audio was 0.58 A, and fell to 0.32 A when power saving options were utilized. This efficiency allows smaller battery packs to be used. In fact, I enjoyed several hours of operation using a very lightweight, rechargeable, 9.6-V battery pack. For portable operation enthusiasts, the IC-703's compact and lightweight stature is very attractive.

Some Things Stay the Same

But you would expect a radio that looks exactly like the '706MkIIG to behave very much like the '706MkIIG. And in most ways, the '703 does. Back in 1999, we complimented the performance of the DSP included standard on the MkIIG. The same DSP functions, an automatic notch filter and a noise blanker, have found their way into the '703. The ARRL Lab measured a very impressive single-tone noise reduction of 65 dB for the autonotch filter; this measurement is one of the best ever measured in our Lab.

Something that did not change from the MkIIG is the availability of 1200 and 9600 baud packet operation, and United States users should be aware of this and

Bottom Line

The IC-703 looks a lot like the IC-706MkIIG, but trades a capable internal antenna tuner for some bands and 90 W of power. The result is a radio that will turn the heads of low-power and portable operators who yearn for features galore in a lightweight box.

Brennan Price, N4QX ♦ Assistant Technical Editor ♦ n4qx@arrl.org

Table 1
ICOM IC-703, serial number 1801133

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-30 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 MHz.	Receive[1] and transmit, as specified.
Power requirement: Receive, 0.45 A (max audio); transmit, 3.0 A (10 W output).	Receive, 0.58 A;[2] transmit, 2.5 A. Tested at 13.8 V.
Modes of operation: SSB, CW, AM, FM, RTTY.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, <0.16 μV.	Noise floor (MDS), 500 Hz filter: *Preamp off* / *Preamp on* 1.0 MHz: –121 dBm / –129 dBm 3.5 MHz: –133 dBm / –141 dBm 14 MHz: –131 dBm / –141 dBm
AM sensitivity, 10 dB S/N: 0.5-1.8 MHz, <13 μV; 1.8-30 MHz, <2 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: *Preamp off* / *Preamp on* 1.0 MHz: 6.5 μV / 2.34 μV 3.8 MHz: 1.5 μV / 0.537 μV
FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5 μV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 29 MHz: 0.537 μV / 0.193 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: Spacing: *20 kHz* / *5 kHz* *Preamp off/on* / *Preamp off/on* 3.5 MHz: 127*/127 dB / 95/95 dB 14 MHz: 121*/122* dB / 95/95 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500 Hz filter: Spacing: *20 kHz* / *5 kHz* *Preamp off/on* / *Preamp off/on* 3.5 MHz: 93/93 dB / 78/77 dB 14 MHz: 89/91 dB / 76/76 dB
Third-order intercept: Not specified.	Spacing: *20 kHz* / *5 kHz* *Preamp off/on* / *Preamp off/on* 3.5 MHz: +12/+1.8 dBm / –14/–21 dBm 14 MHz: +11/+1.9 dBm / –14/–21 dBm

avoid using this function in most instances. Of the bands found on the '703, 1200 baud packet operation is only permitted in the United States on 10 meters [97.307(f)(4)]. What's more, 9600-baud operation is not permitted at all on HF; users interested in that speed must wait for the 6-meter capability of the '703 Plus [97.307(f)(5)].

Nevertheless, the IC-703 earns high marks for ease of operation and ergodynamics, just as the MkIIG did. The controls are identically positioned, with the large VFO knob on the right of the large display, and separate AF and M-CH controls to its left. Backlighting enhances the visibility of the buttons in the dark, and the various menu options are easily toggled by a MENU and three F keys. The control panel is detachable from the radio, allowing for operation from a distance limited only by the length of the remote cable.

Overall, ICOM has added a tuner to the MkIIG in exchange for VHF/UHF capability and some wattage. What remains in the IC-703 is a lightweight station with modest power but all the bells and whistles of the MkIIG. These qaulities may be attractive to those who have always been interested in portable, low-power operation but have wanted more features.

Comparing the Numbers

Testing in the ARRL lab indicates that the '703 offers slight improvements over the MkIIG in receiver performance. The results are spelled out in Table 1. Let's take a closer look at how the '703 stacks up to the '706 family.

Receiver sensitivity for SSB and CW signals was down slightly, but not significantly from the MkIIG. AM sensitivity was significantly degraded from the MkIIG, rising from 0.68 to 1.5 μV on 3.8 MHz with the preamp off. However, all sensitivity measurements fell well within ICOM's stated specifications, and an argument can be made that an overly sensitive radio during crowded conditions can be a hindrance. With the '703, I cleanly heard all that I wanted to hear.

Pleasantly surprising was the IC-703's dynamic range performance. Across the board, the '703 outperforms the '706 line in both blocking and two-tone, third-order IMD dynamic range at the ARRL standard test spacing of 20 kHz. In the four years that have passed since the MkIIG's arrival on the market, the ARRL Lab has begun dynamic range testing at 5-kHz spacing, and the '703 performs credibly at the new test.

Finally, third-order intercept numbers were uniformly positive at 20-kHz spacing on the '703, an improvement over the

Second-order intercept: Not specified.	Preamp off, +56 dBm; preamp on, +47 dBm.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 67 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 73 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 40.7 μV; preamp on, 15.1 μV.
Squelch sensitivity: SSB, 1.8-30 MHz, <5.6 μV; FM, 28-30 MHz, <0.32 μV.	At threshold, preamp on: SSB, 14 MHz, 4.51 μV; FM, 29 MHz, 0.186 μV.
Receiver audio output: 1.0 W at 10% THD into 8 Ω.	1.3 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW (500 Hz filter): 326-870 Hz (544 Hz) USB: 414-2920 Hz (2506 Hz) LSB: 85-2532 Hz (2447 Hz) AM: 36-3310 Hz (3274 Hz).
IF and image rejection, 70 dB.	First IF rejection, 116 dB; image rejection, 121 dB.

Transmitter

Transmitter Dynamic Testing

Power output: SSB, CW, FM, 10 W high, 0.1 W low; AM (carrier), 4 W high, 0.1 W low.	CW, SSB, FM, typically 9 W high, <0.1 W low; AM, typically 2.9 W high, <0.1 W low.
Spurious-signal and harmonic suppression: <50 dB	54 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: >40 dB.	58 dB.
Undesired sideband suppression: >50 dB.	70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1.
CW keyer speed range: Not specified.	6 to 52 WPM.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 20 ms. Unit is suitable for use on AMTOR.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 40 ms; FM, 16 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 2.3×6.6×7.9 inches; weight, 4.3 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

*Measurement was noise-limited at the value indicated.
[1]Receive sensitivity is reduced below 250 kHz.
[2]With all power saving options enabled, 320 mA.

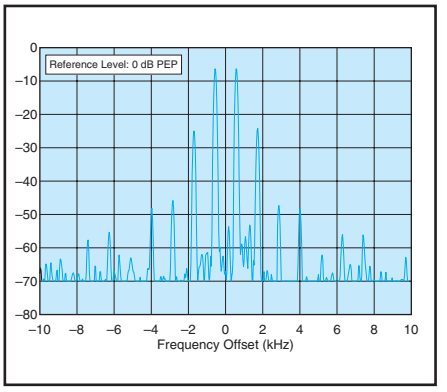


Figure 1—Worst-case spectral display of the IC-703 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 24 dB below PEP output, and the worst-case fifth-order product is down approximately 46 dB. The transmitter was being operated at 10 W PEP output at 7.25 MHz.

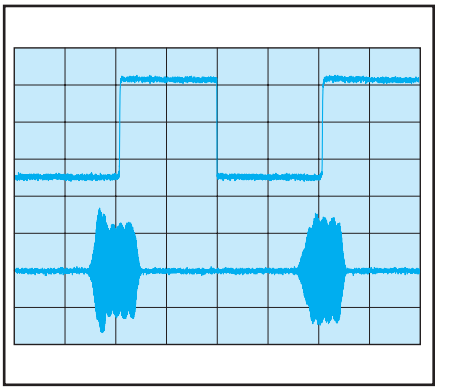


Figure 2—CW keying waveform for the IC-703 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is approximately 60 wpm. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transmitter was being operated at 10 W output at 14.2 MHz. Note the considerable shortening of both dits.

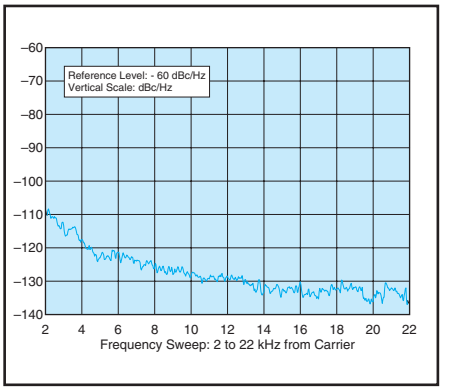


Figure 3—Worst-case spectral display of the IC-703 transmitter output during composite-noise testing. Power output is 10 W at 14.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

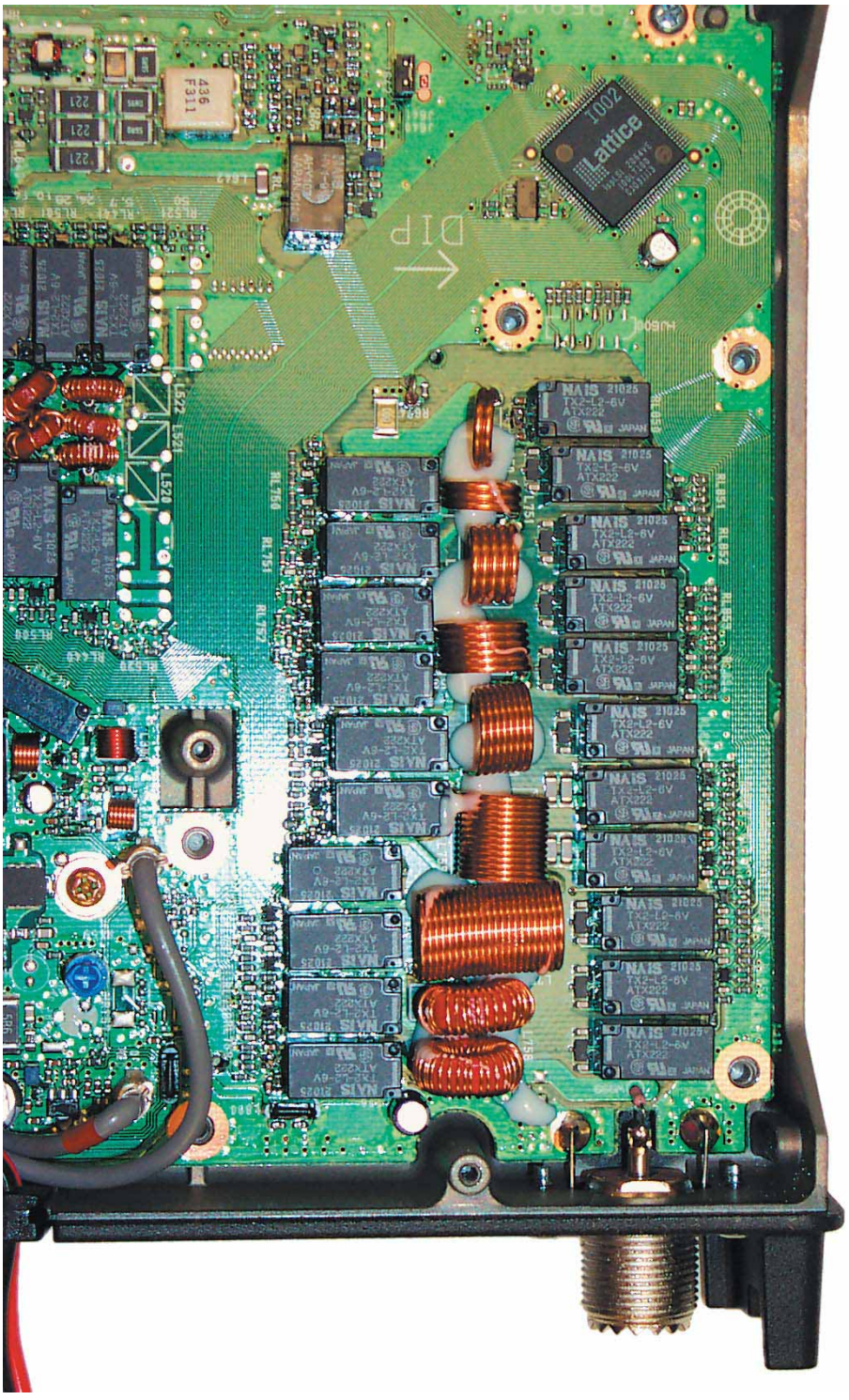


Figure 4—A peek inside the ICOM IC-703 with the bottom panel removed reveals the automatic antenna matching network that comes standard with the transceiver. This network successfully matched SWRs of up to 8:1 in the ARRL Lab.

MkIIG's uniformly negative numbers. Only at the close spacing of 5 kHz does the IP3 fall into the negative numbers, –14 dB with the preamp off and –21 dB with it on.

The IC-703 outperforms its specification for IF and image rejection by a healthy margin. Overall, the '703's receiver performance is on par with its high-powered cousins, and continues the trend of incremental improvements. The transmitter, however, shows relatively high third-order products during two-tone IMD testing (see Figure 1). The '703 performs about 6 dB worse than the MkIIG here.

CW Keying and ALC

In the first two IC-706 models, we noted some limitations on the CW keying, particularly in full-break-in mode. Dits were shortened in full-break-in keying at speeds of around 30 WPM or above. These shortened dits are once again evident in the IC-703 (see the keying waveform in Figure 2). The dits default to their normal weight in semi-break-in mode, however. High-speed CW operators may wish to take this into consideration.

Also, the leading-edge spike of the CW waveform on our unit of the IC-703 indicates a recurrence of a problem observed to an extent in the 706 series—the failure of the ALC to take hold until a short time into the transmission. While one is unlikely to drive an amplifier with the '703, some '706 users reported that the leading spike would fault amplifiers. The spike had been minimized in the MkIIG, but was again prominent in our unit.

In fairness, our unit of the IC-703 was one of the first units sold in the United States. ICOM America Chief Engineer John Gibbs, KC7YXD, indicates that the leading spike was remedied prior to the recent release of the 6-meter capable IC-703 Plus, and that this fix has been incorporated into all but the first few IC-703 units sold in the United States. We plan to revisit the CW and ALC issues in a forthcoming review.

Good Bang for the Buck

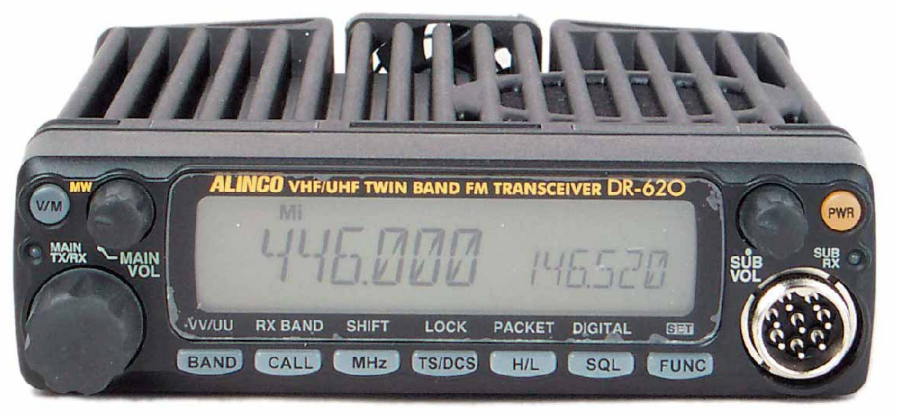
ICOM has combined a no-nonsense HF transceiver patterned after its successful IC-706 series with a surprisingly capable antenna tuner in a lightweight, affordable package. As mentioned above, hams who are looking for a lightweight, low-power radio with a number of nice features will find the IC-703 worth a serious look. So will hams in close quarters, such as apartments or condominiums, where RF safety and susceptibility concerns must be considered. And in these tight economic times, the pricetag is attractive, particularly for a starter HF rig for a General class licensee.

For under $700, ICOM has provided a nice little radio, patterned very much after the successful IC-706 series. It shares much of its older cousins' limitations, but includes and improves upon much of their features, even while shedding some bands and some power. For the low-power market and the low-price class, this is a commendable effort.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004, tel 425-454-8155; fax 425-454-1509; **www.icomamerica.com**. Price: $679.95.

Alinco DR-620T VHF/UHF FM Transceiver

Reviewed by Dan Henderson, N1ND
ARRL Contest Branch Manager



Not too many years ago, the concept of a dual-band VHF/UHF radio seemed distant. Today it seems that dual-band radios are standard for base station or mobile FM operation. Into this market Alinco introduces the DR-620T, its latest 144/440 MHz FM transceiver.

The DR-620T is packed with pretty much all of the features that today's amateur has come to expect. But these standard features come with lots of bells and whistles that Alinco hopes will attract amateurs who enjoy a wide range of activities on the VHF/UHF bands.

User-Customizable Appearance

One physical design feature stands out, and offers unprecedented flexibility and convenience for mobile installation and operation. Have you ever had to compromise with how to place a mobile radio in the car so you could still hear the speaker? The DR-620T resolves this by making it possible to detach the front panel and turning it 180° so you can position both the control panel and the speaker to your liking (see Figure 5). The days of choosing between standing on your ear to read the display or listening to a muffled speaker covered by the carpet or dashboard are history. Users can choose the configuration (speaker up or speaker down) that works for them.

Another user-customizable feature is the display color, solving the phenomenon of liking a radio but hating the color of the display backlighting. Alinco gives the DR-620T user the option of three display illuminations: amber (a reddish-orange), yellow or orange. When combined with the 4-setting dimmer feature for adjusting the intensity of the back lighting, the DR-620T should provide a combination easy on the eyes of any operator.

Running Down the Basics

When it comes to standard FM communication, the DR-620T packs the punch to get the signal through with three power levels. Low power on both 144 and 440 MHz is 5 W, mid-level power is 10 W, and the high-power setting offers 50 W on VHF and 35 W on UHF. The PWR button is located among the array of buttons on the bottom of the front panel, perhaps not in the most conspicuous location but easily accessible once you learn the layout of the function keys.

As do many other modern radios, the '620T includes a power supply voltage display in its package of features. While activating this display is not intuitive, it is simple: the user presses the SQL and FUNC keys simultaneously, and the voltage is shown in the lower right corner of the display, just beside the frequency. This display terminates when any other key is pressed.

Having previously owned a dual-band mobile that included both bands' audio controls on a single knob, I especially liked having distinct adjustment knobs for the MAIN volume and the SUB band volume controls. This makes it easier for those of us with big fingers. Also especially helpful were the distinctly separated reception indicators. Placing the indicator for each band on opposite sides of the radio allowed me to tell which receiver was active in one glance.

One thing I have always liked about Alinco products has been their relative simplicity. It has always seemed that some mobile radios required you to push button A, then hold button B while pressing button C to get to the controls for the feature you wanted to employ. Alinco again keeps it simple. The '620T user presses the FUNC key to activate the various functional capabilities of the rig.

The radio has plenty of memory capability, with 200 available channels for storing those frequently used repeater pairs or simplex frequencies. There are 80 channels reserved each for VHF and UHF frequency storage, along with 40 channels available for either VHF or UHF. In addition there is also available a primary CALL channel for both VHF and UHF. One simple push of the V/M key, located in the upper left corner of the front panel, switches the rig between VFO and memory operation.

Programming a channel into memory was relatively easy. All you do is first set up the channel parameters in VHF mode (offset, CTCSS tones, DCS codes, etc). Next push the FUNC key and rotate the main dial to select the desired memory in which to store the information. Once you find the channel, push the V/M key, listen for a beep and you're all set!

Get confused by what repeater is on what frequency? The DR-620T allows you do alphanumeric labeling. Press the H/L Key from the front panel along with the FUNC key and you will see letters appear on the main display. Rotate the main dial until the desired letter comes up. By pressing the BAND key the displayed letter is written into memory, and the next letter space appears. Repeat the process until the alphanumeric designation you desire is displayed (such as "W1AW/R"). Once you have finished, press any key other than BAND or CALL and you are finished. The CALL key can be used during programming to delete all characters already programmed. You won't have to worry if the 146.91 repeater you have keyed in is the one you need for your home tone decoder or the one you programmed in with a different decoder for your recent vacation road trip.

Menu Options Abound

In step with modern technology, the Alinco DR-620T has a wide range of user-determined parameters that assist the operator. Ever talked a repeater down (nah, none of us have *ever* done that)? You can program the time-out-timer for up to 450 seconds. When five seconds

Bottom Line

The newest dual-band mobile offering from Alinco maintains the brand's ease of use while incorporating digital voice capability.

Table 2
Alinco DR-620T, serial number M000558

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 87.5-174,[1] 335-480 MHz; transmit, 144-148, 430-450 MHz.	Receive and transmit, as specified.
Power requirement: Receive, 0.6 A (max audio); transmit, 11 A (high power).	Receive, 0.68 A; transmit, 8.2 A. Tested at 13.8 V.
Modes of operation: FM, AM (receive only).	As specified.
Receiver	**Receiver Dynamic Testing**
AM sensitivity: Not specified.	AM, 10 dB S+N/N: 120 MHz, 12.3 μV.
FM sensitivity, 12 dB SINAD: 0.2 μV.	For 12 dB SINAD, 144 MHz, 0.18 μV; 430 MHz, 0.15 μV;
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 146 MHz, 64 dB; 440 MHz, 61 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 146 MHz, 57 dB; 440 MHz, 56 dB; 10 MHz channel spacing: 146 MHz, 68 dB; 440 MHz, 66 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	78 dB.
S-meter sensitivity: Not specified.	S9 indication: 146 MHz, 4.6 μV; 440 MHz, 3.6 μV.
Squelch sensitivity: < 0.126 μV.	At threshold: 146 MHz, 0.11 μV; 440 MHz, 0.068 μV.
Receiver audio output: 2 W at 10% THD into 8 Ω.	2.7 W at 10% THD into 8 Ω.
Spurious and image rejection: 70 dB.	First IF rejection, 146 MHz, 126 dB; 440 MHz, 142 dB; Image rejection, 146 MHz, 95 dB; 440 MHz, 113 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output (H/M/L), 144 MHz: 50/10/5 W; 430 MHz, 35/10/5 W.	146 MHz, 55/9.2/4.3 W; 440 MHz, 35/10.2/5.4 W.
Spurious-signal and harmonic suppression: 60 dB.	VHF, 60 dB; UHF, 70 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 146 MHz, 198 ms; 440 MHz, 106 ms.
Receive-transmit turnaround time (tx delay): Not specified.	146, 440 MHz, 136 ms.
Size (height, width, depth): main unit, 1.6×5.5×7.3 inches; weight, 2.2 pounds.	

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.
[1]WFM only for 87.5-108 MHz and AM only for 108-136 MHz.

remain, the user gets an audible beep as a warning. When you surpass the programmed time, the radio automatically stops transmitting and returns to receive, just in time for you to hear the laughter of your friends! Release the PTT and press it again to return to normal transceiver operation.

When tuning in the VHF mode, this radio allows you to select between 10 different sized step intervals for tuning, from 5 kHz to 100 kHz. The default step is the smallest, 5 kHz. Another popular feature is the automatic power off function, which, when activated, will turn off the radio after there has been 30 minutes of inactivity.

Sure to be popular is the DR-620T's adaptability to use in packet operation and APRS. Users can automatically program their call sign (up to six characters) while operating in the packet communications mode. You can also easily select between 1200 and 9600 baud for setting the transmission speed, although 9600 baud capability requires an additional module. When operating APRS, there are seven settings to enable regular beacon transmissions, from a half minute up to 30 minutes apart.

Groovin'

Like to sometimes slip away from the wonders of Amateur Radio and kick back to jam with your favorite FM broadcast station? When the radio is in the VFO mode, holding the FUNC key and then pressing the CALL key will move the radio to the FM broadcasting band. Probably of more interest is the ability of the DR-620T to receive AM. Note that the radio will still transmit FM if it is in the AM receiver mode. Also, if narrow-band FM is used in your areas, the DR-620T includes a narrow-band mode feature, that lowers the microphone gain and modulation during transmission as well as the demodulation on the receiver side of the operation.

The DR-620T includes a theft alarm system that can be interfaced between the radio and your automobile. An optional digital voice communications module, the EJ-47U, enables digital voice transmission in the 10F3 digital mode. This is not compatible with the 20F3 digital modulation scheme used by the EJ-43U module reviewed with the DJ-596T handheld in June 2002. The EJ-47U module is compatible with other Alinco transceivers currently sold only in Japan—the DR-135MkII mobile and the DJ-596MkII and DJ-593MkII handhelds. The radio may be interfaced with a personal computer, and Classic Business Technologies released a software package to download settings to the DR-620T during Hamvention 2003.

Another Good Effort

I found the DR-620T to be relatively simple to set up for basic dual-band operation. Over the weekend I used the ra-

Figure 5—(Top) Is this a defect? Did Alinco manufacture this unit of the DR-620T upside down? No, not at all. Alinco allows the user to decide whether she wants the speaker facing up or facing down by rotating the front panel 180 degrees. (Right) As you can see, in this configuration, the speaker is at the bottom of the radio, ideal for mounting just under a shelf or dashboard.

dio, I temporarily installed it in my car and was able to make several QSOs on several local VHF or UHF repeaters. After programming in several repeater pairs, I was able to control the radio easily from the included microphone. The quality of the audio was good, and while tuned to my favorite FM radio station, I was able to rock with the sounds of the oldies.

Over the years Alinco has provided good quality products with substantial bang for the buck. Once again, they have provided a good quality radio at a good price that provides decent value. It will be a welcome addition to many amateur stations.

Manufacturer: Alinco Inc, Shin Dai Building 8F, 1-2-6 Doujimahama, Kitaku, Osaka 530-0004 Japan. Alinco's US distributor is ATOC Distributing LLC, 23 S High St, Covington, OH 45318; tel 937-473-2840; fax 937-473-2862; **www.alinco.com**. Price: $339.95; EJ-47U digital voice board: $169.95; EJ-50U TNC board: $119.95. QST

Going Once, Going Twice . . .

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review, Short Takes or New Products columns.—Ed.]

The ARRL-purchased equipment listed below is for sale to the highest bidder. Prices quoted are the minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

ICOM IC-T90A triband handheld transceiver, serial number 01090 (see "Product Review," Jan 2003 *QST*). Minimum bid: $170.

Vectronics HFT-1500 manual antenna tuner (see "Product Review," Feb 2003 *QST*). Minimum bid: $280.

Ten-Tec 238A manual antenna tuner (see "Product Review," Feb 2003 *QST*). Minimum bid: $300.

Palstar AT1500CV manual antenna tuner (see "Product Review," Feb 2003 *QST*). Minimum bid: $285.

MFJ-986 manual antenna tuner (see "Product Review," Feb 2003 *QST*). Minimum bid: $185.

Ameritron ATR-30 manual antenna tuner (see "Product Review," Feb 2003 *QST*). Minimum bid: $380.

ICOM IC-2720H dual-band FM transceiver, serial number 01024 (see "Product Review," Mar 2003 *QST*). Minimum bid: $240.

Alinco DJ-S40T UHF handheld transceiver, serial number M000529 (see "Product Review," Mar 2003 *QST*). Minimum bid: $50.

Ten-Tec Argonaut V MF/HF Transceiver Model 516, serial number 08C10452 (see "Product Review," Apr 2003 *QST*). Minimum bid: $560.

Yaesu FT-2800M 2-Meter FM Transceiver, serial number 2M010815 (see "Product Review," Jun 2003 *QST*). Minimum bid: $105.

MFJ 461 Pocket CW Reader (see "Product Review," Jun 2003 *QST*). Minimum bid: $50.

Sealed bids must be submitted by mail and must be postmarked on or before September 1, 2003. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In case of equal high bids, the nigh bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone or by mail. Once notified, confirmation from the successful bidder of intent to purchase the item must be made within two weeks. No response within this period will be interpreted as an indication of the winning bidder's refusal to complete the transaction. The next highest bidder will then have the option of purchasing the item. No other notifications will be made, and no other information will be given to anyone other than the successful bidders regarding the final price or the identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494.

FCC Declines to Grant LF Allocation, Gives Channelized Access to 5-MHz

The FCC bowed to power company concerns and declined to grant amateurs an expected sliver-band allocation at 136 kHz "at this time." But, in a compromise with government users, the Commission gave amateurs secondary access to five discrete 2.8-kHz-wide channels in the vicinity of 5 MHz instead of the 150-kHz band ARRL had requested. In its *Notice of Proposed Rule Making* a year ago, the FCC appeared inclined to go along with both ARRL requests.

The FCC did agree in its *Report and Order* (ET Docket 02-98) to elevate the Amateur Service—but not the Amateur-Satellite Service—to primary status at 2400 to 2402 MHz. The changes to Part 97 go into effect 30 days after publication in *The Federal Register*, which had not occurred as of press time.

"We are disappointed that the FCC could not see its way clear to providing even a narrow LF allocation to the Amateur Service, given earlier encouraging signs and the general trend in other countries," ARRL Chief Executive Officer David Sumner, K1ZZ, said of the FCC's decision. Several European countries already have LF allocations in the vicinity of 136 kHz.

The FCC, however, found itself more persuaded by arguments from power companies that amateur operation at 136 kHz might interfere with power line communications (PLC) used to control the power grid. "We believe that the utility companies have raised a valid concern that an allocation to the amateur service could result in the need for PLCs to modify or cease their operations to avoid causing interference to amateurs," the FCC said in the *R&O*. The FCC also cited the possibility of amateur-to-PLC interference.

"We will not jeopardize the reliability of electrical service to the public," the FCC concluded.

Conceding that its alternatives are "less attractive to amateur operators," the FCC said amateurs wishing to experiment with LF could apply for experimental licenses or operate under existing Part 15 rules on that part of the spectrum.

The granting of just five spot frequencies—5332, 5348, 5368, 5373, and 5405 kHz—at 60 meters was less of a surprise given opposition expressed last fall by the National Telecommunications and Information Administration (NTIA). The NTIA had cited a possible need for the requested band by federal government users and proposed the five specific frequencies for secondary amateur use. The FCC has granted operation on USB (2K8J3E emission) only, with a maximum effective radiated power limit of 50 W. The channels—each with a maximum permissible bandwidth of 2.8 kHz—will be available to General and higher class licensees.

"While the new amateur privileges at 5 MHz are not as flexible as we had hoped, we recognize that much has changed since the ARRL petition for rulemaking was submitted to the FCC in the summer of 2001," Sumner said. "Federal agencies with homeland security responsibilities have renewed interest in HF radiocommunication."

Sumner predicted that, over time, amateurs "will develop a record of disciplined, responsible use of the five channels in the public interest that will justify another look at these rather severe initial restrictions." The restriction to USB is aimed at maintaining interoperability with federal government users, who conceivably could require immediate access to one of the amateur secondary channels.

The Commission denied requests by the United PowerLine Council and the PowerLine Communications Association to delay action in the proceeding. Both organizations said amateur operation in the vicinity of 5 MHz could affect plans for broadband over future power line (BPL) deployment (see below).

"We are pleased that the FCC has underscored the fact that broadband PLC systems must be designed so as to not cause harmful interference to licensed, allocated services," Sumner said.

Sumner said the ARRL was pleased to see 2400-2402 MHz upgraded to primary. "The upgrade of the 2400-2402 MHz amateur allocation to primary provides a seamless primary allocation from 2390 to 2417 MHz, in addition to the secondary allocations of 2300-2310 and 2417-2450 MHz," he said.

The *Report and Order* is available on the FCC's Web site, **hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-105A1.doc**.

FCC Receives Hundreds of Comments in "Broadband over Power Line" Inquiry

The FCC's *Notice of Inquiry* (*NOI*) on the deployment of "Broadband over Power Line" (BPL) technology (ET Docket 03-104), released April 28, has been receiving hundreds of electronically filed comments. Many of the more than 500 comments filed by press time came from the amateur community. Comments are due August 6, with Reply Comments by September 5.

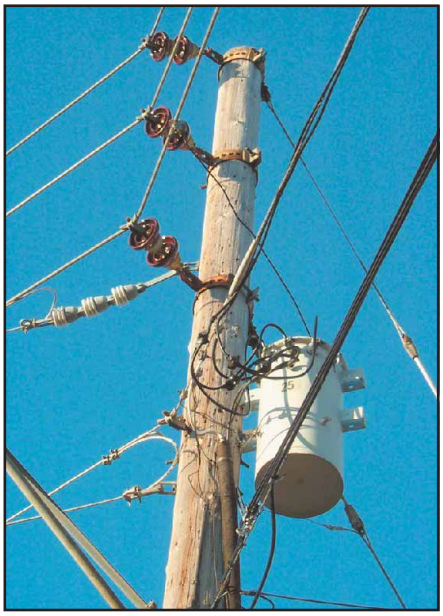
A form of power line communication (PLC), BPL has raised concerns of substantial interference to amateur HF bands because it would couple high-frequency RF to parts of the power grid and use existing power lines as the transmission medium to deliver broadband and Internet services.

The FCC has expressed unabashed enthusiasm for BPL. ARRL CEO David Sumner, K1ZZ, says Commission members have been acting more like cheerleaders than regulators. "We were disappointed in the tenor of some commissioners' statements, but we were encouraged by the fact that in the *NOI* itself the FCC did point out that licensed services—including Amateur Radio—'must be protected from harmful interference' from BPL," he said.

In the *NOI*, the FCC acknowledges the interference risk from BPL. "The multiple-carrier transmission nature of the new high-speed BPL technology could pose increased risk of harmful interference, and thus new BPL devices may need a higher degree of oversight to ensure that authorized users are not subject to interference," the FCC said. New digital power line designs use multiple carriers spread over a wide frequency range—from 2 MHz up to 80 MHz—and capable of high data rates—up to 20 MB/s.

The major interference threat to amateurs comes from so-called "access BPL," because its signals can radiate from outside power lines—possibly for great distances. The FCC also has conceded that close proximity of access BPL equipment on utility poles might affect—and be affected by—cable TV and DSL service. ARRL Laboratory Manager and RFI guru Ed Hare, W1RFI, has cautioned that BPL

Rick Lindquist, N1RL ♦ Senior News Editor ♦ n1rl@arrl.org



deployment could mean "a significant increase in noise levels" on HF.

Current FCC Part 15 rules limit the amount of RF energy that can be injected into the power lines, but, as the FCC concedes, "the new generation of high-speed BPL devices that use wide spectrum was not contemplated" when those rules were formulated. The FCC invited comments on possible changes to those rules. The FCC also seeks information on a possible access BPL standards, spectrum and bandwidth, modulation techniques and data transmission speeds. Additionally, the Commission seeks the status of BPL development and anticipated deployment in the marketplace.

The administrator of the National Telecommunications and Information Administration (NTIA) Nancy J. Victory, applauded the FCC's decision to launch its BPL inquiry. In an April 24 letter to FCC Chairman Michael Powell, the other four commissioners and to FCC Office of Engineering and Technology Chief Edmond J. Thomas, Victory said BPL "holds great promise" and urged the Commission to "move forward expeditiously with its inquiry." At the same time, Victory called on the FCC to make sure that BPL does not cause harmful interference to other services.

The ARRL Lab has prepared a comprehensive information page, "Power Line Communications (PLC) and Amateur Radio," on the ARRL Web site, **www.arrl.org/tis/info/html/plc/**. ARRL Lab staff also plan to visit sites where BPL is undergoing field testing.

FCC OPENS RECEIVER INTERFERENCE IMMUNITY INQUIRY

The FCC wants to know how it can incorporate receiver interference immunity specifications within its overall spectrum policy. In a *Notice of Inquiry* (*NOI*) in ET Docket 03-65, released March 24, the FCC seeks public comments on possible methods and means of improving receiver performance. The Commission suggests that these could include incentives, guidelines or regulatory requirements—or a combination of all three.

"From a technical standpoint, a radio receiver's susceptibility to interference is largely dependent on the interference immunity of the device, particularly with regard to its rejection of undesired radio frequency (RF) energy and signals," the FCC said in its introduction to the *NOI*. While expressing its reluctance "to implement a new regulatory regime" of mandatory receiver standards, the Commission said it believes incorporating receiver performance specifications could "promote more efficient utilization of the spectrum and create opportunities for new and additional use of radio communications."

The FCC said the *NOI* builds upon the recent work of its Spectrum Policy Task Force, which looked at ways to improve overall radio spectrum management. The ARRL commented on the Task Force report and plans to comment in the receiver interference immunity *NOI* as well.

While the *NOI* does not specifically address interference from Amateur Radio transmitters to consumer TV and radio receivers, the FCC does seek information describing the interference immunity characteristics of "receivers used in the various radio services." With respect to broadcast sets, the FCC suggests in its *NOI* that set manufacturers have been doing a pretty good job all along.

FCC Chairman Michael Powell said he'd prefer that the Commission "rely on market incentives and voluntary industry

"The Big Project" Gets Big Boost from Las Vegas Club

The ARRL Education and Technology Project ("The Big Project") got a boost this spring in the form of a $1000 check from the Las Vegas Radio Amateur Club. ARRL President Jim Haynie, W5JBP, received the donation at the club's April 8 meeting while he was in Vegas attending the National Association of Broadcasters convention.

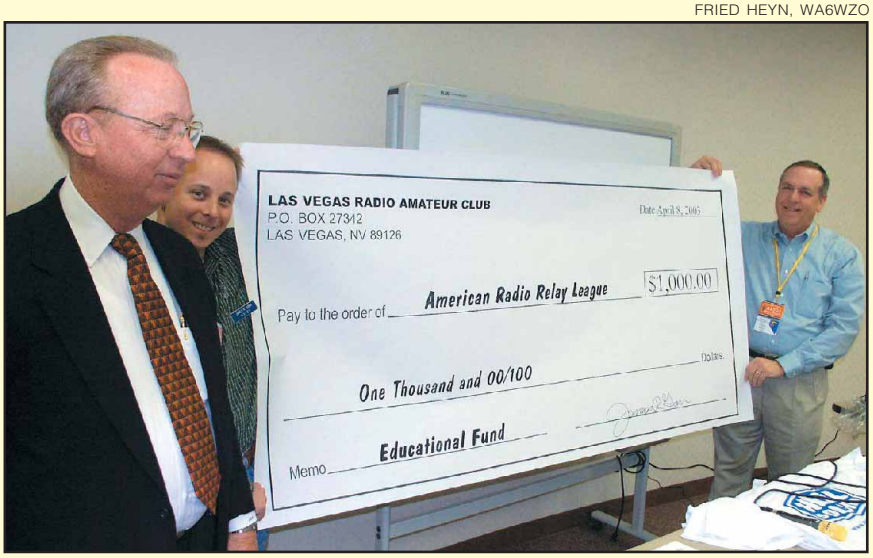
"It came as a total surprise to me," Haynie said. "It's a wonderful gift for the project."

Equally thrilled was ARRL Chief Development Officer Mary Hobart, K1MMH. She said the LVRAC contribution was most welcome and hopes the gift will spur others to similar action. "Our dedication to the future of Amateur Radio is now more important than ever before," she commented. "Next to spectrum defense, the ARRL Education and Technology Program is the most important thing we do."

Both Haynie and Hobart expressed their appreciation on behalf of the ARRL for the generous gift from the LVRAC.

The Education and Technology Program puts ham radio directly into schools, supplying equipment and Amateur Radio-related curriculum materials. To date, 50 schools have been accepted into the program. Hobart urged all interested in the future of Amateur Radio to contribute to the fund by clicking on "Donate to ARRL" on the ARRL Web site.

FRIED HEYN, WA6WZO



A big check for The Big Project: **(L-R) ARRL President Jim Haynie, W5JBP, LVRAC Treasurer Jamie Gorr, N3TOY, and LVRAC President Charlie Kunz, AA5QJ.**

FCC SEEKS ARRL ASSISTANCE IN CURBING UNLICENSED 10-METER INCURSIONS

The FCC has requested the assistance of the ARRL Amateur Auxiliary/Official Observers in monitoring for illegal operation on 10-meters. The request came April 28 letter from FCC Special Counsel Riley Hollingsworth, who says incursions on the band by apparently unlicensed operators continue to be a major enforcement headache.

