Official Journal of
ARRL
The national association
for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

August 2004

QST reviews
ICOM IC-7800
HF and 6 Meter Transceiver

6 meters: a magical band

What ARRL Lab test numbers measure

A G5RV for 17

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3B9C Rodrigues Island

IC-7800
The Ultimate HF!

Multiple Meter Readouts See the latest in meter technology with the '7800's virtual meter system. These digital meters are visually superior to and of a higher performance than analog. Don't believe it? Log on to www.icomamerica.com/7800 and see for yourself!

Multiple Spectrum Displays You can select a standard spectrum display either centered on your operating frequency or a fixed range to view the band! Choose how you want to SEE the band, and then tune to what signals you see. (Photo shows the fixed range spectrum display.)

CF Card Slot The ultimate way to "take your rig with you". Just pull your CF card from your '7800, slide it into another '7800, and you now have your rig!

Triple Band Stack Registers Memorizes the last 3 used frequencies – quick recall for band hopping, provides the ultimate in multi-mode flexibility.

DUAL RECEIVER CONTROLS

Digital Voice Recorder Controls Simple record and play controls for the internal DVR. Great for quick recording and playback of a call, great for reducing the number of broken calls in your log.

Dual VFO Tuning Knobs Independent tuning knobs for each receiver. There's no mistake about which receiver you are adjusting, as the size difference allows for "no-look" operation!

DUAL RECEIVER CONTROLS

Gentlemen, start your engines. All four of them!

Power your way to front of the pack with Icom's new IC-7800. Cutting edge digital meets the best of world class analog, resulting in an amazing 110dB of receiver dynamic range and a *+40dBm IP3 in the HF bands!* But that's not all. The '7800 has two identical, independent receiver circuits. Receive two different bands simultaneously on different antennas, with no adverse effects from one receiver to the other – take your band hopping and contesting to the next level! There are four 32-bit floating point DSP units with 24-bit AD/DA converters, one each for the main RX, second RX, TX, and spectrum scope, to accelerate data processing to whiplash speeds! Newly designed power amplifiers provide a powerful 200W of output power at full duty cycle and low transmit IMD. So what are you waiting for? Make your move. See your authorized Icom dealer!

Dual Receive Controls Separate key receiver controls are available for each receiver. Controls for volume, RF gain, and DSP controls, the '7800 also has independent controls for the Digital Twin PassBand tuning as well as the 70 dB Manual Notch filters. Whether in a contest, or just hopping around the bands, easy access to receiver controls such as volume, RF gain, and AGC adjustments are at your fingertips.

Dual Digital Twin PassBand Tuning Only Icom brings you Digital Twin PassBand tuning. Adjustments can be made for each receiver without affecting the other receiver.

Independent Digi-Sel Controls Incorporated into the IC-7800 is a newly designed digital pre-selector, with separate controls for each receiver.

Independent Auto Tune Automatically zero beat your CW or AM carrier signals. The '7800 makes sure you're right on the proper frequency for these modes. Each receiver has a separate control.

Independent AGC Settings Multiple AGC settings for each receiver. On-the-fly adjustment for either preset AGC settings, or a completely variable AGC control.

www.icomamerica.com

ICOM

NEW IC-R20
ULTRA-WIDEBAND RECEIVER

Catch & Release!

And NO License Required!

Casting around for your next strike in a handheld receiver/scanner? Scale up your listening pleasure. On-the-fly, Icom's IC-R20 allows you to digitally record and play back up to 4 HOURS* of whatever you want to tune in on. *Zzzzzzzzzing!*

- **150kHz – 3.3GHz** (cellular blocked)
- **SSB/CW/AM/FM/WFM**
- **Dual Watch** – on the R20's easy-to-see, dot-matrix LCD. It, and the keypad, has backlighting
- **Internal Bar Antenna** – for improved low-band reception
- **1250 Memory Channels** – enter by front panel, or by optional PC software
- **Icom's Dynamic Memory Scan (DMS)** – store memories in up to 18 banks of 100, then mix and match your memories to scan as you like. Plus link the banks!
- **1650 mAh Li-Ion battery** – powerful, lightweight, and lasts for many hours of listening pleasure. Recharger included
- **Telescoping Antenna** – multi-angled, with popular BNC connection
- **CTCSS/DTCS/DTMF Decode** – listen in on the repeaters and "channelized" transmissions
- **Pre-Set Most Popular Memories** – fast access to all broadcast TV and FM radio frequencies
- **And Much More!** – Auto Squelch, Noise Blanker, Auto Noise Limiter, Attenuator and RF Gain controls, Multiple Scan functions (including Voice Scan Control), CI-V ready, and still more! Even a USB cloning cable is included!

Stop floundering and start listening, even if just for the halibut. With the R20, you'll be shouting WAHOO! Perch yourself at your favorite authorized dealer – they'll net you a reel good deal!

Dual Watch Between Bands!

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HAM-IV

HAM-IV
$559.95

The most popular rotator in the world!

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

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

TAILTWISTER SERIES II

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

T-2X
$649.95

T-2XD
$1029.95
with DCU-1

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

CD-45II

CD-45II
$389.95

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

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

HAM-V

HAM-V
$949.95
with DCU-1

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

ROTATOR OPTIONS

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

AR-40

AR-40
$289.95

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

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

HDR-300A

HDR-300A
$1379.95

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

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

Digital Automatic Controller

DCU-1
$649.95

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

AR-35 Rotator/Controller

AR-35
$69.95

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

RBD-5
$29.95

NEW! Automatic Rotator Brake Delay

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

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SG7500NMO


SG7900A
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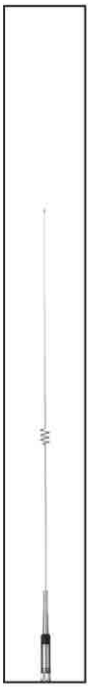
SGM911


NR72BNMO


NR73BNMO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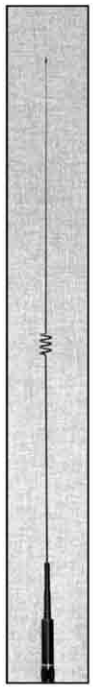
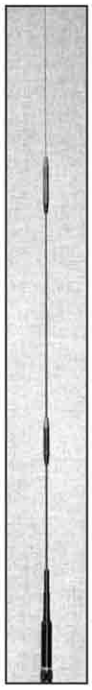
NR770HB


NR770HNMO
NR770HBNMO


CR627B
CR627BNMO

HV7A Mobile Antenna System

For New HF/VHF transceivers

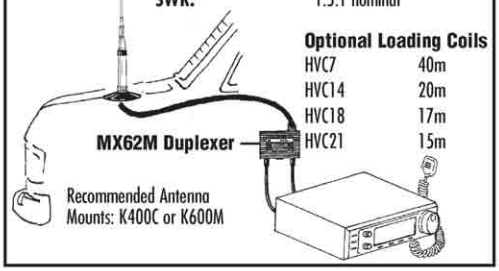
(Such as: IC706 series, FT100 & NEW FT8900R)

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, FT100 and New FT8900R 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

Optional Loading Coils

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



MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
MR77	2m/70cm	70	MAG	20	1/4λ, 1/2λ
MR77SMA	2m/70cm	70	MAG	20	1/4λ, 1/2λ
NR72BNMO*6	2m/70cm	100	NMO	13.8	1/4λ, 1/2λ
NR73BNMO	2m/70cm	100	NMO	33.5	1/2λ, 1-5/8λ
NR770HA7	2m/70cm	200	UHF	40.2	1/2λ, 2-5/8λ
NR770HNMO8	2m/70cm	200	NMO	38.2	1/2λ, 2-5/8λ
NR770RA	2m/70cm	200	UHF	38.6	1/2λ, 2-5/8λ
NR7900A*	2m/70cm	300/250	UHF	57	1/4+1/2λ, 3-5/8λ
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
SG7900ANMO*	2m/70cm	150	NMO	62	7/8λ, 3-5/8λ
SGM510	2m/70cm	100	UHF	37	1/2λ, 2-5/8λ