"This is the first phase of a renewed investigation effort and may be thought of as 'detect, collect data, and report,'" said ARRL Field and Regulatory Correspondent Chuck Skolaut, KØBOG, who forwarded the request to OOs May 1.

Hollingsworth said the FCC wants help with a stepped-up effort through October to identify any unlicensed operation on 10 meters "whether from business entities—including trucking companies—truckers or other individuals operating domestically." Hollingsworth said the FCC does not need direction-finding but would appreciate where possible "the names and cities of the operators, and license plate numbers and state if from a vehicle."

The handful of reports from OOs as of press time suggested some truckers may be wandering into the lower end of the 10-meter CW band as they try to avoid congestion on 11 meters. One monitoring report said a driver making runs in the Midwest for a well-known package delivery service was heard on AM on 28.085. The trucker reportedly bragged about having 465 "channels" available to him between 24 and 30 MHz. Another report from Maryland indicated apparent CB-type activity on 28.115 MHz that appeared to emanate from Florida.

Skolaut said the FCC would like to concentrate on obtaining reports of this type of operation to help identify specific areas of the US where this problem is prevalent, although he concedes that not all illegal 10-meter operation originates in the US. "The FCC asks that OOs obtain as much information as possible and send their reports through normal channels to ARRL Headquarters," he said. The decision to record the transmissions of suspected interlopers was left up to individual OOs.

The FCC request was made under a longstanding agreement between ARRL and the FCC regarding the use of Amateur Radio volunteers to assist in enforcement.

Amateur Enforcement

♦ **FCC warns amateurs that unlicensed operation could cost ham ticket:** The FCC has let a trio of Idaho amateurs know that unlicensed operation outside Amateur Radio frequencies could lead to revocation of their ham tickets. FCC Special Counsel Riley Hollingsworth wrote three Boise amateurs earlier this year, citing allegations that they had transmitted without a license on 26.350, 27.420 and 27.700 MHz using SSB and SSTV. Letters went out March 17 to Dave Every, KD7QAS; John F. Hail, KD7QAW; and Tom M. Sjoberg, KD7RCS. Hollingsworth said he understands that the unlicensed operations have ceased. The three frequencies involved are below and above the Citizens Band.

An Ohio ham, Dave K. Childers, N8QGI, also heard from Hollingsworth March 18 in a case involving alleged obscene or indecent transmissions last December on 27.115 MHz—CB channel 13. Hollingsworth did not raise the issue of unlicensed operation in that case, but he did spell out the FCC's position on the transmission of obscene or indecent language. He told Childers that a tape recording would be made available to him upon request.

♦ **FCC sends *Warning Notice* following deliberate interference allegations:** The FCC also sent a *Warning Notice* March 24 to Anthony L. Basile, N3HFB, of Pennsylvania, citing "monitoring information" indicating that the licensee has been deliberately interfering with three 2-meter repeater systems in his area. FCC Special Counsel Riley Hollingsworth warned of fines and revocation proceedings and said that until the matter is resolved, the FCC would not routinely renew Basile's Advanced class license, which expires in September. A similar *Warning Notice* went out March 18 to Tech Plus licensee Erin J. Rourke, NØKCN, of North Dakota, alleging deliberate interference to a 2-meter repeater in the Fargo area.

programs to establish receiver immunity guidelines."

Comments in ET Docket 03-65 are due July 21. Reply comments are due August 18.

TENNESSEE, INDIANA AMATEUR ANTENNA BILLS SIGNED INTO LAW

Amateur Radio antenna bills in Tennessee and Indiana have been signed into law by the governors of those states. Their successful passage brings to 19 the number of states that have adopted amateur antenna laws based on the limited federal preemption known as PRB-1. Original versions of both bills had contained minimum regulatory antenna structure heights, below which localities could not regulate. Both left their respective legislatures without those provisions.

Tennessee Gov Phil Bredesen signed his state's bill—a compromise between the House and Senate versions of the legislation—on April 29. The measure became law immediately upon his signature. ARRL Tennessee State Government Liaison Ingrid Klose, KD4F, credited "a concerted effort by Tennessee hams" for the bill's passage.

At the request of Tennessee ARRL Section leadership, lawmakers eliminated language from the original Senate bill that would have incorporated a schedule of minimum regulatory height limits. Tennessee Section Manager Terry Cox, KB4KA, said proponents realized that chances of retaining the original wording were slim, given the opposition to last year's proposal, which had included a similar schedule of minimum antenna structure heights.

Indiana's bill got Gov Frank O'Bannon's signature on April 30. It becomes effective July 1. The bill that cleared the General Assembly did not contain language incorporating a 75-foot minimum regulatory antenna structure height that was written into the Senate version of the bill but not included in the version passed by the House. A House-Senate conference committee cut out the 75-foot minimum, and the Senate passed the stripped-down measure on a 39-9 roll-call vote.

The bills approved in both states prohibit localities from enacting or enforcing ordinances, resolutions or orders that do not comply with the PRB-1 limited federal preemption—distilled within the Part 97 Amateur Service rules in §97.15, "Station antenna structures." Both measures also require ordinances involving the placement, screening or height of Amateur Radio antennas based on health, safety or aesthetics to "reasonably accommodate" Amateur Radio communications and represent the minimal practicable regulation to accomplish a municipality's or county's legitimate purpose. The Indiana law also permits municipalities or counties to act to protect or preserve historical or architectural districts established under local, state or federal law.

In Brief

● **Cingular Wireless petition cites ARRL Part 15 position:** Cingular Wireless cited an ARRL position in a *Supplement to Petition for Reconsideration* filed this spring regarding the FCC's Ultra-Wideband (UWB) proceeding, ET Docket 98-153. "The fatal flaw associated with unlicensed operations has already been raised by the American Radio Relay League (ARRL)," Cingular said. Cingular was referring to the League's February 2002 *Petition for Reconsideration* in ET Docket 98-156. In that docket, the FCC proposed allowing Part 15 fixed point-to-point transmitters in the 24.05 to 24.25 GHz band to operate at field strengths of up to 2500 mV per meter, in response to a *Petition for Rule Making* from Sierra Digital Communications Inc. The ARRL has maintained that unlicensed devices that pose likely risk of interference to licensed services should be licensed. The wireless service provider asserted that under Section 301 of the Communications Act, "UWB devices require licenses," and it concluded that the FCC's authority to permit unlicensed, intentional radiators, such as UWB, "is therefore non-existent."

● **USA/IARU Region 2 radio direction-finding championships set:** The combined third USA Amateur Radio Direction Finding (ARDF) and second International Amateur Radio Union (IARU) Region 2 ARDF championships get under way near Cincinnati, Ohio, July 30. The ARDF competition will follow standard IARU rules governing international championships. Event sponsors, the OH-KY-IN Amateur Radio Society and the Cincinnati Orienteering Club, promise challenging courses on 2 meters and 80 meters. The championships are open to anyone, at any radio-orienteering skill level, from any country with an IARU society. More information is on the Region 2 ARDF Championships 2003 Web site, **www.ardfusa.com**. General information about ARDF is on the site of ARRL ARDF Coordinator Joe Moell, KØOV, **www.homingin.com**.

● **Vote on QST Cover Plaque award:** The winner of the *QST* Cover Plaque Award for March was Anthony Monteiro, AA2TX, for his article "Work OSCAR 40 with Cardboard Box Antennas!" The April winner was Dave Benson, K1SWL, for his article "The RockMite—A Simple Transceiver for 40 or 20." Congratulations, Paul and Dave! 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**.

● **W8 QSL Bureau address change:** The address for the W8 incoming QSL Bureau has changed to W8 QSL Bureau, PO Box 307, W Chester, OH 45071-0307. Jay Slough, K4ZLE, **k4zle@arrl.net**, is the new W8 QSL Bureau manager.

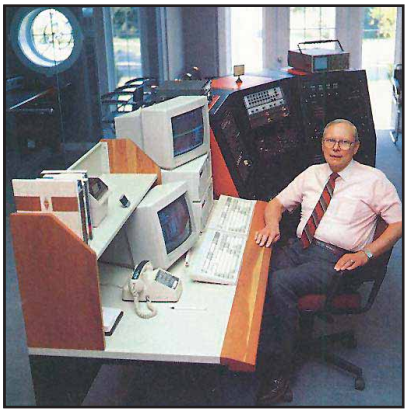
Former W1AW Chief Operator Chuck Bender, W1WPR, SK

Former W1AW staff member Charles R. "Chuck" Bender, W1WPR, of West Hartford, Connecticut, died April 17. He was 79. Bender served as an operator at Maxim Memorial Station W1AW for more than 37 years—from 1952 until his retirement in 1989—the last 17 years as chief operator.

"Chuck was a fixture at W1AW," said ARRL Chief Operating Officer Mark Wilson, K1RO. "For many League members, he was the visible, human face of ARRL Headquarters as he greeted visitors to the station during his tenure." Bender's photo also graced W1AW's QSL card for a number of years, making him probably one of the most recognized hams in the country.

Bender met his wife Arline while both were on the Headquarters staff, and they were married on Field Day in 1968. Arline Bender, WA1VMC, died last December.

A Pennsylvania native, Bender saw action during World War II and previously was W3ODU. Survivors include a daughter, Susan Lyhne. At Bender's request, no public memorial service was held.



Chuck Bender, W1WPR, sits behind the desk of the then-recently remodeled W1AW in late 1989.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee and Western Massachusetts sections. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are *not* acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. We suggest the following format:

(Place and Date)

Field & Educational Services Manager
ARRL
225 Main St
Newington, CT 06111

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

(Signature___ Call Sign___ City__ ZIP__)

Any candidate for the office of Section Manager must be a resident of the section, a licensed amateur of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters by 4 PM Eastern Time on September 5, 2003. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 1, 2003, to full members of record as of September 5, 2003 which is the closing date for nominations. Returns will be counted November 18, 2003. Section Managers elected as a result of the above procedure will take office January 1, 2004.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 2004. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the October 2003 *QST*. A Section Manager elected through the resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Field & Educational Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Rosalie White, K1STO, Field & Educational Services Manager* QST

Nominees Sought for ARRL Board of Directors

If you're a full ARRL member in one of the following five divisions and are interested in playing a part in the League's democratic organization, here's the opportunity. Nominations are open for the offices of director and vice director for the 2004-2006 term in the Central, Hudson, New England, Northwestern and Roanoke divisions.

ARRL Divisions

The policies of the League are established by 15 directors who are elected to the Board on a geographical basis to represent their divisions and constituents (see page 10 of any recent *QST* for a list of the divisions, directors and vice directors). These 15 directors serve for three-year terms, with five standing for election in each.

Just as in national or state politics, ARRL voters/members have the privilege and responsibility to decide that they like the actions of their incumbent representatives and support them actively for reelection or to decide that other representatives could do a better job, and to work for the election of those persons. Vice directors, who succeed to director in the event of a midterm vacancy and serve as director at any Board meeting the director is unable to attend, are elected at the same time.

Call for Nominations

Nominations are open for director and vice director in the five divisions mentioned above for the three-year term beginning January 1, 2004.

How to Nominate

1. *Obtain official nominating petition forms.* This package consists of a cover letter; a reprint of this election announcement; blank Official Nominating Petition forms and Candidate's Questionnaires for the offices of director and vice director; a copy of the ARRL Articles of Association and Bylaws; and an informational pamphlet for candidates.

Any full member residing in a division where there is an election may request an official nominating petition package. You don't need to be a candidate to request the forms. Your request for forms must be received by the Secretary *no later than noon Eastern Time on Friday, August 8, 2003.* There are separate forms for director and vice director nominations.

2. *Submit petition with statement of eligibility and willingness to serve.* Official forms bearing the *signatures of 10 full members of the division* and naming a full member of the division as a candidate for director or vice director, must be submitted, with a statement *signed by the candidate* attesting to his or her eligibility, willingness to run and willingness to assume the office if elected. These documents must be filed with the secretary *no later than noon Eastern Time on Friday, August 15, 2003*. Only original documents can be accepted; *no facsimiles of any kind are acceptable.* On Monday, August 18, 2003, the secretary will notify each candidate of the names and call signs of each other candidate for the same office. Candidates will then have until Friday, August 29, 2003, to submit 300-word statements and photographs, if they desire these to accompany the ballot, in accordance with instructions that will be supplied.

3. *Election Committee to certify eligibility.* In accordance with the Bylaws, an Election Committee, composed of three directors not subject to election this year, is responsible for the conduct of the election. This year, the Election Committee consists of Rick Roderick, K5UR (chair), Walt Stinson, WØCP, and Bernie Fuller, N3EFN.

The nominee must hold at least a Technician amateur license, be at least 21 years of age and have been licensed and a full member of the League for a continuous term of at least four years immediately preceding nomination. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League by the Board, or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be used for his or her private benefit. The idea behind these rules is to ensure that candidates: (1) possess a lasting interest in Amateur Radio and the League, (2) have the legal capacity to make decisions for the ARRL and (3) are free from conflicts of interest.

Balloting Will Follow

If there is only one eligible candidate for an office, he or she will be declared elected by the Election Committee. Otherwise, ballots will be sent to all full members of the League in that division who are in good standing as of September 10, 2003. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 2003 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 21, 2003. A group of nominators can name a candidate for director or vice director, or both, but there are no "slates," as such. Each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes. Because all the powers of the director are transferred to the vice director in the event of the director's death, resignation, recall, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

Absentee Ballots

All ARRL members licensed by the FCC, but temporarily residing outside the US, are eligible for full membership. Members overseas who arrange to be listed as full members in an appropriate division prior to September 10, 2003, will be able to vote this year where elections are being held. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses. Even within the US, full members temporarily living outside the ARRL division they consider home may have voting privileges by notifying the Secretary prior to September 10, 2003, giving their current *QST* address and the reason that another division is considered home. If your home is in the Central, Hudson, New England, Northwestern or Roanoke divisions but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2003, so you can receive a ballot from your home division.

The Incumbents

These people presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year:

Central—George R. Isely, W9GIG and Howard S. Huntington, K9KM

Hudson—Frank Fallon, N2FF and Stephen A. Mendelsohn, W2ML

New England—Tom Frenaye, K1KI and Mike Raisbeck, K1TWF

Northwestern—Greg Milnes, W7OZ and Jim Fenstermaker, K9JF

Roanoke—Dennis Bodson, W4PWF and Rev. Leslie Shattuck, K4NK

For the Board of Directors:

May 23, 2003

David Sumner, K1ZZ
Secretary

What's in Your Call-Out Bag?

By Wayne Yoshida, KH6WZ

As emergency communicators, we must be instantly ready to respond with full communications capability. This literally means that your communications gear must be all packed up into an easily transportable package. The Huntington Beach Radio Amateur Civil Emergency Service (RACES) group calls this a "Call-Out Bag," or "Grab-N-Go Bag."

One night, instead of the usual roll call, the net control station decided to deploy us all to the Field Operations Center, equipped for a communications emergency. We were instructed to bring our Call-Out Bag. I panicked. The contents of my Call-Out Bag were scattered all over my house with various items (like my folding J-pole) in use for "temporary-permanent" purposes, so I headed off to the rendezvous point without The Bag.

After this rather public display of unpreparedness, I decided it was time to correct this by making a dedicated Huntington Beach RACES Call-Out Bag.

A Multi-Bag Affair

First, my bag is actually three bags: two fanny packs and a mid-size soft backpack. Figure 1 shows the fanny pack, which is my "all mission bag." This bag carries all absolutely essential items needed for any assignment: a dual band handheld radio, extra battery pack, gain antenna and other accessories.

Figure 2 shows the first priority: Power. Clockwise from the top: Fast charger. This Yaesu device runs on 12 V dc, a really nice feature. As a bonus, the quick charger gets its power from the original "wall wart" that comes with the radio—a nice money saver. This means that the Yaesu quick charger can be used on either ac mains or 12 V dc, a very good emergency preparedness feature. Notice the power cable has been split and rejoined with an Anderson Powerpole. Spare battery pack. Cigarette lighter cord. The wall wart charger. A modified cigarette lighter cord Y connector. A "plain" dc cable. I recently added a small 7 Ah gel cell to the fanny sack for almost unlimited handheld talk time.

Next on the priority list is the RF and audio, shown in Figure 3. Again, from left to right: The small plastic container protects the boom mic/earpiece with PTT-only. It's cheaper and lighter, and the unit won't accidentally key with ambient noise. The earpiece is essential for high-noise environments like parades. The boom microphone frees at least one hand. A Yaesu speaker-mic, with an earphone from the junk box. This

Figure 1—An "All Mission Bag."

Figure 3—RF and Audio are the second priority. The small plastic container protects the boom mic/earpiece with PTT-only. The bundle of "stuff" at the bottom is a twin-lead J-Pole with a PVC pipe "radome" and clamp.

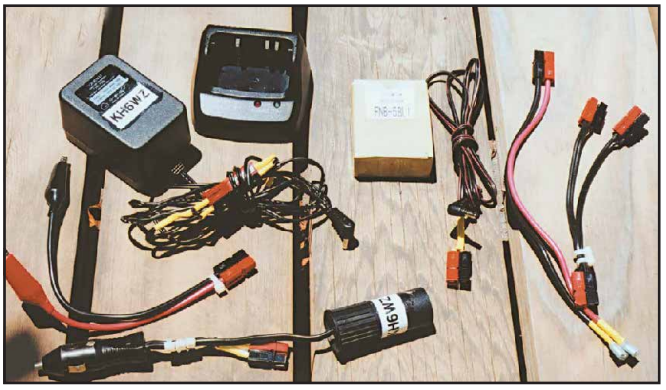


Figure 2—Power considerations.

Figure 4—Personal items—your favorite energy snacks as well as a spare car key. The yellow object at the lower left is a flashlight battery (bicycle headlamp).

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

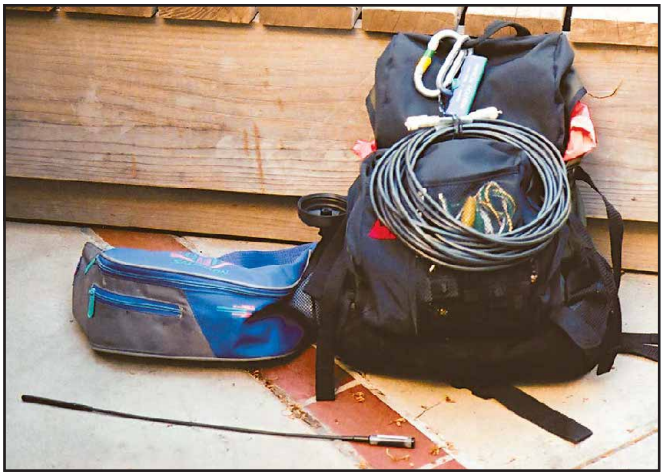


Figure 5—The second bag—the backpack—supplements the fanny pack for more extensive assignments.

Figure 6—Additional items for longer assignments.

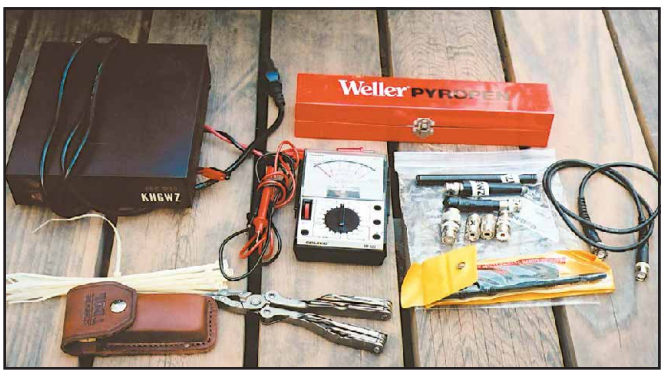


Figure 7—The tool kit.

Figure 8—Longer-duration assignments may allow for better station equipment and improved portable antennas.

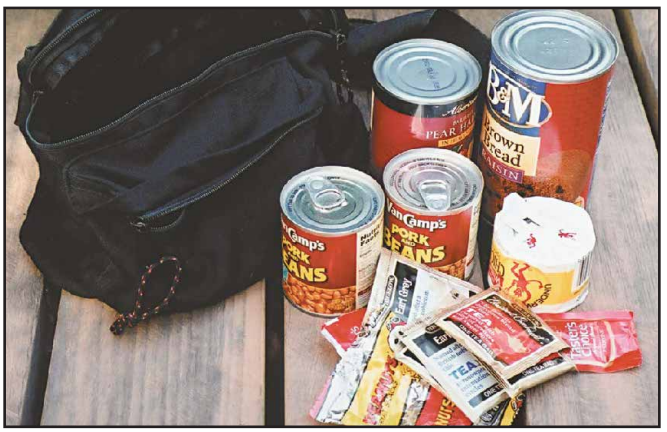


Figure 9—The "meal kit" contains nonperishable items.

Figure 10—The car trunk includes a 12 V, 17 Ah gel cell, portable antennas, RF amplifier, leather gloves. The blue stuff sack on top of the bin stores a dual-band Yagi (Arrow OSCAR antenna).

is a back-up in case the headset breaks.

The coil of cables includes: Dual band portable J-pole antenna made from TV twinlead, terminated in a PL-259. Go to **www.arrl.org/tis/info/pdf/9409061.pdf**. A 1/2 inch PVC "radome," cut up into foot-long or so pieces, makes the antenna compact enough to fit into the fanny sack. Couplers are used to put the pipe back together, and the antenna can now be extended. The J-pole can be hand held or clamped to a support.

A length of RG-58 with a PL-259 on one end and a BNC male on the other. This can be connected to a mobile or base station antenna cable via a PL-258 (double-female, or barrel adapter). A cable with an SMA on one end, and BNC female on the other. The film can holds an SMA-to-BNC and a BNC-to-SO-239 adapter.

The black object on the bottom left is an NMO-to-SO-239 adapter, to adapt "M-type" antennas to the NMO mounts on my car.

Finally, personal items are shown in Figure 4. Yes, all this gear fits into the fanny pack. I got the pack years ago from the 10 dollar bin at a ski shop just after a season ended (it came with a ski bag).

The Second Bag

The second bag—the backpack—includes the entire fanny

pack plus additional items for more extensive assignments. See Figure 5. Here, some of the priorities change since the main things are already covered in the fanny sack.

Non-RACES clothing includes T-shirt, sweat pants, hooded sweatshirt, hat and poncho. I recently added a pair of "giant pants" from the thrift store to wear over my street clothes. This idea came about after having to change a blown heater hose on the freeway in my "Sunday clothes."

See Figure 6. Additional items for longer assignments include: disposable rubber gloves, waterless hand cleaner, antiseptic, spare eyeglasses, radio-operating manual, guidebook, copy of Amateur Radio license, a portable water heater, if ac is present, for hot beverages.

The tool kit, Figure 7, has been evolving over the years from previous DXpeditioning experiences. Replacing a blown or broken fuse, checking for correct ac voltages, checking continuity in cables, verifying polarity, and checking for shorts or open circuits are the most common field checks to do. Anything beyond this is not going to be fixable in the field. A back-up radio is the best alternative. Highlights in the tool section include the cordless butane-powered soldering iron/torch, the $5 VOM from Surplus Sales of Nebraska, the Schrade multi-tool. An assortment of handheld antennas and coax adapters is also included.

Figure 8 is the antenna and power section. A "universal power siphon cable" is made with a pair of number 12 wires with crocodile clips on one end and barrier strips for negative and positive on the other. The clips can be hooked to a convenient vehicular battery. A 6 m/2 m/70 cm dipole and coax is included for possible "base station" operation. Bungee cords and/or nylon webbing (the blue coil) can be used to hold the dipole up. Nylon webbing can also be used as a tow "rope." It's sold at camping/climbing stores.

The Third Bag

The third and final bag is the "meal kit," containing various canned or dried foods from the grocery store. See Figure 9. Here's a hint: Each time you go grocery shopping, you should get some "emergency food." Don't forget to bring plenty of water and drinks.

Finally, in the car trunk, Figure 10, I have an "emergency starter battery" sold at many hardware stores. Inside the booster case is a 12 V, 17 Ah gel cell.

Three lengths of scrap 1 1/2-inch PVC pipe with couplings can be plugged together to make an antenna mast; the wire antennas or a mobile antenna can be hose-clamped together to a suitable anchor such as a stair rail or a fence post. A woodworker's mini bar clamp can be used to clamp the mast or the antenna to a suitable mounting point.

Remember that this article is only a guideline and my equipment continues to change and evolve.

As emergency communicators, we all need to be fully equipped and ready to go at a moment's notice.

All photos by the author.

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
April 2003

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.

710 N2CCN
515 N9TVT
511 K6SOJ
485 W2MTA
480 W7TVA
450 N2LTC
420 N9VE
405 AD5KE
355 W2LC
340 KA2ZNZ
263 KD1SM K9JPS
255 KD1LE
244 KB5ILY
240 N7TOD AG9G
230 KB2SNP
215 KB2CCD
212 NN2H
210 KB2KOJ
205 W5OMG
204 KAØDBK
198 W5ZX
195 KB2ETO
194 AD4BL W6JPH
193 N2HQL
189 N6NKO
180 W7ARC
179 W4AUN
175 WI2G
170 WB2KNS
168 K6YR
165 K4RLD
163 AC5VN
160 N5NAV KK3F KB2RTZ KG4CHW
159 WNØY
156 W5JYJ
155 W6DOB
152 N3WAV
150 NN7H N1LKJ
145 W3YVQ
140 KG4FXG N2IKR
138 KG9B
136 W2MTO
135 N8IO
134 W5ARS
133 N1IST W9RCW
130 WB5ZED W5IM W4EAT WA4DOX N3RB
128 WA1QAA
126 K4YVX WB2UVB
125 KC5OZT
WJ2F W2CC
120 AC5XK WB1CHU AB4XK W4ZJY W6IVV K4BEH K4IWW W3BBQ WX4J K4FQU KA4FZI KD4GR W1GMF KW1U WA9ZTY W6QZ W8YS
119 N4TAB
118 KB1GID
117 KBØDTI KB8GFC
115 KA2YKN KB2VRO
113 KB4KA
112 W2GUT
110 K5MC N2AKZ W5GKH KA5KLU K5UPN N7YSS K2BCL N3SW KF5A KK5GY WA5OUV W7GB KL5T AF4NS KE4JHJ KG4OQA KØIBS K8AE N8FPN K2UL AG4DL
NR2F WA2YL KC4ZHF K9LGU W7QM W7ZIW N8NMA
109 WA1JVV
108 K2ABX
107 N4VVX
106 KB9KEG
105 WX4H
104 WB2LEZ
103 W5PY N5OUJ
100 K5IQZ WB2GTG KB2KLH AF4QZ KA4UIV WA8SSI ABØWR WØWWR KB5TCH KD5SWI K4SCL W1QU W1ALE WD9F W7GHT K7GXZ KEØXQ KG4OTL K3SS AA8SN K8GA N8ZJU KC2EOT WB2QIX N9MN WA4EIC WA9VND N1IQI W9CBE W9YCV W7LG WW8D
99 W7TC WD4LSS
98 KJ7SI
97 AK6DV
96 WB5NIC WØHXB KC3Y
95 W4DLZ K5DPG N5KWB N8OD
93 KD5ITA AL7N KA2BCE
92 NF5B KBØYTM
91 WB6UZX W4CC N2OPJ
90 KE2SX N8DD KK7TN W4CKS W4PIM W5RXU K4WKT K4FUM WB4GGS K3CN K2VX N3WK AA3GV WA8RCR WX8Y KG2D WA2GUP WB2IJH AA2SV WA2CUW W8IM K1JPG KF4WIJ WB4PAM NG1A K6IUI WD8DHC KF6OIF
89 W4FAL
86 W1JTH AF2K
84 KD4EFM N3KB W4DGH W4NTI WB4BIK
83 K5ER WA2YOW N1TPU
82 AA4BN
80 WAØLYK KL7ORNE, AA4YW KE3FL K8KV KE4UOF N2GJ KL7OR
79 N3OR KC2IYC
78 KB8CVH
77 W7VSE K4KAM K8SH
75 KC6SKK N8FXH KB8NDS
74 WB7VYH
73 KB5PGY N7LV WB4UHC
70 N8IBR KB7US K1TSV K1FP W4WXA KAØYEB KB1HDO W7DPW KC6NBI

The following stations qualified for PSHR points in previous months, but were not recognized in this column: (Mar) W3YVQ 135, W7NEO 80, KL7OR 80. (Feb) KL7OR 70. (Jan) KL7OR 80.

Section Traffic Manager Reports
April 2003

The following ARRL Section Traffic Managers reported: AK, AR, CO, EMA, EPA, EWA, GA, ID, IL, IN, KS, KY, LA, MDC, ME, MI, NC, NFL, NH, NLI, NNJ, NV, OH, OK, OR, ORG, SB, SC, SD, SFL, SJV, SNJ, STX, TN, VA, VT, WI, WCF, WMA, WNY, WPA, WWA, WY.

Section Emergency Coordinator Reports
April 2003

The following ARRL Section Emergency Coordinators reported: AK, AR, AZ, EWA, IL, IN, KS, KY, LA, MDC, MN, NE, NC, NV, SC, SFL, SNJ, SV, TN, WNY, WMA, WV.

Brass Pounders League
April 2003

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*
W1GMF	0	927	1497	24	2448
KK3F	37	1166	1126	0	2329
W4ZJY	0	973	934	0	1907
N2LTC	0	593	596	47	1236
WB5ZED	44	474	518	22	1058
KW1U	0	539	526	12	1051
K9JPS	0	487	35	482	1004
WX4H	0	425	527	0	952
N1IQI	0	300	526	0	826
W4EAT	0	371	353	0	724
K7BDU	6	330	294	3	633
K2BCL	13	290	262	48	613
KA5KLU	0	257	278	39	574
K4FQU	198	101	268	4	571
W6DOB	0	215	331	21	567
N8IO	104	146	265	12	529
K5UPN	16	257	245	3	521
N9VE	0	244	42	228	514

BPL for 100 or more originations plus deliveries: N5IKN 328, WB1CHU 273, K9GU 164, W9RCW 152, W9IHW 147. (Mar) WX4H 1120.

Profiles of VHFers

In addition to the VHF propagation beacons that tell us the band conditions, we all know certain stations on certain bands that are live beacons—stations among the first we hear during an opening and the last to disappear. There is always a lot of curiosity about what other people have for stations and why they do as well as they do. This month I will feature three such stations, each one a beacon in its own way. Their approaches are both similar and quite different. All three live in relatively quiet locations with clear horizons and make liberal use of transverters; one station is almost completely homebrew, another mixes some homebrew and commercial elements and the third is almost completely commercial but has a complex homebrew control system.

K4QI—Russ Holshouser, Jr

K4QI (ex-K4QIF) has been a fixture from various locations in Virginia and North Carolina for many years, especially on 432 and 1296 MHz. Part of his success is his location in FM06jb on top of a hill at 240 meters ASL in Efland, North Carolina, the third highest point in Orange county. His antennas are clear of both trees and horizon clutter. The closest above-ground power lines are over 3/4 mile away, so noise is almost nonexistent. Most of the equipment is of Russ' homebrew design with the exception of a pair of Drake TR7 transceivers, which supply 1 mW of IF drive for up converters. That loud 1296 signal comes from a 30-year-old six-tube 7289 water-cooled power amplifier and a receive converter of similar age.

K4QI

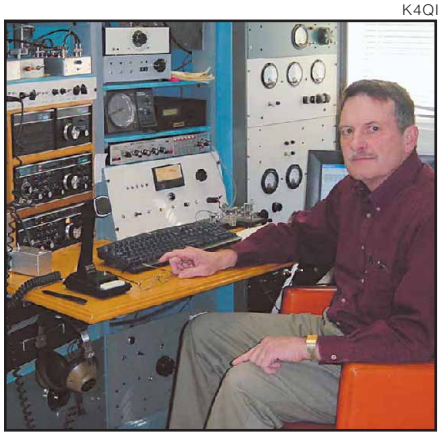


Figure 1—K4QI at his mostly homebrew station.

This Month

July 6	Good EME conditions*
July 19-20	CQ World Wide VHF Contest—Saturday 1800 UTC until Sunday 2100 UTC
July 24-27	Central States VHF Society 2003 Conference—Tulsa, Oklahoma

*Moon data from W5LUU

K4QI

Figure 2—Multiple stacked Yagis and loopers on a 28-meter crank-up tower at K4QI. The big Yagi below the stacks is a side-mounted 6-meter M² 6M7JHV.

K4QI

Figure 3—The K4QI 7.5-meter homebrew dish on a polar mount.

The inside of the station shown in Figure 1 is built around three racks with a 6-meter transceiver, 8877 final and all the receive converters in the left rack. One TR7 is the 6-meter IF, and the other is switched to drive the other four bands (144, 222, 432 and 1296 MHz). The center rack contains the 222-MHz power amplifier, transmit converters, the band switching system, rotator control for a TIC ring rotator, Yaesu G-800 and the polar-axis drive for the 1296-MHz EME antenna. The right-hand rack contains an 8877 amplifier for 144 MHz, an 8938 amplifier for 432 MHz and 600 W on 1296 MHz.

Figure 2 shows the 28-meter US Tower crank-up tower with many antennas: four 4-meter homebrew K1FO Yagis for 144 MHz, a 4-meter homebrew K1FO Yagi for 222 MHz, four modified KLM Yagis for 432 MHz, four 45-element loop Yagis for 1296 MHz, a three-element HB Yagi for 50 MHz and a side mounted seven-element M² 6M7JHV Yagi for 50 MHz. All of the preamplifiers for the tropo antennas are mounted at the base of the tower, and 2.2-cm Heliax runs up the tower. Figure 3 shows the EME antenna, a 7.5-meter homebrew dish on a polar mount for 432 and 1296 MHz.

AA2UK—Bill Lentz

AA2UK is a much more recent convert to serious VHF operating. To quote him, *"How did I get into this mess? I had an 11-element Cushcraft antenna on an eight-meter tripod and a Kenwood TR-9130 in 1995 and used to listen to all of my neighbors work stuff I couldn't even hear! I figured that there had to be room for another big gun on the East Coast. After my first contest in 1995, where I only ran four bands 6, 2, 432 and 1296 and got over 100 k, I got the attention of the Packrats, was invited in and under the tutelage of W3RJW proceeded to get on 10 bands all within six months. I had to move in late 1998, so the old station had to be disassembled, but I loved this hobby and found this site in 2000—an abandoned FM radio station. I cut a deal and there I was back into this crazy hobby."*

The AA2UK station seen in Figure 4 is one of the largest you are likely to see and

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AA2UK

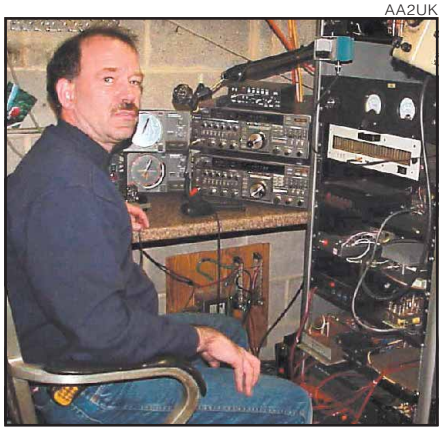


Figure 4—AA2UK at his 6-meter to daylight station.

AA2UK

Figure 5—The top of the 95-meter tower at AA2UK with the stacked arrays described in the text.

KMØT

Figure 6—KMØT at his fine multiband station in EM13.

produces one of the most dominant microwave signals in the country. The site is buried in the Jersey Pine Barrens in FM29qo and has only one neighbor less than 3 km away. The station is set up around a pair of FT-736Rs with DEM transverters for 903 and 1296 and DB6NT transverters for all the other microwave bands up to 24 GHz. For the microwave bands, a single switch drives a homebrew switching matrix. TE Systems bricks drive legal-limit amplifiers on 6 meters (3CX1000), 2 meters and 222 MHz (8877s). On 432 MHz is an old K2RIW (2×4CX250Bs); 903 and 1296 MHz are 2×7289s modified for water-cooling; 2304 MHz has a solid-state Spectarian 200 W amplifier and at 3456 MHz is a Toshiba 55-W solid-state amplifier. From 5.7 GHz up, all of the equipment including the HEMPT preamp is mounted behind the dish, even the power supplies, which are supplied by a 120-V ac conduit running up the tower. There are 5 W amplifiers for 5.7 and 10 GHz and 2 W on 24 GHz.

The most striking feature of the AA2UK station is a large guyed 95-meter tower (Figure 5). There is a 6, 2 meter and 440 MHz FM array at the top and a six-dipole array for 2-meter FM at 88 meters. The next set of Yagis is an M^2 18XXX at 65 meters for 2 meters, a KLM 22LBX for 222 MHz at 63 meters and an M^2 seven-element JHV for 6 meters at 61 meters. Further down the tower is a 222 MHz vertical on a 1-m side arm at 57 meters, and a 1-m side arm at 52 meters with the tower-mounted 5.7 and 10-GHz equipment. The last stack is a 13-element M^2 for 432 MHz at 40 meters, a 903 MHz loop Yagi above that; the top of that section has 55-element 1296-MHz loop Yagi at 43 meters and below that Blowtorch super loop Yagis for 2.3 and 3.4 GHz. The feed lines are all 2.2-cm Heliax with 4.1-cm Heliax planned for 1.2 and 2.3 GHz.

KMØT—Mike King

The current VHF+ iteration of the KMØT station dates back only to 1999. Mike's station is interesting because it shows what can be done from scratch in a very short time and from a location in western Iowa (EN13vb) that is a relatively long distance from any population centers. During this time, Mike has worked 67 countries on 6 meters, the contiguous 48 states on 2 meters and finished well up in the top ten nationally in the VHF contests. Mike says, "I give the credit to the Elmers in the area and from the Northern Lights Radio Society [in the Twin Cities]. Without feedback and encouragement from the members of the NLRS via their e-mail reflector, those who had 'been there and done that,' things would have been much tougher to put together. It's very important to be involved with a local weak-signal VHF club if possible." Additional details can be found at Mike's Web site **www.qsl.net/km0t/**.

To maximize performance and DX capability, the station is designed around high-performance IF radios and transverters. Homebrew IF switches driving a switching matrix controller allow him to take advantage of contest-grade IF radios to run multiple transverters with a single microphone, CW paddle, PTT switch and headphones. The station is built around three IF radios, a DEM transverter for 222 MHz, SSB Electronic transverters for all other bands through 23 cm, and DB6NT transverters for 13 to 3 cm (Figure 6). One FT-1000MP controls 144 and 432 MHz, another FT-1000MP controls 50 and 222 MHz, and an IC-756PROII/SSB 2-meter transverter feeds transverters for the microwave bands through 3 cm. Transverters for 13 cm and above are tower-mounted in weatherproof enclosures associated with their antennas.

Mike really likes the ICOM's spectrum display, which has been invaluable in finding those high-band stations that are just off frequency. Power is derived from a variety of solid-state brick amplifiers ranging from 350 W on 6 and 2 meters to 100 W on 23 cm. The higher microwave bands each have 15-30 W amplifiers with the exception of 5.7 GHz, where the amplifier is in progress.

Antennas for 50 through 3546 MHz are mounted on a 55-foot HDX-555 crank-up tower. They are arrayed on a four-meter chromalloy mast in a combination of relatively small interlaced Yagis to minimize interaction and an H frame with loop Yagis for 902 MHz and up (Figure 7). The bottom four bands have a stack of M^2 Yagis: a 6M5 on 6 meters, two vertically stacked 2-meter 2M9SSBs, a 5-λ 222-MHz Yagi and a 9 λ 432-MHz Yagi. Pairs of vertically stacked long-boom loop Yagis/Blowtorches are used from 902 MHz through 3.4 GHz. The stack is turned accurately by an M^2 Orion OR-2800P and fed with either Times LMR-600 or LMR-1200. The microwave equipment is mounted on a

KMØT

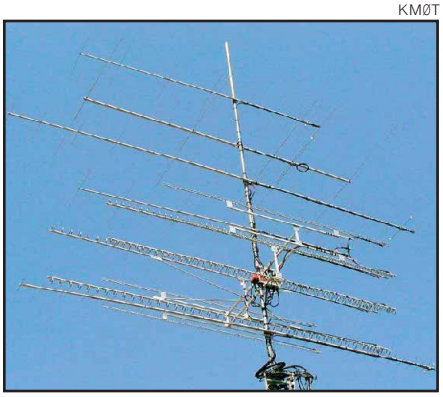


Figure 7—Stacked arrays at KMØT described in the text on a 17-meter crank-up tower.

KMØT

Figure 8—Microwave antennas and FM Yagis on a 13-meter crank-up mast at KMØT.

13-meter crank-up mast with a OR-2800P azimuth rotator at the base (Figure 8). At the top, two 60-cm dishes are arrayed on a cross-boom mounted on a Yaesu elevation rotor, a very useful feature. Both dishes have their transverters and amplifiers mounted in weatherproof enclosures on the backsides. The 24-GHz station is in progress.

With population as sparse as it is in his area, Mike has enlisted the aid of a (relatively) local rover, Gene Mitchell, NØDQS. With the flat local terrain, this has generated a source of grids and activity for anyone living near them. Mike has also built some extra portable microwave equipment in hopes of generating some interest among the local FM repeater users.

ON THE BANDS

April marks the nominal beginning of the 6-meter E_s season and a peak in north/south propagation by a variety of propagation modes, F2, TE, E_s and complex E_s links to both TE and F2. The sunspot cycle continues to decline with flux numbers in April beginning at 160 declining to 99 on the 17th and then rising slowly to 155 by month's end. Even so, April was a good month for enhanced propagation of various types. My thanks to N3DB, W3XO/5, W4PRZ, K5IX, K5LLL, W5OZI, K5SW, KA5TJIJ, W5UWB, K5VH, N6PEQ, K6QXY, N6RA, K7JA, WA7JTM, K7ON, KE8FD, K9MU, NØJK, WØRT, XE2ED, G4UPS, VK3OT and the 50/144 Propagation Loggers and DX Summit (OH2BUA) for the following.

Tropospheric Ducting

Oh to be in the South in April! The weather often beautiful, and everywhere on the Gulf coast and either side of it, the tropo is often splendid, and 2003 was no different. On April 13, Tom, K5VH (EM00xe), came within less than 20 km of the 2.3 and 3.4-GHz North American distance records contacting Ron, WA8TTM (EL98pj), at 1593 km.

Festivities began on April 3 with Sam, K5SW (EM25), working Georgia, Alabama, eastern Tennessee, Kentucky and points in between on 2 meters. Sam also says that he could hear stations out to western Texas in the duct off the back of his beam. The opening extended to the north on the same morning, with Rick, WØRT (EM27), working W4EUH (EM73) and W4HP (EM75) on 2 meters and 70 cm. Gary, KE8FD/4 (EM84ku), reports a 1660-km 2-meter contact with W5III (DM91sj) and numerous contacts out to EM00, EM02 and EL09 on the third and 1262 km contacts with W5LUA on 2 m through 13 cm. The 23 and 13-cm contacts may be the first ever between South Carolina and Texas on those bands. Numerous contacts are reported between western Texas and Florida on the 13th and 14th. Ron, K5LLL (EM10kf), came within 3 km of the 13-cm distance record with KØVXM (EL98pj) on the 13th. The duct apparently extended westward as Bill, W3XO/5 (EM00), worked NN5DX (DM80) and KB5UOT (DM84). Conditions were also enhanced along the Gulf on the 17th to the 19th. Particularly on the 19th, Paul, KA5TJI (EM20), worked DM42, 43 and 44 and Ken, AC4TO, worked both into southern Florida and W5MRB in EM35. W4HP (EM75) reached EM40, 50 and 51 at that time. Finally some of the goodies reached the East Coast, but far inland, as K4QI (FM06) worked AL1VE (FN54) around 0100Z on April 20.

Aurora

Although there were several periods of minor storming, the A index never exceeded 27. A few 6-meter AU contacts were reported on the propagation reflectors, but the only US 2-meter contacts noted were between KØAWU (EN37) and VE3KRP (EN58) and KAØPQW (EN33).

6 Meter F2/E_s/TE

Even with the declining sunspot numbers, F2 and TE propagation was quite good in April especially in the South and Southwest regions. Propagation to the south and across the equator was enhanced at times by an active sun and high K values (≈4 or occasionally more). One such event generated good conditions from Texas and California into the Pacific and 5W1SA and numerous VK/ZLs on April 3, 5 and again on the 18th. VK4FNQ, VK4CXQ, VK2ZXC, VK2ANZ, ZL2AGI, ZL2TPY, ZL3TY, KH6SX, NH7RO and K6MIO/KH6 are among those reported worked by W5UWB (EL17), N6RA (CM87), N7CW (DM12), N6PEQ (DM13) K6QXY (CM88), WA7JTM (DM33) and K7JA (DM03). The southern US had a very strong season into central and southern South America with contacts being reported on at least 11 days with ZP6CW and numerous LU, CX, CE and PY stations either by TE or some TE/F2 or TE/E_s link. Jon, NØJK notes spots in Europe for EM1U in Antarctica. Who will be the first "W" to work him?

Last year was perhaps the worst E_s season here in the US that I remember in the 20 years I have been on the band. This year started out much better and featured E_s essentially every day once the season got underway on April 19. Prior to that date, there were a number of openings to the Caribbean, Central America and the north coast of South America, which probably involved some combination of F2 and E_s propagation. I did not note any instances of double hop E_s to the west but this early in the season most of the E_s tends to be on a north/south line. DX Summit displayed much activity from Europe, almost all of which looked to be single-hop E_s.

VK9XI

Figure 9—The exotic QTH of VK9XI with a five-element 6-meter beam overlooking the ocean.

The DXpedition of the month was Christmas Island, VK9XI, activated by well known DXer, Steve, VK3OT, between April 7 and 21. Operating from a beautiful location overlooking the water (see Figure 9) with a TS-690 and a five-element M^2 Yagi, Steve made 1203 contacts in 32 countries in spite of the declining sunspots. His log indicates contacts as far eastward as F8OP and EH7KW and numerous lucky stations in southern and Eastern Europe.

HERE AND THERE

CQ World Wide VHF Contest

This 6 and 2-meter affair is open to stations anywhere in the world. The contest runs from 1800Z July 19 to 2100Z July 20. Details, rules and log sheets can be found in the June issue of *CQ* magazine or at **www.cq-amateur-radio.com/World%20Wide%20VHF%20Contest.html**.

Central States VHF Society 2003 Conference

This largest of the annual VHF Conferences will be held in Tulsa, Oklahoma, from July 24-27. This is a good chance to meet VHF-minded hams from all over the country and discuss all of the latest technical and operating developments. More details are located at **members.cox.net/csvhfs/**.

More Homebrew VHF+ Antennas

Compliments of Ed, K3DNE, on the VHF Contesting Reflector, here are two other links to simple homebrew antennas that can get you on the VHF bands: **commfaculty.fullerton.edu/woverbeck/quagi.htm**; and **AC3L.com/antenna.htm**.

DC to Daylight—*Part 1*

You may have heard the term "DC to Daylight" used to describe wideband operating, or to emphasize microwave operation. Of course, we are not meant to take idioms literally, but what about those frequencies in the upper regions? We call all frequencies from 30 GHz to 300 GHz the *EHF band*, for Extremely High Frequency. These are also called millimeter waves because their wavelength is between 1 cm and 1 mm. Successful operation on these frequencies represents one of the exciting frontiers in ham radio. Only a handful of hams have completed contacts in the most difficult bands, but many more are building equipment and making contacts at 47 GHz and 80 GHz each year.

Atmosphere

The atmosphere consists of various gases, two of which are significant absorbers of EHF signals—water vapor and oxygen. Figure 1 is a graph of the absorption curves over the microwave spectrum up to 260 GHz. The vertical axis shows a scale in decibels per kilometer. You must add this figure to the normal R^2 (distance) losses that occur because signals spread out as they travel. These absorption losses can become a very dominant part of the system losses when you are trying to establish a communication link.

For example, consider a situation where your communication link has 50 dB of signal-to-noise ratio (S/N) at a distance of 1 km. In our example, we are operating at 145 GHz where there is a 1 dB/km atmospheric attenuation. Doubling the distance to 2 km adds 6 dB in R^2 losses and 1 dB in atmospheric loss, yielding 7 more decibels of system loss, or dropping to 43 dB of S/N. But, increasing from 1 km to 100 km there are an additional 40 dB of R^2 loss and 99 dB of atmospheric loss, yielding a link S/N of –89 dB (no chance of signal reception). Without the atmospheric losses—for instance, if we were operating at 10 GHz where the total atmospheric loss might be 2 dB—the link would be a strong 8 dB of S/N at 100 km, which is enough for easy CW or even an SSB conversation.

Note that the right hand side of this chart represents frequencies that are less than 1/1000 the frequency of light! The "sub-millimeter wave" region between 300 GHz and infrared is largely unexplored—so there is a huge gap between the highest frequencies that hams (or anyone) use in the normal RF sense and infrared laser communications at about 450 THz (one terahertz is 1000 GHz).

Water Vapor

The electrically polarized nature of the H_2O molecule in its gaseous form causes an overall trend of increasing absorption with frequency. For all practical purposes, the atmosphere becomes opaque in the sub-millimeter wavelengths, and becomes very transparent again in the infrared and visible wavelengths. Figure 1 shows the major absorbers in the EHF area. The absorption peaks at 22.2 and 183.31 GHz correspond to specific mechanical resonances of the H_2O molecule as its electric field interacts with RF energy. Between the peaks, a low-loss, or transmission, "window" appears.

In practical terms, water vapor is the only major contribution to absorption on the 245 GHz band, and significant DX could be achieved when the air is extremely dry. During normal summer conditions, however, attenuation exceeding 10 dB per km could be a difficult obstacle for even a "minimum" contact over a few kilometers.

Figure 1 shows the Amateur Radio bands overlaid upon the atmospheric absorption chart. In this chart we see the effect of lowering the amount of atmospheric water to extremely low levels. The solid curve would be typical for a cool, dry spring or autumn day in New England (40% relative humidity, 65ºF). Clearly, the best DX is possible only during very dry weather—the drier the better. In temperate climates, the very lowest atmospheric water content is achieved in the winter. The dashed line represents *extremely* dry winter conditions—such as might occur at 15% relative humidity around 10ºF. Typical dry days in the winter will fall about halfway between the two lines. This chart is drawn from standard literature [Crane 1981, ARRL 1990, Ulaby 1981], and it is quite adequate for determining attenuation on the EHF bands—except for the 120 GHz band.

Oxygen

The oxygen molecule O_2 has no electrical dipole moment of consequence, but does have a magnetic moment. As the molecule changes between various quantum states, these magnetic moments change, giving rise to specific energy absorption. There are many such "hyperfine" moments that result in a family of over 30 absorption frequencies around 60 GHz (53 to 65 GHz) and a single absorption line at 118.750343 GHz. At high altitudes (low pressure and temperature) the molecular interactions are minimal, and the individual hyperfine frequencies can be resolved, but at altitudes where amateurs operate, normal atmospheric pressure induces smearing of these frequencies, resulting in a very broad peak centered at 60 GHz. The 118 GHz line, however, is a single, distinct line.

Dropping in frequency from the 200 GHz window, the next available window is between the 118 GHz oxygen line and the 183 GHz water vapor line (see Figure 1). The 145 GHz amateur band is situated in this window. We should con-

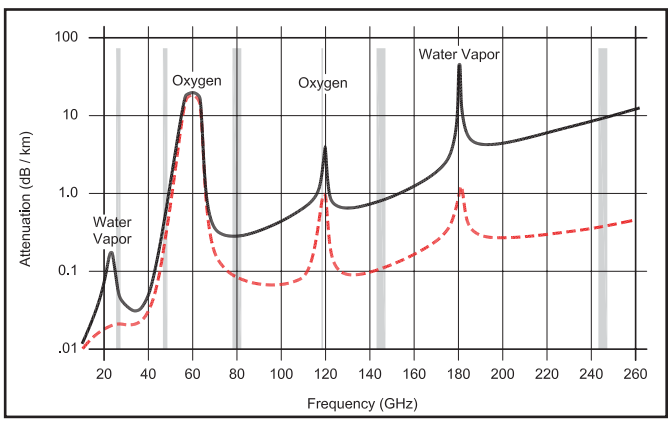


Figure 1—Atmospheric absorption at EHF. The solid line assumes water vapor of 7.5 grams per cubic meter, while the dashed line presents 0.25 grams. The EHF radio amateur bands (and 24 GHz) are shown in gray.

Tom Williams, WA1MBA ♦ wa1mba@arrl.org

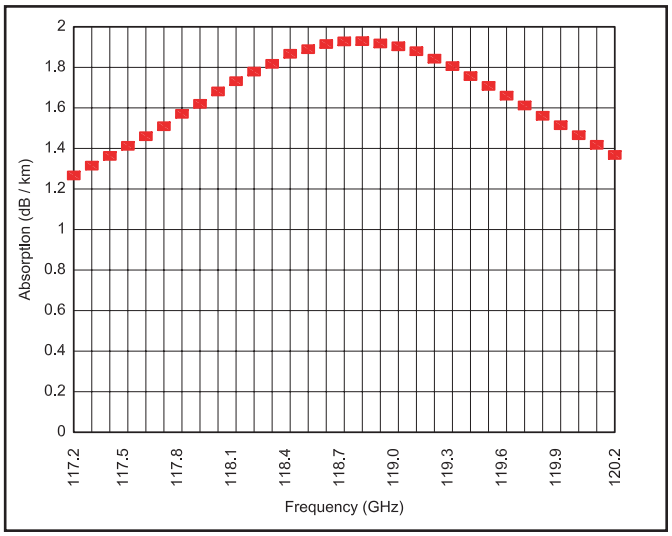


Figure 2—This figure details the 118 GHz oxygen line for reasonably dry conditions of 7.5 grams per cubic meter of water vapor. The 120 GHz band is at the far right part of this chart (119.980 to 120.020 GHz).

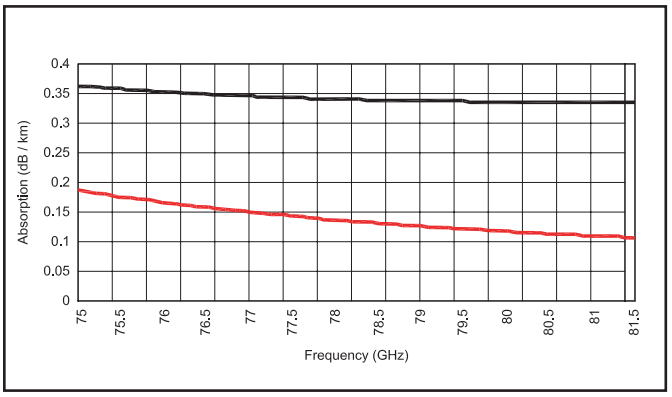


Figure 3—The absorption chart for the 80 GHz amateur band region of the EHF spectrum. The top line represents dry conditions (7.5 g/m^3), while the bottom represents extremely dry (0.25 g/m^3) conditions.

The EHF Amateur Bands

The EHF Amateur Radio bands are 47.0 to 47.2, 75.5 to 81.0,* 119.98 to 120.02, 142 to 149 GHz, and 241 to 250 GHz. All frequencies above 300 GHz constitute another single amateur band that includes laser communications.

*The US allocation for the 80 GHz band was changed in 1998 to allow for automotive collision avoidance radar in the 76 to 77 GHz region. Amateurs now have primary status at 75.5 to 76 GHz, but 76 to 77 GHz is suspended; therefore there is no amateur operation 76 to 77 GHz. 77 to 77.5 GHz is secondary, 77.5 to 78 GHz primary for amateur (this represents an upgrade), and 78 to 81 GHz secondary. See FCC report FCC98150 (**www.fcc.gov/Bureaus/Engineering_Technology/Orders/1998/fcc98150.txt**).

sider ourselves lucky to have a wide amateur band in this region. Attenuation is still dominated by water vapor, so that in extremely dry conditions this band is only slightly better for propagation than 245 GHz, but in more typical conditions it can be significantly better than 245.

Looking at Figure 1, it is easy to believe that 120 GHz would be the most difficult upper EHF amateur band. While the upper two bands are relatively free of absorption from oxygen, in order to achieve DX on the 120 GHz band, one has to contend with the 118 GHz oxygen line nearby as well as water vapor absorption. Not much is published about this oxygen line, primarily because the 60 GHz lines are so interesting, and also because much of the original work on oxygen absorption was performed when it was difficult to measure frequencies this high [Van Vleck 1947]. Figure 2 is a plot of the shape of this line at standard pressure and temperature as derived from equations in a computer program [Liebe 86]. Note that in the band of interest, the total path loss is only 1.5 dB per km for average conditions and falls to under 1.2 dB in dry conditions—only slightly worse than 145 GHz.

Because of recent interest in the 80 GHz band, we should take a closer look at attenuation there. As can be seen in Figure 3, the difference between dry and extremely dry conditions can, at say 100 km (the range of the world record), make a difference of over 20 dB (35 dB for dry and 15 dB for extremely dry). Twenty decibels is a huge difference in signal levels.

Propagation

Situations where microwave DX is generally enhanced may also be useful to EHF. Extending line-of-sight by increasing altitude is common enough. Remember that the two enemies are water vapor and oxygen. Because great DX will always be hampered by water vapor, some European amateurs have taken advantage of the drier air when working from high mountains. Also, at higher altitudes, the atmosphere is less dense, and so there is less oxygen, too, enough to make a difference.

Rain scatter is a distinct possibility at EHF, where there is a significant forward scattering component. So far, I have not heard of any successful experiments with rain scatter in these bands.

Tropospheric inversions offer an interesting set of advantages to EHF propagation, in that they not only significantly improve DX by offering ducting, but usually also have extremely low dew points—lower than the 2.5 g/m^3 lines on these charts. In an inversion, a drier and less dense air mass becomes trapped in heavier air, forming a long fold. This presents a sharp difference in refractive index and, much like a dielectric waveguide, can become a transmission medium for microwaves. Such inversions may be hundreds of miles long. So far, there have not been enough EHF contacts to explore the types of propagation that might be available.

In Part 2 of DC to Daylight, Microwavelengths will describe devices and circuits for these frequencies and give some examples of successful ham radio communications in the rarified portions of our hobby.

References

The ARRL UHF/Microwave Experimenter's Manual, "Antennas, Components and Design" (Newington: ARRL, 1990). Available from your local dealer or the ARRL Bookstore, tel (toll-free in the US) 888-277-5289 or elsewhere 860-594-0355, or **www.arrl.org/shop/**. ARRL order no. 3126, $20 plus shipping.

Crane, R. J. (1981), "Fundamental Limitations caused by RF Propagation," *Proceedings of the IEEE*, 59, pp 196-209.

Liebe, H. J., (1983) "Atmospheric EHF Window Transparencies near 35, 90, 140, and 220 GHz," *IEEE Transactions on Antennas and Propagation*, AP-31, pp 127-135.

Liebe, H. J., (1986) "TBLNGEN" (A Fortran Program), Institute for Telecommunication Sciences, NTIA/ITS.S3, Boulder, Colorado, Jun 1986.

Ulaby, Fawwaz T., Richard K. Moore, and Adrian K. Fung, Microwave Remote Sensing Active and Passive, Volume 1, chapters 4, 5 and 6. (Norwood, MA: Artech House, 1981).

Van Vleck, J. H. (1947), "The Absorption of Microwaves by Oxygen," *Physical Review*, 71, pp 413-424.

Timor-Leste Goes QRT

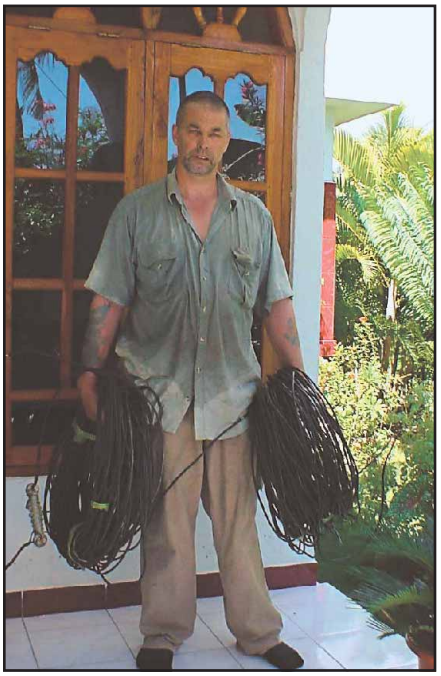
Editor's Note: As this column was being finalized, Timor-Leste began to issue call signs again. Thor was assigned 4W3DX. This is great news and we should continue to see activity from 4W.

By Richard Boyd, KE3Q

It appears that the Democratic Republic of Timor-Leste (formerly East Timor) is off the air. As Thor Stefansson, 4W6MM, says it, it "is well and truly QRT." A change of staff at UN headquarters in New York led to an official sending out a message saying that since the "UNTAET" organization's charter in Timor-Leste expired May 20, 2002, all ham radio operating authority also expired on that date. A successor organization called "UNMISET" does not have the same telecommunications and other authority that UNTAET had; an emerging Timor-Leste government is expected to take over responsibility for administrative things such as ham radio licensing, and it has yet to "take up the reins" on this.

Thor says Timor-Leste now has its own telephone country code, leading him to speculate that it now has ITU status and "a call sign allocation is only a formality away." Thor is eager for this to happen as soon as possible. He wants to get back on the air because he realized the towers of the old site of the Portuguese Telecommunications antenna farm (MARKONI) by his house made it possible to put up a rhombic directly overhead. He bought 1000 feet of two-conductor wire that had to be unraveled, a day-long job in hot weather, then two weekends up the 150-foot towers assisted by Dan, VK8AN, and Peter, G3WQU. The rhombic is indeed up at 150 feet, pointed at 315°, each leg approximately 350 feet. After all this work, Thor is now suffering from muscle cramps as he recovers. Inside his ham shack, an Emtron DX-2SP full legal power amplifier is waiting. He thinks he's going to finally be loud with the amp and big antenna.

Thor is scheduled to leave Timor-Leste and UN service on June 30 so operating time is running out for him. G3WQU, mentioned above, has chosen to go for the comforts of an apartment house with air conditioning, satellite TV and a hot shower, so he will be moving and just using a vertical antenna at the new QTH, once Thor leaves. Says Thor, "The house will fall into the hands of the landlord when I leave. I will try to instruct him to protect the antenna and feed lines for future DXpeditions may want to use the rhombic. The Force-12 C3S will stay on top of the tower fixed on the USA." Thor requested the call sign 4U1ET for the UN mission in Timor-Leste, but that now appears unlikely at best, given the response from UNHQ in New York.



Thor, 4W6MM, the first UN worker in East Timor will soon be heading home after making over 40,000 QSOs.

Previous operations from Timor-Leste with the 4W call sign prefix were under a United Nations provision allowing authorization and administration of ham radio operations by the United Nations "during clearly defined transitional periods in the absence of a national government." That period officially ended, according to UN officials, on May 20, 2002. Consequently, all valid operations from Timor-Leste now appear to have been limited to the period of March 1, 2000 and May 20, 2002.

After that date, licenses apparently have to be issued by the newly created Ministry of Transports and Communications in Timor-Leste, led by that bureau's minister, Dr Joao Carrascalao. Apparently no licenses have yet been issued by Dr Carrascalao.

INTERNATIONAL DX CONVENTION

The dates for 55th Annual International DX Convention in Visalia will be April 23, 24, and 25, 2004. The convention will be held at the Holiday Inn Hotel and Conference Center Visalia. The Holiday Inn began taking reservations May 15, 2003. For complete details, see the convention home page at **www.scdxc.org/visalia**.

PACIFIC NORTHWEST DX CONVENTION

The annual Pacific Northwest DX Convention will be held July 18 and 19 in Vancouver, British Columbia, Canada. This year's event will be sponsored by the British Columbia DX Club. The complete agenda can be found at **www.bcdxc.org/2003convention.htm**. Martti Laine, OH2BH, will be the dinner speaker.

DX NEWS FROM AROUND THE GLOBE

3V—TUNISIA

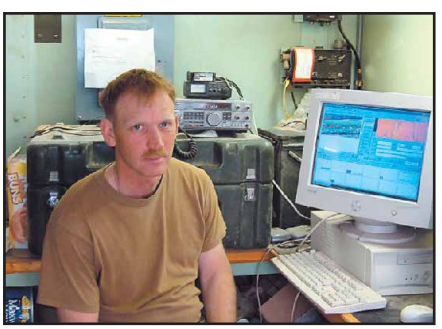
Look for Francois, F8DVD, to be active from Djerba Island (AF-083), Tunisia, using the call sign of the Djerba Scouts Radio Club, 3V8SM. Plans are to be QRV on the HF bands on SSB only from June 23 to July 4. QSLs for this operation only go to F8DVD. If sending via the bureau, please write "via F8DVD/71" on the card. Direct QSLs go via Francois Bergez, 6 rue Liberte, 71000 Macon, France.

5T—MAURITANIA

DL8YHR, Frank, will be heading to Mauritania in early summer. He'll be mostly active on 2 (EME) and 6 meters with some HF from June 28-July 7. Frank will be operating from the QTH of 5T5SN. No mention of call sign was made. Equipment will include a FT-920 and an IC-706MKIIG. QSL via ON4ANT.

5W—SAMOA

Ulli, DL2AH, has planned his first DXpedition from American Samoa July 16-



Willie, KV4EB/YI, was just one of several US military Amateur Radio operators who have been QRV from Iraq since the war.

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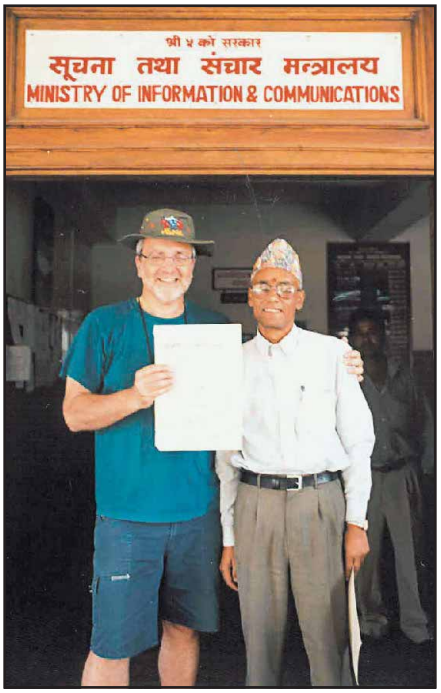


Dov, 4Z4DX, operated in Nepal as 9N7DX in April and May of this year. He was visiting his son Mat, 4Z5DX, who is currently living in Kathmandu.

23. He will take an FT-1000MP and use a Gap Titan and Windom antennas. Look for activity on 10-40 meters SSB, RTTY and PSK.

7P—LESOTHO

A North American team is heading to Lesotho, 7P8, for operations from July 18-25. 7P8CF and 7P8TA will be the main phone operators with 7P8MJ, 7P8NK, 7P8DA and 7P8IZ mostly CW and digital modes. The Texas DX Society and the Lone Star DX Association are the main sponsors. K5LBU says, "We hope to have at least one station on the air 24 hours a day." The operation will be from the Hotel Mount Maluti (**www.seelesotho.com/mountmaluti.htm**) near Mohale's Hoek. Gear will be tribanders, 2-element WARC antenna, log periodic, Alpha Delta dipoles for 160/80/40, plus Kenwood TS-850, ICOM IC-706 and '756, and 600 and 1000 W amplifiers. Most of that gear is already in place. ZS6WPX will be on the site to coordinate the operation. QSL each via their home calls: 7P8CF via K5LBU, 7P8TA via WW5L, 7P8MJ via W5MJ, 7P8NK via VA7DX, 7P8DA via K4SV, 7P8IZ via WØIZ.

AFRICAN DOUBLE JUMP

Joe, AA4NN; Mauro, IN3QBR, and Fabrizio, IN3ZNR, will join forces again to put on what is being called "The African Double Jump" DXpedition. The group plans to activate Botswana and Lesotho in early July. First stop will be South Africa where they will meet up with ZS6WPX, Andre. They may be active for a day or two from ZS. The guys will then head to Botswana for operations July 2-6. Here they will use the calls A25NN and A25ZNR. Next stop will be Lesotho where they expect to be QRV as 7P8JB and 7P8NR July 7-12. Joe may possibly go to Mozambique afterwards. They have a Web page at **www.qsl.net/xu7aay/africa/page2.html**.

CY9—ST PAUL ISLAND

Vance, N5VL, is leading the team heading St Paul Island (NA-138) in July. Team members will include Robert, NØRN; Joe, KO4RR; Igor, WØIZ; Andrea (YL), K5AAH; Alan, K5AB; Dale, VE7SV, and Vance, N5VL. They plan to be QRV on 2 through 160 meters CW, SSB and RTTY July 24-August 2, including the RSGB IOTA Contest. A serious effort will be made on the low bands with a Battle Creek Special vertical. They will give the call sign out when they're ready to start up. The group has requested a special call sign for the test. They will be staying in tents as there are no buildings for use by the team. Fresh water and food will also have to be taken to the island. The group is looking for financial support. Keep an eye on Vance's Web page at **hometown.aol.com/vlepierre/myhomepage/index.html**. QSL via N5VL.

D2—ANGOLA

RK3BR, Vladimir, will be in Angola for the next year and QRV in his spare time as D2CR. He is located about 35 km north of Saurimo. QSL via Vladimir Eremeev, PO Box 26, Moscow, 121609, Russia.

FP—ST PIERRE & MIQUELON

Paul, FP/K9OT, and Peg, FP/KB9LIE, are planning their third annual low-power DX vacation to Miquelon (NA-032) from July 27 to August 5. This will include an entry by FP/K9OT in the CW North American QSO Party. They will operate both CW and SSB and concentrate on 160, 80, 40, 30, 17, 12 and 10 meters, which are in the greatest demand. Special attention will again be given to QRP stations, mobiles, and VK-ZL-JA-JT Oceania. QSL via home calls; bureau cards will be accepted. For direct cards, please include SASE or SAE with one GS or IRC (old or new style). Check out their Web page at **www.mhtc.net/~k9ot**.

JW—SVALBARD

Terje, LA3OHA, is organizing a trip to Prins Karls Forland (EU-063), Svalbard. The Arctic summer 2003 trip is expected to take place from July 27 to 30.

PJ2—NETHERLAND ANTILLES

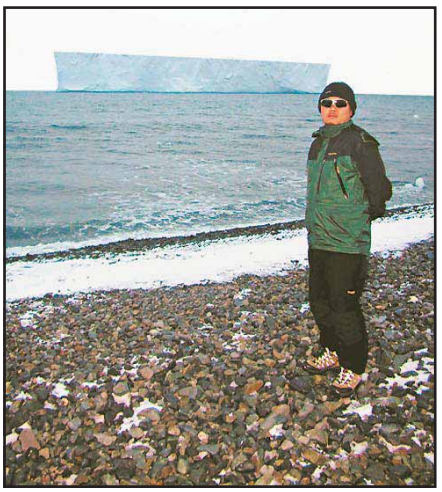
Peter, PA2VST, says he will be on holiday on Bonaire from July 28 to August 11. Look for PJ4/PA2VST, mostly on 6 meters.

UA—EUROPEAN RUSSIA

R1PQ will be a special Russian call from Novaya Zemlya Island (EU-035) for 10 days sometime between July 15 and August 15. Vlad, UA1RG, and others from the Radio Club Volgogda plan to be there.

VP2M—MONTSERRAT

Members of the FDXPG will be on the road again! Three members of the Florida DXPedition Group—Bill, W4WX/VP2MHX; William, N2WB, and Bob, K9MDO (both waiting on VP2M calls)—will be on Montserrat from July 22-29. Three Kenwood TS-570D stations will be active on most bands and modes. This will be a little warm-up for the upcoming San Andres trip in October.



Lee, DS4CNB, is stationed at South Korea's "King Sejong" base on King George Island, South Shetlands (AN-010) until November 2003. He's QRV most days as D88S.

VP9—BERMUDA

Chris Patterson, W3CMP, plans an expedition to Bermuda, VP9, June 27-July 5, concentrating on 6 meter operation. He has gotten a higher power permit from Bermuda telecom (tnx VP9GE) to use a 3CX800 amplifier and nine-element M^2 antenna. Chris also will have about 200 W on 2 meters, hoping for some sporadic-E to Europe, Africa, the US and Central America, he says.

XU—CAMBODIA

Danny, MØGMT, and Oliver, DJ9AO, plan to be QRV from Cambodia August 2 to 19. They will be operating from the DX-shack hotel in Sihanoukville. Licenses and call signs will not be known until the end of June. They hope to be active with two transmitters at the same time. Danny is creating a Web page and promises more details to follow, around the end of June.

YB—INDONESIA

Wen, YB2DGR, and Rivai, YB2MTA, will get on the air from the YB7 Karimata Group (OC-NEW) July 24-30 including the RSGB IOTA Contest. They will have two barefoot radios and concentrate on 15 SSB and 20 CW. QSL via EA7FTR. Here's the Web page to go with it: **www3.ocn.ne.jp/~iota/newpage45.htm**.

YV—VENEZUELA

Members of the Grupo DX Caracas, along with W4DTA, Steve, plan to activate Los Monjes Island (SA-015) July 17-20. They will use special call YW1M to celebrate the navy anniversary and the 180th anniversary of the battle of the Lago de Maracaibo. They will be QRV on all bands on CW, SSB, Satellite and 6 meters. QSLs will go via W4SO (mail drop).

WRAP-UP

That's all for this month. Thanks to KE3Q and *The Daily DX*. Don't forget to send your photos, DX news, club newsletters, etc, to **w3ur@arrl.org**. Until next month, see you in the pileups!—*Bernie, W3UR* QST

A Spy Radio

Just the saying the words "Spy Radio" brings a quickening to one's heartbeat. The first time I saw one, it belonged to a ham friend who lived in the Washington, DC area. He showed it to me one evening when I was visiting. This was in the early 1990s.

Building suspense as he opened the drawer where he had it stored, he told me he found it under a table at a local hamfest, wrapped up inside a canvas bag. It appeared larger than I first thought. It was an RS-6.

He pulled out the four pieces—a receiver, a transmitter, a universal power supply and a filter assembly. He showed me how they all plugged together to make one complete transmitter-receiver. In no time at all he had it tuned up on 40 meters and was calling a W4 in North Carolina.

In 1995, I had the good fortune to find an unbuilt Knight-Kit receiver. After having it a while I offered it on an Internet newsgroup. I said in my offer I would trade it for something interesting. A ham from California came back with an offer of an RS-6. I made the deal.

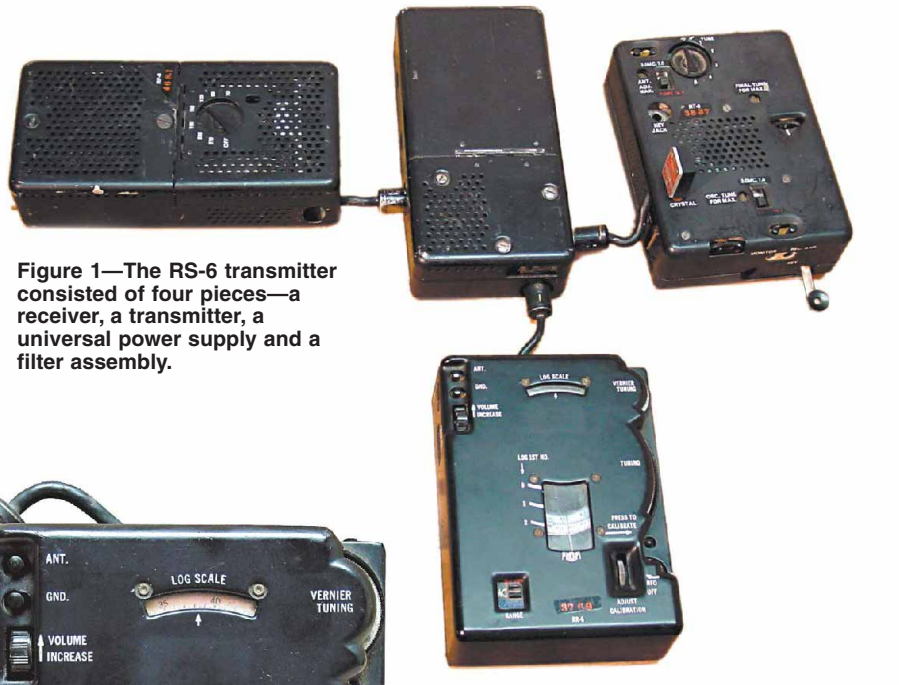


Figure 1—The RS-6 transmitter consisted of four pieces—a receiver, a transmitter, a universal power supply and a filter assembly.

Figure 2—The RR-6, an eight-tube superheterodyne two-band receiver.

Finding Spy Radio Information

Don Reaves, W5OR, runs an excellent Web page at **www.MilitaryRadio.com**. One of many areas on his site is Peter McCollum's research paper, *U.S. Clandestine Radio Equipment*. It's a great history about the use of radios and spying. There you will find the history of many spy-type radios, including the RS-6. Peter has given me permission to quote information from his research paper.

The RS-6 Station

The RS-6 is made up of four units: receiver, transmitter, power supply and power supply filter unit (which also provides storage for some accessories). It uses subminiature tubes in the receiver and power supply regulator, and a miniature tube is used as the transmit oscillator.

The Transmitter

The RT-6 tunes 3-16.5 MHz (or 4.5-22 MHz in the RT-6A) in two bands with up to 10 W output. The crystal oscillator is a 6AG5 (or a 6AK6 in the RT-6A). The final tube is a 2E26. Maximum keying speeds are 40 WPM with the built-in key or an external hand key (in either case using the internal keying relay), or 60 WPM with an automated keyer that drives the tube cathodes directly. This circuit is not too different from some 1960 Novice rigs.

There is a small, built-in CW key that swings out of the body of the transmitter. This allows for normal hand keying. There are provisions for attaching an additional key, such as a semi-automatic bug for up to 40 WPM. A tape keyer may also be inserted into the key jack, and by folding the hand key in to the body the keyer bypasses the keying relay, allowing for high-speed CW.

Tuning is fairly easy, as neon indicators are provided allowing you to "tune for maximum" brilliance. You can pretune without the antenna by turning the antenna impedance matching switch to 0, keeping the signal off the air until needed. The last tuning operation is to tune the impedance matching switch for maximum brilliance.

The Receiver

The RR-6 is an eight-tube superheterodyne two-band receiver. It has one stage of tuned RF and the IF is 455 kHz. It tunes 3-15 MHz (or 4.5-22 MHz in the RR-6A), with either VFO or crystal control. It can receive AM stations and also has a BFO for CW. There is a 500 kHz crystal calibrator built-in so you can calibrate the dial.

Placing the TRANS switch in the transmit position will allow it to receive when the transmitter is not keyed. When the transmitter CW key is pressed, the keying relay automatically switches the antenna to the transmitter. This allows the operator to listen between characters or words if he wishes. Means are also provided for the RR-6 to have an antenna separate from the transmitter. It was pretty well thought-out.

There is an earphone jack for listening. A small pair of earphones comes with the RS-6, but any earphones will work in there. There's plenty of volume.

The Power Supply

Being able to use the radio anywhere in the world was important. So the power supply operates from 70 to 270 V ac, 42-400 Hz, or from 6 V dc. The ac power

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switch starts at OFF position, then switches ON to 270 V, then 230, 190, 150, 120, 95 and 70, until you match the supply voltage. When the neon lamp glows, you have the correct setting. By starting the switch at the high end, it prevents placing too high a source voltage on the set. It was built this way because at the time parts of Hungary and Thailand used 100 V power; areas of Albania, Bulgaria and Colombia had 150 V, and sections of Libya used 270 V.

There is a 6 V dc vibrator supply providing the 400 V needed for the set, by using the dc connector and a car battery. Clamps were provided to tap the car battery at 6 V.

It was also possible to use a hand crank generator, such as the Signal Corps GN-38 (or GN-58). This unit is large and hard to conceal, but it allowed the radio to be operated anywhere without depending on any local power sources.

Who Used These Radios?

Anytime this radio is mentioned to more than one person, it always causes a debate. The debate centers on whether spies used this radio. Some say there is no documentation to prove that our spies carried these radios around. Others say real spies don't talk or leave paper trails. It doesn't really matter—it's still a great radio.