MODEL	BAND (MHz)	WATTS	CONN.	HT. IN.	ELEMENT PHASING
CR8900A*6, 11	10m/6m/2m 70cm	60	UHF	50	1/4λ, 1/4λ 1/2λ, 2-5/8λ
SG2000HD*	2m	250	UHF	62.6	1/2λ+3/8λ
CR320A*6	2m/1-1/4m 70cm	200/100 200	UHF	37.4	1/4λ, 1/2λ 2-5/8λ
CR627B*6,9 CR627BNMO*6,9	6m/2m 70cm	120	UHF/NMO	60	1/4λ, 1/2+1/4λ 2-5/8λ
HF6FX*6	6m	250	UHF	40	1/4λ
HF50CX*6	6m	200	UHF	75	3/8λ
NR22L*	2m	100	UHF	96.8	2-5/8λ
NR2000NA	2m/70cm 23cm	100	N	39	1/2λ, 2-5/8λ 5-5/8λ
M285*10	2m	200	UHF	52.4	5/8λ
M685*6	6m	200	UHF	52.4	1/4λ
MG200	2.4GHz	-	N	23.6	3-1/2λ
SGM911*6,9	6m/2m/70cm	60	UHF	41	1/4λ, 1/2λ,2-5/8λ
NR124	23cm	100	N	25	4-5/8λ

FOLD-OVER

Patented One-Touch Fold-Over Feature.
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* Not recommended for Magnet Mount
6 Grounding required
7 NR770HB same specs but in black finish.
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10 Tunable from 140-174MHz
11 FM only

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

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Our Cover
Part of Mauritius, Rodrigues is a rare (but not terribly rare) island, one the UK-based Five Star DXers Association found inviting and hospitable. The article begins on page 45. Photos by Justin Snow, G4TSH.

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

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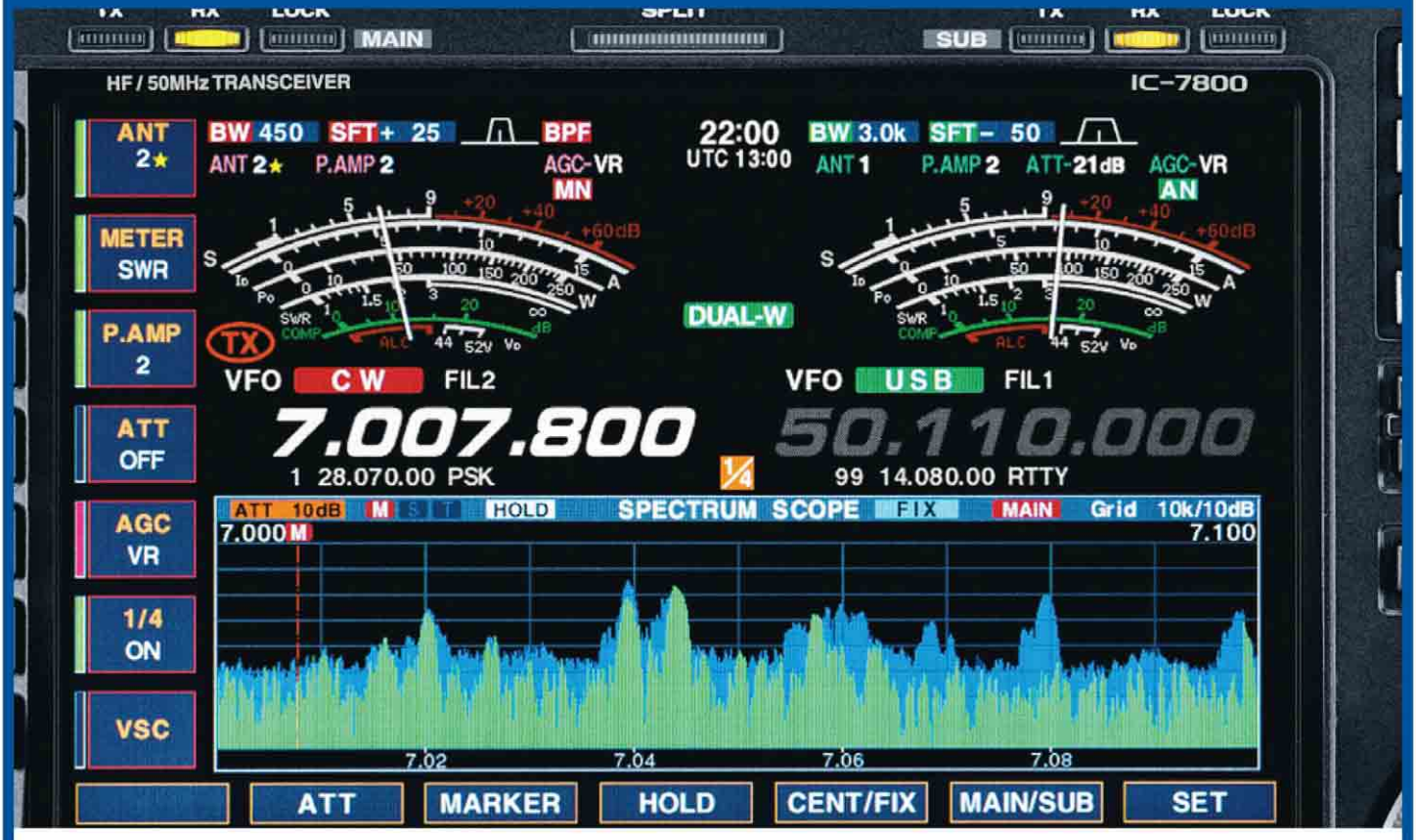
Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

DON'T MESS WITH TEXAS TOWERS



★Finally, a rig with a Texas size screen★

Dig down deep in that DX pileup to capture your prize QSL. The IC-7800 is here. There's never been a more advanced amateur rig, ever. The band scope, with its own dedicated 32 bit CPU, offers commercial test equipment responsiveness. Seven steps ranging from +/-2.5kHz to +/-250kHz deftly represent up to 500kHz of spectrum. Once you've visually targeted the pileup you want to break through, swoop in with the 7800's unmatched DSP filtering to claim your prize. There's so much more to this rig, we'd have to take out a poster-sized ad to describe it! So call us, instead.

★ New IC-7800 ★

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IC-2720H

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"IT SEEMS TO US..."

Harmful Interference

Belatedly and grudgingly, the proponents of Broadband over Power Line (BPL) are beginning to acknowledge that their systems cause interference to radiocommunication. They have a new refrain: it may be interference, but it isn't *harmful* interference.

Every radio amateur should be familiar with the concept of harmful interference. The definition is right there in Part 97:

Harmful interference. Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations. (FCC Rules, §97.3(a)(23))

This definition does not just apply to the Amateur Radio Service. It originates in the Constitution of the International Telecommunication Union (ITU) and is faithfully reproduced in the international Radio Regulations as well as in the general rules and regulations (Part 2) of the FCC Rules.

Amateur Radio is a radiocommunication service. BPL is not. In the spectrum management context, BPL has no rights whatsoever. In fact, the international Radio Regulations—which have the force and effect of a treaty—require that "Administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, *including power and telecommunication distribution networks*...does not cause harmful interference to a radiocommunication service...." [emphasis added]

Mark this: Protecting the Amateur Radio Service from harmful interference from BPL is *not optional* for the FCC. It is *required*. The FCC couldn't get out from under that obligation if it wanted to.

For most of its 70-year history—that is, until very recently—the FCC gave more than lip service to its obligation to protect licensed services. It is the reason that the following rule is enshrined in Part 15:

Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator. (FCC Rules, §15.5(b))

With this background it should be obvious why the BPL proponents are grasping at the "it may be interference, but it isn't harmful interference" straw. They know they don't have a leg to stand on.

Going back to our definition, if a BPL system "seriously degrades, obstructs or repeatedly interrupts" amateur radiocommunication then it is in violation. It doesn't matter how weak the signal is that you're trying to hear, or whether you're operating in the comfort of your own home, portable or mobile: BPL cannot inflict serious degradation, repeated misinterpretation, or repeated loss of information (these terms are taken from the ITU definition of "interference") on a radiocommunication service.

If a violation occurs, what happens then? What *should* happen is obvious: it must be corrected immediately. Remember, the operation of the device is "subject to the conditions that no harmful interference is caused and that interference must be accepted...." If the device causes harmful interference then it must be shut down. Period. Remember, neither the device nor its operator has any right whatsoever to use the radio spectrum if doing so causes harmful interference.

And if the operator, once informed of the harmful interference, willfully refuses to take immediate corrective action? Then a higher authority than the FCC kicks in: the Communications Act of 1934, by which the FCC was created in the first place. Section 333 says, "*No person shall willfully or maliciously interfere with or cause interference to any radio communications of any station licensed or authorized by or under this Act or operated by the United States Government.*" Clearly, the operator of a device causing harmful interference who refuses to fix the problem immediately is interfering willfully and is subject to stiff penalties.

This is exactly what has happened in Cedar Rapids, Iowa, where the station of Jim Spencer, WØSR, has been subjected to harmful interference from BPL for more than *12 weeks* despite repeated demands to the operator, Alliant Energy. The ARRL has interceded with the FCC's Enforcement Bureau on Jim's behalf, requesting that a monetary forfeiture of no less than $10,000 be levied against Alliant Energy.

Power utility companies often receive complaints of harmful interference to licensed radiocommunication services resulting from sparking and corona discharge. The radio users receiving such interference are entitled to prompt resolution of the interference. However, no one would expect the interruption of electrical service to scores of customers until the sparking/corona problem can be rectified.

The situation with regard to BPL interference is entirely different. The radio users receiving harmful interference from a BPL source have *every right* to expect that the interference will be eliminated *immediately* upon notification to the operator.

According to §15.5(c) of the FCC Rules, "The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected." Offenders may argue that they are not obligated to remedy interference until the FCC tells them to. Nonsense. That's like arguing that if you run a red light and cause an accident, but a police officer doesn't see you, then it's not your fault.

For a BPL system operator knowingly to continue to cause harmful interference to a licensed radiocommunication service—amateur or otherwise—is totally unacceptable. There is no reasonable reading of the international Radio Regulations, Communications Act, and the FCC Rules that could lead to a different conclusion.—*David Sumner, K1ZZ*

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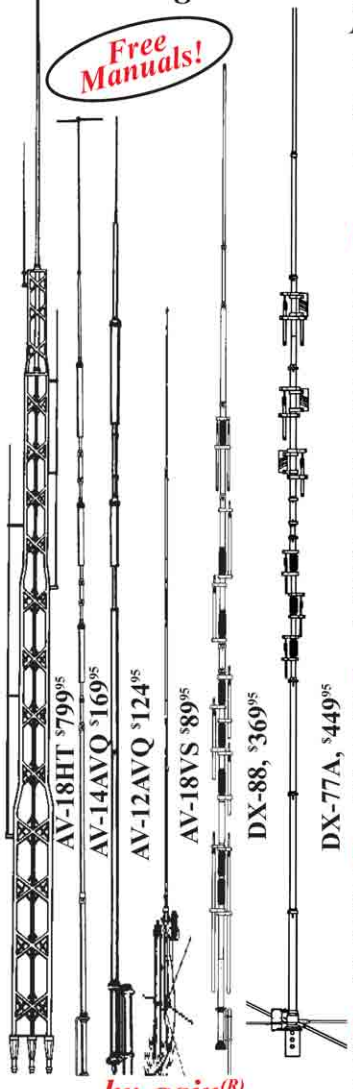

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AV-18HT, $799.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs.

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

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

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

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

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

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

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AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$134.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$89.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

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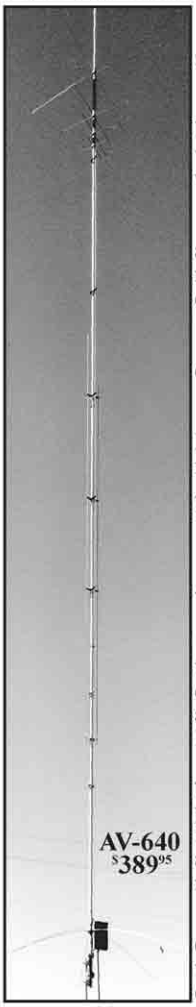

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This rugged 2 meter mobile is ready for the "real world" of heavy use in demanding conditions. Whether you're chasing storms or chatting through the commute, you'll appreciate the large alphanumeric display, the big illuminated mic and the well designed functions that are easy to use. 100 memories, AM Airband receive, high stability TCXO, ignition key on/off feature, theft alarm, direct frequency input & optional internal TNC or optional internal digital voice module and more!

DR-235T 222 MHz

FM Mobile/Base Transceiver

If you're not yet on 222 MHz, you're not using all your privileges. From voice contacts to remote control of repeaters and more, now you can get on 222 MHz at a reasonable price. Enjoy 100 memories, alphanumeric channel labels, ignition key on/off operation, large illuminated mic, autodial memories, CTCSS encode+decode, DCS, wide/narrow FM operation, optional internal TNC and a host of features.

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There are many reasons you might want a monoband 440 MHz transceiver and the DR-435 is ready for whatever job you have in mind. From working repeaters, UHF satellites, remote command and control, data or simplex voice, and more; you'll find the 100 memories, large alphanumeric display, mic with illuminated keys all well designed to suit your purposes. Packed with features like CTCSS encode+decode, DCS, tone bursts, theft alarm, alphanumeric display, autodial memories, high stability TCXO and more.

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ARRL in ACTION

***YOUR* membership at work**

By Steve Ford, WB8IMY, sford@arrl.org

ARRL Airs BPL Concerns on National Public Radio

On May 26, 2004, National Public Radio broadcast a report by Larry Abramson on the subject of radio interference. The story aired on the popular "Morning Edition" program and included a discussion of the Broadband Over Power Lines (BPL) controversy.

While compiling the report, Abramson contacted ARRL Chief Executive Officer David Sumner, K1ZZ, for comments. In the final version of the story that aired May 26, Abramson included the following comment by Sumner: "The only right that BPL has to use the radio spectrum is if it does not cause any harmful interference to radio communications services. Licensed radio users *clearly* have priority here."

Keeping the BPL issue on the media's radar screen is the challenge faced by Jennifer Hagy, N1TDY, Media Relations Manager at ARRL Headquarters. Jennifer was interviewed for BPL articles in *Phone+* magazine and *Technology Daily*, a newsletter published by *The National Journal* in Washington, DC.

Shortly after reading the text of President Bush's speech on broadband technology—in which he encouraged further development of BPL—Jennifer drafted a national press release to promote the League's opposing views. The release was distributed via PR Newswire to thousands of media outlets throughout the country, including Web sites and print and broadcast outlets.

NQ1R at the 2004 Boston Marathon

When he isn't busy with his duties as ARRL Marketing Manager, Bob Inderbitzen, NQ1R, keeps his finger on the pulse of Amateur Radio by putting his ham skills to work in volunteer activities. On April 19, Bob journeyed to Boston to join several hundred other amateurs who volunteered as radio personnel for the 108th Boston Marathon.

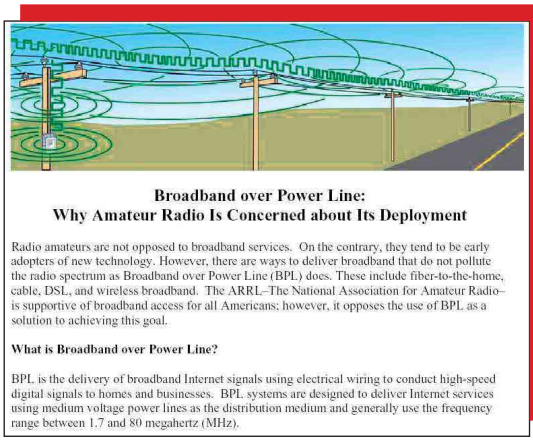
"I helped direct medical buses into downtown Boston after they'd swept the course for injured runners," Bob said. "I was located on a side-street, near the finish line. The road was closed to traffic, except for official buses using the route to approach the large medical tent. As the first runners finished the race, I was surprised to learn that my quiet little street was also used to escort the winners off the finish line area. Enjoying some glory by association, I had a firsthand meeting with each winner from the men's, women's and wheelchair races!"

ARRL's Bob Inderbitzen, NQ1R, at the finish line of the 2004 Boston Marathon.