Peter McCollum's research has found the following:

> It is reported that the RS-6 was made by GTE in Waltham, MA. A ham that traded McCollum an RS-6 set said that a friend of his recognized it, and said that he used to work in the Waltham plant where they were built. GTE has been contacted about this. They said that their Waltham plant was making that sort of thing (secret military comm gear) in the '50s or '60s, but they didn't know specifically about the RS-6.
>
> The RS-6 is known to have been onboard equipment in the following aircraft: B/RB-47E, B-47 ECM, and B/RB-52. A SAC manual (Manual 64-1) has been seen that specifically lists the RS-6 as required equipment during certain types of missions. It is listed as "Radio kit, long range, type RS-6." The contents of the kit include a nylon container (*not* the same as the bags for the individual RS-6 components), and a GN-58 generator (the manual says "GN-68," but that is presumed to be a misprint). [The information in this paragraph is courtesy of McCollum's friend, Danny Cahn.—*Ed.*]

One story is that RS-6's were mounted on the bottom of B-47 ejection seats, and that the crew would use them to call for a pick-up after they had released nuclear weapons on a Soviet target. This would be needed because a B-47 wouldn't have enough range to hit the USSR and return, so it would have to ditch on the way back home.

How Many were Built?

McCollum says:

Based on the observed serial numbers, a large number of RS-6 sets were manufactured—probably about 10,000 sets of RS-6 and RS-6A combined. RS-6 components are known to number from 33 to over 10,400. The RT-6 and RR-6 units are seen in the range up to about 8000, while RT-6A and RR-6A units cover the 8000-10,000 range, and RP-6 and RA-6 cover the entire range of numbers (there is no RA-6A or RP-6A). So it appears that RS-6A manufacturing continued the numbering where the RS-6 left off—the numbers were not reset to 0 when the A model was introduced.

Figure 3—The RT-6 transmitted up to 10 W in two bands. The "A" model provided wideband capability.

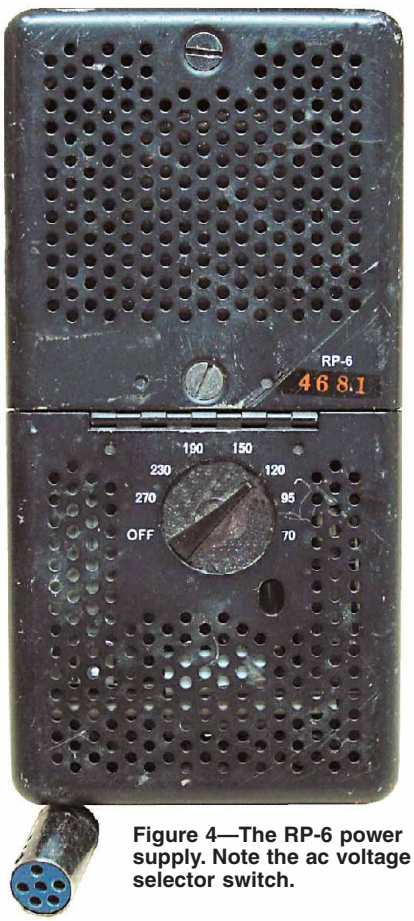


Figure 4—The RP-6 power supply. Note the ac voltage selector switch.

It is unknown how many were made for the CIA, as compared to SAC or other users. It is interesting to note that all of the observed serial numbers (except for one early set) are above 2300, although the manual (or the Addendum) mentions numbers as low as 33. Perhaps the low-numbered units are the ones that were delivered to the CIA, and the remainder were delivered to the military and thus found their way into surplus channels via the MARS program, etc.

The RS-6 may have started production in about 1951. An early unit appears to have component date codes in 1951. Most other units have codes for 1952 and 1953. By observation of markings in the RR-6 receiver, the IF transformers are marked with a number such as "119-3-25"—the "3" represents 1953, and the "25" is week number for that year. The Manual Addendum is dated May 1953, and mentions serial numbers up to 2614 with certain hardware differences. Production of the RS-6A probably stopped about mid-1954, as determined by the "119-4-14" marking seen in an RR-6A.

Conclusion

Peter McCollum is collecting statistics such as serial numbers and IF can numbers. He would appreciate any information you can contribute. You can contact him via his Web page, at **www.MilitaryRadio.com**. Also, my thanks to Ludwell Sibley, KB2EVN, for providing me with information on the RS-6.

EXHIBITS AND HAMFESTS

A large 1930s "Plug-in Coil" Receiver Exhibit will run through the entire summer at the New England Wireless and Steam Museum, 1300 Frenchtown Rd, East Greenwich, RI 02818, tel 401-885-0545. This is a wonderful place to visit. A link to the museum Web site and the hamfests below can be found on my Web page, **www.eht.com/oldradio/arrl/index.html**.

Thanks to Al Klase, N3FRQ, the K2TQN Museum has a new exhibit. Al refurbished a Collins 32V3 AM transmitter and will have a working Collins AM receiver to match it. Plans are to have it on the air this summer. You can see it at the 53rd Annual Winchester Hamfest, August 3, 2003, at the Clarke County Ruritan Fairgrounds in Berryville, Virginia; at the Fall-Fest, home of the 2003 ARRL Maryland/DC Section Convention, September 6-7, Howard County Fairgrounds, West Friendship, Maryland, and the Delaware Valley Radio Association and the NJ Antique Radio Club Hamfest/Antique Radio Meet, September 14, 2003. More on this event next month.

Look for my hat at the hamfests and say hello.—*K2TQN* QST

Hot Rodding the NorCal NC-40A

Now and then I get the urge to modify one of my QRP rigs, in an attempt to wring some extra performance out of it. My all time favorite rig to play with is the NorCal 40-A kit by Wilderness Radio (**www.fix.net/~jparker/wild.html**). Costing $129 plus shipping for a complete kit including all the parts, case, controls and even knobs, this single band 40 meter CW transceiver kit makes an excellent RF platform to become a modification test bed.

Obviously, you must get the kit built up in stock configuration and working before trying any modifications to the basic design. To ensure that the enhancements really do work, a working stock radio is a prerequisite. Never attempt any modifications on a rig as you build it unless these mods are thoroughly described in the instruction manual and are part of a manufacturer's upgrade to the existing kit.

A Plan of Attack

Starting on page 24 of the NC-40A manual, Bob "QRP Bob" Dyer, K6KK, owner of Wilderness Radio, outlines several modifications that will definitely make it more user friendly. It is essential at this point to make a game plan and list the modifications that you *really* want to perform and what kind of performance enhancements you really expect from this little rig. Wilderness Radio has provided additional voltage and control lines on the PC board. These are shown on page 24 of the manual.

Where Am I?

The stock NC-40A is a little sparse in the calibration markings for the main tuning control. Therefore, one needs to determine one's operating frequency accurately, especially if the VFO tuning range has been extended beyond stock configuration. On previous NC-40As I have utilized the Wilderness KC1 Keyer/Frequency Counter PC mod, but I really prefer to have the front panel space available for a power/S-meter. Using the KC1 eats up most of the available space on the front panel. Therefore, in order to keep track of my operating frequency I prefer to use the Small Wonder Labs (**www.smallwonderlabs.com**) FreqMite ($25 plus shipping), a small audio CW readout frequency counter that can be positioned on the back panel. This saves front panel room and still gives an accurate readout of your operating frequency.

Souping-up the stock NorCal NC-40A kit by Wilderness Radio can make it more user friendly—and more fun.

RICH ARLAND, K7SZ

The photo shows a close-up of the underside of a Motorola MRF-237 power transistor with the base lead bent across the bottom to make the transistor a "drop-in fit" on the Wilderness Radio NC-40A PC board. Be sure this lead does not touch the metal area on the bottom of the transistor.

"Wider is Better!

The stock NC-40A has a rather narrow tuning range, on the order of 40 to 45 kHz. While this might be fine for some, I really like to cover from the bottom edge of 40 meters (7.000 MHz) to 7.100 MHz. Extending the tuning range can be accomplished by changing the value of C49 in the VFO circuitry. The larger you make C49 the wider the tuning range of the VFO.

Now, before you start swapping out capacitors, there are a couple of tradeoffs. First you will need to realign the VFO to get the proper coverage, and this will most certainly entail removing turns from inductor L9 Secondly, since the NC-40A uses varactor tuning, the tuning is nonlinear. As you increase the tuning range of the radio, you also compress the tuning range on the main tuning control, causing stations to bunch up at one end of the dial. It will be very difficult to tune in stations using the stock potentiometer. There is a fix, of course: replace the 10 kΩ pot with a 10 kΩ multi-turn pot, which will act as a band spread, making tuning much easier. Finally, there is a tendency for the power output to drop off at one or possibly both ends of the extended tuning range, if you opt for more than 50 or 60 kHz of span. This is not all that critical but you need to be aware of it.

On my NC-40A, I replaced the 47 pF capacitor at C49 with one of 100 pF. This yielded approximately 103.5 kHz of VFO tuning range. In addition, to get the band edge set properly, I had to remove approximately four turns from L9. The radio now tunes from 7000.5 kHz to 7104.0 kHz. A 10-turn precision 10 kΩ potentiometer was substituted for the stock tuning control.

Power UP!

The final amplifier in a stock NC-40A is a 2SC799 NPN transistor. Running flat out, with a 13.76 V dc power source, I was able to get about 2.25 W of RF output from the stock radio. The manual says that the PA will average about 60% efficiency. My calculations came out to 59%, so we're in the ballpark.

Next I removed the 2SC799 and replaced it with a Motorola MRF-237 NPN power transistor. This mod is a bit tricky, as the pins on the MRF-237 are opposite those of the 2SC799. Discard the plastic spacer used under the stock PA and bend the base lead of the MRF-237 across the underside of the body of the transistor. Line up the holes with the transistor leads and drop that puppy in! Be sure that the base lead *does not touch* the underside of the MFR-237 transistor.

With the new PA installed power shot up to 4 W output, after a quick retune of C39 Now, that's what I call a worthwhile enhancement! Of course, there is a price to be paid. In this instance the transmit current soars, heat buildup on the PA is increased, and your power budget is impacted. The transmit current with the stock transistor was 307.66 mA, key down into a 50 Ω dummy load. After the MRF-237 was installed, the transmit current jumped to 452 mA, which yielded an input power of 6.22 W and a power output of 4 W. The efficiency of the new PA was in excess of 64%! The 144.34 mA increase in PA collector current is a reasonable price to pay for an additional 1.25 W of RF at the antenna jack.

Wrapping it Up

I hope you have found this column informative. Feel free to delve in and create your own QRP "hot rod."

[Editor's Note: The opinions expressed in this column are those of the author, not necessarily those of the ARRL.]

Rich Arland, K7SZ ♦ 25 Amherst Ave, Wilkes Barre, PA 18702 ♦ k7sz@arrl.org

Buddipole Portable Antenna

Among the portable HF/VHF antennas I've seen to date, the Buddipole by W3FF Antennas is one of the classiest by far. This is apparent from the moment you open the package. Everything is extraordinarily well crafted, right down to the 22-inch-long rip-stop "quiver" that holds the disassembled antenna components.

The Buddipole is an inductively loaded, limited-space dipole designed to operate on 40 through 2 meters. This antenna isn't intended for permanent installations. On the contrary, the Buddipole's strength is its compact size, light weight and rapid assembly. These aspects make the Buddipole ideal for outdoor operating while camping, hiking, or as a temporary antenna for any application.

Assembly and Tuning

The basic Buddipole arrives in a black plastic tube (with a screw-on cap) for long-term storage. Inside you find a polypropylene T connector with a $^1/_2$-inch plumbing thread, two 22-inch inner dipole arms, two $1^3/_4$-inch diameter coils, two stainless-steel telescoping whips, the soft nylon bag and a matching section that contains 12 feet of coax with a BNC connector. For this review, we also ordered the collapsible Buddipole Mast that extends from 22 inches to more than 8 feet in a series of locking sections. The mast fits comfortably into the bag as well. The entire antenna weighs only 2 pounds.

I started my stopwatch and began the assembly by setting the mast into a tripod and screwing on the T connector. Following that, I attached the inner dipole arms, the coils and the telescoping whips. The coaxial cable plugged into the T and I was finished. Total assembly time: 11 minutes. Not bad for the first time out.

Studying the instructions, I attached the coil taps at the color-coded points and extended the whips for operation on 20 meters. The total length of the dipole was just under 16 feet.

I "cheated" at this stage because I had an antenna analyzer, which makes it much easier to tune an antenna of this type. By sweeping with the analyzer I instantly knew that I needed to shorten the telescoping whips somewhat to achieve a match. The result was an SWR of about 1.5:1. In my installation, the tuning seemed rather sharp, but I'd prefer sharp tuning to the flat, across-the-band SWR of an antenna that behaved like an air-cooled dummy load. As you'd expect, the 2:1 SWR bandwidth was narrowest on 40 meters and became broader as the frequency increased.

How Does it Play?

The answer is "remarkably well." Was the Buddipole as good as my full-size wire antenna? No, but the difference on most bands amounted to between one and three S units. With the Buddipole I made phone and digital contacts on 40 through 10 meters using from 5 to 100 W (the Buddipole is rated at a maximum of 250 W). Six meters didn't favor me with an opening while I had the antenna, so I didn't have an opportunity to test the Buddipole on that band. Local performance on 2-meter SSB and FM met expectations.

It is important to keep in mind that the Buddipole is a compromise antenna. It attempts to strike a balance between the need for manageable size and weight vs the desire for the best possible performance. The performance compromise was most noticeable on 40 and 20 meters where the Buddipole is only about $^1/_8$ and $^1/_4$ wavelength respectively, but above 20 meters the antenna seemed to compare favorably to a dipole at the same height.

Like most well-made things, the Buddipole is not inexpensive. But if you enjoy Amateur Radio in the great outdoors and need a rugged, portable antenna that can be set up anywhere without needing a support (such as a tree), the Buddipole is worth the cost.

Manufacturer: W3FF Antennas, 2390 Templeton Dr, Redding, CA 96002; tel 530-226-8446; **www.buddipole.com**. *Standard Buddipole: $195. Buddipole Mast: $40. Tripod: $70.* QST

The Buddipole set up in my back yard and tuned for 20 meters.

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

Interview with Ben Schupack, NW7DX, Recipient of First Goldfarb Memorial Scholarship

By H. Ward Silver, NØAX

I called Ben at home on a Saturday morning between his numerous activities and responding to many well-wishers' notes. He's an active young man.

Did you know that you were under consideration as a finalist? "No—not until I got the call from N5TC. I hoped that my activity on the air would give me a good shot at it. Tom got my mom, Lynette, and me on the phone to give us the big news. It was pretty amazing—Mom, Dad (Jay, KD7NXS), and my sister Chaia all went out for a big Mexican dinner that night!"

How did you get interested in ham radio? "I started listening to a scanner and stumbled across some ham radio repeaters here in the Seattle area, so I got on the Internet and found some ham radio chat rooms. Some people say the Internet is hurting ham radio, but that's what got me interested and the people I met there were very helpful in getting me started. My Elmers were cyber-Elmers!"

What were your first interests, once you were licensed? "I got an HW-101 and started pounding brass on 40 meters—it's still my favorite mode. CW is a whole other language and that's really cool. Later on I discovered contesting, QRP and PSK31. I also build kits." Ben is an active contester and holds the world record for the Rookie category in the WPX CW contest from K7RI's station. "My first contest was the CQ WW CW and the next two years I was invited to operate with the W7RM multi-operator crew. My favorite contest is WPX CW and I'll be entering it again this year with the rare NW7 prefix."

An ARRL member, Ben is active in the Redmond Top-Key Contest Club (Redmond, WA) and is also a member of the Western Washington DX Club. One of his goals for college is to start a ham radio club at his chosen school, Whitman College in Walla Walla, Washington.

Ben is considering a major in chemistry, leaning toward a career in dentistry and is also interested in biology and environmental science. He chose Whitman, a small, liberal arts college in southeastern Washington because of its excellent reputation and small size, the enthusiasm of other students, and being within a day's travel from home. Another reason for choosing Whitman was the music program and an excellent trombone instructor. Ben plays both trombone and euphonium in several groups—he is a member of five music groups. "I would like to keep music as a lifelong interest, even though it won't be my main career."

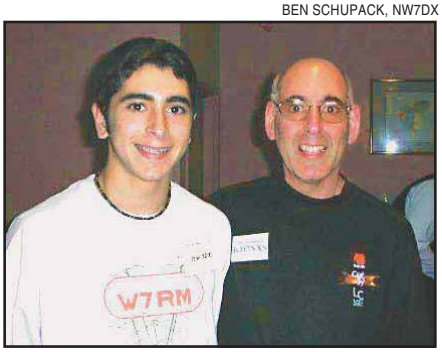
Besides these many activities, what else is Ben up to? "I really like biking. I have my own recumbent bike with an SGC2020 rig and mobile whips. I will be riding it in the 200-mile Seattle-to-Vancouver event this summer and also in the Beaver Lake triathlon. I also have a part-time job at Coldstone Creamery." Ben is going to have a busy summer; he will be operating in Field Day with the Redmond club a week after attending the ARRL National Convention in Arlington, Texas to receive his scholarship. That's a week after his high school graduation.

Ben's list of activities and achievements makes me tired just to read through them. He has all the tools for success and on top of that is a swell young guy with a great smile and CW chops to boot. Keep an eye on NW7DX—he's a keeper!

The Goldfarb Memorial Scholarship

The Goldfarb Memorial Scholarship was established late last year (see March 2003 *QST*, page 101). The scholarship is intended to assist a qualified student to obtain a college education. The award is based upon qualifications, financial need and other funding sources. In a typical year the award is expected to be $10,000 or more. Applications for the 2004 award will be accepted starting October 1, 2003. See **www.arrl.org/arrlf/** for further information.

BEN SCHUPACK, NW7DX



Ben, NW7DX and dad Jay, KD7NXS, together at the NW DX Convention. Ben says: "After three years of bugging him, my dad finally got his ham radio license, and was presented and congratulated during the Convention dinner. It's not too often that a son can get his dad interested in radio."

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Fund
Don Calbick, W7GB, in fond memory of Carl G. Slutter, W3BM

The Jesse Bieberman Meritorious Membership Fund
Dan Trigilio, W6DAN, in fond memory of Joseph R. Riccitelli, Sr, WA1JKS, and Molly G. Dane-Fuller

The Edmond A. Metzger Scholarship Fund
John Swartz, WA9AQN

The Paul and Helen L. Grauer Scholarship Fund
Northwest Missouri Winter Hamfest (Missouri)

The General Fund
Santiam Canyon Amateur Radio Enthusiasts (Oregon), in fond memory of Ivan Kittle, W6TXQ
G. Ed Harris, K4YP, in fond memory of Merton Iwerks, W4IUI
Pauline Brandt, in loving memory of Philip H. Brandt, W3ELJ
Hiawatha ARA, Inc (Michigan), in fond memory of Marvin C. Oysti, WB8BYU
Charles and Margie Britt and Daniel R. Block, in fond memory of Richard E. Porter, W8IWY
Jeffrey S. Lantz, KB6VBZ
Charles W. Clifford, Jr, W6QMY, in fond memory of James L. Dean, W9MM, and James "Jay" B. Stoddard
Steven G. Katz, N8WL, and Constance K. Barsky, WD8ODC, in fond memory of John N. Cochrane, W8QQ
Stamford ARA (Connecticut), in fond memory of Charles Ball, N1CML
Robin B. Denegri, N6ZPO, in fond memory of Jim Maxwell, W6CF
LeRoy and IdaMarie Piccard, in fond memory of Joseph C. Mixsell, Sr, WA2GTV

As received and acknowledged during the months of **March** and **April**.

STRAYS

ARRL EDUCATION & TECHNOLOGY FUND

◊ The ARRL Education & Technology Fund was launched in 2000 to inspire the next generation of Amateur Radio and to provide a catalyst for improved education. With support from ARRL members, foundations and corporations, 30 schools will use Amateur Radio in classrooms, in enrichment programs and in after-school programs in 2003. A professionally developed curriculum has been completed and will be tested in 2003. ARRL is dedicated to improving education using Amateur Radio, to preparing a technically trained workforce for the future and to ensuring a strong future for Amateur Radio. The Education & Technology Program goal is to put Amateur Radio in 300 schools and you can help. Mail your donation or contribute on the Web at **www.arrl.org/**.

Mary E. Lau, N1VH ♦ Secretary, ARRL Foundation Inc. ♦ n1vh@arrl.org

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

AA1DO, Al Alvareztorres Jr, West Hartford, CT
KA1FOW, Ralph B. Paskman, Morehead, NC
*W1HRJ, Paul J. Bedoian Sr, Newington, CT
W1LMA, Wilma M. Barkemeyer, Grants Pass, OR
W1OAZ, Donald L. Coleman Jr, Hinsdale, MA
W1OOP, Henry H. Cross, Needham, MA
N1PEP, Henry G. Lustig, Vergennes, VT
N1QXX, D. Robert DePratti Jr, Orange, MA
N1VFM, Robert G. Crossmon, Keene, NH
W1VMY, Paul P. Lombardo, Wethersfield, CT
*W1WPR, Charles R. Bender, W Hartford, CT
KB2ECR, Francis W. Lear, Roselle, NJ
WA2GTV, J. C. Mixsell Sr, Folsom, LA
W2IET, Andrew Rau Jr, Rutherford, NJ
W2IRF, Ferd L. Heinis, Wayne, NJ
WA2IWP, John E. Sixt Sr, Springville, NY
WA2MPG, Sam Jakubec, Wantagh, NY
K2MQX, Abner M. Swartzentruber, Lowville, NY
WA2RAP, Edward J. O'Reilly, Sun City Center, FL
W2SZR, Monroe Javerbaum, Delray Beach, FL
WA2UEJ, Robert L. Holden, Sebring, FL
*W2WRS, Lawrence C. Widmann, Baldwinsville, NY
W3EAU, Leslie R. Strandt, Chicago, IL
W3MMJ, Sigmund S. Stacey, Erie, PA
W3OLN, Joseph F. Sawchuk, Cincinnati, OH
NQ3O, Boyd W. Ferry, Wellsboro, PA
WA4BQH, Charles F. McKee, Gastonia, NC
W4BVG, Thomas J. Moffett, Utica, NY
K4CHY, Frank K. Burgess, Lexington, KY
KA4CIP, James M. Roberts, Pulaski, TN
KF4FAH, James R. Hollerbach, Ridgeville, SC
KE4FBO, Edmund F. Kline, Hardy, VA
W4FKL, Robert Webb, Henderson, TN
K4HBG, Garry O. Caudell, Ashland, KY
N4HEH, Thomas A. Davison, Nicholson, GA
*K4IX, Elias "Bus" Etheridge Jr, Norfolk, VA
KC4JXO, Robert L. Reed, Raceland, KY
K4KDX, Amaziah P. Smith, Raleigh, NC
KD4NPV, Frank T. Richardson, Mooresville, AL
WB4QAX, Howard D. Dunlap, Leesburg, FL
W4WBT, William B. Taylor Jr, Fort Mill, SC
W5AEN, Leroy H. Scott Jr, Shreveport, LA
N5BX, Arthur C. Guyton, Jackson, MS
W5CFA, Howard L. Bitsko, Cameron, OK
WB5D, Robert D. Currier, Jackson, MS
KD5DVE, Christopher B. Campbell, Ruidoso, NM
*W5EJ, Ed Juge, Hondo, NM
KA5ETQ, Harvey G. Albright, Norman, OK
W5EWM, Walter F. Hardgrave, Cottonwood Falls, KS
WA5FLO, Flo G. Murray, Kerrville, TX
W5GKO, Holland O. Tyler, Conway, AR
KC5HIY, C. W. Satterfield, Jackson, MS
N5HJX, Frank J. Dow, Houston, TX
WA5HOK, Oscar O. Chappelle, Ruidoso, NM
KC5HRP, George W. Harris Jr, Boerne, TX
W5JJW, Leo H. Freeman, Summit, MS
W5LMS, Virgil J. Holobaugh, Shreveport, LA
WB5MFK, James E. Cain, Tishomingo, MS
KD5NDL, Rob Mills Jr, Ruidoso, NM
ex-K5OES, Grady T. Hudlow, Russellville, AR
WM5Q, Paul F. Cline, Arlington, TN
*WA5RD, Ward F. Trammell, Colcord, OK
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W6FJS, John Noboru Ito, Las Vegas, NV
K6HAU, James D. Laux, Fresno, CA
*KH6HQ, Lavern Peterson, Madera, CA
W6IMP, Tatsumi Tajima, Alameda, CA
W6KOE, David W. Degregori, Los Banos, CA
N6LSW, Bernard L. Williams, Fresno, CA
KE6OD, Robert G. Morrow, Reedley, CA
KF6PGW, John P. Brady, Clearlake, CA
*WA6UZP, James K. Lucas, Clifton, CO
W7AQQ, James Liebman, Sherman, CT
WL7AV, George W. Stevens, Anchorage, AK
W7DPK, Bill C. Roper, Cut Bank, MT
*N7DRT, David B. Tyler, Poulsbo, WA
K7EEK, Eugene E. Welcome, Tacoma, WA
K7FEZ, Edwin R. Dahl, Spokane, WA
W7HBK, Francis A. Henline, Spokane, WA
W7HBM, Gordon F. Ziesing, Whitehall, MT
*AC7I, Meltiar G. Workman, Salt Lake City, UT
WA7KJY, Julian H. Cornell, Spokane, WA
W7KUH, Walter R. Marten, Great Falls, MT
W7QGF, Betty L. Gorton, Bellevue, WA
K7ROB, Robert J. Estes, Canby, OR
KB7RSX, James R. Kurtz, Anacortes, WA
KA7TIF, June W. Farmer, Longview, WA
W7VJO, Orville R. Anderson, Seattle, WA
W7YJG, Albert J. DeBacco, Cheyenne, WY
K7ZR, Jack D. Bock, Clinton, WA
W8EUK, Lyle V. Gray, New Philadelphia, OH
WA8GIL, Dale G. Shook, Newcomerstown, OH
N8HRP, William R. Kirby, Franklin, OH
W8HXE, Winton A. Webb, Perry, OH
N8LW, Lovell M. Webb, Charleston, WV
*W8NYS, Ivan J. Frey, Akron, OH
*W8QQ, John M. Cochrane, Granville, OH
*W8RYW, James K. Norman, West Lafayette, OH
W8STD, Alex Shashaty, Leetonia, OH
KG8Y, Gareld W. Swartzlander, Fremont, OH
K8ZJV, Lambert X. Chapin, Huntington Woods, MI
K9CR, Clifford K. Riley, Fort Wayne, IN
KA9CSF, Rudolph J. Fath, East Moline, IL
*W9CWT, Charles C. Gannon, Madison, MS
K9DCJ, Arnold C. Bachmann, Mount Horeb, WI
*W9DH, Loren F. Ashwood, Pisgah Forest, NC
W9OCH, Ralph E. Skoog, Highland, IN
W9QGU, Frank Phillips, Dekalb, IL
K9RBJ, Paul Richardson, Elkhart, IN
WB9RKO, Melvin N. Brueckner, Beaver Dam, WI
K9TF, Jan W. Dibble, Galveston, IN
W9UEM, Charles E. Campbell, Indianapolis, IN
W9VRV, Leo A. Gary, Chicago, IL
WA9VYE, Glenn I. Miller, Stoughton, WI
WØAOD, Dale E. Cooper, Olathe, KS
WØBC, Wade H. Williams, Leawood, KS
NØGGG, Robert H. Lee, Boulder, CO
KAØHKA, Larry L. Copeland, Belen, NM
NØKDA, Art Bartholomew, Sullivan, MO
WØLXW, James A. Peterson, Bozeman, MT
WAØRCZ, Karl E. Gordon, Solomon, KS
*KAØSSE, Robert P. Priddy, Kansas City, MO
NØSWY, Jerry O. Smith Jr, Shawnee, KS
KAØTDO, Robert W. Meyer, Grand Island, NE
*WØULK, Theodore Riemann, Saint Louis, MO
VA3SMW, Stan Waltz, Windsor, ON, Canada
VA3AMD, William A. Henderson, La Salle, ON, Canada

*Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

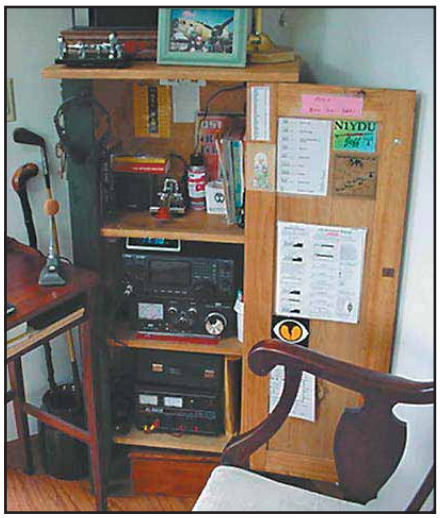
Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL's. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth 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

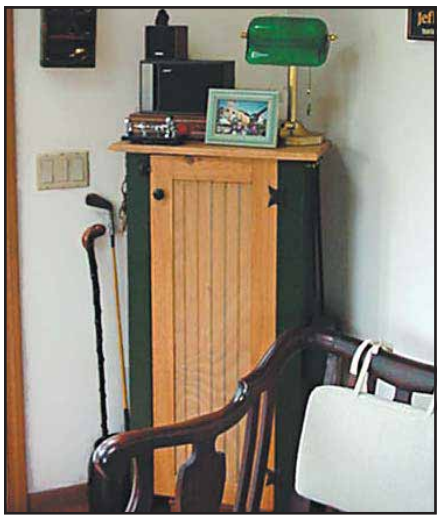
Kathy Capodicasa, N1GZO ♦ Silent Key Administrator ♦ n1gzo@arrl.org

STRAYS

QST Congratulates...

◊ Steven P. Henke, W9SH, who has been appointed Vice President and General Manager of Kenwood USA Corporation's Communications Division.



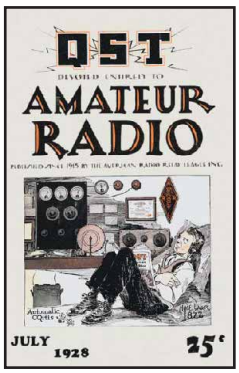


JEFF MITCHELL, N1YDU

Now you see the shack; now you don't! **Jeff Mitchell, N1YDU, of Hope Valley, Rhode Island, has a "family approved" shack if there ever was one!**

75, 50 AND 25 YEARS AGO

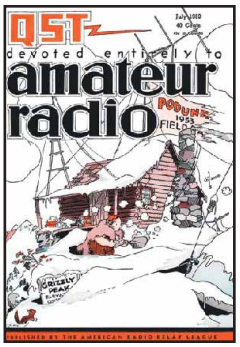
July 1928



♦ The cover art by Clyde Darr, 8ZZ, shows "Automatic CQitis," with the OM's CQ wheel transmitting never-ending CQs as he dozes with a copy of QST open across his lap. At the time the editorial was written, the new 10-meter band had been open only a few weeks. It reports that transatlantic and transcontinental QSOs are being made, even with low power. The ensuing discussion of antennas "leads us to a gorgeous idea.…Why not use one of Prof. Hertz's horizontal antennas, one of Herr Meissner's horizontal reflectors, and a few of Dr. Yagi's horizontal directors...?"

Ross Hull presents "Some notes on a Visit to the Naval Research Laboratory" and its well-known and widely heard station, NKF. Paul Segal, General Counsel of the A.R.R.L., discusses "What is Amateur Radio Traffic?", making a case for what traffic can and cannot legally be handled by hams. Gordon Macintosh tells about the work of experimental station "1XV-1XAN," as it experiments with radio propagation. "A Phone Transmitter for the Beginner or Advanced Amateur" is described by William Tanner, 8CMU. George Hart describes "A Super-Regenerator for Short Waves." Joseph Fuchs describes his "Tests on a Method of Voltage Feeding the Antenna." Don Wallace, 6AM, tells about his wife's "Becoming an Operator in 15 Minutes."

July 1953



♦ The cover cartoon by Gil Gildersleeve, W1CJD, shows the end of this year's Field Day for the Podunk Hollow gang atop Grizzly Peak—shoveling out from a snowstorm, rather than enjoying the balmy weather at the start of the weekend. The editorial announces that a League slide show and accompanying script, prepared by Phil Rand, W1DBM, will soon be available for clubs to borrow. The presentation illustrates the types of TVI caused by various sources.

Ed Tilton, W1HDQ, discusses "Noise Generators—Their Uses and Limitations." Howard Wright, W1PNB, presents "Low-Pressure Modulation Facts," discussing even that new mode showing up on the amateur bands—S.S.B. Lew McCoy, W1ICP, says, "Let's Use Neon Bulbs" in applications such as indicators and oscillators. William Varnedoe, W4TKL, tells about "QSYing the 75-Meter Mobile Antenna." Ken Bowles, W2ZGP, and Rolf Dyce, W2TTU, discuss "Remote Control with a 420-Mc. link."

July 1978

♦ The cover photo, by W9KDR, shows Dick Daniels and Jan King putting the finishing touches on the eighth OSCAR satellite. The editorial describes the advertising policies of QST and how they protect the reader.

Bill Jones, W7KGZ, tells about "A Digital Speed Readout for the Electronic Keyer." Frank Regler, OD5CG, discusses "Series-Section Transmission-Line Impedance Matching." Wayne Overbeck, N6NB, details how you can "Put Your All-Mode 2-Meter Rig on 220!" Doug DeMaw, W1FB, presents Part 3 of his series, "Transmitter Design—Emphasis on Anatomy." Dave Bell, W6AQ, participated in the CQ WW DX Test by going "West to Macao." Bernie Glassmeyer, W9KDR, and Charles Harris, WB2CHO, report that "OSCAR 8 Has a Message for You." "How's DX?" by Bill Lowry, W1VV, tells about "KV4AA—100,000 QSOs in Three Years." Bob Halprin, K1XA, and Stan Horzepa, WA1LOU, report on the "Results, 1978 Simulated Emergency Test." 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 1.818, 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 from 10 AM until noon and from 1 PM until 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, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day and the following day. QST

COMING CONVENTIONS

June 20-22
San Francisco Section, Ferndale, CA*
ARRL National, Arlington, TX*

August 16-17
Alabama Section, Huntsville

August 17
Kansas State, Salina

August 22-23
New Mexico State, Albuquerque

August 23
Missouri State, Columbia

August 23-24
West Virginia State, Weston

September 5-7
Southwestern Division, Long Beach, CA

September 6-7
Maryland-DC Section, West Friendship
Great Lakes Division, Findlay, OH

September 7
Western Pennsylvania Section, Butler

***See June *QST* for details.**

UTAH STATE CONVENTION

July 11-13, Bryce

The Utah State Convention, sponsored by the Utah Hamfest Committee, will be held at Ruby's Inn; 1 mile N of Bryce Canyon National Park. Features include swapmeet (free, bring your own tables); dealers; seminars; ARRL forum; VE sessions (Saturday 9-11 AM, best to pre-register; Fred Villanueva, N7FV, **villa72@juno.com**); special guest ARRL Vice President Kay Craigie, N3KN; Transmitter Hunt; CW/Mobile installation contest; BBQ and Eyeball QSO Party (Friday; 6:30 PM); Dutch Oven Dinner (Saturday, 5:30-7:30 PM, Campground Picnic Area, $12.50); Breakfast Buffet (Sunday); Wouff-Hong ceremony; Special Event Station; camping; refreshments. Talk-in on 146.98. Admission is $8 in advance, $11 at the door; youth $3 in advance, $5 at the door. Contact Ray Riding, AC7RR, 77 N Tiebreaker Cir, Grantsville, UT 84029; 435-884-3217; **ac7rr@arrl.net**; **www.utahhamfest.org**.

SOUTHEASTERN DIVISION CONVENTION

July 12-13, Gainesville, GA

The Southeastern Division Convention ("Coolest Hamfest in Georgia"), sponsored by the Lanierland ARC, will be held at the Georgia Mountains Center, 305 Main St; I-85 to I-985, take Exit 20, left onto Queen City Pkwy, go to 4th traffic signal, take right onto Jesse Jewell Pkwy (SR 369), GMC is on left at 3rd light. Doors are open for setup on Friday noon to 8 PM, Saturday 6-8 AM; public Saturday 8 AM to 5 PM, Sunday 9 AM to 3 PM. Features include Hamfest/Computer Expo, air-conditioned facilities, dealer tables and booths, large covered tailgate area ($10 per marked spot), meetings and forums, VE sessions (Saturday, promptly at noon, $10 fee; Norman Harrill, N4NH, 828-253-1192, **NormanHarrill@worldnet.att.net**), free on-site golf cart transportation for the handicapped, free parking, refreshments. Talk-in on 146.67 (131.8 Hz). Admission is $5 in advance, $6 at the door; under 12 free with paying adult. Tables are $15-$20 each (ac power $15 per drop, bring your own cords). Contact Terry Jones, W4TL, 4816 Windwalker Dr, Flowery Branch, GA 30542; 770-967-6364; **w4tl@arrl.net**; **www.lanierlandarc.org/hamfest.htm**.

OKLAHOMA STATE CONVENTION

July 18-19, Oklahoma City

The Oklahoma State Convention ("Ham Holiday 2003"), sponsored by the Central Oklahoma Radio Amateurs, will be held at the Oklahoma State Fair Park, (Made in Oklahoma Building), NE of the intersection of I-40 and I-44. Doors are open for setup Friday noon to 4 PM, Saturday 7-8 AM; public Friday 5-9 PM, Saturday 8 AM to 3 PM. Features include Hamfest/Computer Show, flea market, dealers (contact Ron McCubbin, KC5QCV, 405-341-0591; **kc5qcv@cox.net**), technical and non-technical programs, WAS card-checking, VE sessions. Talk-in on 146.82. Admission is $7 in advance, $10 at the door; under 16 free with paying adult. Tables are $15 in advance, $20 at the door (if available); electrical hookup $10. Contact Chuck Kanach, KC5EZS, c/o "CORA Ham Holiday 2003," Box 265, Ft Supply, OK 73841-0265; 405-390-2231; **kc5ezs@arrl.net**; **www.qsl.net/coranews/index.html**.

MONTANA STATE CONVENTION

July 18-20, East Glacier

The Montana State Convention (69th Glacier-Waterton International Peace Park Hamfest), sponsored by the Glacier-Waterton International Hamfest Committee, will be held at the Three Forks Campground, 16 miles W of East Glacier on Hwy 2, between mileposts 191 and 192. Features include flea market, tailgating, vendors, dealer displays, junque auction, QCWA meeting, bunny hunt, contests, seminars and programs, VE sessions, BBQ lunch and supper (Saturday), breakfast (Sunday), camping (406-226-4479). Talk-in on 146.52. Admission is $12 in advance, $15 at the door. Tables are $5 (for bazaar and craft sale). Contact Beverly Nord, WB7UOJ, 4706 152nd St SW, Lynnwood, WA 98037; 425-745-5351; **bevnord@aol.com**; **www.gwhamfest.org**.

ARIZONA STATE CONVENTION

July 25-27, Flagstaff

The Arizona State Convention (Fort Tuthill Hamfest), sponsored by the AR Council of Arizona, will be held at the Ft Tuthill County Park, 3 miles S of the junction of I-40 and I-17; Exit 337 off I-17 (Airport Exit), turn W (crossing Rte 89A) into Park. Doors are open for exhibit hall on Friday noon to 5 PM, Saturday 9 AM to 5 PM, Sunday 9 AM to 2 PM; hamfest hours are from dawn to dusk Friday and Saturday and dawn to 2 PM Sunday. Features include commercial vendors, major manufacturers, tailgating, seminars, ARRL forum, tech sessions, junque sale (Sunday), VE sessions (Saturday, 8:30 AM to noon; walk-ins accepted), BBQ Dinner (Saturday eve), RV camping. Talk-in on 146.98 (162.2 Hz). Admission is $1. Contact ARCA, 16845 N 29th Ave, No 312, Phoenix, AZ 85053-3041; 602-881-2722; **n7kkq@arrl.net**; **www.arca-az.org/arca**.