As has been a tradition for many years, the Boston Marathon utilizes the support of Amateur Radio operators for this event. Hams provide radio support at the start area in Hopkinton, Massachusetts, along the length of the 26-mile course at aid and water stations, from school buses that "sweep" the race route, and at the finish line. Most use a 2-meter or dual-band handheld transceiver. Communications are directed through 2-meter nets on dozens of repeaters, and some APRS is utilized. Radio amateurs provide vital links to assist parking and start line safety, with relaying supply requirements for aid stations, and with ambulance dispatch. At the finish line, the huge medical tent and surrounding areas require the close coordination of hams working with medical teams and shadowing other race officials.

BPL Handout Available from ARRL

ARRL has posted a two-page document on the Web at **www.arrl.org/tis/info/HTML/plc/BPL-leave-behind.pdf** that discusses Broadband over Power Line (BPL) in lay terms. "Broadband over Power Line: Why Amateur Radio is Concerned about its Deployment" is available for reprinting and use as a handout when, for example, dealing with members of Congress, municipal officials, power utilities and the news media. While emphasizing that hams do not oppose broadband services *per se* and tend to be "early adopters" of new technology, the information sheet outlines Amateur Radio's concern about BPL's potential to create interference. Other broadband delivery methods "do not pollute the radio spectrum as BPL does," the paper states. It also defines BPL, outlines its current deployment status, discusses FCC regulations already in place and explains that BPL's interference potential is real, not just theoretical. Finally, it lists "Others at risk," including short-wave listeners, public safety agencies and federal government radio systems. —*Rick Lindquist, N1RL*



Broadband over Power Line:
Why Amateur Radio Is Concerned about Its Deployment

Radio amateurs are not opposed to broadband services. On the contrary, they tend to be early adopters of new technology. However, there are ways to deliver broadband that do not pollute the radio spectrum as Broadband over Power Line (BPL) does. These include fiber-to-the-home, cable, DSL, and wireless broadband. The ARRL–The National Association for Amateur Radio–is supportive of broadband access for all Americans; however, it opposes the use of BPL as a solution to achieving this goal.

What is Broadband over Power Line?

BPL is the delivery of broadband Internet signals using electrical wiring to conduct high-speed digital signals to homes and businesses. BPL systems are designed to deliver Internet services using medium voltage power lines as the distribution medium and generally use the frequency range between 1.7 and 80 megahertz (MHz).

A portion of the new 2-page BPL handout available on the Web at **www.arrl.org/tis/info/HTML/plc/BPL-leave-behind.pdf**.

ARRL ARES Supports Simulated Airport Disaster

On May 8, 2004, an airliner crashed at Dulles International Airport in northern Virginia near Washington, DC—a *simulated* crash, that is.

According to Larry Hughes, K3HE, the ARRL Public Information Officer for the Virginia section, more than 100 hams participated in the airport disaster simulation. All were part of ARES—the ARRL-sponsored Amateur Radio Emergency Service. Their job was to provide communications during the transport and treatment of the 200 "victims." The amateur volunteers set up portable repeaters around the crash site, as well as amateur television links that allowed officials to view the drill as it unfolded.

Amateurs were stationed at area hospitals to report on arriving victims. They also traveled on victim-transport buses using APRS (Automatic Position Reporting System) to give officials the ability to track vehicle movements in real time.

Curt Vainio, K1CV, the Dulles Airport Operations Duty Manager, requested ARES involvement in the drill. The primary organizers were Howard Cunningham, Jr, WD5DBC, Emergency Coordinator for Fairfax County; David Lane, KG4GIY, Emergency Coordinator for Prince William County, and Thomas Dawson, WB3AKD, Emergency Coordinator for Loudoun County.

According to Larry Hughes, amateurs in many areas can participate in similar drills. "Airports with scheduled commercial airlines, with planes carrying more than 30 passengers, must do a drill every three years. I suggest contacting the Airport Operations Manager and offering your services."

"Victims" are treated at the scene before being transported to hospitals.

Janet Shadle, KG4JBB, and Daniel Sullivan, KO1D, at their posts during the crash simulation.

Talking 'Tennas at Dayton

Resident ARRL antenna expert Dean Straw, N6BV, was a featured speaker at the Antenna Technology Forum at this year's Dayton Hamvention. Tim Duffy, K3LR, moderated the forum.

Dean is the editor of the popular *ARRL Antenna Book*, and is assisting with the production of the new *2005 ARRL Handbook*, scheduled for release this fall. An internationally recognized authority on antenna design, Dean has authored several popular software programs included with *The ARRL Antenna Book*. You can download PDF files of his Hamvention presentation at **www.kkn.net/dayton2004/N6BV-Dayton-2004.pdf**.

Dean Straw, N6BV, speaking at the 2004 Dayton Hamvention.

"It's Just My Job"

"Thanks, but I consider it my job as the ARRL Technical Specialist in this area." That was the response from Jim Pratt, K7QI, when he started receiving notes of appreciation for doing an antenna installation.

This story started when Bill Burrows, WA7NCL, had a conversation on the air with Carroll Clark, W7IML. Clark, as W7IML prefers to be called, is 79 years old and indicated he was having difficulty getting his new Hy-gain AV640 vertical antenna installed. Not knowing anyone in Clark's town of Snohomish, Washington, WA7NLC contacted the ARRL Western Washington Section Manager, Ed Bruette, N7NVP, to locate a volunteer or two to complete the antenna project. N7NVP contacted the ARRL Snohomish County Emergency Coordinator Ed Empey, WA7ETH, to identify the willing volunteers.

ARRL Technical Specialist Jim Pratt, K7QI, stepped up to the project without hesitation. A few days later, Clark's vertical was standing tall, not on the fence as Clark first intended but on a mast alongside the chimney. K7QI retuned it for the CW bands where Clark likes to operate, anchored the mast and installed a dc ground system. W7IML's first contact on the new antenna was with VKØDX (Antarctica).

Clark, who was first licensed in 1940, thanks the ARRL for having volunteers like Jim in its ranks.

Bringing *QST* to Life: Jodi Morin, KA1JPA

The words you are reading right now were placed on this page by Assistant Production Supervisor Jodi Morin, KA1JPA. For almost 25 years she has been creating the pages you enjoy in *QST* every month. There is an art and a science to the job of print "compositing," as Jodi knows well.

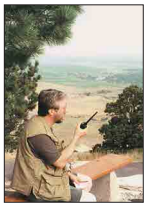
"In laying out an article for *QST* (actually, any of our publications), we try to put the emphasis on the ham and not just the hardware. At the page layout stage of a technical or general-interest article, photos are prioritized not only by subject discussed, but specifically by the individuals engaged in the proceedings. After all, the hardware can't enjoy the result, but *humans* sure do!

"My challenge is to make *QST* as attractive and readable as possible for our members. One big step in that direction was the decision to use color throughout the magazine a few years ago. We also took that opportunity to increase the type size slightly for easier reading."

When asked what members could do to improve how their digital photos appear in *QST*, Jodi replied, "Members send us some lovely digital images. We'd like you, your equipment and your activities to look their best. Submitting high-resolution, evenly lit photos is the key."

Guide to ARRL Member Services

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



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

Technical and Regulatory Information Services

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

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

ARRLWeb www.arrl.org

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

ARRL E-mail Forwarding

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

ARRL News

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

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

Insurance

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

Books, Software and Operating Resources

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

DXCC/VUCC

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

Volunteer Examiner Coordinator (VEC)

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

FCC License Renewal/Modifications Service

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

Educational Materials

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

Trust in Advertising

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

ARRL Foundation

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

Write for *QST*

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

Interested in Becoming a Ham?

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

We're at *your* Service

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

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

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

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

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

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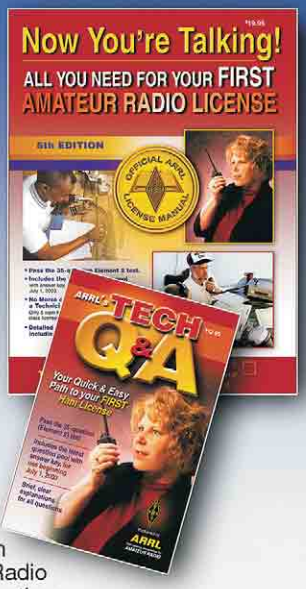

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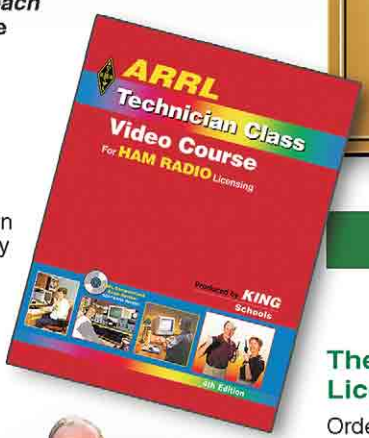

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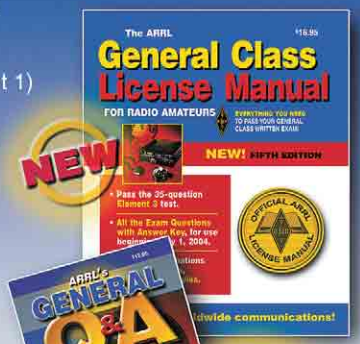

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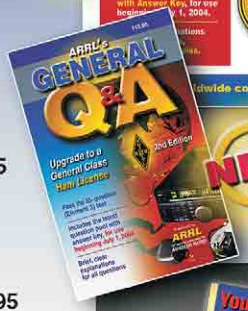

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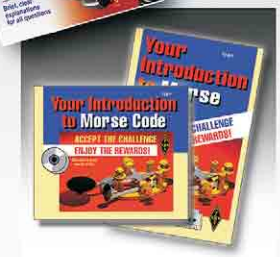

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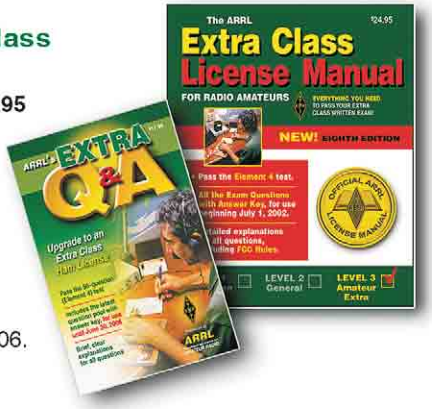

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UP FRONT IN QST

K2KN Among Those Honored at D-Day Commemoration

In early June, John Gallagher, K2KN, of Sidney, New York, traveled to France where, 60 years earlier, the young Radioman First Class had landed with the 6th Naval Beach Battalion. He was one of 100 D-Day vets to have been invited to take part in the 60th anniversary ceremonies at Normandy and Paris as a guest of the French Government. In Paris, John received the Legion of Honor, the most prestigious award bestowed by France, "in recognition for your participation in the liberation of France during the Second World War," according to a letter from the French Ambassador to the US.

A ham since age 14, John lost his operator's license during the D-Day invasion on June 6, 1944. A piece of shrapnel that entered his face just after he hit the beach caused him to lose an eye. Despite the nearly fatal injury, he went on to a career with IBM, retiring in 1984. John had earlier earned the French Croix de Guerre and the Purple Heart.

The 100 D-Day vets selected to make the all-expenses-paid trip represent all the American WW II veterans who took part in the liberation of France. Similarly, K2KN represents the Amateur Radio operators, many now Silent Keys, who served their country with distinction during that war.

COURTESY K2KN

A French general expresses his nation's gratitude to John Gallagher, K2KN, at a ceremony in Paris.

Kentucky's Youngest Extra

Aside from his avid pursuit of DX, Christopher Lee Castle, KI4BOQ, of West Van Lear, plays the drums, guitar (bass, acoustic and electric) and a little piano. His musical talents have won him competitions playing the drums and steel guitar. His Amateur Radio talents have earned him an Amateur Extra class license (February 2004, just before his 12th birthday).

Chris comes from a family of hams—his father Ron is KI4NM, grandfather Donald is KI4NL, grandmother Deloris is N4OKP and great-grandfather Clyde Jr was N4KJQ (SK).—*John D. Meyers, NB4K, ARRL Section Manager, Kentucky*

COURTESY NB4K

On the air, 12 year old Amateur Extra Chris Castle enjoys DXing. He's a member of the Big Sandy Amateur Radio Club and the Johnson County ARES.

DAN MILLER, K3UFG

What is Ham Reality, anyway? Oh, wait... it's a real estate office. ARRL Midwest Division Director Wade Walstrom, WØEJ (left), and Vice Director Bruce Frahm, KØBJ, found a place that would likely be friendly toward antennas when they grabbed a bite while attending last year's Missouri State Convention in Columbia.

NN3SI original operator honored: Joseph P. Fincutter, W3IK (left), receives a special Smithsonian Institution certificate of appreciation for his long years of service as Chief Operator of NN3SI, in Washington's National Museum of American History, Behring Center. Joe was the original operator of NN3SI when it first opened in 1976. Making the presentation is John B. Johnston, W3BE, current club station licensee of NN3SI.

COURTESY W3BE

VUCC through the Window

MICHELE BERGH, W1MKY

Dale, AF1T, in front of his microwave setup and 24 inch dish with one of the windows he used to make microwave contacts from his bedroom.

MICHELE BERGH, W1MKY

The author holding a small horn he used to give Dale his last grid on 3456 and 5760 MHz. The 24 inch dish and window are in the background.

The VHF/UHF Century Club (VUCC) award is earned by working a set number of grid locators (or "squares") on a particular VHF, UHF or microwave band. It's a challenging and fun award. Depending on the band, you will need to work and confirm 100, 50, 25, 10 or 5 grids. But of course to attain VUCC, everyone knows that you have to have a big antenna and live in a good spot. Or lacking that, you'll need a four wheel drive vehicle to take you up to the higher mountaintops. Those with homeowner association restrictions on outside antennas, QRP power or no handy mountaintop should forget about this particular award, right?

Not really.… Dale Clement, AF1T, of Henniker, New Hampshire, has recently demonstrated what can be done with some planning and persistence. He managed to get his VUCC on not one but two microwave bands with his transmitter, receiver and even his antennas completely inside his bedroom. Yes, I said microwave bands—those line of sight frequencies with "limited range."

Some of you may have heard of, or even tried, indoor antennas on the HF bands. It's an old trick for the apartment dweller: Run the antenna around the baseboard, or install it in the attic. While not necessarily as effective as an outdoor antenna, it does work, and even DX contacts are attainable. Even short range VHF contacts are possible with a small whip sitting on a desk or table. But microwaves? Well, most of us wouldn't even consider trying these frequencies with something inside the house.

Dale doesn't live right in the middle of a city—he's on a good-sized hill out of town. But he's still blocked in some directions: To the north he looks right into a hill behind his house, and on the day I worked him on 5.7 GHz I was astounded to discover that the path from his window to where I was located went right through a tree just outside that window. He copied my $^1/_2$ W signals just fine even though my antenna was nothing more than a small horn. In fact we had earlier worked over that identical 27 km path on 3.4 GHz when my power was a mere 35 mW to that same horn. At 3.4 GHz the horn was something that would normally be used strictly to feed a larger parabolic dish antenna—its measured gain was around a hundred times less than a 3 foot dish. But since I was backpacking on my end, a dish was impractical.

What's the secret to working microwaves from a bedroom window? On the higher microwave bands you need a minimum of 5 grids, so knowledge of potential locations on the other end and a bit of map work are required. Having a good antenna on at least one end of the path is important as well. And of course you need advance liaison with other stations. Calling "CQ" just won't work. Some of the stations AF1T worked were home stations, and some were "rovers" like myself. Since Dale isn't favorably situated right at the corner of 4 grids, distances worked were fairly long, the longest being with N1GJ on Cape Cod, Massachusetts, at *192 km*. That's certainly well beyond "line of sight" and rather impressive for a through-the-window indoor antenna.