WEST GULF DIVISION CONVENTION

August 1-2, Austin, TX

The West Gulf Division Convention (Austin Summerfest 2003), co-sponsored by the Austin ARC, the Austin Repeater Organization, and the Texas VHF-FM Society, will be held at the Red Lion Hotel, NE corner of the intersection of IH-35 and US Hwy 290 N. Doors are open Friday 6-9 PM, Saturday 8 AM to 4 PM. Features include indoor and outdoor swapfest, tailgating, dealers, exhibits, forums and technical sessions (ARRL, DX, emergency communications, weather, packet radio, QRP, microwave), Texas VHF-FM Society annual meeting, VE sessions. Talk-in on 146.94. Admission is $8 in advance, $10 at the door, under 18 free. Tables are $10 (6-ft, electricity $5 additional through advance registration only; limit of 3 tables to a customer; first-come, first-served). Contact Joe Makeever, W5HS, 8609 Tallwood Dr, Austin, TX 78759; 512-345-0800; **w5hs@arrl.net**; **www.austinsummerfest.org**.

WESTERN NEW YORK SECTION CONVENTION

August 3, Williamsville

The Western New York Section Convention (Greater Buffalo Hamfest and Exposition), sponsored by the Lancaster ARC, will be held at the Main Transit Fire Department Recreation Grounds, 6777 Main St; NYS Thruway (I-90) to Exit 49 (Depew), take Rte 78 (Transit Rd) N to Rte 5 (Main St), turn left (W) on Rte 5, proceed approximately 0.2 miles, grounds on left (S) side of street. Doors are open 6 AM to 4 PM. Features include huge outdoor flea market (tailgating fee $5 plus admission; Jim, 716-542-4201), commercial vendors, WNY section club championship competition, contests, demos, ARRL talks, forums, foxhunt, VE sessions (Main Building, 9:30 AM; Hal, NH7R, 716-832-0031, **n2gdu@arrl.net**; walk-ins accepted), all-you-can-eat pancake breakfast, refreshments. Talk-in on 147.255. Admission is $7. Tables are $15 (8-ft). Contact Luke Calianno, N2GDU, 1105 Ransom Rd, Lancaster, NY 14086; 716-683-8880; **n2gdu@arrl.net**; **gbhamfest.hamgate.net**.

KENTUCKY STATE CONVENTION

August 9-10, Lexington

The Kentucky State Convention, sponsored by the Bluegrass ARS, will be held at the Central Kentucky Technical College, 308 Vo Tech Rd; KY 4 to US 60/US 421, Exit 7, Leestown Rd; from N go right on Leestown Rd/US 421; from S go left on Leestown Rd/US 421, left onto Vo Tech Rd. Banquet will be Saturday eve (Aug 9; Four Points Sheraton, Newtown Pike at I-75; Jeanie Dalton, KB8QLC, **kb8qlc@arrl.net**). Doors are open for setup Saturday 6-8 PM, Sunday 6-8 AM; public Sunday 8 AM to 4 PM. Features include indoor and outdoor flea market, commercial vendors, tailgating ($5 per vehicle), forums (ARRL, ARES, ATV), Electrical Safety Around Powerlines demonstration, Special Event Station, VE sessions (contact Fernie Williams, KE4MAI by Jul 25; 859-245-2140; **ke4mai@arrl.net**), handicapped accessible, free parking, free overnight self-contained camping, refreshments. Talk-in on 146.76. Admission is $5 in advance, $6 at the door. Tables are $15 before Jul 25, $25 after Jul 25. Contact Bluegrass ARS, Box 4411, Lexington, KY 40544-4411; 859-245-2140 or 859-231-0974; **hamfest@bluegrassars.org**; **www.bluegrassars.org/**.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **July 1** to be listed in the **September** 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.)

Arizona (Flagstaff)—Jul 25-27, Arizona State Convention. See "Coming Conventions."

British Columbia (Vancouver)—Jul 18-20; Pacific Northwest DX Convention, Earl Dery, VE7IN, 604-536-3281.

†California (Goleta)—Aug 10, 8:30 AM to 3:30 PM. *Spr:* Santa Barbara ARC. Elk's Lodge Picnic Grounds, 150 N Kellogg Ave; Hwy 101 N to Patterson Ave, go N 1/10 mile to Calle Real, go W 5/10 miles to Kellogg Ave, right turn to entrance; or Hwy 101 S to Fairview Ave, go N 2/10 mile to Calle Real, go E 5/10 mile to Kellogg Ave. Vendors, operating displays, VE sessions, BBQ. *TI:* 146.79 (131.8 Hz), 222.32 (131.8 Hz). *Adm:* Free. Tables: $10 (call ahead). Marvin Johnston, KE6HTS, 408 Grove Ln, Santa Barbara, CA 93105; 805-687-8881; **marvin@rain.org**; **www.sbarc.org**.

†Colorado (Loveland)—Jul 19; set up 6 AM; public 8 AM to 2 PM. *Spr:* Northern Colorado ARC. Larimer County Fairgrounds (McMillan Building), 700 S Railroad Ave; take I-25 to Exit 255, go W on Colorado 402 approximately 4.5 miles, past Hwy 287, then N on Railroad Ave. Swapmeet, commercial exhibitors, radio and computer gear, VE sessions, free parking. *TI:* 145.115 (100 Hz). *Adm:* $4. Tables: $12 (includes 1 admission). Willis Whatley, WA5VRL, 2920 Bassick St, Fort Collins, CO 80526; 970-407-6599; **whatley@frii.com**; **home.earthlink.net/~ncarc/index.htm**.

Florida (Boca Raton)—Jul 19. Lew Lehman, K4LEW, 561-392-3913.

†Florida (Milton)—Jul 25-26; set up Friday noon; public 5-9 PM; Saturday 8 AM to 2 PM. *Spr:* Milton ARC. Santa Rosa County Auditorium, 4530 Jimmy's Way; I-10, Exit 22, go N 7 miles toward Milton; just before intersection of Hwy 90 and Avalon Blvd bear right onto 191 (old Bagdad Hwy), go 3 short blocks, turn right at Auditorium Marque onto Spikes Way, Auditorium on left. Air-conditioned, VE sessions (Saturday 8 AM to noon). *TI:* 145.49. *Adm:* $3. Tables: $8. Walter Yarbrough, WA4TFR, 4301 Bell Ln, Pace, FL 32571; 850-994-7335; **wa4tfr@worldnet.att.net**; **home.att.net/~k4ozl/marc.htm**.

Georgia (Gainesville)—Jul 12-13, Southeastern Division Convention. See "Coming Conventions."

†Georgia (Valdosta)—Aug 8-10; Friday 4-9 PM (inside vendors only), Saturday 8 AM to 6 PM, Sunday 8 AM to 1 PM. *Sprs:* Valdosta and South Georgia ARCs. Lowndes County Fairgrounds and Civic Center, 2102 E Hill Ave; take Exit 16 off I-75, go E on Hwy 84, go through town, Civic Center is approximately ½ mile from where Hill and Center St come back together on left, follow signs for parking. Swap tables, tailgating, vendors, "Bring and Buy" table (by reservation only; 3 items per person); forums, VE sessions, self-contained RV parking on site ($35 per spot). *TI:* 146.76 (141.3 Hz). *Adm:* advance $6 (before Jul 15), door $8. Tables: $15. Wayne Brant, KO4QJ, Box 3644, Valdosta, GA 31604-3644; 229-794-4677; **pres@varc.net**; **www.varc.net**.

†Illinois (Peotone)—Aug 10, 6 AM to 3 PM. *Spr:* Hamfesters RC. Will County Fairgrounds; I-57 to Peotone Exit 327, go E 1 mile to Fairgrounds. Flea market, Amateur Radio and computer equipment, commercial vendors, VE sessions, free parking, refreshments. *TI:* 146.52. *Adm:* advance $5 (double-stub), door $6 (single stub); under 12 free. Tables: $15. Robert Nelson, WB9WFR, 1720 Vollmer Rd, Flossmoor, IL 60422; 708-227-7984 or 708-756-7984; **wb9wfr@arrl.net**; **www.hamfesters.org**.

†Illinois (Quincy)—Aug 9, 8 AM to 2 PM. *Spr:* Western Illinois ARC. Eagles Alps Grounds, 3737 N 5th St; follow 5th St, 4.5 miles N of downtown Quincy. Ham Radio/Computer Swapfest; indoor facilities; tailgating (free with paid admission); VE sessions (12:30 PM, all classes; Mike Nowack, NA9Q, 217-224-8526; **na9q@arrl.net**); WAS, DXCC, and VUCC Card Checking (**k0ca@arrl.net**); plenty of convenient parking; refreshments. *TI:* 147.03. *Adm:* advance $4, door $5; under 12 free. Tables: $10 (first table), $16 (2 tables), $21 (3 tables), $5 each (after the first 3 tables). Jim Funk, N9JF, 2742 N 230th Ave, Liberty, IL 62347; 217-336-4191; **n9jf@adams.net**; **www.qsl.net/w9awe**.

†Illinois (Sugar Grove)—Jul 20; set up Saturday 7 PM, Sunday 6-8 AM; public 8 AM. *Spr:* Fox River Radio League. Waubonsee Community College, Rte 47 at Waubonsee Dr, 5 miles NW of Aurora. Flea market, commercial dealers, computer vendors, VE sessions (10 AM, bring original and copy of license, photo ID, CSCE, fee), overnight camping (Bliss Woods, Kane County Park; 630-466-4182), free paved parking, refreshments. *TI:* 147.21 (103.5/107.2 Hz). *Adm:* advance $5, door $7. Tables: advance $8, hamfest weekend $15. Maurice Schietecatte, W9CEO, c/o FRRL, Box 673, Batavia, IL 60510; 815-786-2860; **scat42@msn.com**; **www.frrl.org**.

†Indiana (Greentown)—Aug 10, 7:30 AM to 1 PM. *Sprs:* Kokomo and Grant County ARCs. Lions Club Fairgrounds, 3 blocks N of Hwys 35/22. Tailgating ($3 per spot), VE sessions. *TI:* 147.24, 146.79. *Adm:* advance $4, door $5. Tables: $8 (indoor). Nick Nickerson, K9NQW, 517 N Hendricks Ave, Marion, IN 46952-2319; 765-668-4814; **k9nqw@arrl.net**; **www.grantarc.com/greentown.html**.

†Indiana (Indianapolis)—Jul 12, 7 AM to 3 PM. *Spr:* Indianapolis Hamfest Assn. Camp Sertoma, 2316 S German Church Rd; SE Marion County, US Hwy 52 (Brookville Rd). Huge indoor/outdoor flea market (outdoor space $5 per vehicle), forums, 2 M foxhunt, QSL and Homebrew contests, Midwest Military Radio Collectors demo and display, VE sessions, free parking. *TI:* 146.76. *Adm:* advance $5, door $7. Tables: $15. R. A. Blake, N9FIM, 11064 Indian Lake Blvd, Indianapolis, IN 46236; 317-261-6658; **tlsmyser@comcast.net**; **www.indyhamfest.com**.

Indiana (Indianapolis)—Aug 9. Joe Lobraico, K9OOA, 317-255-3000.

†Iowa (Amana/Cedar Rapids)—Aug 10; set up 6 AM; public 8 AM. *Spr:* Cedar Valley ARC. Amana Colonies Outdoor Convention Center and RV/Camping Park, 39 38th Ave (Hwys 220 and 151); from I-80 take Exit 225, go N on US Hwy 151, follow signs to Amana Visitors Center. Air-conditioned, ham and computer vendors, huge outdoor flea market, ARRL forum, VE sessions (Darrel Peterson, WAØKHH, **wa0khh@arrl.net**), refreshments. *TI:* 146.745, 146.52. *Adm:* $5. Tables: 8-ft $10 (Katie Gugler, KØKTG, **k0ktg@arrl.net**). Dave Franks, KCØEZL, 620½ 1st Ave NW, Cedar Rapids, IA 52405; 319-241-0719; **kc0ezl@mchsi.com**; **www.cvarc.rf.org**.

Kentucky (Lexington)—Aug 9-10, Kentucky State Convention. See "Coming Conventions."

†Louisiana (Slidell)—Jul 19, 8 AM to 2:30 PM. *Spr:* Ozone ARC. Slidell Municipal Auditorium, 2056 2nd St; from I-12 exit on US 11 S, turn left on Fremoux (traffic light at AMTRACK station), go 1 block to 2nd St, turn right; from I-10 exit on US 190 W, go to US 11 S (left turn), go to Fremoux, turn left, go 1 block to 2nd St, turn right. Flea market, commercial dealers, forums, VE sessions, QLF contest. *TI:* 147.27 (114.8 Hz). *Adm:* $3. Tables: 8-ft $20 (commercial), $7 (flea market). Jerry Finnegan, KC5WLA, Box 553, Slidell, LA 70159; 985-639-9690; **kc5wla@arrl.net**; **www.w5sla.org**.

†Maine (St Albans)—Aug 9, 8 AM to noon. *Spr:* Piscataquis ARC. SnoDevil's Snowmobile Club, 9 Bryant Rd; N of St Albans on Rte 152 (Todd's Corner Rd). Tailgating (free), VE sessions (9 AM, on site; all classes), camping and RV spaces (no hookups), free parking, refreshments. *TI:* 147.39, 146.52. *Adm:* $5, under 12 free. George Dean, WA1JMM, Box 365, Brownville Junction, ME 04415; 207-965-8864; **wa1jmm@midmaine.com**; **www.qsl.net/parc/**.

†Maine (Union)—Aug 2; set up 7 AM; public 8 AM to Noon. *Spr:* Pen-Bay ARC. Union Masonic Lodge, Sennebec Rd; 1 mile N of Rte 17. Flea market, tailgating ($2 each), VE sessions (12:30 PM), refreshments. *TI:* 147.06, 145.49. *Adm:* $5, under 12 free with paying adult. Tables: $4. Scott Ewen, KB1DSW, 408 River Rd, Cushing, ME 04563; 207-354-6809; **blueberryacre@yahoo.com**.

†Maryland (Timonium)—Jul 27; set up Saturday 2 PM; public Sunday 8 AM to 4 PM. *Spr:* Baltimore RA Television Society. Timonium Fairgrounds, York Rd; take I-695 (Baltimore Beltway) to Exit 24 (I-83 N); from I-83 take Exit 17 (Padonia Rd) E, turn right at 3rd traffic light onto York Rd, (MD Rte 45), continue S on York Rd to Fairgrounds entrance. Hamfest/Computerfest, giant flea market (opens 6 AM), vendors, electronics, equipment, tailgating ($10 per space; first-come, first-served basis; no advanced reservations), VE sessions (check in 8:30 AM, free exams 9 AM; pre-registration required; John Creel, WB3GXW, 301-572-5124, 6-9 PM; **creewb3gxw@aol.com**), card checking (DXCC, WAS, VUCC), handicapped accessible, refreshments. *TI:* 147.03, 224.96, 448.325. *Adm:* $6, under 12 free. Tables: $60 each (in air-conditioned Main Exhibit Hall). Bob Bennett, W3WCQ, c/o BRATS, Box 5915, Baltimore, MD 21282-5915; 410-828-1605 or 410-461-0086 (phone/fax); **hamfest@bratsatv.org** or **bbennett@ketron.com**; **www.bratsatv.org**.

†Maryland (Westminster)—Aug 10, 8 AM to 2 PM. *Spr:* Carroll County ARC. Agricultural Center, Smith Ave; MD 140 W to Center St, left on Center St to Gist Ave, right on Gist Ave to Smith Ave, right on Smith Ave, hamfest at top of hill. Tailgating (space included with admission). *TI:* 145.41. *Adm:* $5. Steve Beckman, N3SB, 2145 Bethel Rd, Finksburg, MD 21048; 410-876-1482; **n3sb@qis.net**; **www.qis.net/~k3pzn**.

Massachusetts (Cambridge)—Jul 20. Nick Altenbernd, KA1MQX, 617-253-3776.

Michigan (Alpha)—Aug 9. Ken Hookenson, N8XTC, 906-265-5430.

†Michigan (Petoskey)—Jul 12, 8 AM to Noon. *Spr:* Straits Area ARC. Emmet County Fairgrounds 4-H Building, Charlevoix Ave (US 31 S); go N on US 131 to Petoskey intersection of US 131 and 31, turn left; or go S on US 31, turn right at intersection of US 31 and 131. VE sessions. *TI:* 146.68 (110.9 Hz). *Adm:* $5. Tables: $8. Cliff Rosebohm, KC8NVI, 7574 Hedrick Rd, Harbor Springs, MI 49740; 231-526-5645; **kc8nvi@glccomputers.com**; **www.w8gqn.org**.

†Michigan (Tawas)—Aug 2, 8 AM to Noon. *Spr:* Iosco County AR Enthusiasts. Tawas Area High School, 255 M-55; 2.5 miles W of US 23 on S side of M-55 Hwy. Trunk sales in parking lot, VE sessions. *TI:* 146.64, 146.9. *Adm:* advance $4, door $5. Tables: $7. John Alexander, W8GZF, 327 E Washington St, East Tawas, MI 48730; 989-362-2398; **n1640d@i-star.com**.

†Minnesota (Brainerd)—Jul 19, 9 AM to 2 PM. *Spr:* Brainerd Area ARC. National Guard Armory, 1115 Wright St; from Hwy 371 turn E on Wright St, go 4 blocks to Armory. Commercial vendors, Amateur Radio and computer equipment, free parking, refreshments. *TI:* 147.225, 145.13, 444.925. *Adm:* $5, under 12 free. Tables: $10 (plus admission; first-come, first-served basis). Al Doree, WØRC, 3876 E Shamineau Dr, Motley, MN

†ARRL Hamfest

56466; 218-575-2404; **w0rc@arrl.net**; **www.brainerdham.org**.

†**Missouri (Crane)—Aug 2**, 8 AM to 2 PM. *Spr:* Crane Hamfest Committee. Crane City Park, on Hwy 13; 27 miles S of Springfield or 40 miles N of Branson. Buy-Sell-Swap, computers, electronics, tailgating, VE sessions, refreshments. *TI:* 145.23. *Adm:* $2. Tables: $5. Lonnie Allen, KCØHJP, 701 Agnes St, Crane, MO 65633; 417-723-5671; **lonniehallen@cs.com; www.qsl.net/n0tbo.**

†**Missouri (Licking)—Jul 12.** *Spr:* Ozark Mountain Amateur Repeater Club. Intercounty Electric Building, 102 Maple Ave; Hwy 63 N and S to Maple Ave, go 1 block E to building. *TI:* 146.85. *Adm:* $3. Tables: $5. Blanche White, NØFLR, 628 Cleveland Rd, Houston, MO 65483; 417-967-3000.

†**Missouri (Warrensburg)—Jul 19;** set up 6 AM; public 8 AM to 1 PM. *Spr:* Warrensburg Area ARC. Johnson County Fairgrounds, 3 miles W of Warrensburg on Hwy 50. Air-conditioned building, vendors, guest HF station, APRS demo, Red Cross Emergency Command Post Communications Bus, VE sessions (advance registration preferred but walk-ins accepted), refreshments. *TI:* 146.88. *Adm:* $5. Tables: $10. Keith Raihala, NØVJ, Box 1364, Warrensburg, MO 64093; 660-422-7273; **n0vj@arrl.net; waarci.dyndns.org**.

†**Missouri (Washington)—Jul 20,** 6 AM to 2 PM. *Spr:* Zero Beaters ARC. Bernie E. Hillerman Park, Grand Ave; from Hwy 47 take 5th St, go right onto Grand Ave, just past lake. Ham Radio/Computer Flea Market, commercial vendors, VE sessions, technical sessions, free parking, refreshments. *TI:* 147.24. *Adm:* Free. Tables: 8-ft (inside pavilion). Keith Wilson, KØZH, 385 S Main, St Clair, MO 63077; 636-629-7368; **n0mfd@arrl.net**.

Montana (East Glacier)—Jul 18-20, Montana State Convention. See "Coming Conventions."

†**Nebraska (North Bend)—Jul 19,** 9 AM to 1 PM. *Spr:* Pioneer ARC. St Charles Parish Center, 811 Locust St; 2 blocks N of US Hwy 30 or 2 blocks E of NE Hwy 79. Air-conditioned, flea market, free parking, refreshments. *TI:* 146.67. *Adm:* $2. Tables: advance $5, door $7 (electricity available). Rich Mehaffey, KBØARZ, 1525 County Rd 5, North Bend, NE 68649; 402-652-3410; **mehaffey@dtnspeed.net**; **www.alltel.net/~jlhoffman/index.htm**.

†**New Jersey (Augusta)—Jul 13;** set up Saturday after 6 PM; public Sunday 8 AM. *Spr:* Sussex County ARC. Sussex County Fairgrounds, Plains Rd; Rte 80 W to Rte 15, Rte 15 turns into Rte 206, turn right onto Plains Rd. Large indoor selling area in Exhibition Building, acres of tailgating ($15 per space), DXCC card checking, handicapped accessible, unlimited free parking, refreshments. *TI:* 147.3. *Adm:* $5, nonham spouses and children free. Tables: $15 (indoor, limited basis). Dan Carter, N2ERH, 8 Carter Ln, Branchville, NJ 07826; 973-948-6999; **hamfest@scarcnj.org**; **www.sussexhamfest.org**.

†**New Jersey (Bayville)—Aug 10**; set up 6 AM; public 8 AM. *Spr:* Jersey Shore ARS. Bayville Firehouse, 445 Rte 9; Garden State Parkway to Exit 80, S Toms River, stay in far right-hand lane, follow ramp back under Parkway keeping to right (US Rte 9), stay on Rte 9 S to Bayville. All indoor air-conditioned, VE sessions (11 AM), refreshments. *TI:* 146.91 (127.3 Hz), 443.35 (141.3 Hz). *Adm:* $5, nonham spouses and under 14 free. Tables: $15. Ed Genoino, WA2NDA, 1429 Island View Dr, Forked River, NJ 08731; 609-971-2792; **wa2nda@aol.com**; **www.jsars.org**.

†**New York (Alexander)—Jul 19,** 6:30 AM to 4 PM. *Spr:* Genesee Radio Amateurs. Fireman's Recreation Center, 10708 Rte 98; NYS Thruway Exit 48 (Batavia), go S on Rte 98 for approximately 11 miles to Alexander, Center is just S of the Village of Alexander. Batavia Hamfest/Computerfest, free indoor/outdoor flea market, vendors, foxhunt (10:15 AM), Chicken BBQ, camping. *TI:* 147.285, 146.52. *Adm:* $5. Tables: Free (just sign up). Harold Hay, W2ABQ, 5066 Clinton State Rd No 10, Batavia, NY 14020; 585-343-2844; **wa2abq@localnet.com**; **www. hamgate.net/~gram/**.

†**New York (Frankfort/Utica)—Jul 26;** set up 6 AM; public 8 AM. *Spr:* Utica ARC. Herkimer County Fairgrounds, Cemetary St; NYS Thruway to Exit 30 (Herkimer), at traffic light after toll booth turn left and proceed over bridge, bear right, take NYS 5S W, proceed 5 miles to exit marked Fairgrounds. VE sessions, refreshments. *TI:* 145.45. *Adm:* $4. Tables: $5 (plus admission and inside space fee of $3 per space). Bob Decker, AA2CU, 4 Forest Rd, Utica, NY 13501; 315-797-6614; **tbd2626@yahoo.com**.

†**New York (Ithaca)—Aug 2,** 7 AM to 2 PM. *Spr:* Tompkins County ARC. Tompkins County Airport, 68 Brown Rd; from I-81 take Cortland Exit, follow signs to Rte 13 and Ithaca, turn right on Warren Rd, go N ¼ mile to Brown Rd, go past airport terminal. Flea market, vendors, seminars, VE sessions, refreshments. *TI:* 146.97 (103 Hz). *Adm:* advance $4, door $5. Tables: $10. Doug Reid, NE2T, 105 Sheldon Rd, Ithaca, NY 14850-2501; 607-257-6066; **jdreid@lightlink.com**; **www2.compcenter.com/~tcarc**.

New York (Williamsville)—Aug 3, Western New York Section Convention. See "Coming Conventions."

†**North Carolina (Cary)—Jul 19;** set up Friday 6:30-9:30 PM, Saturday 6:30 AM; public 8 AM to 2 PM. *Spr:* Cary ARC. Herbert Young Community Center, 404 N Academy St; corner of N Academy St and Chapel Hill Rd; Exit 290 off I-40 towards Cary, stay on Chapel Hill Rd to N Academy (approximately 2 miles), turn left. Indoor air-conditioned swapfest, vendors, VE sessions (walk-ins accepted, registration 10 AM, testing 11 AM), refreshments. *TI:* 145.39. *Adm:* advance $4, door $5. Tables: $10 (6-ft). Will Harper, K4IWW, Box 53, Cary, NC 27512; 919-467-0224; **n4nc@arrl.net**; **www.qsl.net/n4nc**.

†**North Carolina (Salisbury)—Jul 12,** 8 AM to 2 PM. *Spr:* Rowan ARS. Salisbury Civic Center, 315 S Boundary St; exit I-85 at Exit 76-B, turn right on E Innes St, go 3 blocks and turn left on S Boundary, go 2 blocks to Civic Center. Tailgating (free with admission), auction (1 PM), VE sessions. *TI:* 146.73 (94.8 Hz), 146.52. *Adm:* advance $4, door $5. Tables: $5 (8-ft). Ralph Brown, WB4AQK, 1621 Emerald St, Salisbury, NC 28144; 704-636-5902; **rbrown@salisbury.net**.

†**North Carolina (Waynesville)—Jul 26,** 8 AM to 4 PM. *Spr:* Western Carolina ARS. Haywood County Fairgrounds, 758 Crabtree Rd, near Waynesville and Lake Junaluska; approximately 25 miles W of Asheville; I-40 to Exit 24, S on Hwy 209 for 2½ miles, hamfest on left. Covered flea market, dealers, tailgating (free with paid admission), vendors, VE sessions (2 PM, Haywood Community College, walk-ins only), forums, free parking, refreshments. *TI:* 146.91 (91.5 Hz), 147.39, 145.19. *Adm:* advance $5, door $6. Tables: $10. Robert Dockery, WD4CNZ, 72 Ormond Ave, Asheville, NC 28806; 828-254-0513; **wd4cnz@arrl.net**; **www.wcars.org/hamfest/index.htm**.

†**Ohio (Cincinnati)—Jul 26,** 6 AM to 1 PM (outdoor flea market); 8 AM to 1 PM (indoor vendor area). *Spr:* OH-KY-IN ARS. Diamond Oaks Career Development Center, 6375 Harrison Rd; approximately 1 mile SE of Rybolt Rd/Harrison Rd Exit, from I-74 (Exit 11). Special seminars, ARRL forum, transmitter hunts, DXCC/WAS card checking, indoor air-conditioned vendor spaces, outdoor flea market ($1 per space), VE sessions (8 AM, walk-ins accepted), free parking, handicapped accessible, free parking, refreshments. *TI:* 146.67, 146.925. *Adm:* advance $5, door $6, under 13 free. Tables: $10 (6-ft, indoor with free electricity; no outside tables or electricity provided). Mr Lynn Ernst, WD8JAW, 10650 Aspen Pl, Union, KY 41091-7665; 859-657-6161; **wd8jaw@arrl.net**; **www.ohkyin.org**.

†**Ohio (Columbus)—Aug 2,** 8 AM to 1 PM. *Spr:* Voice of Aladdin ARC. Aladdin Shrine Complex, 3850 Stelzer Rd; exit I-270 at Easton Exit, proceed W to first light, turn right onto Stelzer Rd, Complex is located on right. HAM"OH"RAMA, flea market, commercial exhibits, free seminars, VE sessions, refreshments. *TI:* 147.24. *Adm:* advance $4, door $5. Tables: $8 (6-ft). James Morton, KB8KPJ, 6070 Northgap Dr, Columbus, OH 43229-1945; 614-846-7790; **kb8kpj@cs.com**; **www.qsl.net/w8fez**.

†**Ohio (Randolph)—Jul 27;** set up 6 AM; public 8 AM to 3 PM. *Spr:* Portage ARC. Portage County Fairgrounds, 4215 Fairgrounds Rd; between Akron and Youngstown on State Rte 44, 4 miles S of I-76. Huge outside flea market ($3 per space), indoor vendors, computers and electronics, radio and electronic consignment auction, VE sessions, ARRL officials, unlimited free parking, handicapped parking, restaurant on grounds serving breakfast and lunch. *TI:* 145.39. *Adm:* advance $4, door $5. Tables: $10 (indoor with electricity). Joanne Solak, KJ3O, 9971 Diagonal Rd, Mantua, OH 44255; 330-274-8240; **ljs@config.com**; **parc.portage.oh.us**.

†**Ohio (Wellington)—Jul 19;** set up Friday 6-9 PM, Saturday 6-8 AM; public 8 AM to 2 PM. *Spr:* Northern Ohio ARS. Lorain County Fairgrounds, 23000 Fairgrounds Blvd (Rte 18); Rte 58 to Rte 18 in Wellington, W on Rte 18, 1 mile to Fairgrounds entrance on S side of Rte 18. Huge outdoor flea market area ($5 per 8-ft space), ample indoor commercial space (reservations required), dealers, vendors, overnight parking for RVs and campers (no hookups), VE sessions. *TI:* 146.7. *Adm:* $5. Tables: $15 (8-ft). Tom Porter, W8KYZ, 161 Herrmann Dr, Avon Lake, OH 44012; 440-930-9115; **www.apk.net/noars/noarsfe.htm**.

Oklahoma (Oklahoma City)—Jul 18-19, Oklahoma State Convention. See "Coming Conventions."

Oregon (Bandon)—Jul 19. Paul Andersen, K7AIA, 541-888-2050.

†**Pennsylvania (Beach Haven/Salem Township)—Jul 19;** set up 6 AM; public 8 AM. *Spr:* Jonestown Mountain Repeater Assn. Beach Haven Carnival Grounds; Rte 11 between Berwick and Shickshinny. Hamfest/Computer Show, flea market, electronics, new and used equipment, tailgating (1 free space with paid admission), VE sessions (10 AM), handicapped accessible, refreshments. *TI:* 145.13 (77.0 Hz), 146.52. *Adm:* advance $4, door $5 (nonham spouses and children free). Tables: advance $8, door $10 ($5 per 8-ft space if you bring your own table). Frank Wolfe, KB3ETK, 570-825-8856; **jmrahamclub@aol.com**; **members.aol.com/jmrahamclub/**.

†**Pennsylvania (Kimberton)—Jul 13;** sellers 7 AM, buyers 8 AM. *Spr:* Mid-Atlantic ARC. Kimberton Fire Company Fairgrounds, Rte 113, S of intersection with Rte 23. Valley Forge Hamfest and Computer Fair, Amateur Radio and computer gear dealers, electronics, demonstrations, tailgating ($6 per space, plus admission; no reserved tailgate spaces), refreshments. *TI:* 146.835, 443.8 (131.8 Hz). *Adm:* $6, nonham spouses and children free. Tables: with electricity $10 each (1-4 tables), $8 each (5 or more tables), plus admission. Rick Miskinis, N3AGS, c/o MARC, Box 2154, Southeastern, PA 19399; 610-825-9590; **reservations@marc-radio.org** or **hamfest-info@marc-radio.org**; **www.marc-radio.org/hamfest.html**.

†**Pennsylvania (Lewistown)—Aug 2;** set up 6:30 AM; public 8 AM. *Spr:* Juniata Valley ARC. Decatur Fire Co, located on US Rte 522 N; 8 miles E of Lewistown, in the town of Alfarata, look for signs. Vendors, tailgating ($5, includes admission), refreshments. *TI:* 146.91. *Adm:* $2, nonham spouses and children free. Tables: $10 (electricity $2 extra; bring your own power cords). Cliff Bell, WB3IVX, c/o JVARC, Box 73, Yeagertown, PA 17099; 717-248-2616; **wb3ivx@localnet.com**.

†**Pennsylvania (Matamoras)—Aug 3;** set up 7 AM; public 8 AM. *Spr:* Tri-State ARA. Matamoras Airport Park, 7th St; I-84 W to first exit in PA (Exit 53), take right at end of ramp, go approximately ½ mile E, turn right on 7th St. Tailgating ($7, includes admission), refreshments. *TI:* 145.35 (100 Hz), 146.76 (100 Hz). *Adm:* $5. Tables: $10. Paul Hild, KD3L, Box 522, Millrift, PA 18340; 570-491-4808; **kd3l@rocketmail.com**; **www.qsl.net/k3tsa/**.

†**Pennsylvania (Pittsburgh)—Jul 13**, 8 AM to 2 PM. *Spr:* North Hills ARC. Northland Public Library, 300 Cumberland Rd; from US Rte 19, go E on Cumberland Rd to Library on right. Free paved tailgating (for 1st space only, additional spaces $10 each), buy-sell-swap, electronics, handicapped accessible, free parking, refresh-

ments. *TI:* 147.09. *Adm:* Free. Tables: $15. Joe Springer, AA3TA, 2601 Clare St, Glenshaw, PA 15116; 412-486-1681; **aa3ta@bellatlantic.net; www.nharc.pgh.pa.us**.

†Pennsylvania (Union City)—Jul 12, 8 AM to 2 PM. *Spr:* Union City Wireless Assn. Central CB Grounds, Parker Rd; just S of Union City off Rte 8. Swapmeet, Eyeball QSO. *TI:* 146.7. *Adm:* $3. Tables: $8. Bill Young, W7RVY, 11 Prospect St, Union City, PA 16438; 814-438-2151; **w7rvy@velocity.net**; **www.qsl.net/ucwa/**.

†Pennsylvania (Wilkes-Barre/Dallas)—Jul 6; set up 6 AM; public 8 AM to 3 PM. *Spr:* Murgas ARC. Luzerne County Fairgrounds; from I-81 take Exit 170 B to Rte 309 N to Rte 415 to Rte 118 W. Hamfest/Computer Flea Market, dealers, equipment, computer hardware and software, tailgating (1 free space), VE sessions (10 AM; 570-779-2981, **jcaffrey@microserve.net**). *TI:* 146.61, 146.52. *Adm:* advance $4, door $5. Tables: $14 (8 ft, indoors, with electricity; Frank, N3WPG, 570-824-7579; or George, K3ZK, 570-735-7794). Make check or money order payable to Murgas ARC and send to Frank Karcheski, N3WPG, 332 Madison St, Wilkes-Barre, PA 18705; 570-824-7579; **n3wpg@juno.com**; **www.qsl.net/k3ytl.**

†South Dakota (Clear Lake)—Jul 26-27; Saturday 5 PM (meal only), Sunday 8 AM to 3:30 PM (all other activities). *Spr:* Deuel County ARC. City Park, N side of Clear Lake; from junction of Hwys 15 and 22 go N through Clear Lake 1 mile to City Park, on W side of Hwy 15. Flea market, VE sessions, camping. *TI:* 147.18 (146.2 Hz), 145.39. *Adm:* $5. Tables: Free. Dan Kelly, WAØYIN, Box 742, Clear Lake, SD 57226; 605-874-2701; **dkelly@itctel.com**; **www.qsl.net/dcarc/hamfest2003.html**.

†Tennessee (Dayton)—Jul 19, 6 AM. *Spr:* Rhea County ARS. Cedar Point Park; located at the junction of Hwys 27 and 30. *TI:* 147.39. *Adm:* Free. Tommy Mize, KO4SY, 433 Magnolia Ave, Dayton, TN 37321; 423-570-0840; **ko4sy@arrl.net**; **rcars.net**.

Texas (Austin)—Aug 1-2, West Gulf Division Convention. See "Coming Conventions."

†Texas (Denison)—Jul 19; set up Friday 6-9 PM, Saturday 6-8 AM; public 8 AM. *Spr:* Grayson County ARC. Silver Wings Club, Grayson County Airport; take Exit 65 (Hwy 691 from US Hwy 75), go W on Hwy 691 to Airport entrance, follow signs to Hamfest. Seminars, VE sessions (11 AM; all license classes and CW). *TI:* 147.0. *Adm:* advance $5, door $7; under 13 free when accompanied by paying parent. Tables: advance $8, door $10. Gene Hodge, K5DPS, 211 N Brinkley St, Sherman, TX 75092; 903-893-6082; **kc5aft@gte.net**; **home1.gte.net/wb5dcu/nortex00.html**.

†Texas (Texas City)—Jul 12; set up 5 AM (commercial vendors), 7 AM (flea market tables); public 8 AM to 3 PM. *Spr:* Tidelands ARS. Doyle Convention Center, 2100 5th Ave N; I-45 to Texas City (take Exit 16), go 8 miles E to 21st St, turn right, go 4 blocks down on left. Swap tables, major vendors, forums, left foot CW contest, VE sessions, refreshments. *TI:* 147.14, 442.025 (103.5 Hz). *Adm:* advance $4, door $5. Tables: $6 (non-vendor flea market; plus admission), $15 (vendor/commercial; no admission fee required); power available but not guaranteed, bring your own extension cords and duct tape. Joe Wileman, AA5OP, Box 73, Texas City, TX 77592; 409-945-6794; **aa5op@arrl.net**; **www.tidelands.org**.

Utah (Bryce)—Jul 11-13, Utah State Convention. See "Coming Conventions."

†Vermont (Essex Junction)—Aug 2; set up Friday 5-7 PM (vendors can drive a car into the skating facility to unload and set up and leave it overnight in a locked building); public Saturday 8 AM to 1 PM. *Spr:* Burlington ARC. Essex Junction Skating Rink, 2 Educational Dr; I-89 to Exit 15 to VT Rte 15E, follow Rte 15E to junction of VT Rte 2A, follow signs to Old Colchester Rd, parking lot on right. Vendors, VE sessions. *TI:* 146.61. *Adm:* $5. Tables: $10. Renee Berteau, N1UXK, 97 Maplewood Ave, Milton, VT 05468; 802-893-7660; **n1uxk@juno.com**; **www.vtstetson.net/barcpage.html**.

†Virginia (Berryville)—Aug 3, 6 AM. *Spr:* Shenandoah Valley ARC. Clarke County Ruritan Fairgrounds, Business Rte 7; I-81 (at Winchester), Exit 315 to Rte 7 E (9 miles), bear right onto Business Rte 7, just before traffic light, Fairgrounds on left; or intersection of Rte 340 and Rte 7 in Berryville, go W approximately 2 miles, Fairgrounds on right. Winchester Hamfest/Computer Show, electronics flea market, tailgating ($7 per space), commercial dealers, VE sessions (all classes, registration at noon, exams promptly at 1 PM; Cooley School, across from hamfest; walk-ins accepted, $10 fee), country ham and egg breakfast, Chicken and Beef BBQ. *TI:* 146.82 (146.2 Hz). *Adm:* $5, under 16 free. Tables: $12, $15, and $20. Irv Barb, W4DHU, 2549 Senseny Rd, Berryville, VA 22611; 540-955-1745; **ibarb@visuallink.com**; **www.Vvalley.com/svarc/hamfest**.

†West Virginia (Huntington)—Aug 9, 8 AM to 3 PM. *Spr:* Tri-State ARA. Veteran's Memorial Field House, 2590 5th Ave; I-64 to Exit 11, go N (right) on Hal Greer Blvd to 5th Ave, go E (right) on 5th Ave to Field House (large facility on N side of street). Flea market, dealers, forums, VE sessions, free parking (across street at Krogers). *TI:* 146.76. *Adm:* $5. Tables: advance $8 (if received by Jul 31), $12 (after Jul 31). Phillip Beckett, AB8ME, 29 Valley View Dr, Huntington, WV 25704; 304-429-6114; **ab8me@hotmail.com**; **www.qsl.net/tara**.

†Wisconsin (Oak Creek)—Jul 12, 6 AM to 2 PM. *Spr:* South Milwaukee ARC. American Legion Post No 434 Grounds, 9327 S Shepard Ave; Ryan Rd Exit, go E to Shepard Ave, then go N ¼ mile. Swapfest, limited free overnight camping, breakfast and lunch, free parking. *TI:* 146.52. *Adm:* $5. Tables: Bring your own. Robert Kastelic, WB9TIK, 7410 S Clement Ave, Oak Creek, WI 53154; 414-764-3871; **kastelic@execpc.com;** or Vern Teske, W9RYA, 414-762-3235; **ryatex@aol.com**.