As interesting as this accomplishment is, it should also give inspiration to hams who must live with antenna restrictions. A standard 18 inch offset dish (allowed or at least tolerated in many locations with restrictive covenants) works fine for the higher microwave bands. And most of us have at least one—often more—good shots out the windows of our homes. Even if your window looks out on a watertower or other large structure, all is not lost. Microwavers often use "bounce" shots to make a contact. What reflects a microwave signal and how well it does it might pleasantly surprise you. Even rain and snow clouds and aircraft can be pressed into service.

The bottom line is that regardless of where you live, possibilities exist for working microwaves that you may not have previously considered. A key part of ham radio is experimenting. I encourage you to give it a try. You might not only earn your own VUCC award "through the window," but might even beat AF1T's record.

A word about RF safety: It's always a good idea to keep people and pets away from the line of sight of a microwave antenna, and it's also a good idea to keep power levels as low as possible. For more, see the ARRL book *RF Safety and You* and the sidebar "The RF Proximity Question" in Mar 2004 *QST*, page 29.***~By Chip Taylor, W1AIM***

JOHN HESS, KG8NR

A Time for Radio: John Hess, KG8NR, of Redmond, Washington, was attracted by FM (fragrance modulation) to this beautiful, fragrant rose while visiting Heirloom Roses near St Paul, Oregon.

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THE REASON WHY

♦ I just read "The Reason Why" [Apr 2004, page 59] in which ARRL founder Hiram Percy Maxim reviews in 1927 the "early ARRL." I was exceptionally impressed with one particular excerpt that I think still holds true today:

> …we insisted from the beginning that no selfish motive for anybody or anything should ever prevail. Everything that ARRL undertakes must be 100% for the general good. That policy bred loyalty and confidence. With those two things an organization can prosper forever."

Simple, but powerful and true, words.—*Pete Malvasi, W2PM, Ramsey, New Jersey*

THE BPL SCHEME

♦ It takes an awful lot smoke and nonsense to get me to comment, but the BPL issue has done the job. What we are experiencing is a violation of a long and fast-held principle: *stay away from get-rich schemes*.

The scheme is being played out on our politicians, federal, state and local governments, and public utility commissions. The payoff is taxes, fees and royalties to help offset the poor financial condition being experienced by most government agencies and entities. While this is certainly not the total fix, they reason, all funds will be graciously accepted. So who would expect them to not to turn a blind eye to incumbent radio services, reports of system shortcomings, credible technical reports and obvious interference issues?—*Steve Bissell, WA2CIA, Gowanda, New York*

ARE WE HACKERS?

♦ In the last few years I have noticed a growing public misuse and abuse of the term "hacker," and now it is popping up on Amateur Radio Web sites and forums. This is quite troubling. As soon as something goes wrong with a Web site, something as simple and common as a forum database error, people start "crying hacker."

Why is this troubling to me? Think back to where the term came from. A hacker is nothing more than a person who is interested in learning how something works—someone who takes something apart, not to make profit, but to learn from it and make it better. Sound familiar? Whether you like it or not, the hacker culture grew from the Amateur Radio community. I have met more "hackers" in Amateur Radio than I have ever met in computer clubs or over on-line BBS systems.—*Terry Reinert, KG4JSC, Melbourne, Florida*

NICE FARM, OM!

♦ K1FK's, article [Jun 2004, pages 34-39] on building a 75 foot top loaded vertical antenna amazed me, not so much for the effort, size and complexity as for the amount of property Dave has. I flipped the pages back and forth looking at the views and came to the conclusion that he must have at least an acre of land. Even in Maine this must be a huge lot, and the biggest lawn I've seen outside of a golf course.

Oh, did I mention I was born and raised in suburban Los Angeles? I'm sure many of my fellow LA-area hams were drooling, not so much for the antenna system (it was indeed impressive) but for the sheer open space. It's not the first time I've seen an article on huge antenna farms that seemed to literally be on farms!

That's one thing most of us lack—space. Our lots, typical of the Downey area, are measured in thousands of square *feet*, and most don't exceed 2000. That's why antennas and towers seem to run up against neighborhood opposition. And it's getting worse with small to average tract homes being remodeled into two story "mini-mansions" with barely any room left in yards to put up a patio umbrella, let alone a decent antenna.

Good luck with that antenna Dave, and be glad you've got room to breathe. —*John Powell, KF6EOJ, Downey, California*

VHF-UHF CONTESTING

♦ Let me state *a priori* that I am not opposed to the reformulation of the VHF-UHF contest structure [proposed by a subcommittee of the ARRL Board of Directors—*Ed.*]. Certainly, the present structure has been in place for an extended period, and changing it is not a bad idea. The changes in the scoring and the allowed bands are intended to eliminate unfairness and promote more activity. Whether this will occur is moot. The simple fact is that radio contests are innately unfair and most entrants have no chance of winning. There will always be stations and clubs with more resources, better QTHs and innate skill that will tend to dominate.

However, I'm not sure that the rule changes will do much to promote new or increased activity. Presently, many operators operate for a short period of time during a contest and are not likely to submit a log. They are often heard to say, "Just handing out a few points." There is no incentive for the less capable stations to operate for any extended period of time as no amount of effort or new scoring systems will place them at the top of the results listing. What is needed is a mechanism to entice such operators and new contesters to contest and contest for longer periods of time.

I propose that the contests offer achievement levels that lower capability stations can aspire to reach. For example, all stations scoring above a certain level would be eligible for a "contest achievement award." Those levels can be normalized by region to allow stations in less populous areas of the country to achieve as well. The awards can also be made cumulative and carryover from contest to contest. This will introduce an aspect to the contests not unlike that associated with DXCC or WAS. It will allow one to work toward a goal independent of winning the contest. One could take several years to reach, for example the 100,000-point club. Another approach could be "merit badges" where awards are issued for specific attainments. For example, initial contacts beyond certain distances on each band.—*Charles Pearce, K3YWY, Emmaus, Pennsylvania*

[Editor's Note: A summary of the proposed changes can be found at **www.arrl.org/news/features/2004/02/26/2/**.]

DO IT SAFELY

♦ Each month I eagerly await the arrival of *QST* and the July 2004 issue was no different. Having only 2 meter capability, one of the first columns I read is "The World Above 50 MHz."

The various mobile stations and the

antenna array are impressive, and there have been some very creative solutions to the challenges of setting up these stations. I have some *serious* safety concerns, however.

I have had the unfortunate opportunity to follow a fellow ham who had the dubious dc-to-daylight station installed in the vehicle. More often than not, the person was so preoccupied with talking on the various radios that the quality of driving became a hazard to all other motorists. Your pictures show each rig *parked* off the pavement. This is a very important point that I felt wasn't emphasized sufficiently.

Figure 3 (page 84) shows "The NØDQS view from the front seat. All of the equipment is readily at hand." I trembled as I considered that caption while looking at that picture. First, that plastic shelving was never designed to be used in a moving vehicle. Even with all power to the gear shut off, the shelving is *not* designed for the stresses that would be experienced going down a road, around curves, over bumps, etc. All of this is in the front seat, making the driver the likely target of the "radio missile" should a collision occur.

The picture shows an elastic "bungee cord" holding the HF radio in place, and it appears the same method is being used for the other radio. This is severely inadequate by itself. A hard corner, and gear could be coming loose, if not flying. It was impossible to tell from the pictures how high this stack of gear is and if it blocked the driver's view of the passenger side mirror.

My final two concerns have to do with the antenna structures. Unfortunately, none of your pictures showed the antenna in a stowed or travel position. Some of them look as though, even in the stowed position, they would add considerable height to the vehicle. This is especially important to consider for two reasons: There are laws limiting how high a vehicle and load can be, and the added height will make the vehicle more top-heavy. Even a light PVC frame can add substantially to the top-heavy feeling if there are strong crosswinds. I used to drive truck for a living and can tell you it doesn't take much 2 inch PVC pipe to make a substantial wind barrier.