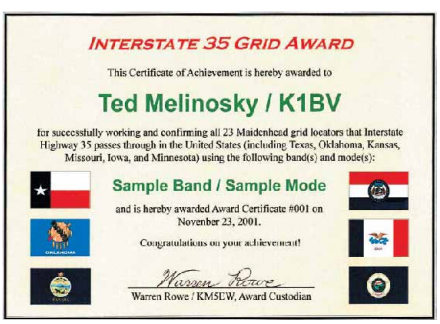
STRAYS

NEW GRID AWARD SERIES

◊ Warren Rowe, KM5EW, has launched an award series for any amateur interested in hunting grid locators for awards on HF, VHF and above. The purpose of this award series is to promote the challenge of making contacts with Maidenhead grid locators in either of two categories: HF—10 to 160 meters—and VHF and above.

The general requirements are as follows:

- All contacts must be made within 50 miles of your home location.
- The ARRL World Grid Locator Atlas and the ARRL North American Grid Locator Map will be the guidelines used for the entire award series. *Note:* For Alaskan grid locators, only the locators including the town of Unalaska in the Aleutian Islands and eastward will be used in the award series due to the difficulty of reaching the remote areas west of Unalaska.
- GCR list will be accepted with two amateurs signing the list, regardless of license class, confirming that the applicant made the required contacts. SWLs must have two officers of SWL club sign GCR list. You don't have to confirm the contacts by QSL cards (you can if you wish), but you should be prepared to answer any questions the Awards Custodian may have concerning the application, should it be deemed necessary.
- Complete GCR lists of worked locators for each award are required. No partial lists will be accepted.
- Contacts must have been made on or after January 1, 2000.
- No repeater or cross-mode contacts will be accepted, but satellite and EME will be accepted for VHF and above. Maritime mobile contacts will be accepted, but aeronautical mobile contacts will not be accepted for the entire award series.



Fees: $5 for W/VE; $8 DX for each award, $1 for W/VE and $2 DX for endorsement labels (for USA Grid Locator Award) drawn either on US bank or International Postal Money Order. IRCs or stamps will *not* be accepted.

The list of awards in the series includes: *The USA Grid Locator Award* for contacting 300 (basic award) different US grid locators (endorsement labels available); *The Worked All Alaska Grids Award* for contacting all grid locators within the state of Alaska; *The Worked All California Grids Award* for contacting all grid locators within the state of California; *The Worked All Texas Grids Award* for contacting all grid locators within the state of Texas, and *The Interstate 35 Grid Award* for contacting all 23 grid locators that Interstate 35 passes through (from Laredo, Texas to Duluth, Minnesota).

These awards can be achieved in either the HF or VHF and above categories; they cannot be mixed. To apply for any of the listed awards, send GCR list and fees to Warren Rowe, KM5EW, PO Box 2457, Temple, TX 76503-2457. For inquiries, send Warren a self-addressed, stamped envelope or an e-mail message to **km5ew@arrl.net**.

CONTEST CORRAL

W1AW Qualifying Runs are 10 PM EDT Monday, Jul 7 (35-10 WPM), and 9 AM EDT Wednesday, Jul 23. The K6YR West Coast Qualifying Run will be at 9 PM PDT Wednesday, Jul 16. Check the W1AW Schedule elsewhere in this issue for details.

Abbreviations

SO—Single-Op; M2—Multiop—2 Transmitters; MO—Multi-Op; MS—Multi-Op, Single Transmitter; MM—Multi-Op, Multiple Transmitters; AB—All Band; SB—Single Band; S/P/C—State/Province/DXCC Entity; HP—High Power; LP—Low Power; Entity—DXCC Entity

No contest activity on 30, 17 or 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 before publication.

July 1-6

Canada Day Contest—CW/Phone—sponsored by the Radio Amateurs of Canada (RAC) from 0000Z-2359Z Jul 1. Frequencies: 160-10, 6 and 2 meters. Categories: SOAB-HP, LP, QRP (<5 W), SOSB, MS. Exchange: VE1-9 send RS(T) and province or territory, VEØ and non-VE send RS(T) and serial number. QSO Points: VE and VEØs—10 pts, non-VE—2 pts, RAC official stations (suffix of -RAC)—20 pts. Score: QSO Points × Provinces/Territories counted once per band and mode. For more information—**www.rac.ca/CANDAY.htm**. Logs due Jul 31 to **ve9qed@rac.ca** or Radio Amateurs of Canada, 720 Belfast Rd, Ste 217, Ottawa, ON K1G 0Z5, Canada.

MI QRP July 4th CW Sprint—2300Z Jul 4-0300Z Jul 5 (see Jan *QST*, p 97, or **www.qsl.net/miqrpclub**).

Venezuelan Independence Day Contest—CW/SSB—sponsored by the Radio Club Venezolano from 0000Z Jul 5-2400Z Jul 6. Frequencies: 160-10 meters. Categories: SOAB and SOSB (CW, SSB, and mixed), MS (mixed mode). Exchange: RS(T) plus serial number. Work any station—not just YV. QSO Points: Own country—1 pt, different country, same continent—3 pts, different cont—5 pts. Score: QSO Points × YV call areas + DXCC entities counted once per band. For more information—**radioclubvenezolano.org/concurso.htm.** Logs due Aug 31 to **contestyv@cantv.net** or Radio Club Venezolano, Concurso, Independencia de Venezuela, PO Box 2285, Caracas 1010-A, Venezuela.

DL-DX-RTTY-Contest—sponsored by the DL-DX-RTTY Group from 1100Z Jul 5-1059Z Jul 6. Frequencies: 80-10 meters. Categories: SOAB and SO-Dipole/Ground-Plane (Full-time, 6 Hour), MS. Exchange: RST + serial number. QSO Points: own country—5 pts, diff country—10 pts, diff continent—15 pts, with DL station add 3 pts from EU, 5 points elsewhere. Score: QSO Points × DXCC entities + VK/VE/JA/W call areas from each band. For more information—**www.dl-dx.de**. Logs due Aug 10 to **logs@dl-dx.de**.

DARC 10-Meter Digital "Corona"—RTTY/AMTOR/PACTOR/PSK31/Clover—sponsored by Deutscher Amateur Radio Club from 1100Z-1700Z Jul 6 (see Nov *QST*, p 102, or **www.darc.de/referate/dx/**).

July 12-13

IARU HF World Championship—1200Z Jul 12 to 1200Z Jul 13 (see Apr *QST*, p 99, or **www.iaru.org/contest.html**).

FISTS Summer Sprint—CW—1700Z-2100Z Jul 12 (see Feb *QST*, p 103, or **www.fists.org**).

QRP ARCI Summer Homebrew Sprint—CW—2000Z-2400Z Jul 13 (see Dec *QST*, p 93, or **personal.palouse.net/rfoltz/arci/arcitst.htm**). Add the following bonus points for each band on which homebrew gear is used; 2000 pts for homebrew transmitter, 3000 pts for homebrew receiver, 5000 pts for homebrew transceiver.

July 19-20

North American RTTY QSO Party—sponsored by the *National Contest Journal* from 1800Z Jul 19-0600Z Jul 20. Frequencies: 80-10 meters, 100 W max power. Categories SOAB and M2, SO stations operate 10 hours max with off times of at least 30 min. Exchange: Name and SPC. QSO Points: 1 pt/QSO. Score is QSO Points × SPC (NA entities only) counted once per band. DX QSOs count for QSO points, but not as multipliers. For more information—**www.ncjweb.com**. Logs due 30 days after the contest to **rttynaqp@ncjweb.com** or Wayne Matlock, K7WM, Rte 2, Box 102, Cibola, AZ 85328.

CQC Great Colorado Gold Rush—CW—sponsored by the Colorado QRP Club, from 2000Z-2200Z Jul 22. Frequencies: 20 meters only. Categories: Wire, Vertical, Beam or Portable. Exchange: RST + SPC + Category + CQC member number or power output. Work stations up to three times during the contest, with at least 30 min between QSOs. QSO Points: 1st QSO—3 pts, 2nd QSO—2 pts, 3rd QSO—1 pt. Score: QSO Points × SPC + CQC members. For more information—**www.cqc.org/contests/gold2003.htm**. Logs are due 30 days after the contest to **contest@cqc.org** or Goldrush, c/o CQC, PO Box 371883, Denver, CO 80237-1883.

CQ WW VHF Contest—all modes—sponsored by *CQ Magazine* from 1800Z Jul 19-2100Z Jul 20. Frequencies: 50 and 144 MHz bands, except 146.52 MHz (and other national simplex calling frequencies) and repeater frequencies. Please avoid the DX windows and international calling frequencies. Categories: SOAB, SOSB, MM, Rover, QRP (<10 W). Exchange: Call sign and four-digit Maidenhead grid. Work Rover stations in each grid. QSO Points: 50 MHz—1 pt, 144 MHz—2 pts. Score: QSO Points × grids counted once per band (Rovers count grids from each activated grid). For more information—**www.cq-amateur-radio.com**. Logs in Cabrillo format due Sep 1 to **cqvhf@cqww.com** or CQ VHF Contest, 25 Newbridge Rd, Hicksville, NY 11801.

Pacific 160 Meter Contest—CW/SSB—Sponsored by the Wireless Institute of Australia from 0700-2330Z Jul 19. Work P2, ZL and VK only. Frequencies (MHz): CW 1.810-1.840, SSB 1.843-1.875. Categories: SO, MS and SWL. Exchange: RS(T) and serial number. QSO Points: 5 pts/QSO outside P2, ZL, VK. Score: QSO Points × P2, ZL, VK call areas. For more information—**www.vkham.com/contest.** Logs due Aug 16 to **vk3vp@vkham.com** or Ian Godsil, VK3VP, 363 Nepean Hwy, Chelsea, 3196, Australia.

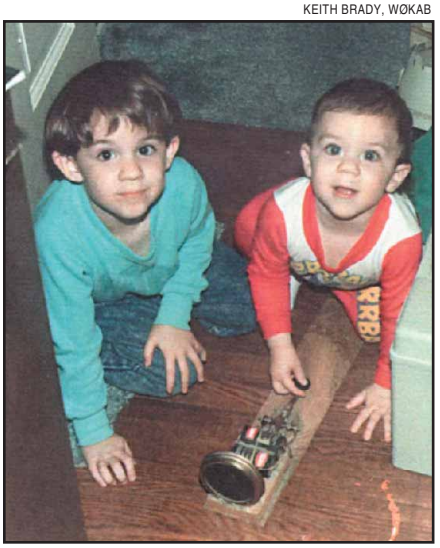
July 26-27

RSGB Islands-On-The-Air Contest—CW/SSB—sponsored by the RSGB from 1200Z Jul 26-1200Z Jul 27. Frequencies: 80-10 meters. Categories: SOAB (SSB/CW/Mixed), SOAB-Limited (SSB/CW/Mixed, 12 hours max), MS. All categories Island or World (non-Island). Exchange: RS(T) and serial number, Island stations add IOTA reference number. QSO Points: Contacts with own IOTA—3 pts, with other IOTA—15 pts, non-island—3 pts. Score: QSO Points × IOTA refs, counted once per band and mode. For more information—**www.rsgbhfcc.org** or **iotacontest@rsgbhfcc.org**. Logs due Aug 31 to **iota.logs@rsgbhfcc.org** or RSGB IOTA Contest, PO Box 9, Potters Bar, Herts EN6 3RH, England.

Kentucky QSO Party—CW/SSB/Digital—sponsored by the Bullitt Amateur Radio Society from 1600Z Jul 26-0400Z Jul 27. Frequencies (MHz): SSB ±20 kHz from General band edge; CW 3.550, 7.050, 14.050, 21.050, 28.050 (digital QSOs count as CW). Categories: SSB, CW, Mixed-Mode or Rover, use of packet spotting encouraged. Rovers identify as "Rover" or "/R" and may be worked once per county. Exchange: Name and KY county or SPC. QSO Points: SSB—1 pt, CW/Digital—2 pts, Rovers—2 pts both modes. Score: KY stations—QSO Points × SPC + KY4KY (count VE provinces, KL7/KH6 count as states), non-KY stations—QSO Points × KY counties + KY4KY, multipliers count only once. For more information—**www.qsl.net/ky4ky/kyqsopartyrules.html**. Logs due 10 days after the contest to **KC4WQ@mis.net** or KY QSO Party, c/o KC4WQ, 1229 Zoneton Rd, Shepherdsville, KY 40165. QST

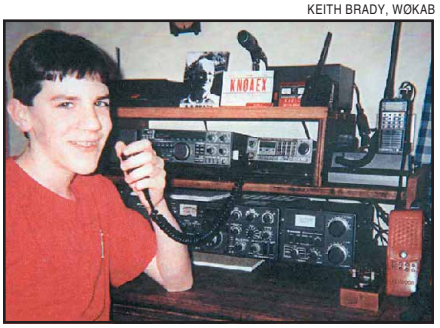
STRAYS

KEITH BRADY, WØKAB



At the top, brothers Kayla and Kalen Brady, sons of Keith, WØKAB, of Rolla, Missouri, enjoy themselves back in 1991. Now KCØPCG, Kalen (below) now seems to prefer phone. Kalen is a third-generation ham.

KEITH BRADY, WØKAB



H. Ward Silver, NØAX ♦ 22916 107th Ave SW, Vashon, WA 98070 ♦ n0ax@arrl.org

SPECIAL EVENTS

Warren, OH: Warren Amateur Radio Association, W8P. 1400Z **Jul 1**-2000Z **Jul 31**. 4th Annual Packard Museum Car Show. 28.450 14.260 7.260 3.860. Certificate. WARA, PO Box 809, Warren, OH 44482.

Dayton, OH: Huber Heights ARC and Clark County ARA, W8I. 1000Z **Jul 3**-1900Z **Jul 6**. From the US Air Force Museum, in honor of the 100th anniversary of flight and the two Wright brothers. 28.403 21.303 14.303 7.230. QSL. W8I, c/o Jim Ebner, N8JE, 5861 Fishburg Rd, Huber Heights, OH 45424-4253. **www.hharc.org**.

Cleveland, OH: NASA Glenn ARC and NASA Visitor Center Station, NA8SA and N8VC. 1300Z **Jul 3**-0000Z **Jul 20**. Celebrating Ohio's Centennial of Flight. 28.480 21.380 14.280 7.280. Certificate. NASA Glenn Amateur Radio Club, 21000 Brookpark Rd MS 8-1, Cleveland, OH 44135. **www.grc.nasa.gov/WWW/Clubs/NA8SA/**.

Beecher, IL: Hams of Monee, W9B. 1600Z-2300Z **Jul 4**. Third Annual Welcome Home Beecher Train Depot. 28.340 14.270 14.040 7.270. Certificate. Gene Backlin, 26811 Greenbriar Dr, Monee, IL 60449.

East Stroudsburg, PA: Pocono ARK and Eastern PA ARA, W3PRK/N3IS. 1600Z-2100Z **Jul 4**. American Freedom Festival. 14.250 7.150 3.870. Certificate. Bill Connelly, W3MJ, RR 3 Box 3165, East Stroudsburg, PA 18301.

Hannibal, MO: Hannibal Amateur Radio Club, WØMTL. 1400Z-2100Z **Jul 4**. National Tom Sawyer Days (America's Home Town). 28.360 21.360 14.260 7.260. Certificate. Robert G. Mitchell, 816 Long Dr, Quincy, IL 62305.

St Augustine, FL: St Augustine Amateur Radio Society, N4AUG. 2000Z-2400Z **Jul 4**. Nation's Oldest City Fourth of July Celebration. 21.370 14.280. QSL. SAARS, PO Box 860084, St Augustine, FL 32086-0084.

Shiloh National Military Park, TN: Shiloh Wireless Society, K4S. 1600Z-1800Z **Jul 4**. Independence Day at Shiloh National Military Park. 14.270 18.136. QSL. Jim Buffington, K5JIM, 402 S Matubba St, Aberdeen, MS 39730.

Thompson, OH: Lake County Amateur Radio Association, N8GB. 1400Z **Jul 4**-0100Z **Jul 5**. "Heritage of Our Country"—Happy Birthday America. 28.450 21.350 7.246. Certificate. George R. Bair, 386 Cedarbrook Dr, Painesville, OH 44077.

Fruita, CO: Western Colorado Amateur Radio Club, NØV. 0100Z **Jul 4**-2100Z **Jul 6**. Dedication of Western Slope Vietnam War Memorial. SSB gen portion of 10 15 20 40 m. QSL. Al Acker, WA4HND, 1685 Mae Ct, Fruita, CO 81521. **www.wcarc.ws/status.htm**.

Etna Green, IN: Hoosier Lakes Radio Club, W9E. 1300Z-2200Z **Jul 5**. 150th anniversary of the only "Etna Green" in the world. 21.343 14.243 7.243. Certificate. Hoosier Lakes Radio Club, PO Box 981, Warsaw, IN 46581.

Smithville, TN: DeKalb County Amateur Radio Club, KC4GUG. 1500Z-2200Z **Jul 5**. 32nd Annual Smithville Fiddlers Jamboree & Crafts Festival. 28.425 21.335 14.280 7.275. QSL. Wm. Freddy Curtis, 288 Dogwood Cr, Smithville, TN 37166-2712. **www.geocities.com/kg4bto1/darc_warc.htm**.

Ashland, OH: Ashland Area Amateur Radio Club, W8O. 1300Z **Jul 5**-2000Z **Jul 6**. Ashland BalloonFest 2003. 7.250. Certificate. AAARC, 834 CR 30A, 432 Center St, Ashland, OH 44805.

Perkasie, PA: RF Hill ARC, W3AI. 1600Z-2000Z **Jul 6**. Pennridge Community Days. 14.250 7.250. Certificate. Norm Fusaro, 3170 Bedminster Rd, Ottsville, PA 18942.

Austin, TX: Naturist Amateur Radio Club, NU5DE. 0000Z **Jul 7**-2400Z **Jul 13**. Annual Nude Awareness Celebration. 21.365 28.465 14.265 7.265. QSL. Naturist Amateur Radio Club, PO Box 200812, Austin, TX 78720.

Milwaukee, WI: West Allis Radio Amateur Club, W9C. 1800Z **Jul 9**-0200Z **Jul 12**. The Great Circus Parade Showgrounds. 145.170 14.240 7.240. Certificate. Dick Wood, S 46 W 22328 Tansdale Rd, Waukesha, WI 53189.

Iola, WI: Waupaca/Waushara Country ARES/RACES, AB9DW. 1300Z **Jul 11**-2300Z **Jul 13**. The Annual Iola Old Car Show. 14.250 7.250. Certificate. Dan Weggel, E 854 Golke Rd, Waupaca, WI 54981.

Trenton, MI: Motor City Radio Club, W8MRM. 1400Z **Jul 11**-2359Z **Jul 13**. 28th Annual Trenton Mid-Summer Festival. 14.244 14.044 7.244 7.044. Certificate. Motor City Radio Club, W8MRM, Trenton Mid-Summer Festival Station, PO Box 337, Wyandotte, MI 48192.

Kane, PA: Kane Amateur Radio Operators, N3ELI. 2200Z **Jul 18**-2000Z **Jul 20**. Celebrating the annual Kanefest Festival. 28.355 21.355 14.255 7.255. Certificate. Donald R. Pistner, 1250 E Main St, Bradford, PA 16701.

Dayton, TN: Rhea County Amateur Radio Society, K4DPD. 1200Z-1800Z **Jul 19**. Scopes Trial Special Event. 28.340 21.340 14.240 7.240. QSL. Rhea County Amateur Radio Society, PO Box 233, Evensville, TN 37332.

Wapakoneta, OH: Reservoir Amateur Radio Association, K8QYL. 1300Z-2000Z **Jul 19**. Celebrating the Neil Armstrong Festival of Flight. 28.450 21.350 14.235 7.230. Certificate. Walter Vogel, WB8FNB, 14455 Co Rd 66A, St Marys, OH 45885.

Boston, MA: USS *Cassin Young* Amateur Radio Club, WW2DD. 0001Z **Jul 19**-2359Z **Jul 20**. Museum Ship Radio Event. 18.160 14.260 7.039 3.860. Certificate. Mark Starin, K1RMC, 457 Varney St, Manchester, NH 03102. Work seven ships for certificate. **www.qsl.net/ww2dd/event.html**.

DeSmet, SD: Huron ARC and Lake Area Radio Klub, WØNOZ. 1600Z **Jul 19**-2200Z **Jul 20**. Annual Little House on the Prairie Pageant. 28.465 21.365 14.265 7.265. Certificate. Huron ARC, PO Box 205, Huron, SD 57350.

Groton, CT: CT RI Contest Group, N1S. 0001Z **Jul 19**-2359Z **Jul 20**. Submarine USS *Nautilus* SSN571/Museum Ships On The Air. 28.360 21.360 14.260 7.260. QSL. KB1LN, POB 995, Charlestown, RI 02813.

Springfield, OH: Independent Radio Association, K4H. 1400Z **Jul 19**-0400Z **Jul 20**. Commemorating Year 101 of 4H. 28.410 21.260 14.260 7.230. QSL. Independent Radio Association, PO Box 523, Springfield, OH 45501.

Tiffin, OH: Seneca Radio Club, W8ID. 1600Z **Jul 20**-2359Z **Jul 27**. Ohio Bicentennial—First Ohio Governor, Edward Tiffin. 21.350 14.250 7.250 3.875. Certificate. Seneca Radio Club, W8ID, Bicentennial Special Event-0703, 126 Hopewell Ave, Tiffin, OH 44883.

Flint, MI: Genesee County Radio Club, W8ACW. 1700Z **Jul 23**-1900Z **Jul 26**. 100th Anniversary of Buick Motor Division. 28.460 21.460 14.260 7.260. QSL. Genesee County Radio Club, Inc, PO Box 617, Flint, MI 48504-0617. **www.buickclub.org**.

Shiloh, OH: Ohio's Bicentennial Group of Shiloh, K8S. 1200Z **Jul 25**-2100Z **Jul 26**. Ohio's Bicentennial and Shiloh's Ox Roast. 146.42 FM 28.420 7.270 3.900. Certificate. Danny Bailey, KB8STK, 70 Euclid St, Shiloh, OH 44878.

Wilmington, NC: United States Power Squadrons Amateur Radio Net, W4E. 1300Z **Jul 25**-2200Z **Jul 28**. Safe Boating Campaign from USCG tall ship *Eagle*. 28.367 21.267 14.267 7.267. Certificate. Donald R. Stark, N3HOW, 65 Stark Spur, Eighty Four, PA 15330.

Fredericksburg, VA: Rappahannock Valley Amateur Radio Club, K4TS. 2000Z **Jul 25**-0200Z **Aug 3**. Fredericksburg Agricultural Fair. 21.350 14.260 7.250. QSL. Rappahannock Valley Amateur Radio Club, PO Box 1496, Fredericksburg, VA 22402-1496.

Swansea, MA: Fall River Amateur Radio Club, W1ACT. 1300Z-1700Z **Jul 26**. Annual Geek-fest, clam-boil and flea market at American Legion Post 303. 145.150. QSL. George Lavoie, PO Box 3421, Fall River, MA 02722. **kb1cna@msn.com**, **kb1cnb@arrl.net**, **n1joy@arrl.net**.

Marcella, NJ: Nutley Amateur Radio Society, W2GLQ. 1500Z-2200Z **Jul 26**. From the New Jersey Camp for the Blind. General class frequencies. QSL and certificate. Nutley ARS, American Red Cross Building, 169 Chestnut St, Nutley, NJ 07110.

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 **Sep** *QST* would have to be received by **Jul 1**. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

STRAYS

W6CF MEMORIAL WEB SITE

◊ The family of Jim Maxwell W6CF, has established a Jim Maxwell Memorial Web site (**www.jimmaxwell.net**). The site includes recollections, tributes and photographs from Jim's friends and family. The ARRL Pacific Division Director died February 6 at age 69. He had served as a member of the ARRL Board of Directors since 2000 and as Pacific Division Vice Director from 1994 until 2000. A Life Member of the ARRL and an avid DXer, Maxwell also generously supported the League through contributions to the ARRL Diamond Club, the ARRL Foundation and other programs.—*Glenn Thomas, WB6W, ARRL Section Manager, Santa Clara Valley Section, Milpitas, California*

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

By **Dan Henderson, N1ND**
Contest Branch Manager

Results, 2002 ARRL 10-Meter Contest

What decline in 10-meter propagation?

You could hear the voices from around the globe…ZL3GA: "Ten never fails to surprise!"…AE9B: "You think we can talk those sunspots into staying around a little longer?"… K1TH: "ZL1AIH called me after the band 'died' Sunday night. Ten Meters is always good for a surprise."…K6ENT: "Great contest here on the West Coast. The storm kind of beat up on us."

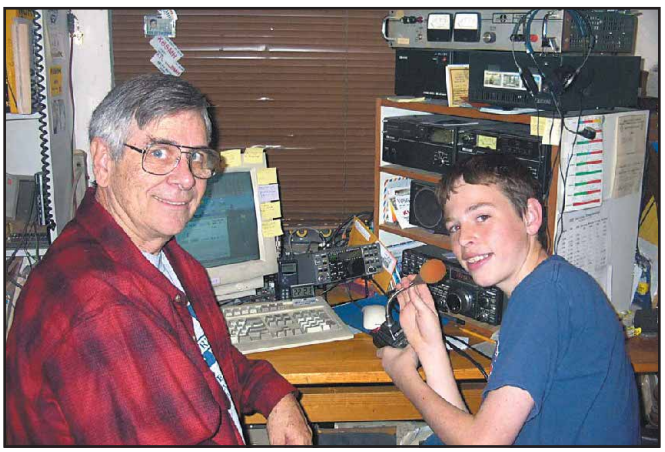
If you are into 10 meters, I hope you didn't miss the 2002 ARRL 10-Meter Contest held December 14-15. Of course the odds are that if you contest at all, you may have been active during the weekend, as the Log Checking team reported that over 40,000 call signs were found in the record 3120 competitive logs received. That is a record number of logs submitted for *any* ARRL single weekend contest.

In section after section, you can find close finishes and hot competition between operators that may only consider themselves "small pistols."

Take the Single Operator Low Power Phone Only category in Maine. Tim, AA1UT, racked up 86 multipliers but was a few QSOs short of taking top honors from Sam, WA5RPP. Work your way down the East Coast a bit to the Western New York section. Tom, N2CU, worked four fewer QSOs but was able to edge Warren, K2SM, on the basis of just two more multipliers in the Single Operator QRP CW Only category.

Head to Eastern Pennsylvania where Ralph, WA3ELQ, found 19 fewer multipliers than Larry, WB3EVL, but worked 59 more stations, leading him to a scant 414 point victory in the section for Single Operator Low Power Phone Only race. Strategy and mode made the difference between Bruce, KØBJ, and Bill, NØAG. Bill racked up more QSOs and multipliers in his Single Op Mixed Mode Low Power effort, but Bruce was able to take Kansas on the strength of making more higher value CW QSOs, winning by only 5238 points.

The margin of victory for Charles, WB6IYM, over Vic, KF6RIP, was only 1832 in the East Bay race for the Single Operator High Power CW Only title. And they won't get any closer than Bob, W7LR's 132-point "thrashing" of Eric, K7ABV, in the Mixed Mode High Power race in Montana. One more QSO or multiplier for Eric or fewer for Bob would have changed the name on the winner's certificate.



If you have worked many contests, you are sure to have Jerry, K6III, in the log. In this year's 10-Meter Contest, Jerry was busy Elmering aspiring young contester Joseph, KG6NED.

DX Entries

Besides the continental US and Canada, entries were received from 110 DXCC entities worldwide. Top continental participation came from Europe (839 entries). Japan (161) had the most participation from a single DX entity.

At least one new scoring record was set for each of the six continents—Africa, Asia, Europe, North America, Oceania and South America. Most noteworthy, however, is that three overall combined W/VE and DX scoring records were set during the weekend.

Jim, N6TJ, is no stranger to contesters. Operating from his ZD8Z QTH, Jim rewrote the books with his spectacular performance in the Single Operator Mixed Mode High Power category (which also becomes the new Africa record). His score of 4.7 Megapoints may stand for some time. Jim outscored his nearest competitor by 24%—quite a feat when you consider that the category runner-up was John, K4BAI (certainly no slouch when it comes to contesting) operating as 8P9Z, who managed to shatter the old record by 13% while setting the North American record.

Another well-known contester, Fabio, I4UFH, clawed his way into the overall category record books. Operating as D44TD, Fabio forged ahead of the previous record holders with a score of 1,815,120 in the Single Operator Phone Only High Power category.

Rounding out the overall record-setting performances was the Single Operator Phone Only QRP entry of Tony, KP4KE. Tony's score of 366k breaks the old category record by 22% and left his competition in the dust by more than doubling the score of his nearest challenger. Congratulations to the three new World Record holders!

DX Single Operator QRP Categories

The Mixed Mode competition ended as a hard fought two-station affair between two Asian stations—Haruo, JA2AXB, and Dima, RX9SR. After log checking, a scant 1712 points separated the two, with Haruo claiming the win. Other continental winners included Victor, UXØIB (Europe), Tim, NHØH (Oceania) and Waldir, PY2WC (South America).

Besides Tony, KP4KE, only one other Phone Only station was able to better the 100k mark—European winner Rafael,

Top Ten, W/VE

Mixed Mode, QRP

KG9X	825,790
K9OM	786,318
NA4CW	609,960
WA8ZBT	432,950
VE3BUC	394,424
K0PC	376,872
K3TW	348,880
K8BL	342,084
N8IE	303,808
K0OU	300,720

Mixed Mode, Low Power

VY2TT (K6LA, op)	1,884,420
N8II	1,358,104
W0YR	1,295,152
W1HR (K1FWE, op)	1,229,272
K7SS	1,183,084
WD5K	1,157,166
K0OB	1,134,240
N0AT	1,091,800
VE5SF	1,036,366
NE9U	1,015,650

Mixed Mode, High Power

W9RE	2,564,592
K9NW	2,462,524
WC4E	2,364,852
W2RE	2,347,776
VE3AT	2,282,380
K1XX	2,193,964
K3ZO	2,149,030
W5WMU	2,128,462
K4WX	2,019,624
K4RO	1,974,176

Phone Only, QRP

NX9T	153,000
NJ2F	110,860
K4LOG	105,728
KK0Q	95,996
N1BQ	89,024
AB2IW	86,940
W7PE	79,220
W7YA	75,600
WR6WR (N6WR, op)	64,428
N2XT	62,790

Phone Only, Low Power

W3EP	504,284
W7ZR	502,740
N7BES	405,444
W8DD	362,768
KE9KD	348,960
AC0W	348,612
KT3RR	332,004
VE4MM	302,556
N6IIU	302,400
NY4T	281,792

Phone Only, High Power

W5PR	1,014,420
K4XS	945,360
WB9Z	915,936
VA5DX	878,572
K5TR (WM5R, op)	801,944
K4WI	793,408
K0DU	777,596
KY5R	767,880
N4OX	760,612
K7RI	697,108

CW Only, QRP

VE5UF	527,076
KG5U	452,200
N7OU	334,080
N0UR	331,816
N4IJ	271,400
W6JTI	248,032
AA1CA	231,120
W7RAB (KH7YD, op)	228,816
WA8WV	213,344
K7MM	207,312

CW Only, Low Power

K1TO	1,218,000
W3PP	889,088
N4PN	877,200
K9QVB	736,560
N4ZI	732,096
KM0O	718,640
NY3A	717,660
W5TM (W5AO, op)	715,500
WB4TDH	675,672
K5KA	667,980

CW Only, High Power

N2NL	1,382,320
K7GM	1,244,796
K3CR (LZ4AX, op)	1,232,160
W5KFT (K5PI, op)	1,191,664
W0SD (W0DB, op)	1,191,508
KD4D (@N3HBX)	1,191,508
K4ZA	1,190,700
N9RV	1,188,616
K7BV	1,177,920
KM5G	1,137,192

Multioperator

N2NT	3,023,542
NX5M	2,821,728
K1SE	2,498,600
N4GN	2,491,904
W4MYA	2,483,968
N2OW	2,459,744
N5OT	2,318,676
K8CC	2,237,472
N5YA	2,174,934
KD0S	2,001,408

Top Ten, DX

Mixed Mode, QRP

JA2AXB	229,992
RX9SR	228,280
UX0IB	181,504
ER5DX	160,740
YU1LM	136,864
PY2WC	131,846
UU4J (UU4JO,op)	127,544
RZ9IB	72,226
RW3SU	57,240
HG5Z	55,616

Mixed Mode, Low Power

FY5FY	2,288,540
C6ANK (W9AU, op)	1,244,220
CT1ILT	1,223,552
XW1IC	1,189,224
L73F (LU5FF, op)	1,133,730
LZ9W	1,085,280
HA6NF	978,880
EA5AER	837,456
UA4FER	791,700
LY3BA	779,248

Mixed Mode, High Power

ZD8Z (N6TJ,op)	4,733,880
8P9Z (K4BAI/8P9HT)	3,788,386
KH7X (KH6ND	2,522,160
9A5E	1,956,654
OK1RI	1,800,582
RK4FF	1,594,840
YZ1AU	1,560,736
M0SDX	1,529,496
S58A	1,525,188
UA2FB	1,362,930

Phone Only, QRP

KP4KE	366,750
CT7BOP (CT1BOP, op)	154,320
LU1VK	95,076
UA3BL	83,300
LU2EE	66,528
T94DO	66,240
JA2JSF	44,772
US5WDL	38,400
JI1HFJ	34,456
9A7ZZ	33,756

Phone Only, Low Power

P40B (P43P, op)	748,170
ZX2B (PY2MNL, op)	512,276
XT2TI	463,488
HO1A	438,792
LP5F (LU1FZR, op)	419,520
KG4DX (W4WX, op)	345,610
TF8GX	343,278
G3VAO	325,728
HK3JJH	315,090
G0AEV	290,550

Phone Only, High Power

D44TD (I4UFH, op)	1,815,120
ZX5J	1,420,848
WP2Z (K8MJZ, op)	1,088,004
LU1HF	945,180
ZF2AH	911,436
TM5C (F6CTT, op)	863,200
HC1HC	826,880
CN8KD	778,128
LP7H (LU9HS, op)	745,150
GM4YXI	743,490

CW Only, QRP

AY7EE	250,880
JA1YNE (JR1NKN, op)	233,640
SP5DDJ	182,304
UA0KCL/3	178,976
UW5U (UY2UA, op)	149,968
JA2IU	141,840
ZS6DX	138,376
OK2WTM	131,316
EA7AAW	127,696
YO7FT	118,272

CW Only, Low Power

NP3A (@NP4Z)	862,752
CO8ZZ	595,200
EA6ACC	563,712
I3MLU (IZ3EYZ, op)	540,864
IK7JWY	538,144
ZL1GO	517,532
SU9US	514,360
JF1SQC	499,488
5B4AHA	491,040
ZL1BYZ	460,964

CW Only, High Power

ZF2NT	1,594,200
JY9NX (JM1CAX, op)	1,264,896
PY2NDX	1,229,584
OD5/OK1MU	1,032,624
9A5Y (9A3LG, op)	1,028,856
9H1ZA	1,016,400
4L8A	944,772
F6BEE	937,860
JG1ILF	850,816
VR2BG	837,344

Multioperator

LT1F	3,151,780
CX5BW	2,767,008
ZW5B	2,606,310
LQ7D	2,572,612
P40K	2,272,952
PJ2T	2,170,710
TI5N	2,154,600
RW6AWT	2,109,990
ON4UN	1,873,400
KL7RA	1,783,554

CT1BOP, operating CT7BOP. Mac, JA2JSF, posted the top score from Asia while Ron, AH6RH, claimed the category for Oceania. Francisco, LU1VK, finished with the top score from South America.

Arnoldo, AY7EE, set the pace in the CW Only category with a new South American record for the category. Within shouting distance in second place and winning Asia was Atsushi, JR1NKN, operating as JA1YNE, who said "I enjoyed good propagation. I felt as if I were in Statesside. Thank you all." Salwa, SP5DDJ, led the European entrants in the category and finished third overall. Winning Oceania was Dale, DU7/N7ET, while Rudi, ZS6DX, set a new scoring mark for Africa.

DX Single Operator Low Power Categories

Three of the top four stations in the Mixed Mode category were able to up the ante on their continental records. Winning the overall category and setting a new South American standard was Didier, FY5FY, who comfortably outscored Norm, W9AU, who operated as C6ANK and posted the top score from North America, by over one million points. Filipe, CT1ILT and Champ, XW1IC, finished third and fourth as they set new continental records forc Europe and Asia, respectively. Andrei, ZL1TM, was tops in Oceania and Heijo, EA8/DJ1OJ, took top honors in Africa.

Jacobo, P43P, operated as P40B and set a new South American category record in winning the Phone Only competition. His nearest challenge came from Wanderley, PY2MNL, operating as ZX2B. Dani, XT2TI, submitted the winning log from Africa while finishing third overall. Fourth overall and tops from North America was Guenter, HO1A.

The best European score (and seventh place overall) came from Gulli, TF8GX. The winner from Asia was Shizuo, JA1SWB, and Bernie, VK4EJ, was tops in Oceania.

CW Only witnessed a runaway winner in the form of North American champion Eric, NP3A, operating from the NP4Z station. Eric was almost 300k ahead of Josep, EA6ACC, who took first place among European entrants. The only continental record in the category was set by Oceania champion Aki, ZL1GO, who finished in fifth place overall. Rounding out the continental winners were Bob, SU9US, in Africa and sixth overall, seventh place overall Seiichiro, JF1SQC in Asia, and Hugo, LU1EWL, for South America.

DX Single Operator High Power Categories

After the ZD8Z and 8P9Z records, third place was claimed by yet another continental record-setting performance. Mike, KH6ND, dominated Oceania from the KH7R QTH using the call sign KH7X. Fourth place finisher Robert, 9A5E, was the top European score, though not a new continental record. Akira, JA8RWU, while not finishing in the top ten did manage to take the top score for Asia in the 2002 contest. Finally Paulo, PV8DX, was the top score submitted from South America.

Besides Fabio, D44TD (Africa) just one more Phone Only station managed to set a new continental record—category runner-up Sergio, operating ZX5J for the South American record. Stan, K8MJZ, operating as WP2Z, finished third with just over one million points to win the North American title. Joseph, F6CTT, operator of TM5C, was the top scoring European during the event, finishing sixth overall, while Oceania was won by Martin, ZL1ANJ, and Asia by Nobuo, JA6GCE.

Another familiar operator, Bruce, ZF2NT, led the way in the CW Only category with a score of 1.5 Megapoints and the North American win for 2002. Joining Bruce near the top of the box was the top Asian score posted by JY9NX, being operated by Koji, JM1CAX. Third place finisher Rafael, PY2NDX, was the top scoring station from South America while R.C., 9A3LG, opped the 9A5Y station to the European title and a fourth place finish overall. John, VK4EMM, rounded out the continental winners by taking Oceania.

DX Multioperator

Only one continental record was set in the Multioperator category, posted by the category winners at LT1F in South America. The operators included LU1FAM, LU1FGE, LU1FJ, LU1FKR, LU1FT, LU3FZW and LU5DX. The runner-up, also from South America, was the CX5BW entry, with CX7BY, CX8CO, and CX4DX assisting in their 36 hours of operation. TI5N, with KD3TB, TI3TLS, TI2WGO, and TI5KD running the show, was next, posting the top North American score. RW6AWT used the skills of RN6BN, RA6CO, RA6CM, and RU6CQ to take top honors among European entrants and RT9W with RU9WX, RX9WR, RW9WW, and RA9WR taking turns in the chair placed first among Asians. Finally ZL6QH ranked number one in Oceania with ZL2AOV and ZL2BSJ sharing the workload.

W/VE QRP Categories

QRP operations continue to grow. A total of 279 Single Operator QRP entries were received in the three categories—approximately 9% of all contest entries received. Almost half of the QRP entries were from CW-only operators (135) followed by Phone Only (78) and Mixed Mode (65). There were also four multioperator entries that ran QRP.