This was an excellent article and I gained much insight reading it. I do feel that the safety concerns warrant consideration and mention. I hope *QST* continues printing articles on creating effective mobile stations, and I hope those articles will also address the safety issues. *—Douglas R. Wescott, KF6QXU, El Cajon, California*

♦ The "2003 Simulated Emergency Test Results" article [July 2004, pages 100-102] contained some good information about emergency communications. However, I was disappointed in what I saw in the photograph on the top of page 101—the use of a wet-cell battery indoors and placed on top of the radio table. Prudent safety practices would suggest that the indoor use of wet-cell batteries of this type be avoided if possible. A more appropriate choice would be gel-cell or AGM-type batteries. However, if you *must* use a wet-cell indoors, I would suggest that it be placed in a protective plastic battery container similar to the type used for marine applications. The battery should then be placed on the floor, not the table, to avoid tipping over or spillage on the table or any other accidents.*—Erik Hoover, KK7OA, EC, Ravalli County, Hamilton, Montana*

♦ A photograph on page 5 of the June 2004 issue of *QST* depicts a Field Day buff on top of a tower—actually balancing himself on the boom of what appears to be a 2 element 40 meter Yagi and attempting to install another antenna on the same mast. I shuddered just looking at this recipe for disaster. Please, in the interest of safety, do not encourage such activities by printing photos such as this!*—Gerald Fasse, W8GF, Warren, Michigan*

25 YEARS AGO

♦ I was shocked when I realized that the Versakeyer electronic keyer was first described in *QST* 25 years ago [May 2004, page 101]. I built one at that time. I installed the 5 V capacitors included with the parts kit I bought and proceeded to operate the keyer. But after just a few operations it locked into the key-down position and I couldn't get it to unlock. Using only a VOM, I finally found the source of the problem: I replaced the 5 V caps with 100 V caps and am still using the Versakeyer.

This is a great keyer and it has worked well for me these past 25 years. I wonder how many hams are still using it.*—Phillip Barros, K5OGX, Fort Smith, Arkansas*

PUSH TO TALK

♦ I was delighted to see the reference to the 1950s TV Show "Highway Patrol" in the July issue of *QST* [Old Radio, page 88]. It was hard to tell if this was the case in the photo, but Broderick Crawford was notorious for talking into the back of the microphone.

It gave me a chuckle today as it did then.*—Bill Finkelstein, WB6JAO, Santa Rosa, California* QST

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By Bob Adams, W6BEG

The Code Player

Pocket portable CW practice and a great microcontroller project, too!

Figure 1—A front view of the code player showing the control buttons.

In my quest to become a better CW operator I found that I progressed faster when using code tapes or computer practice in addition to on-air copy. A computer is fine for use at home when the time is available, but some sort of portable device is required to make use of time that is normally wasted when driving, waiting and the like. I needed a device that can quickly be loaded with a new text file, has a large character capacity, and is small and battery powered.

I originally designed the code player to use a common SX18 microcontroller. The player uses 16 kB of EEPROM memory using two 24LC64 chips. The SX18 has now become obsolete, however, and the SX28, which has more pins, has replaced it. The SX28 will still fit in the specified enclosure. 16 k of memory will store 2.7 hours of code at 20 WPM. Text files are sent from a PC to the code player using *HyperTerminal* or any software that will send text files at 1200 baud. It takes less than two minutes to download 16,000 characters to the code player EEPROM memory. The code player will send code from 5-60 WPM using the Farnsworth method for speeds below 18 WPM.[1] The unit fits in a shirt pocket and, when used with an earpiece, code can be practiced just about anywhere. Figure 1 shows the code player front panel.

Circuit and Software Operation

Figure 2 shows the schematic and parts list for the code player. The SX28 microcontroller (**www.ubicom.com/products/processors/sx28ac.html**) used in the code player is a general purpose controller. While it does not have built-in features like RS-232 serial communications or timer functions, its clock rate can be varied from 32 kHz to 50 MHz. This allows many functions to be implemented in software, allowing one controller chip to be used in many applications. If another function is required, just crank up the clock speed and add the necessary software. Clock rates from 32 kHz to 4 MHz are set in a configuration word written to the SX28. Clock rates greater than 4 MHz require an external resonator connected to the OSC1 and OSC2 pins. The controller has 2 kB of EEPROM program memory and 139 bytes of RAM, and can be programmed in-circuit through the OSC1 and OSC2 pins.

The main control software for the code player checks to see which buttons are pressed, turns on the appropriate LEDs and calls software functions to do the required tasks. The object code is contained in a file in **cplayer.zip** (cdplayobj.txt).[2]

The text file received from the RS-232 port is stored in ASCII form in the 24LC64. Data is written to and read from the 24LC64 EEPROM memory chips serially using the SCL (serial clock) and SDA (serial data) pins (see Figure 2). The SCL pin is used to clock data in and out of the 24LC64 and is generated by the SX28. The clock rate used in the code player is 250 kHz. Data bits sent and received from the 27LC64s are valid when the clock signal is high. In order to read or write 8 bits (one byte) from or to the 27LC64, a control byte and 2 address bytes must also be sent so that the total number of clocks required is 32. For a clock of 250 kHz this results in a total read or write time of 0.13 ms—a theoretical maximum code speed of around 1000 WPM.

When the code player is sending code, as each ASCII character is read from the 24LC64, the ASCII number is used as an index to the GetCWTable. Bit positions 7 through 3 contain the dot/dash pattern with 0 representing a dot and a 1 representing a dash. Bit positions 2 through 0 contain the number of dots/dashes in the character. For example, the ASCII number for the letter "B" is 66. In the GetCWTable the entry for index 66 is 10000100 in binary. The right-hand three digits are "100" binary that convert to "4" decimal, which means that there are 4 dots/dashes in the letter "B." The first 4 binary digits of the table entry for "B" are 1000, which convert to dash-dot-dot-dot.

Dots and dashes are output to pin 14 (RB4) of the SX28 as an 800 Hz square wave, which is filtered by R6, R7, C4 and C5 to reduce harmonic content. There is also a keying output on pin 15 (RB5), which is +5 V when the 800 Hz tone is being sent and 0 V when the 800 Hz tone is not present. This can be connected to a transistor and used to key a radio.

The RS-232 signal from the PC must be level shifted to the +5 V and 0 V logic levels used by the SX28. A –12 V level from the PC must be shifted to +5 V for the SX28 and a +12 V level from the PC must be shifted to 0 V. R8, D1, Q1 and R9 do the shifting. When the TX connection from the PC is –12 V, diode D1 clamps the base emitter voltage of Q1 to –0.7 V. This prevents reverse breakdown of the transistor. When TX is –12 V, Q1 is OFF, which results in +5 V (logic 1) being applied to pin 9 of the SX28 (RA3). When TX is +12 V, transistor Q1 is ON, and +0.4 V (logic 0) is applied to RA3.

The ON/OFF switch S4 is double pole, with one pole used to switch power on and off and the other pole used to switch ground to pin 16 (RB6) of the SX28 when power is switched off. This ground on RB6 signals the controller to save the current file position and code sending speed and to go into the sleep mode. The 47 µF capacitor holds enough charge to allow the controller to accomplish the above tasks before the supply voltage drops low enough to prevent the controller from operating. A diode is placed between the battery positive lead and the 78L05Z +5 V regulator to prevent damage that could occur if a negative voltage were applied.

[1]Notes appear on page 31.