Fred, KG9X (IL), summed up his effort by saying "What an exhausting contest for me. It felt like I was doing a Sprint for 32 hours!" Well, if that's the case we all had better beware of Fred in the next Sprint, as he took top honors in the Mixed Mode category. Actually runner-up Dick, K9OM (NFL), was able to best Fred by more than 50 QSOs. Fred's 42k margin of victory was built by finding 31 additional multipliers during the weekend. Frank, NA4CW (SFL), managed to pull in 219 multipliers (third best in the category) to go along with 869 QSOs to place third in the category.

Phone Only QRP is a challenge to say the least when you are trying to break pileups against stations running twenty or more times your power. Jeff, NX9T (NC) slugged his way through the competition to rack up 615 QSOs and 124 mults (second most world wide in the category) in bringing the championship home, also setting a new Roanoke Division record in the process. Two other stations, Jeff, NJ2F (SFL), and Dick, K4LOG (WCF), also managed to break the 100k point barrier for second and third positions, but neither was within 100 QSOs or 10 multipliers of the winner.

Most people think of CW when they think of QRP operation, and several excellent efforts were posted in this category. Leading the way was Doug, VE5UF (SK), who set a new Canadian record with his 522k point effort. Doug was the only QRP CW operator to surpass the 1000 QSO mark, and also finished second in the category with 120 multipliers in the log. Giving him a hard run was Dale, KG5U (STX), who finished second in total QSOs and third in multipliers and set a new West Gulf mark.

STRATA R. CHALUP, KF6NBZ

Mike, WA2FHF, took a break in SC while touring the United States in his classic 1976 Bluebird Wanderlodge motor home to get into the contest.

W/VE Low Power Categories

Low Power is the most popular set of entry categories in this contest, as nearly 60% of all entries received operated at this power level. The activity level for this year's contest allowed 10 ARRL division records to fall in the three single operator categories.

Ken, K6LA, abandoned the friendly warm climate of southern California to venture to the uncertain weather of Canadian Maritime provinces and operated as VY2TT from Prince Edward Island. The move paid off as Ken easily took the Single Operator Mixed Mode title, posting a substantial 476k points more than runner-up and top US scorer Jeff, N8II (WV). Ken's score of 1,823,760 is also a new Canadian record.

The Single Operator Phone Only category featured the closest race in any W/VE category. Emil, W3EP (CT), and Dick, W7ZR (AZ) duked it out and it was again the battle of the multipliers making the difference. In the end Dick's QSO margin of 91 was not able to offset Emil's margin of 10 multipliers, and Emil won the category by a mere 1544 points. One additional multiplier for Dick would have changed the order of finish. Emil also established a New England category record, joining fourth place finisher Don, W8DD (OH), who set a Great Lakes Division record.

Dan, K1TO (WCF), half of the three-time defending champion duo of the WRTC, entered in the Single Operator CW Only category. The collective groan you heard was from his fellow competitors. Many gave it a valiant try, but none was able to match Dan's effort, as he worked 35% more stations than his nearest competitor and was only tied by runner-up Dallas, W3PP (DE) in the multiplier battle. Dan's winning score of 1,218,000 set the W/VE category record as well as the new mark for the Southeastern Division. Dallas did set a new Atlantic Division record with his runner-up score.

W/VE High Power Categories

In the Single Operator Mixed Mode High power category, the trend of the station with the most multipliers holding off the QSO machine did not hold up. In the battle of the Indiana section, Mike, W9RE used his 202 additional QSOs to hold off another Mike, K9NW (IN), who had 7 additional multipliers. The margin of difference was about 47k points. Mike's score is also a new Central division record.

The South Texas section can claim the only participant in the Single Operator Phone competition to crack the one million-point barrier. Chuck, W5PR, finished a comfortable 63k points ahead of Bill, K4XS (WCF).

High Power CW always means a slugfest between some of the better CW operators on the air. This year was no exception, as less than 200k points, 396 QSOs or 13 multipliers separated the top 10. Dave, N2NL (SFL), took top honors in this highly competitive category holding off nearest opponents Rick, K7GM (NC), and Alex, LZ4AX operating K3CR (WPA), the Penn State University station. Alex's score is a new Atlantic Division record.

W/VE Multioperator

The Multioperator category really means a lot of strategy and planning. A multiop station can not be transmitting more than a single signal at any time. Several multioperator stations seem not to understand that they are limited to operating only 36 of the 48 hours of the contest period. Understanding strategy and the rules is important for the category.

Leading the way in 2002 among W/VE multioperator stations was N2NT (NNJ), who was joined by W2RQ and N2NC. They posted a comfortable 244k margin of victory over NX5M (STX) operating

Region Leaders

Tables list call sign, score, class (A = Mixed Mode, B = Phone only, C = CW only, D = Multioperator), and power (A = QRP, B = Low Power, C = High Power).

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

K3TW	348,880	A	A
N1LW	191,400	A	A
WB2AMU	181,662	A	A
VY2TT	1,884,420	A	B
(K6LA, op)			
W1HR	1,229,272	A	B
(K1FWE, op)			
NY1S	942,920	A	B
W2RE	2,347,776	A	C
K1XX	2,193,964	A	C
K3ZO	2,149,030	A	C
N1BQ	89,024	B	A
AB2IW	86,940	B	A
N2XT	62,790	B	A
W3EPa	504,284	B	B
KT3RR	332,004	B	B
WB2ZTH	258,412	B	B
W1SJ	558,502	B	C
W1AW	454,292	B	C
(N1ND, op)			
N2EOC	436,712	B	C
AA1CA	231,120	C	A
WO2N	202,464	C	A
N2CU	159,200	C	A
W3PP	889,088	C	B
NY3A	717,660	C	B
VO1MP	646,176	C	B
K3CR	1,232,160	C	C
(LZ4AX, op)			
KD4D	1,191,508	C	C
(@N3HBX)			
K4ZA	1,190,700	C	C
N2NT	3,023,542	D	
N2OW	2,459,744	D	
KA1ZD	1,902,222	D	

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

K9OM	786,318	A	A
NA4CW	609,960	A	A
W4DEC	189,476	A	A
N8II	1,358,104	A	B
W0YR	1,295,152	A	B
N4IG	960,500	A	B
WC4E	2,364,852	A	C
W5WMU	2,128,462	A	C
K4WX	2,019,624	A	C
NX9T	153,000	B	A
NJ2F	110,860	B	A
K4LOG	105,728	B	A
NY4T	281,792	B	B
AA5FJ	278,616	B	B
K4FB	228,854	B	B
K4XS	945,360	B	C
K4WI	793,408	B	C
KY5R	767,880	B	C
N4IJ	271,400	C	A
WA8WV	213,344	C	A
K4UK	83,000	C	A
K1TO	1,218,000	C	B
N4PN	877,200	C	B
N4ZI	732,096	C	B
N2NL	1,382,320	C	C
K7GM	1,244,796	C	C
KM5G	1,137,192	C	C
K1SE	2,498,600	D	
W4MYA	2,483,968	D	
K4FCG	1,785,622	D	

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

KG9X	825,790	A	A
VE3BUC	394,424	A	A
K8BL	342,084	A	A
NE9U	1,015,650	A	B
K8NZ	897,750	A	B
VE3CR	678,210	A	B
W9RE	2,564,592	A	C
K9NW	2,462,524	A	C
VE3AT	2,282,380	A	C
KC8QAE	19,656	B	A
W9HL	13,208	B	A
KC8PKY	3,400	B	A
W8DD	362,768	B	B
KC8JUZ	168,300	B	B
KC9UM	162,792	B	B
WB9Z	915,936	B	C
N2BJ	637,606	B	C
N8TR	575,580	B	C
VE3XAX	195,840	C	A
N8AP	161,020	C	A
WA1UJU	152,772	C	A
K9QVB	736,560	C	B
KM0O	718,640	C	B
W8MJ	621,792	C	B
N9RV	1,188,616	C	C
K9BGL	1,062,144	C	C
VA3UA	996,928	C	C
N4GN	2,491,904	D	
K8CC	2,237,472	D	
KI9A	1,725,750	D	

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

WA8ZBT	432,950	A	A
K0PC	376,872	A	A
K0OU	300,720	A	A
WD5K	1,157,166	A	B
K0OB	1,134,240	A	B
N0AT	1,091,800	A	B
K0SR	1,743,488	A	C
K0TT	1,721,832	A	C
W7UT	1,526,800	A	C
KK0Q	95,996	B	A
W5GZ	57,876	B	A
KI0II	29,784	B	A
KE9KD	348,960	B	B
AC0W	348,612	B	B
VE4MM	302,556	B	B
W5PR	1,014,420	B	C
VA5DX	878,572	B	C
K5TR	801,944	B	C
(WM5R, op)			
VE5UF	527,076	C	A
KG5U	452,200	C	A
N0UR	331,816	C	A
W5TM	715,500	C	B
(W5AO, op)			
K5KA	667,980	C	B
KT0K	608,256	C	B
W5KFT	1,191,664	C	C
(K5PI, op)			
W0SD	1,191,508	C	C
(W0DB, op)			
K2BA	987,280	C	C
NX5M	2,821,728	D	
N5OT	2,318,676	D	
N5YA	2,174,934	D	

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

W7AY	209,664	A	A
NK6A	118,800	A	A
W7CD	93,740	A	A
K7SS	1,183,084	A	B
NU6S	949,248	A	B
NT6K	834,552	A	B
K6AM	1,918,762	A	C
N6RO	1,813,222	A	C
K6XX	1,576,208	A	C
W7PE	79,220	B	A
W7YA	75,600	B	A
WR6WR	64,428	B	A
(N6WR, op)			
W7ZR	502,740	B	B
N7BES	405,444	B	B
N6IIU	302,400	B	B
K7RI	697,108	B	C
N7GYD	614,516	B	C
VA7XX	555,296	B	C
N7OU	334,080	C	A
W6JTI	248,032	C	A
W7RAB	228,816	C	A
(KH7YD, op)			
N6JV	466,012	C	B
K7ON	417,300	C	B
VE7SL	416,680	C	B
W6EEN	1,079,752	C	C
(N6RT, op)			
N6MU	816,916	C	C
(@N6NB)			
N7FO	750,892	C	C
(KN5H, op)			
W6YX	1,985,772	D	
K6KM	1,481,634	D	
K6IDX	1,150,404	D	

Africa

EA8/DJ1OJ	488,670	A	B
CT3KN	488,220	A	B
ZD8Z	4,733,880	A	C
(N6TJ,op)			
ZS0E	14,448	A	C
(ZS6AJS, op)			
XT2TI	463,488	B	B
EA8BU	47,728	B	B
ZS4BS	12,672	B	B
D44TD	1,815,120	B	C
(I4UFH, op)			
CN8KD	778,128	B	C
7P8ZZ	397,062	B	C
(ZS6WPX, op)			
ZS6DX	138,376	C	A
SU9US	514,360	C	B
EA8CN	326,368	C	B
EA8AVK	118,192	C	B

Asia

JA2AXB	229,992	A	A
RX9SR	228,280	A	A
RZ9IB	72,226	A	A
XW1IC	1,189,224	A	B
BW3/UA3VCS	506,792	A	B
UN6G	415,888	A	B
JA8RWU	1,155,308	A	C
UA9CDV	918,694	A	C
JI2KVW	902,692	A	C
JA2JSF	44,772	B	A
JI1HFJ	34,456	B	A
JA1SWB	134,310	B	B
UQ1D	107,066	B	B
JQ1BNL	102,336	B	B
JA6GCE	422,508	B	C
JA7NVF	365,904	B	C
JH1OCC	201,552	B	C
JA1YNE	233,640	C	A
(JR1NKN, op)			
UA0KCL/3	178,976	C	A
JA2IU	141,840	C	A
JF1SQC	499,488	C	B
5B4AHA	491,040	C	B
JI1RXQ	455,860	C	B
JY9NX	1,264,896	C	C
(JM1CAX, op)			
OD5/OK1MU	1,032,624	C	C
4L8A	944,772	C	C
RT9W	1,364,500	D	
JJ3YBB	1,134,972	D	
JA2ZJW	1,005,488	D	

Europe

UX0IB	181,504	A	A
ER5DX	160,740	A	A
YU1LM	136,864	A	A
CT1ILT	1,223,552	A	B
LZ9W	1,085,280	A	B
HA6NF	978,880	A	B
9A5E	1,956,654	A	C
OK1RI	1,800,582	A	C
RK4FF	1,594,840	A	C
CT7BOP	154,320	B	A
(CT1BOP, op)			
UA3BL	83,300	B	A
T94DO	66,240	B	A
TF8GX	343,278	B	B
G3VAO	325,728	B	B
G0AEV	290,550	B	B
TM5C	863,200	B	C
(F6CTT, op)			
GM4YXI	743,490	B	C
TK1C	739,350	B	C
(F5MZN, op)			
SP5DDJ	182,304	C	A
UW5U	149,968	C	A
(UY2UA, op)			
OK2WTM	131,316	C	A
EA6ACC	563,712	C	B
I3MLU	540,864	C	B
(IZ3EYZ, op)			
IK7JWY	538,144	C	B
9A5Y	1,028,856	C	C
(9A3LG, op)			
9H1ZA	1,016,400	C	C
F6BEE	937,860	C	C
RW6AWT	2,109,990	D	
ON4UN	1,873,400	D	
M5X	1,676,016	D	

North America

C6ANK	1,244,220	A	B
(W9AU, op)			
CO8LY	705,056	A	B
XE2AC	332,112	A	B
8P9Z	3,788,386	A	C
(K4BAI/8P9HT, op)			
KL1V	494,296	A	C
AL1G	425,852	A	C
KP4KE	366,750	B	A
HO1A	438,792	B	B
KG4DX	45,610	B	B
(W4WX, op)	3		
NP3P	282,720	B	B
(NP3E, op)			
WP2Z	1,088,004	B	C
(K8MJZ, op)			
ZF2AH	911,436	B	C
J37K	527,156	B	C
(AC8G, op)			
NP3A	862,752	C	B
(@NP4Z)			
CO8ZZ	595,200	C	B
HP1AC	154,400	C	B
ZF2NT	1,594,200	C	C
XE1MM	61,568	C	C
TI5N	2,154,600	D	
KL7RA	1,783,554	D	
6J1KK	1,276,020	D	

Oceania

NH0H	16	A	A
ZL1TM	397,500	A	B
KH0/JA1UII	157,440	A	B
KH0/JA1UII	132,060	A	B
KH7X	2,522,160	A	C
(KH6ND (@KH7R)			
VK5GN	602,728	A	C
VK4UC	362,838	A	C
AH6RH	3,038	B	A
KH6CDO	242	B	A
VK4EJ	126,558	B	B
DU1/K6ACZ	41,648	B	B
4D70SAN	40,284	B	B
ZL1ANJ	351,232	B	C
VK4WPX	106,496	B	C
KH3/KH6GMP	101,840	B	C
DU7/N7ET	34,776	C	A
ZL1GO	517,532	C	B
ZL1BYZ	460,964	C	B
ZL2BR	355,240	C	B
VK4EMM	565,800	C	C
ZL1ALZ	104,280	C	C
ZL6QH	1,131,116	D	
KH6IN	235,352	D	
VK6ANC	17,324	D	

South America

PY2WC	131,846	A	A
PY3YD	19,072	A	A
LW5EE	4,234	A	A
FY5FY	2,288,540	A	B
L73F (LU5FF, op)			
	1,133,730	A	B
PY2NY	540,384	A	B
PV8DX	9,912	A	C
LU1VK	95,076	B	A
LU2EE	66,528	B	A
L20E	29,820	B	A
P40B	748,170	B	B
(P43P, op)			
ZX2B	512,276	B	B
(PY2MNL, op)			
LP5F	419,520	B	B
(LU1FZR, op)			
ZX5J	1,420,848	B	C
LU1HF	945,180	B	C
HC1HC	826,880	B	C
AY7EE	250,880	C	A
AY5FZ	34,560	C	A
L55DR	25,760	C	A
(LW5DR, op)			
LU1EWL	419,724	C	B
PY2NA	233,624	C	B
LU2FLN	154,000	C	B
PY2NDX	1,229,584	C	C
AY1DZ	586,224	C	C
ZP6CW	256,608	C	C
LT1F	3,151,780	D	
CX5BW	2,767,008	D	
ZW5B	2,606,310	D	

along with N5XJ, N5OLS, N5DUW and KB5ZFO.

ARRL Affiliated Club Competition

One of the highlights of the 10-Meter Contest each year is the ARRL Affiliated Club Competition. In 2002, a total of 971 entries were claimed for 140 different clubs. A total of 62 clubs received the minimum of three entries.

Another tradition of the ARRL 10-Meter Contest is that the Potomac Valley Radio Club wins the Unlimited Club category, and 2002 was no exception. The PVRC made it a "five-peat" by winning the category for the fifth consecutive year. Runner-up this year was the Northern California Contest Club, who edged out the Society of Midwest Contesters by about 327k points. SMC's total of 95 logs (most for any club) was not able to make up the difference.

The Medium Club Category was a runaway victory by the Florida Contest Group. Their 47 logs totaled 27.2 Megs, easily outdistancing a surprise runner up—The Contest Club of Ontario. Because of a change in the ACC rules allowing RAC affiliates to participate, the CCO edged out the US east coast powerhouse Frankford Radio Club by 778k.

Three Local Club Category entries managed to break the 1-Meg point mark in 2002. The final tally shows that the Redmond Top Key Contest Club held on for a 100k point victory over the Western Wireless Contest Club. Only 150 points behind in 3rd place was the CT RI Contest Club. Congratulations to all participants and the winning clubs.

None of us is naïve enough to think that 2003 will show a repeat of the exceptional conditions we saw in 2002. But then again, many of "those in the know" were pleasantly surprised as the decline in the cycle was not quite in full swing by late 2002. Even if conditions are down from the past couple of years, start planning now for the 2003 ARRL 10 Meter Contest, set for December 13-14. A couple of more QSOs here, a hard-fought multiplier there, and who knows what wallpaper you may have hanging in your shack after the contest? QST

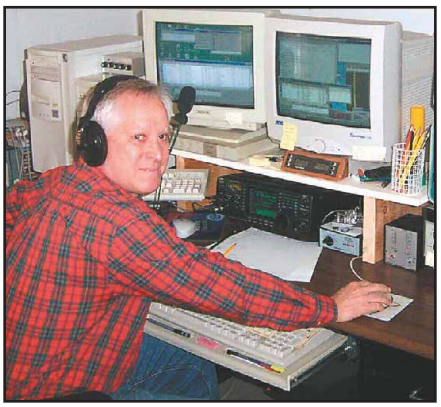
By **Jay Townsend, WS7I**

2003 ARRL RTTY Roundup Results

Another session of the finest couch potato, non-contact sport yet invented, the ARRL RTTY Roundup contest has again taken place. This operator's contest has seen an explosion of activity with a 26% increase in logs being submitted for an all-time record number of 720 logs received. RTTY contesting continues to expand each year, helped by new terminal software with improved features in the contest program. Cabrillo log preparation has also made submitting logs easier than ever before.

The goal of every operator is to improve upon a previous score. Some operators try for a new Division record, some for the all-time category score, some for a missing state. Just keep in mind that you're not the only one who improved his score. This year we have three out of four new Top All-time category winners. Everyone else also worked the new guys and gals on RTTY and that's what makes it interesting.

The most popular class continues to be the low power single operator class with 470 logs submitted. This year another 175 logs were submitted in the high power class. There were 55 multioperator class logs; these were about evenly divided between the high and low power categories.



Finishing second overall among W/VE Single Operator Low Power stations was W1ZT, piloted by George Johnson.

Expanded Results, Line Score Printouts Available

For complete contest results on-line, please visit **www.arrl.org/contests/results**. ARRL members without Internet access may obtain a printout of the complete line scores by sending a self-addressed stamped envelope to ARRL Contest Results, 225 Main St, Newington, CT 06111. Please be sure to include the contest name and year.

Many people enter the multioperator classes to use either one radio or one transmitter and packet. This is an interesting way to get around the raging argument over multi-radio contesting. The limit of six band changes per hour for multioperator stations makes their rate much less than that of single operator stations and also can let those operators that are "antenna challenged" compete.

Roundup is about the Average Station

The average station operator is the one who makes this contest so much fun. This year we highlight Joe, N3XLS, and Al, N3KAE. The 2003 contest was their first RTTY Roundup. Joe and Al spent 22 hours contesting, made about 500 QSOs in 45 states and 9 provinces and worked 33 DX entities for a score of 43,500. Their equipment consisted of a single rig running 50 W to a dipole up 45 feet. Future plans for Joe and Al include making the ARRL RTTY Roundup an annual tradition.

Let's review the high points. Roundup offers four classes for DX and W/VE entries.

Single Operator Low Power

In the 15 years of Roundup, Don, AA5AU, has won this category 12 times.

Top 10 Scores

Single Operator

W/VE—Low Power

AA5AU	219,234
KA4RRU	171,360
N9CK	152,424
WX4TM	149,072
N3SL	143,910
N4BP	113,741
VY2SS	112,332
KC4HW	111,071
KI6DY	105,644
WE9V	101,971

W/VE—High Power

KI1G	250,472
W1ZT	194,056
W5KFT (K5PI, op)	183,120
K6LL	169,730
K4GMH	154,938
WW7OR	151,690
ND5S	147,932
K4MA	143,980
W4GKM	139,840
VE1OP	135,954

DX—Low Power

ZX2B (PY2MNL, op)	132,480
G0URR	118,560
CO8ZZ	82,472
SP6AXW	82,110
UY8IF	80,654
SP6EKS	73,660
UW5U (UY2UA, op)	71,609
LZ2BE	71,094
EU1MM	66,810
YU7AM	66,340

DX—High Power

OR3T (ON4UN, op)	165,312
9A5W	160,655
S54E	136,653
DL4MCF	135,664
LV5V (LU5VV, op)	124,120
RK4FF	110,922
YL7A	109,976
LX5A (LX1RQ, op)	104,299
SN7N	96,330
JH4UYB	88,236

Multioperator

W/VE—Low Power

N2WK	115,168
W6YX	114,648
K4WW	103,550
W5VZF	84,552
KG0QG	78,780
N8LRG	70,512
W1GZ	65,835
K5BAT	64,400
K8VT	57,232
KE4YVD	44,932

W/VE—High Power

K9NS	222,176
W0SD	172,224
NE3H	161,007
KI5XP	139,029
KJ7TH	120,330
K8AA	113,390
K0KO	105,948
K0FJ	102,000
W4CBX	74,121
N4CW	67,517

DX—Low Power

KP2D	148,274
XE1KK	110,922
IK4JSI	72,280
YU7AL	60,078
7L4IOU	18,525
UT0H	10,710
SV1XV	9,936
SV1BDO	6,630
JA8JCR	3,808

DX—High Power

VP5NN	243,164
OL5Q	120,904
EN7Z	116,632
MW2I	105,621
KL7FAA	63,096
JM1LPN	30,562
OM3RJB	22,484
OH2K	5,750

Region Leaders

Tables list call sign, score, class (S = Single Operator, M = Multioperator), and power (A = Low Power, B = High Power).

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

VY2SS	112,332	S	A
W1ECT	98,536	S	A
N2DBI	93,296	S	A
WA1EHK	85,842	S	A
N1NB	78,003	S	A
KI1G	250,472	S	B
W1ZT	194,056	S	B
VE1OP	135,954	S	B
NO2T	108,960	S	B
VE2HQ	93,184	S	B
N2WK	115,168	M	A
W1GZ	65,835	M	A
N3XLS	43,500	M	A
K3UG	36,627	M	A
W1AW	31,600	M	A
NE3H	161,007	M	B
W2YC	57,062	M	B
AJ3M	38,070	M	B

Southeast Region
(Delta, Roanoke and Southeastern Divisions)

AA5AU	219,234	S	A
KA4RRU	171,360	S	A
WX4TM	149,072	S	A
N4BP	113,741	S	A
KC4HW	111,071	S	A
K4GMH	154,938	S	B
K4MA	143,980	S	B
W4GKM	139,840	S	B
K4SV	131,852	S	B
KK5OQ	130,176	S	B
W5VZF	84,552	M	A
K5BAT	64,400	M	A
VE3XD/W4	13,467	M	A
KI5XP	139,029	M	B
W4CBX	74,121	M	B
N4CW	67,517	M	B

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

N9CK	152,424	S	A
WE9V	101,971	S	A
W9HLY	87,468	S	A
W4LC	73,034	S	A
VE3GSI	71,286	S	A
ND5S	147,932	S	B
AI9T	119,830	S	B
VA3DX	112,545	S	B
AB8K	101,660	S	B
W9OL	92,880	S	B
K4WW	103,550	M	A
N8LRG	70,512	M	A
K8VT	57,232	M	A
KE4YVD	44,932	M	A
K9NS	222,176	M	B
K8AA	113,390	M	B
VE3FJB	51,918	M	B
AA9RR	32,130	M	B
KE9S	21,328	M	B

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

N3SL	143,910	S	A
KI6DY	105,644	S	A
VE4COZ	84,192	S	A
KTØDX	83,160	S	A
NØCDA	82,156	S	A
W5KFT (K5PI, op)	183,120	S	B
K5AM	122,910	S	B
KU1CW	122,094	S	B
WØDC	116,256	S	B
VE5CPU	107,601	S	B
KGØQG	78,780	M	A
KOØZ	39,552	M	A
N5RFX	30,525	M	A
KD5KZG	7,200	M	A
AFØS	1,312	M	A
WØSD	172,224	M	B
KØKO	105,948	M	B
KØFJ	102,000	M	B
WØDET	16,512	M	B

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

N6OJ	77,309	S	A
W7ZR	73,392	S	A
W7LD	66,192	S	A
N7UVH	65,384	S	A
AC6DR	58,575	S	A
K6LL	169,730	S	B
WW7OR	151,690	S	B
W7WW	124,925	S	B
KE7AJ	103,158	S	B
K7ZUM	86,668	S	B
W6YX	114,648	M	A
N7PWZ	40,572	M	A
AH6OZ/W7	23,736	M	A
KJ7TH	120,330	M	B

Everyone keeps waiting for Don to try something different. All Don did this year was once again rewrite the category record book with his 219,234 points. Mike, KA4RRU, from Virginia moved into second place this year ahead of Steve, N9CK. The West Coast RTTY guys were represented by Bob, KI6DY, who improved on his 10th place finish last year.

Returning to the DX top spot was ZX2B piloted by Wanderly, PY2MNL. Bob, GØURR, upgraded his station and achieved second place, commenting that 94 QSOs in one hour was "exhilarating stuff." CO8ZZ came in a close third with SP6AXW finishing in fourth place.

Single Operator High Power

For the second year in a row the East Coast dominated this category. Rick, KI1G, set a new all-time record with a first from Rhode Island. George, W1ZT, took his usual second place spot. Robert, K5PI, operating from the W5KFT ranch station finished third. From Arizona, K6LL, operating his single tower station improved to 4th from 7th place last year. Rounding out the top 5 was Mike, K4GMH. From the Pacific Northwest it was WW7OR just a little off the pace in 6th place.

As my Pappy used to tell me, "Son, if you really want to do well in the single operator class, you have to mix running rate with Search and Pounce techniques." At least that's how I remember it.

One of the biggest changes this year on the DX scene was the lack of Caribbean and South American top stations. Europe dominated in 2003. After telling us how to do it last year in his excellent Web article, John, ON4UN, operated as OT3T to win this year. The low bands were excellent and who better to dominate them than John! Tightly behind John was 9A5W who moved up from 4th place last year to 2nd place this year. S54E and DL4MCF completed the European dominance. And 5th place was LV5V with his first high power effort.

The times are a-changing as we cycle from high to low bands, and we can expect the change in winners to shift as well.

Multioperator Low Power

Stateside it was N2WK in a first time Multi/Single effort taking first place honors with some impressive finds in the Multiplier arena. The N2WK team set a new Atlantic Division record. Beating their last year's Roundup effort QSO total by 300, the Stanford University station W6YX could only take second place US. Third place was captured by Shelby, K4WW, from Kentucky. W5VZF and KGØQG rounded out the top 5 stateside.

The goal of restoring the multi-single low power DX record back to KP2D energized that group to achieve it with several hours left in the contest. From Mexico, XE1KK got a lot of attention and came in second. Topping the Europeans was IK4SJI, last year's low power winner, followed by the YU7AL team.

Multioperator High Power

This year was the year of the DX Multi entry. Clearly last year's push from the Caribbean gave W6XY and N6EE the idea to do a DXpedition. So this year they traveled to VP5NN and set a new all-time high-power record. This team has really hit the RTTY scene lately and is having great success. Second this year on the DX side but dropping down a notch was last year's winner, OL5Q. Groups from EN7Z, MW2I and KL7FAA followed in the rankings.

For the second year in a row, K9NS remained on top of the stateside battle, edging out the group from WØSD, who again set another Division record. This year NE3H took East Coast honors. KI5XP, KJ7TH and K8AA ate their dust.

Fun in the Roundup

Echoed in log after log was the joy brought to the RTTY community by the group that activated North Dakota on RTTY in a big way. So we give great homage to the operators from NWØL. It seems that a number of new Worked All States will result from the NWØL operation, which submitted as a checklog. As we get closer to having good representation from all the states in the contest, the missing ones really do pop out. This year it seemed to be Delaware. Wonder who is headed there in 2004.

The compact nature of the event keeps the action hot and heavy and that makes for a fun event. Ken, K7ZUM, thought the neatest thing was that he didn't blow up any of his gear this year because he had learned his lesson from past RTTY contests and now only uses bigger parts!

Perhaps the biggest disappointment was the lack of the good PSK31 activity we have had in the past. It seems that 40 and 80 meters in particular had very limited interest in PSK31.

Next Year

Changes in the rules coming: At a recent ARRL Board meeting the Membership Services Committee voted to include club competition in the RTTY Roundup for 2004. This will most likely result in yet another increase in participation in next year's contest. So wax up your antennas, boys, and gather the club members together for some spirited competition. Perhaps it's time to form a club in your area. Whatever route you take, be ready for the 2004 ARRL RTTY Roundup, January 3-4. 73 QST

By **Steve Ewald, WV1X**

2002 Simulated Emergency Test Results

Scenarios "drive" SET

Lake County, Illinois ARES/RACES

By Donald R. Whitney, K9DRW
ARES Emergency Coordinator and RACES Assistant Radio Officer, Lake County, IL

In 2001, the Lake County, Illinois, ARES/RACES group used an entirely new approach to the Simulated Emergency Test. We let selected local municipalities in the county "drive the SET" using scenarios they created for their own drills. These "situations" would escalate to a point where they exhausted their local resources forcing them to call Lake County Office of Emergency Management for assistance. At this time, Lake County would in turn contact our volunteer group, the Emergency Operation Center (EOC) would be activated and the official 2002 ARES/RACES SET would commence.

Purpose of the 2002 SET

1. To find out the strengths and weaknesses of our own ARES/RACES and other groups in providing emergency communications.

2. To demonstrate to served agencies in Lake County such as the Office of Emergency Management, the Sheriff's Office, municipal police and fire departments and the Red Cross the value that Amateur Radio provides, particularly in time of need.

3. To test the functionality of our newly remodeled Emergency Operations Center.

4. To help radio amateurs gain experience in communications using standard procedures and a variety of modes under simulated emergency conditions.

SET Format

This year, the local municipalities were the ones "calling the shots." In all previous years, a select team of ARES/RACES individuals, led by the EC, would determine the scenario and literally "write the script" for the event. On the day of the SET, the team would unfold the scenario over the air similar to an old-time "radio play." The team that wrote the play would know everything that was going to happen as they created the situations to challenge all participants.

2002 was completely different. The tables were turned as the local municipalities of Buffalo Grove, Wauconda, Antioch and Zion each created and unfolded their individual scenarios that in turn would become our SET scenario. Our job was to respond to the situations that the municipalities created. As the EC, this was truly more challenging than ever before. I am not one that likes surprises; I like to be in control. All we could do was to try to be as prepared as possible for literally any situation. This was the most interesting SET we have had in many years.

Preparing Individually

During our planning meetings and on the weekly nets prior to the SET, we signed up members, but unfortunately we could not share any of the SET plans even if we wanted to. We did not know them. We outlined sample activities and provided general instructions like "make sure you have your Go Kit ready, charge up your HT batteries and stand by for things to happen." We needed all the support we could get. We let it be known that if all you can do is check in, that was fine too. We tried to line up 2 meter, UHF, HF, packet and APRS equipment and operators in advance to be better prepared.

The Day of the SET

All we could ask is for SET participants to be ready for anything. Our plans dictated that we had to leave the EOC vacant until something happened (no hanging around "just in case"). If and when something broke, we planned to respond to the "emergency situations" as the municipalities unfolded them and initiate a directed net if required. Stations were alerted that they might need to be deployed to various locations to provide support for served agencies and possibly pass traffic on behalf of these served agencies.

2002 SET Top Ten

Section	*Points*	*Section*	*Points*	*Section*	*Points*
ARES Activity					
Michigan	4937	Mississippi	1400	Western New York	1230
North Carolina	3997	Eastern Pennsylvania	1349	Ohio	749
Western New York	2696			Western Pennsylvania	659
Ohio	2180	**Section/Local Nets**		Oregon	533
Oregon	1737	North Carolina	3150	Orange	522
Western Pennsylvania	1731	Connecticut	1770	New Hampshire	521
New Hampshire	1628	Michigan	1577	Eastern New York	420
Illinois	1411				

SET Scorecard

The points for ARES activity were awarded in the following manner:

Category	*Points*
A) Number of amateurs participating	2 (each)
B) Number of new amateurs (licensed since 1998)	3 (each)
C) Number of formal third party messages originated on behalf of served agencies	1 (each)
D) Tactical communication was conducted on behalf of served agencies: (<0.5 hour, 5 points; 0.5-1 hour, 10 points; >1 hour, 20 points)	
E) Number of stations on emergency power during test	2 (each)
F) Number of emergency-powered repeaters used in test	10 (each)
G) Dual membership in ARES and RACES is encouraged	10
H) Liaison was maintained with an NTS section/local net	10
I) Digital modes were used during test	10
J) Number of different agencies for which communication was provided.	5 (each)
K) Number of communities in which agencies were contacted	10 (each)
L) Press release was submitted	10

The points for net activity were awarded in the following manner:

A) Total number of messages handled.	1 (each)
B) Number of different stations participating	2 (each)
C) Number of different stations checking-in on emergency power	2 (each)
D) Number of new amateurs (licensed since 1998) in test	3 (each)
E) Number of net control stations	5 (each)
F) Number of different stations performing NTS liaison	5 (each)

It All Came at Once

It was a pleasant thought that each municipality would unfold their scenario one at a time so we could have time to react and respond. No such luck. It all came at once, pressing us to the limit, but what are drills for? Here is what unfolded all within the first hour:

Wauconda had a hazardous material spill situation caused by a tractor-trailer accident requiring evacuation of many residents to local shelters.

Buffalo Grove had a train wreck in the middle of a major winter storm.

Antioch had a train derailment and hazardous material chemical spill with a tank car leaking hydrofluoric and hydrogen cyanide plus a radio and telephone communications outage.

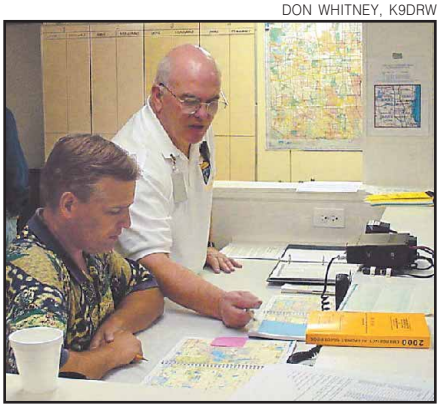
Zion had a major fire and a number of related explosions.

The SET Critique

An important post-SET activity is always the critique session to discuss the test results. Each individual municipality conducted its own critique. We invited representatives from each municipality and all ARES/RACES members who participated to meet at the EOC to review the good points and weaknesses apparent in the drill. When something goes wrong during the SET and we use it as a learning experience, then the exercise is considered successful.

In this case, the critique lasted as long as the SET itself. We learned so much and will be making so many changes that I might even throw caution to the wind in 2003 and do this type of SET again. Remember, I said "might."

DON WHITNEY, K9DRW



Jim Schultz, K9JCS (standing), Director of Lake County Office of Emergency Management and Bruce Becker, N9VID, functioning as the "Incident Commander" discuss the safest way to route responding packet radio operators into the "Haz-Mat Incident Area" involved in the 2002 SET.

Licking County, Ohio

Excerpts from the SET Report by Eldon Peterson, W5UHQ, Licking County EC:

At 6:20 AM on October 5, a simulated F3 tornado swept through northwest Licking County, Ohio. All commercial power was off in the county and phone and cell service was severely limited. Both ARES repeaters (146.88 and 145.47 MHz) were knocked off the air. The 146.88 machine was completely leveled, and we lost the entire machine, tower and emergency power. The 145.47 backup repeater was damaged less, but we lost the top 50 feet of the tower and the antennas and feed line were damaged. We found out later that the majority of the damage was centered in the Alexandria, Ohio, area right by our backup repeater. This is a small, rural community about 30 miles northeast of Columbus.

At 8 AM, the EC, W5UHQ, was notified of the condition by the emergency management agency and initiated an ARES radio call-up and found the repeaters were out. So we tried direct and found that one of our local ARES members (KC8SSG) was already on the way to the secondary repeater site to help Andy, KC8EVM, get the system back on the air. After contact with KC8EVM and a quick analysis of where we could best be used, we concentrated on getting that key repeater back on the air as our primary ARES mission for the SET.

By 8:45 AM, some telephone service was restored, and we were able to contact 7 of 11 members on our recall list. We keep a recall list on our Web site so that all members have access to it. We decided to open our exercise emergency net on 146.52 MHz until we could get repeater coverage re-established.

Although this was a simulated tower repair, this work was scheduled to happen this weekend anyway (for real). We decided, in real time, to combine the exercise with the repeater-repair work to add to the realism of the Simulated Emergency Test.

2003 SET Around the Corner

Thanks to everyone for participating in the annual ARRL Simulated Emergency Test!

October 4 and 5 is the main weekend to focus on for this year's ARRL Simulated Emergency Test. Contact your local or section Field Organization leaders to find out specific dates, times, places and frequencies for the SET in your area.

ARES Activity

Area	Reporter	Points	Section Points
Atlantic Division			
Eastern Pennsylvania			**1349**
Lancaster Co	WB3FQY	607	
Montgomery Co	W3ZQN	527	
Monroe Co	N3ZQT	215	
Maryland-DC			**339**
Anne Arundel Co	N3SEO	201	
Frederick, Brunswick, Myersville	N8AAY	138	
Southern New Jersey			**297**
Ocean Co	WX2NJ	248	
Atlantic Co	N2JVM	49	
Western New York			**2696**
Otsego	N2NQH	838	
Chenango Co	K2DAR	562	
Herkimer Co	N2ZWO	346	
Onondaga Co	WA2PUU	275	
Cayuga/Seneca Co	W2QYT	195	
Delaware Co	AA2RM	188	
Broome Co	KB2YEN	170	
Cortland Co	KB2LUV	100	
Oneida, Madison Co	N2FHR	22	
Western Pennsylvania			**1731**
Beaver Co	K3NPX	938	
Erie Co	N3HPR	420	
Fayette Co	K3FQI	207	
Westmoreland Co	N3WAV	166	
Central Division			
Illinois			**1411**
Lake Co	K9DRW	449	
Decatur	N9RGM	261	
Schaumburg	N9MYC	260	
Dekalb Co	W9ICU	174	
La Salle Co	KF9NZ	136	
Sangamon Co	K9CNP	131	
Indiana			**449**
Bartholomew Co	N9MUS	189	
Whitley Co	WB9UNL	164	
Pike Co	WB9NCE	94	
Wisconsin			**250**
Calumet Co	KN9P	250	
Dakota Division			
Minnesota			**103**
Redwood Co	KA0ISD	103	
Delta Division			
Arkansas			**1144**
Cross Co	W5WPN	308	
Statewide RACES	W5AUU	279	
Boone Co	N5YQC	199	
Benton Co	W5JSR	195	
Washington Co	K1ARK	163	
Pope Co	W5RZ	82	
Louisiana			**964**
NE Louisiana Dist	AC5VN	318	
Calcasieu Parish	WA5LQZ	287	
Acadiana District	K5DPG	165	
Union Parish	KA5JNL	79	
Franklin Parish	N5ASA	44	
Morehouse Parish	KD5KZZ	39	
Terrebonne Parish	KB5UOO	32	
Mississippi			**1400**
Hinds, Madison, Rankin Co	AC5SU	261	
Lee Co	KD5JXL	213	
Jones Co	N5NQ	212	
Lowndes Co	KD5FUO	212	
Southwest MS	N5NZT	124	
Lauderdale, Clarke Co	KD5GWM	121	
Itawamba Co	AD5IS	118	
Attal Co	KB5ZEA	87	
George Co	KA5PMK	52	
Tennessee			**314**
Montgomery Co	W4LWE	314	
Great Lakes Division			
Kentucky			**803**
Sectionwide	KA4MAP	592	
Fayette Co	N4MOM	211	
Michigan			**4937**
District 6	K8SN	906	
Oakland Co	W8HIU	625	
Chippewa/Mackinac	VE3EUI	606	
Alcona Co	W8SZ	596	
Kalamazoo Co	NK8X	398	

Area	Reporter	Points	Section Points
Ontonagon Co	W8UXG	393	
3rd Dist, Iosco	KB8ZYY	309	
Benzie Co	K8BTE	204	
Tuscola Co	N8XTN	204	
Macomb Co	N8MG	202	
Jackson Co	KC8JJT	185	
Muskegon Co	N8YJT	120	
Livingston Co	N8WWX	99	
Saginaw Co	N8VDG	90	
Ohio			**2180**
Stark Co	WD8AYE	309	
Shelby Co	N8KZL	251	
Summit Co	K8EIO	201	
Licking Co	W5UHQ	198	
Franklin Co	KI8GW	155	
Erie Co	K8HLH	149	
Richland Co	N8PA	145	
Adams Co	N8YWX	144	
Preble Co	N8XP	121	
Jefferson Co	N8MGW	112	
Seneca Co	KC8BUJ	100	
Muskingum Co	N8WF	94	
Tuscarawas Co	KB8FZY	94	
Wayne Co	WD8BVV	57	
Montgomery Co	KA0AZS	50	
Hudson Division			
Eastern New York			**516**
Dutchess Co	KC2DAA	283	
Schenectady Co RACES	K2RI	189	
Columbia Co	WE2G	44	
New York City-Long Island			**286**
Nassau Co	WA2WKV	286	
Northern New Jersey			**367**
Hunterdon Co	WB2AZE	125	
Ramsey	WA2MWT	113	
Chatham Borough & Township	W2UH	104	
Englewood	W2CC	25	
Midwest Division			
Iowa			**418**
NW Iowa	N0SPP	162	
Marshall Co	N0MXK	95	
Linn Co	KC0OX	94	
District 1	KB0MGQ	67	
Kansas			**402**
Johnson Co	KB0WEQ	257	
Salina	N0OBM	75	
Dist 6, Zone 34	N0OMC	70	
Missouri			**557**
Greene Co	W0KRB	214	
Jackson Co	K0UAA	175	
Phelps Co	K0OG	168	
Nebraska			**258**
Lancaster Co	K0GND	227	
Washington Co	KB0KXG	31	
New England Division			
Connecticut			**1032**
Fairfield Co	W1WJB	205	
LEPC	W1KLY	162	
Naugatuck	K1XS	121	
Enfield	NM1K	106	
Darien	KD1LY	82	
Milford	KA1DCL	72	
Windham Co SKYWARN	KB1DGY	69	
Bethel	KD1YV	61	
Ridgefield	W1WJB	54	
Fairfield Co SKYWARN	KA1YIQ	44	
New Haven SKYWARN	N1HAW	32	
SE Fairfield Co	N1SBB	24	
Maine			**317**
Hancock Co	W1GHS	190	
Oxford Co	N1GZB	127	
New Hampshire			**1628**
Central	N1RCQ	366	
Cheshire Co	N1NCI	357	
Manchester	W1ZIZ	188	
S Grafton Co	N1HAC	179	
Merrimack Co	K1CFI	151	
W Rockingham	K1WX	106	
E Rockingham	KA1GJU	101	
Hillsborough Co	KA1GOZ	100	
Strafford Co	K1BD	46	
Sullivan Co	AA1XC	34	
Vermont			**62**
Windham Co	KA1ZQX	62	
Western Massachusetts			**989**
Sectionwide	K1VSG	989	
Northwestern Division			
Eastern Washington			**340**
Spokane Co	N7VBW	228	
Whitman Co	W1MOM	112	

Area	Reporter	Points	Section Points
Oregon			**1737**
Clackamas Co	KA7IJK	736	
Multnomah Co	KC7YOC	261	
Sectionwide	W0SPK	253	
Washington Co	N7OGM	241	
Linn Co	WB9HZT	111	
Benton Co	KC7QAE	83	
Clatsop Co	N7DAL	52	
Western Washington			**731**
Medical Services Comms	N7LSL	247	
Pierce Co	N7WGR	213	
Thurston Co	KB7DFL	170	
Grays Harbor Co	N7UJK	101	
Pacific Division			
East Bay			**245**
Vallejo	W0VJO	169	
Pleasanton	KK6ZL	76	
Nevada			**762**
Clark Co	AA5QJ	181	
Elko Co	N7JEH	118	
Washoe Co	N7TOD	109	
Douglas Co	KV7S	102	
S Nye Co	AC7EL	82	
Churchill Co	KT6QK	91	
Lyon Co	KK7KS	46	
Lincoln Co	K7NKH	33	
Pacific			**719**
Hawaii	AH6CP	610	
N Hawaii Island	KH7T	109	
Sacramento Valley			**596**
Monterey Co	W6FDO	262	
Butte Co	N6NPN	115	
Plumas Co	WD6FGB	101	
Amador/Placer Co	KF6YIE	93	
Placer Co	N6UG	27	
Nevada Co	KG6BAJ	-2	
Roanoke Division			
North Carolina			**3997**
Pitt Co	K4ROK	637	
Dist Twelve	WD4PIC	468	
Triad SKYWARN	KB1G	463	
Mecklenburg Co	W4OH	345	
Gaston Co	KC4YOT	253	
Durham Co	KB4WGA	233	
Granville, Person, Vance, Warren Co	K4NSM	226	
Alamance	N4MIO	234	
Union Co	WA3RTC	206	
Cabarrus Co	KA4ATT	179	
Stanly Co	KD4OZI	176	
Craven Co	N8UTY	162	
Montgomery Co	KG4CDI	125	
Henderson Co	W4DK	116	
Moore Co	N4YYL	90	
Wilson Co	KF4OFP	84	
Virginia			**676**
Gloucester Co	KE4NBX	258	
Virginia Beach	KE4AZL	250	
Portsmouth	W4MWC	88	
Williamsburg/James City Co	KC4CMR	80	
West Virginia			**519**
Wood Co	KB8QPW	257	
Raleigh Co	KC8PMI	153	
Monongalia	N8HGL	109	
Rocky Mountain Division			
Colorado			**182**
Dist 25, Delta, Montrose, Ouray Co	KI0KY	92	
Dist 24, Douglas & Elbert Co	KA9ODE	90	
New Mexico			**188**
Lincoln Co	K5RIC	188	
Southeastern Division			
Georgia			**347**
Carroll Co	K4DEY	251	
Gwinnett Co	WA4DYD	96	
Southern Florida			**152**
Orange Co	KG4CWV	152	
Southwestern Division			
Orange			**522**
Riverside	N7PPF	522	
San Diego			**122**
Ramona	KF6ZPN	122	
West Gulf Division			
North Texas			**1146**
Nacogdoches	KK5BE	254	
Irving	KA5OZC	226	
NW Harris Co	KK5CA	190	
Smith Co	N9JN	172	
Coppell	KA1CWM	157	
Mesquite	KA5SNM	147	

Area	Reporter	Points	Section Points
South Texas			**1146**
Travis Co	W5LHC	626	
Corpus Christi	K5CNZ	392	
Kleberg Co	KD5CZM	131	
West Texas			**44**
El Paso Co	KB5HPT	44	

Section/Local Nets

Area/Net	NM	Points	Section Points
Atlantic Division			
Maryland-DC			**179**
MEPN	N3WKE	96	
Anne Arundel Co	N3SEO	83	
Northern New York			**114**
NYPON	N2YJZ	114	
Southern New Jersey			**104**
Cape May Co Red Cross	N2NGW	104	
Western New York			**1230**
OCTEN	KA2ZNZ	399	
Western District Nets	N2JRS	268	
CARES	K2DAR	252	
NYPON	N2YJZ	114	
NY State/Early	WB2QIX	102	
CNYTN	WA2PUU	95	
Western Pennsylvania			**659**
Beaver Co Public Service	K3NPX	388	
Erie Co ARES	N3HPR	170	
Westmoreland Co	N3WAV	101	
Central Division			
Illinois			**341**
Lake Co RACES/ARES	W9FUL	249	
Dekalb Co ARES	W9ICU	92	
Indiana			**110**
Whitley Co ARES	WB9UNL	69	
Pike Co ARC	WB9NCE	41	
Wisconsin			**174**
Calumet ARES	KA9OJN	90	
WI ARES/ RACES HF	N6NKO	84	
Delta Division			
Arkansas			**212**
Cross Co ARES/RACES	W5WPN	148	
NAARS Emerg Net	N5QVC	64	
Louisiana			**339**
LA Traffic Net	N5JU	231	
NE LA ARES	AC5VN	108	
Acadiana Area Net	KN5GRK	63	
Mississippi			**389**
MSPN	W5KWB	290	
Metro Jackson ARES	AC5SU	99	
Tennessee			**151**
C.A.T.S. Emerg Services	KF4PCA	151	
Great Lakes Division			
Michigan			**1577**
Oakland Co ARPSC	KB8POD	330	
Alcona Co	W8SZ	321	
N Lower, Eastern, Upper MI	VE3EUI	246	
Benzie Co ARPSC	K8BTE	123	
Ontonagon Co ARES	W8UXG	123	
Jackson Co ARES	KC8JJT	108	
Iosco Emerg Services	KB8ZYY	106	
Tuscola Co	KC8TXE	92	
Saginaw Co	N8VDG	52	
MACS	W8RNQ	50	
Kalamazoo Co ARPSC	NK8X	26	
Ohio			**749**
Central OH Traffic Net	N8RRB	489	
Shelby Co ARES	NO8C	175	
Seneca Co ARES	KG8UP	69	
Burning River	KF8FE	16	
Hudson Division			
Eastern New York			**420**
Hudson Valley Net	N2JBA	306	
NYPON	N2YJZ	114	
Northern New Jersey			**243**
Hunterdon ARES Net	WB2AZE	134	

Area/Net	NM	Points	Section Points
NJ Phone Net	W2CC	56	
Ramsey	WA2MWT	53	
Midwest Division			
Kansas			**281**
KS Sideband & Phone	N0KFS	153	
Wheat State Wireless	KB0DTI	88	
Echo ARES	KB0DTI	40	
Missouri			**165**
Jackson Co ARES	K0UAA	165	
Nebraska			**177**
Lancaster Co	K0GND	162	
Washington Co	KB0KXG	15	
New England Division			
Connecticut			**1770**
CT ARES Net	W1AGP	1279	
CT Phone Net	N1DIO	212	
Bears of Manchester	NM1K	170	
N CT SKYWARN	K1PAI	78	
Nutmeg VHF Traffic Net	N1WGK	31	
New Hampshire			**521**
Central NH	N1RIQ	136	
S Grafton Co ARES	N1HAC	89	
Manchester Area	W1ZIZ	79	
CAARES	K1CYJ	61	
W Rockingham ARES	K1WX	48	
Hillsborough Co	KA1GOZ	39	
Strafford Co	K1BD	37	
Tri-State FM	N1VFM	32	
Northwestern Division			
Oregon			**533**
Dist 4 ARES/NTS	N7DRM	237	
Multnomah Co ARES/RACES	KD7EYN	161	
Linn Co ARES	WB9HZT	79	
Washington Co ARES	N7OGM	56	
Western Washington			**52**
Auxiliary Emerg Comm	KB7EQW	52	
Pacific Division			
Nevada			**180**
Clark Co ARES/RACES	AA5QJ	101	
NV Section SET Net	N7JEH	79	
Pacific			**273**
Hawaii State SET #1	AH6RH	142	
Hawaii State SET #2	AH6CP	131	
Roanoke Division			
North Carolina			**3150**
Four County ARES	KC4WXA	780	
Tarheel Emergency Net	K4CWZ	483	
Triad SKYWARN	KB1G	393	
Mecklenburg Co	N5JBP	245	
Lincoln Co	KU4KM	208	
Gaston Co ARES	KC4YOT	199	
Union Co ARES	K4RLD	161	
Durham ARES/RACES	KB4WGA	148	
Stanly Co ARES	AE4AH	146	
Alamance Co ARES	N4MIO	142	
Cabarrus Co	KA4ATT	106	
Montgomery Co	KG4CDI	90	
Wilson Co	KF4OFP	49	
Virginia			**233**
Middle Peninsula ARES	KE4NBX	118	
PARES	W4MWC	62	
Williamsburg/James City Co	KC4CMR	53	
West Virginia			**44**
Monongalia ARES	W8GUL	44	
Southeastern Division			
Alabama			**54**
AL Section CW	W4ZJY	54	
Georgia			**94**
Gwinnett Co ARES	WB9JSW	94	
Southwestern Division			
Orange			**522**
Riverside Co RACES	KQ6U	522	
West Gulf Division			
North Texas			**391**
Nacogdoches ARES	KK5BE	228	
DFW Early & DFW Late	W5OMG	163	

2003 ARRL August UHF Contest Announcement

1800 UTC Saturday August 2-1800 UTC Sunday August 3

How to participate: Any amateur station on any band above 222 MHz may be worked. The entry classes for Single Operator are high power and low power. A Rover is a 1 or 2 person station that moves and operates from two or more grid squares. Lastly, there is the Multioperator category. You may rework Rover stations each time they move to a new grid. Use of a spotting network makes your station a Multioperator entry.

What to say: All stations give their call sign and 4 digit grid locator (such as W1AW FN31). Information on how to determine your grid is found on page 86 of April 1994 *QST* or on-line at **www.arrl.org/locate/gridinfo.html**.

Special interest: During the contest, some tropospheric propagation may occur. It is also a good time to make sure all equipment is in proper order for upcoming contests.

Quirks: It can be a great time of year for "hilltopping" while the lower elevations may present a greater challenge during the summer months.

Rule changes this year: The total transmitter output power for a high power entry in any category is either 1500 W PEP or the maximum allowable power level established by the national licensing authority of your country, whichever is lower.

Best reason to participate: This contest is a good way to build up totals for the ARRL UHF operating awards such as VUCC.

Relative challenge: 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. The more bands you are able to utilize the better your results. Rovers are very important during this contest as they activate as many grids as possible.

Scoring: QSOs count three points on 222 and 432 MHz, six points on 902 and 1296 MHz and 12 points each on 2.3 GHz and higher. On each band, every time you work a different grid, you receive a multiplier. Your multiplier total is the sum of grids you worked per band. The final score is your QSO point total times your multiplier total.

Rovers only: The final score consists of the total number of QSO points from all bands times the sum of unique multipliers (grids) worked per band (regardless of which grid they were made in) plus one additional multiplier for every grid activated.

How to report your score: You must send in your entry by September 2, 2003. E-mail Cabrillo format log to **AugustUHF@arrl.org** or send paper logs and complete summary sheet to August UHF Contest, ARRL, 225 Main St, Newington, CT 06111.

Complete rules: The complete rules may be found at **www.arrl.org/contests/forms**. 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 August UHF Contest Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0232. QST

2003 ARRL 10 GHz and Up Contest Announcement

August 16-17 (first weekend) and September 20-21 (second weekend)
6 AM Local Saturday through 12 Midnight Local Sunday

How to participate: Any amateur station on any band 10 GHz and up may be worked. The entry categories are 10 GHz Only and 10 GHz and Up. Operations may take place for 24 hours total on each contest weekend. (Listening times count as operating times.)

What to say: All stations give their call sign and 6 digit grid locator (such as W1AW FN31US). Information on how to determine your grid is found on page 86 of April 1994 *QST* or on-line at **www.arrl.org/locate/gridinfo.html**.

Special interest: During the 10 GHz and Up contest the tropospheric propagation can be especially good during the September part of the contest. You can get some great conditions for operating, whether it is from mountaintops or DXpeditions.

Quirks: Summer and autumn conditions always present a challenge. Scheduling contacts is both permissible and encouraged due to the challenges presented on the microwave bands.

Rule changes this year: The total transmitter output power for a high power entry in any category is either 1500 W PEP or the maximum allowable power level established by the national licensing authority of your country, whichever is lower.

Best reason to participate: The 10 GHz and Up contest is a wonderful time for experimenting. Many operators venture into the "new frontier" as they make contacts on the microwave bands for the first time. For the experienced operator, "pushing the envelope" in terms of distance is one of the great motivating factors.

Relative challenge: 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. The more bands you are able to utilize and unique locations you are able to activate to extend the distance of the QSO the better your results.

Scoring: Distance points—Calculate the distance in km between stations for each successfully completed QSO. QSO points—Count 100 QSO points for each unique call sign worked per band. (Portable indicators added to a call are not considered as making the call sign unique.) Total score: equals distance points plus QSO points. There are no multipliers.

How to report your score: You must send in your entry by October 21, 2003. E-mail Cabrillo format log to **10GHz@arrl.org** or send paper logs and complete summary sheet to 10 GHz and Up Contest, ARRL, 225 Main St, Newington, CT 06111.

Complete Rules: The complete rules may be found at **www.arrl.org/contests/forms**. 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 10 GHz and Up Contest Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: E-mail **contests@arrl.org** or phone 860-594-0232. QST

STRAYS

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- 2M, & 70CM @ 5W
- V/V, U/U, V/U
- Independent controls for each band
- 200 alphnumeric memories
- Auto repeater
- CTCSS encode/decode w/tone scan
- IRLP compatible

NEW!

IC-T90A Triple Band Transceiver

- 6M/2M/70CM @ 5W
- Wide band receiver 495kHz - 999.999MHz**
- 500 alphnumeric memories
- Dynamic memory scan
- Backlit keypad & display
- CTCSS/DTCS encode/decode w/tone scan
- Weather Alert

LOW PRICE

IC-2100H 25N 2M Mobile Transceiver

- Cool dual display
- 50 watts
- CTCSS encode/decode w/tone scan
- Backlit remote control mic
- Mil spec 810, C/D/E*[1]
- Auto repeater
- 113 alphnumeric memories

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- VV/UU/VU
- Wide band RX inc. air & weather bands
- Dynamic Memory Scan (DMS)
- CTCSS/DTCS encode/decode w/tone scan
- Independent controls for each band
- DTMF Encode
- 212 memory channels
- Remote Mounting Kit Included

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- 55 watts VHF (2M), 50 watts UHF (70CM)
- Wide Band RX**
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- DMS w/linked banks

LOW PRICE!

IC-V8000 2M Mobile Transceiver

- 75 watts
- ICOM DMS scanning
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- Weather channel scan
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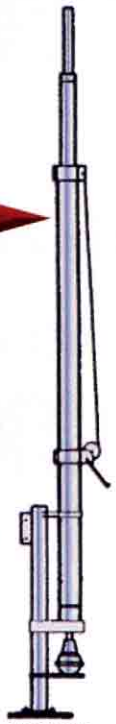

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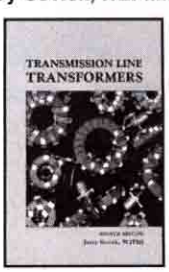

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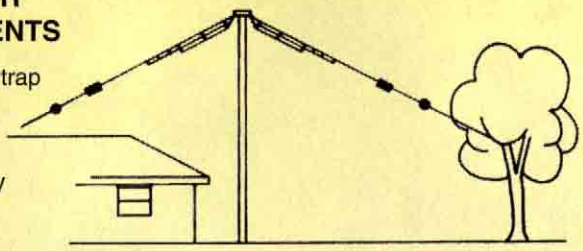

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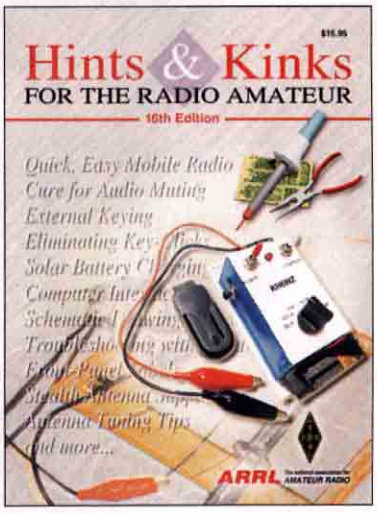

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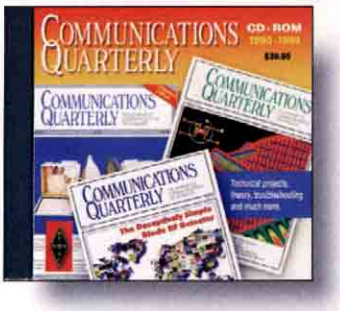

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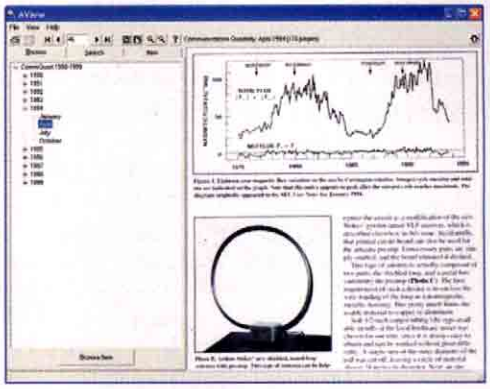

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TH-D7A(G) Explore APRS opportunities with an HT built for the future. (middle) This 5W FM dualband (2M, 440MHz) is equipped with a TNC and provides the radio enthusiast with a range of data communications options. Along with simple packet, use the D7A(G) along with APRS and a GPS unit to send positioning data. Transmit coordinates to a friend, who can pinpoint the location. 4.75"h x 2.25"w x 1.5"d, 12 oz **$359.95**

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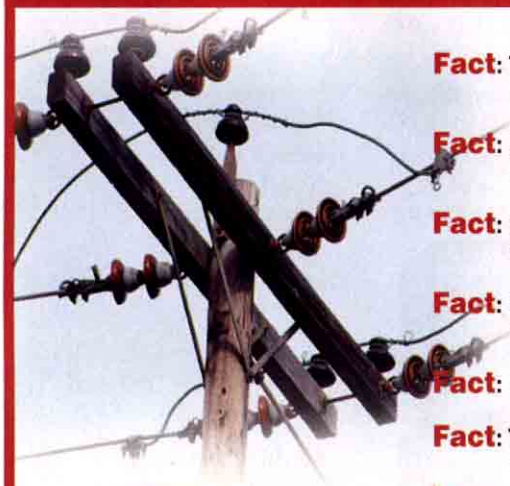

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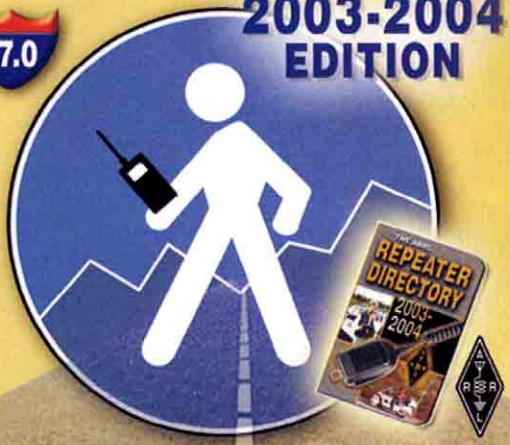

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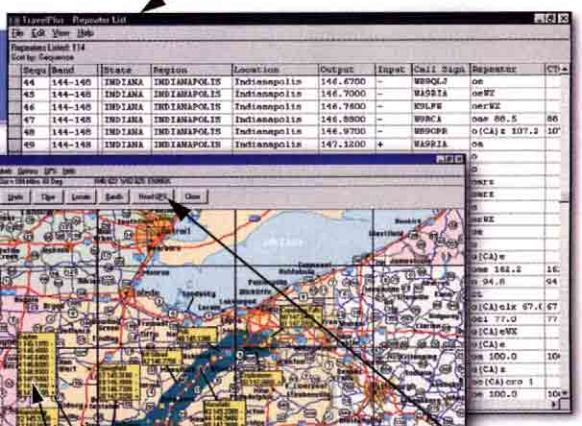

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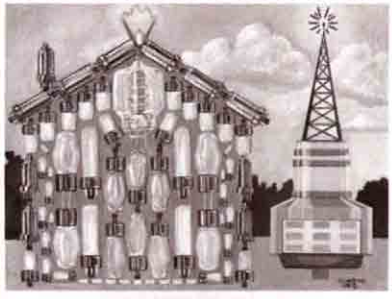

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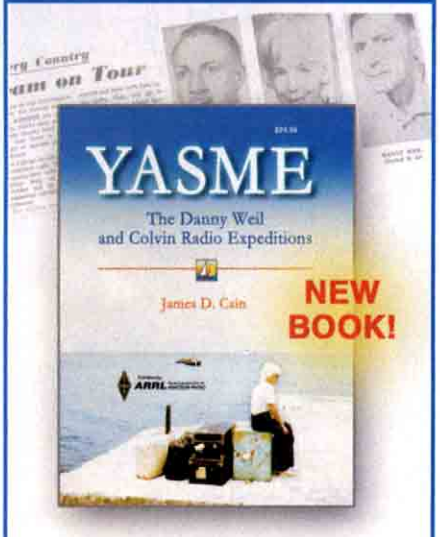

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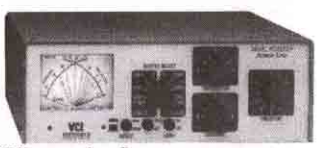

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10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives high efficiency for more power radiated. Results? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

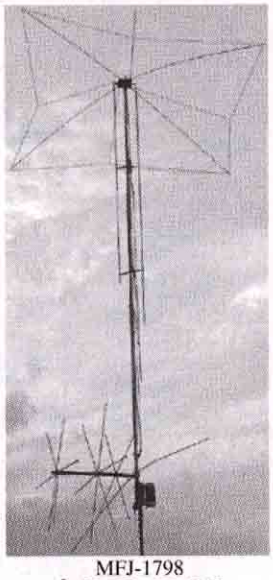
Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.



MFJ-1798
$289.95
Ship Code F

Separate Full Size Radiators

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$379.95
Ship Code F

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes.

Enjoy both DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- not a lossy thin flat-strip -- *gives you highest possible efficiency.*

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

***NEW!* MFJ-1788, $429.95.** Same as MFJ-1786 but covers 40 Meters-15 Meters continuous. Includes super remote control.

MFJ-1782, $339.95. Like MFJ-1786 but control has only fast/slow tune buttons.

MFJ-1780, $249.95. *Box Fan* Portable Loop is about the same size (2x2 foot) as a box fan, complete with handle. Covers 14-30 MHz. Control has fast/slow tunes.

MFJ Portable Antenna

MFJ-1621 **$89.95** Ship Code A

MFJ-1621 lets you operate in most any electrically free area -- apartment, campsite, hotel, the beach, etc. DXCC, WAZ, WAC, WAS have been won with MFJ-1621! Work 40, 30, 20, 17, 15, 12 and 10 Meters with a telescopic whip that extends to 54 inches. Mounted on a sturdy 6x3x6 inch cabinet. Built-in antenna tuner, field strength meter, and 50 feet of RG-58 coax cable. Handles 200 Watts.

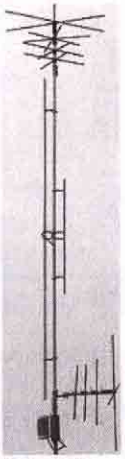
MFJ's G5RV Antenna

MFJ-1778, Ship Code A **$39.95**

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed



MFJ-1796
$209.95
Ship Code F

Only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments,small lots, trailers. Perfect for vacations, field day, DXpedition, camping.

Efficient end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting 1 band has minimum effect on others.

MFJ-1792, $169.95. Full size 1/4 wave radiator for 40 Meters. 33 feet, handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $189.95. Like MFJ-1792 but has full size 20 Meter 1/4 wave also.

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MARCO The Medical Amateur Radio Council Ltd. is a charitable non-profit group of health care professionals who meet weekly at 10:00am Eastern on Sunday for "Grand Rounds" 14.308 MHz. All are welcome. Membership inquiries to WE1MD@arrl.net or CBA. SASE for newsletter to: MARCO, 144 Head of the Tide Road, Belfast, ME 04915. http://www.marco-ltd.org

RAINBOW AMATEUR RADIO ASSOCIATION Serving the gay/lesbian community. ARRL affiliated. Privacy respected. Active weekly HF nets, monthly newsletter, e-mail server, chat room, VE teams, Dxpeditions. Web site: www.rara.org. Information: PO Box 18541, Rochester, NY 14618-0541.

SUSSEX NJ HAMFEST - OUR 25TH ANNUAL New Jersey, (Augusta) Sunday, July 13, 2003. Sponsor: Sussex County ARC. Time: 8 am, Sussex County Fairgrounds, Plains Rd. off Rt 206. Free parking. Refreshments. Admission $5 (YLs and Harmonics free), Tailgate Space $15, Indoor $15 per table. Limited supply of tables available. Contact Dan Carter, N2ERH, 8 Carter Lane, Branchville, NJ 07826; Phone: 973-948-6999; Email: hamfest@scarcnj.org

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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.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

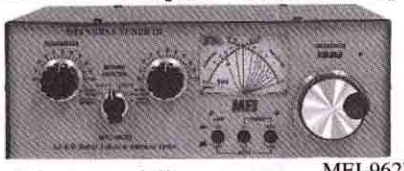
More hams use MFJ tuners than all other tuners in the world!

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* Tuner for Amps



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+6 Meter *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.

MFJ-971 *portable/QRP* Tuner

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 inches.

MFJ-901B *smallest* Versa Tuner

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.

MFJ-16010 *random* wire Tuner

MFJ-16010 **$49.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$79.95**

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**

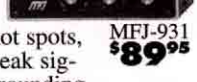
MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground



MFJ-931 **$89.95**

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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DXer's DREAM: Fabulous Mountain Estate located at 7000 feet near lovely Prescott, AZ. Three and a half acres, three story log home and much, much more. Information at www.umog.com/estate.htm

DXshack FG, J6, 3W, XU, XW TRX+kWAMP+Beam ANT & Bed. URL: //qth.com/dxshack email: xu2a@fsinet.or.jp

FIVE LOTS IN PALM BEACH COUNTY, ONE+ ACRES. E-mail for description and county antenna regulations. No homeowners association. Mort Penn, K1MP, mortpenn@earthlink.net Realtor, Coldwell Banker

FOR SALE LEASE OR OPTION Premier Amateur Radio Property located in Northern California near Macdoel just south of Oregon border off Hwy 97. Previous owner Ray Balch, K6VX, now SK. 3 bedroom home, 2 bath, 30x40 foot shop building on flat 40 acres, 1,000 foot airplane landing strip. 3+ operating stations, 7 towers, one at 160 feet, multiple antenna arrays for all frequencies. Over 20,000 CW/Phone DX contacts with logs, QSL cards, awards worldwide. Sportsmen paradise, winter sports, National Wildlife Refuges, Eagle and Geese migration and nesting, much more nearby. Barbra Dahl, KB7OMN, 541-882-1808. kb7omn@arrl.net for photos and descriptions.

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Use sound card and rig for all digital modes!

Plug and Play -- includes software, all cables, AC power supply . . . RFI-proof . . . Isolation transformers -- no hum, noise, distortion . . . Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, Meteor Scatter, others . . . Use as Voice Keyer, CW Contest Memory Keyer . . . Monitor On/Off Switch . . .

MFJ1275/M/T
$99.95

New! Includes AC power supply, RS-232 cable!

Plug this new MFJ-1275/M/T sound card interface between your transceiver and computer and enjoy operating all digital modes.

Everything you need is included -- software, audio cables, RS-232 serial cable and AC power supply.

Provides fully automatic operation with audio and push-to-talk control. It matches sound card audio, eliminates ground loops and provides microphone override.

Models available for all transceivers with 8-pin round, 8-pin modular (RJ-45) or 4-pin round microphone plugs.

Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, high speed CW Meteor Scatter and many others. Also use as Contest Voice Keyer and CW Contest Memory Keyer.

Digital Modes or Normal Operation

Select the ON digital mode -- all connections are made between your rig and computer for instant digital operation.

Select BYPASS normal mode -- your transceiver and computer connections are restored for their normal operation.

Audio Isolation Transformers

Audio isolation transformers and relay eliminate ground loops, audio hum, noise and distortion.

RFI-Proof

Extensive RF suppression and line isolation eliminates RF feedback problems.

Automatic Microphone Override

Transmit mic audio at any time by pressing PTT to override digital modes -- great for SSTV and Contest Voice Keyer.

More Impressive Features

Serial port -- lets computer control radio to override/interrupt digital transmissions.

VOX Control -- lets you use VOX control when not using computer serial port control.

Level Controls -- for transmitter drive and for receiver-to-sound card drive level. No need to adjust microphone gain or sound card level when you change modes.

Stereo or Mono Audio Input -- A front panel switch selects left, right, or both sound card audio output channels to accommodate various programs.

Off-the-air recording -- for replaying or for use with spectrum analyzer programs.

Monitor on/off switch lets you have a normal QSO and receive SSTV pictures at the same time in the *"monitor on"* position. This is great for modes like SSTV and Voice Keyer operation that may require listening to receive audio during operation.

Rugged Construction -- All aluminum cabinet and surface-mount construction gives you years of trouble-free service.

Use any Transceiver

Internal jumpers program microphone wiring for any brand or model radio -- no soldering required. Order **MFJ-1275** for 8-pin *round* mic plug. Order **MFJ-1275M** for 8-pin *modular* mic (RJ45) plug.

NEW! Order MFJ-1275T, for *4-pin round* mic plug, for Ten-Tec and others.

Plug and Play!

Everything you need is included --audio and RS-232 cables, AC power supply and a CD with a collection of the most popular amateur radio software to operate PSK-31, RTTY, SSTV, PACKET, AMTOR, CW, HSCW Meteor Scatter, Contest Voice Keying and other modes. Use 12 VDC or 110 VAC.

No Matter What™ Warranty

Protected by MFJ's famous *No Matter What™* one year limited warranty. MFJ will repair or replace (at our option) your MFJ-1275/M/T *no matter what* for one full year.

Try it for 30 Days

Order from MFJ and try it -- no obligation. If not delighted, return it within 30 days for refund less shipping.

New! *Super* Sound Card Interface

MFJ-1279/M/T
$129.95

This *super* sound card interface has all of the features of the MFJ-1275 ***plus . . .***

- **Auxiliary Input Jack:** Lets you switch your sound card from MFJ-1279 so you can use your sound card for something else. No more plugging/unplugging!
- **Direct CW/FSK Keying Jack:** Allows direct CW or FSK keying operation.
- **Headphone Jack:** Use your stereo headphones so you won't disturb your XYL (also turns off external speaker).
- **Footswitch:** Use footswitch or other for PTT (push-to-talk) when not using VOX.

Plug and Play! Includes software CD, RS-232 and audio cables, AC power supply.

Order MFJ-1279 for 8-pin round mic, MFJ-1279M for 8-pin modular (RJ-45) mic, MFJ-1279T for 4-pin round mic.

Add "X" suffix for 220VAC.

New! *Basic* Digital Interface

MFJ-1273B
$59.95

Plug and Play! Has sound card, radio, speaker, RS-232 jacks. Includes: software CD and RS-232, audio, mic cables. No external power needed. Has no mic jack or mic switch. **Order** MFJ-1273B for 8 pin round mic, MFJ-1273BM for 8-pin modular (RJ-45) mic, MFJ-1273BT for 4-pin round mic.

DSP Sound Card Programs

MFJ-1296, $129.95. *RadioCom4* integrates PSK31, SSTV, FAX/Sat FAX, RTTY, SITOR, DSP audio filters and radio control.

MFJ-1298, $199.95. *RadioCom5* -- all features of *RadioCom4* plus DSP Audio Filter analyzer, Spectrum Analyzer, Dual Scope Display, Sound Recorder, Time and Frequency Management, Frequency Analyzer, 3D Scanner, Satellite tracking, Rig Control for over 80 radios, more! **Free demo at:** ***www.mfjenterprises.com/freedemo.php***

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BROADCAST MICROPHONES and accessories (call letter plates, stands) wanted: early carbon, condenser, ribbon, dynamic models. Cash or trade. James Steele, Box 610, Kingsland, GA 31548. 912-729-6106. jsteele@k-bay106.com; http://www.k-bay106.com/mics.htm

CLASSIC RADIOS — www.radiofinder.com finder@radiofinder.com

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FAMOUS BOOK: FIXING UP NICE OLD RADIOS! Order direct from author. Covers everything from crystal to HRO, Hallicrafters, Hammarlund, Zenith, Scott and tube Hi-Fi. Transmitters too. Lots of easy theory, over 300 pictures, schematics. 186p. Written by an old radio instructor. Very popular. $35 plus $6 shipping. Visa/MC OK. Ed Romney, N4DFX, Box 487, Drayton, SC 29333 www.edromney.com

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre-1950 callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013. 602-840-2653.

TELEGRAPH MUSEUM / COLLECTOR'S INFORMATION: http://w1tp.com

W4QCF MANUALS and Ashville, NC **Museum** www.w4qcfmanuals.com

WANTED: HAMMERLUND speaker and Heath monitorscope (not model HO 10). Richard, KBØEMR, 515-243-9567

WANTED: pre-1925 battery radios, crystal sets, and vacuum tubes. Also early telegraph keys and pre-1900 electrical apparatus. Jim Kreuzer, N2GHD, 1541 Bronson Road, Grand Island, NY 14072. 716-773-4999. wireless@pce.net

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MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

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.

MFJ's *MightyLites*™ are so light and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

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.

Fully Protected

You won't burn up our power supplies!

No RF Hash!

MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV
45 Amp
$199.95
plus s&h

No RF Hash!

They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

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.

MightyLites™ . . . Mighty Features

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.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

NEW! 25 Amp MightyLite™

MFJ-4125
25 Amp
$109.95
plus s&h

Super light, super compact switching power supply delivers 25 Amps maximum/ 22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. ***No RF Hash!*** Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

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.

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.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

New!
MFJ-1117
$54.95

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.

MFJ-1118
$74.95
plus s&h

MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h

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.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! **MFJ-1117, $54.95.** For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

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GENERAL

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$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!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434
$179.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and 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.

MFJ *tunable* Super DSP filter

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.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you

can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

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MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

MFJ-461
$79.95

Is your CW rusty?

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 in. 5½ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $4.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $5.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ *Pocket* Morse Tutor

MFJ-418
$79.95

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ Code Oscillator

MFJ-557
$29.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312, $14.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ in.

MFJ *Pocket* CW Keyer

MFJ-403P
$69.95

Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny 2¼x3¼x1 in.

MFJ *miniature* Travel Iambic Paddle

MFJ-561, $19.95. 1¾Wx1¾Dx¾H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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WANTED: KENWOOD DSP-100 outboard accessory unit for TS-850 transceiver. Mike, KE2LI, 516-489-4094

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WANTED: Late Round Emblem Collins or Rockwell Collins S-Line. Jim, WA3CEX, 1-661-259-2011, jstitz@pacbell.net

WANTED: RMCA (RADIOMARINE CORP OF AMERICA) ITEMS: Pwr Sup RM-6/CRM-20096/RAZ; Rcvr AR-8503/CRM-46092/RAZ; PreSel AR-8503-P/50092/RAZ; Rcvr AR-8504; Rcvr Type B; Rcvr AR-8505; Rcvr 8700; Trans ET-8003; Radio Set 8007. Fone/FAX 928-753-7442. Bill Cronan, N6SE, 1832 Motor Ave, Kingman, AZ 86401-4059

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WANTED: VACUUM TUBES - commercial, industrial, amateur. Radio Daze, LLC, 7620 Omnitech Place, Victor, New York 14564, Phone: (585) 742-2020, Fax: (800) 456-6494, email: info@radiodaze.com

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More Diamond antennas in stock

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Eagle Guy Kit	$29
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Titan Guy Kit	$29
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