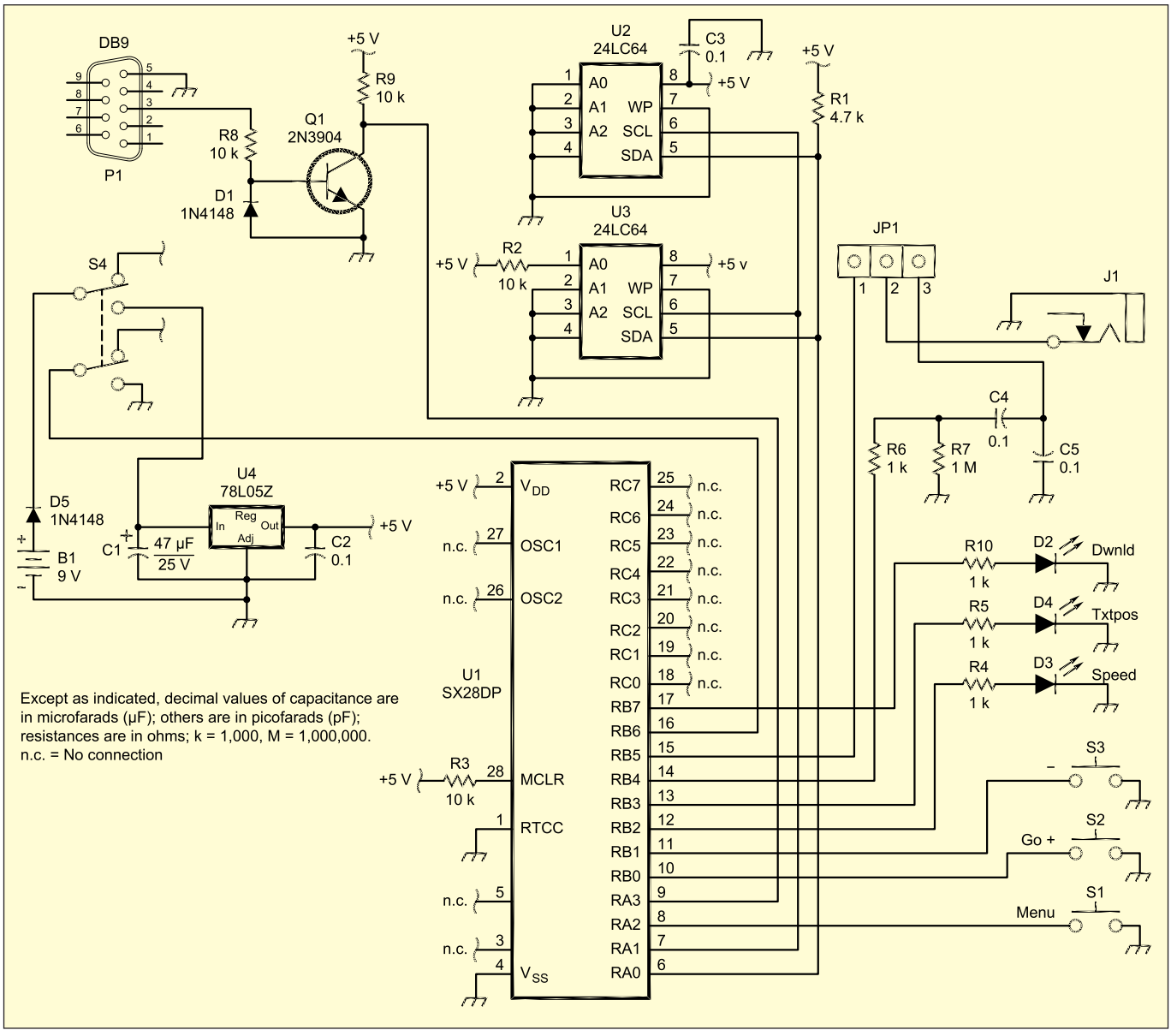

Figure 2—The schematic and parts list for the microcontroller-based code player. Parts suppliers include Mouser Electronics (www.mouser.com) and DigiKey (www.digikey.com).

C1—47 µF capacitor, electrolytic, 25 V (Mouser 140-XRL25V47).
C2, C3, C4, C5—0.1 µF capacitor, ceramic 10 V (Mouser 80-C320C104K5R).
D1, D5—1N4148 diode (Mouser 78-1N4148).
D2, D3, D4—LED, yellow, T1 (Mouser 512-MV5374C).
Q1—2N3904 transistor (Mouser 512-2N3904).
R1—4.7 kΩ, 1/4 W resistor.
R2, R3, R8, R9—10 kΩ, 1/4 W resistor.
R4, R5, R6, R10—1 kΩ, 1/4 W resistor.
R7—1 MΩ, 1/4 W resistor.
S1, S2, S3—NO push-button switch (Mouser 103-1012).
S4—DPDT slide switch (Mouser 629-GF1263011).
U1—SX28 microcontroller (Mouser 619-SX28AC/DP).
U2, U3—EEPROM, 24LC64, 8 k × 8 serial (DigiKey 24LC64-I/P-ND).
U4—Regulator, 78L05, +5 V dc (Mouser 512-LM78L05ACZ).

Miscellaneous
B1—Battery, 9 V.
J1—1/8 inch phone jack (Mouser 16PJ011).
JP1—Pin strip header (Mouser 517-6111TG).
P1—Female DB9 connector (Mouser 571-7479054).
Enclosure—Pac Tec, K-JM33 (Mouser 616-77073).
Shorting shunt (for header) (Mouser 517-950-00).
Snap connector for battery (Mouser 12BC005).

Software at the beginning of the listing (labeled INTERRUPT) is programmed to execute every 104 µs. Each time the controller reaches the 104 µs mark, it stops executing the current software, saves the current data and executes the interrupt software. After the interrupt has been executed, the controller restores previously saved data and resumes executing the software that was interrupted. The interrupt routine in the code player only takes about 15 µs, worst case, so there is plenty of time available in the remaining 89 µs for handling the non-interrupt software chores. Tasks that require precise timing or are high priority should be done in the interrupt software routine. The code player 800 Hz tone, RS-232 communications, 16 bit timer, menu button scan and power off check are done in the interrupt routine.

Construction

First remove the end panels from the Pac Tec enclosure and drill holes for the LEDs, buttons, phone jack, DB9 connector and the power switch. All dimensions are referenced to the lower left corner of

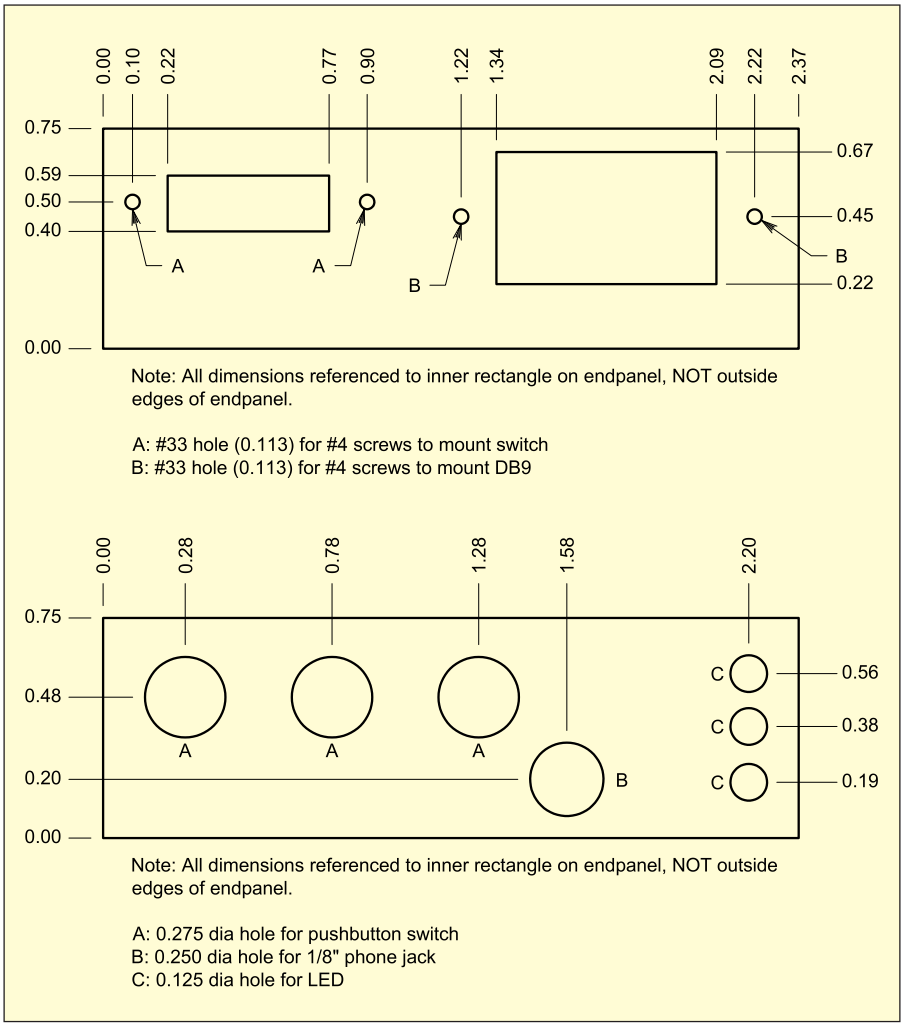

Figure 3—A drilling diagram for the front panel of the code player.

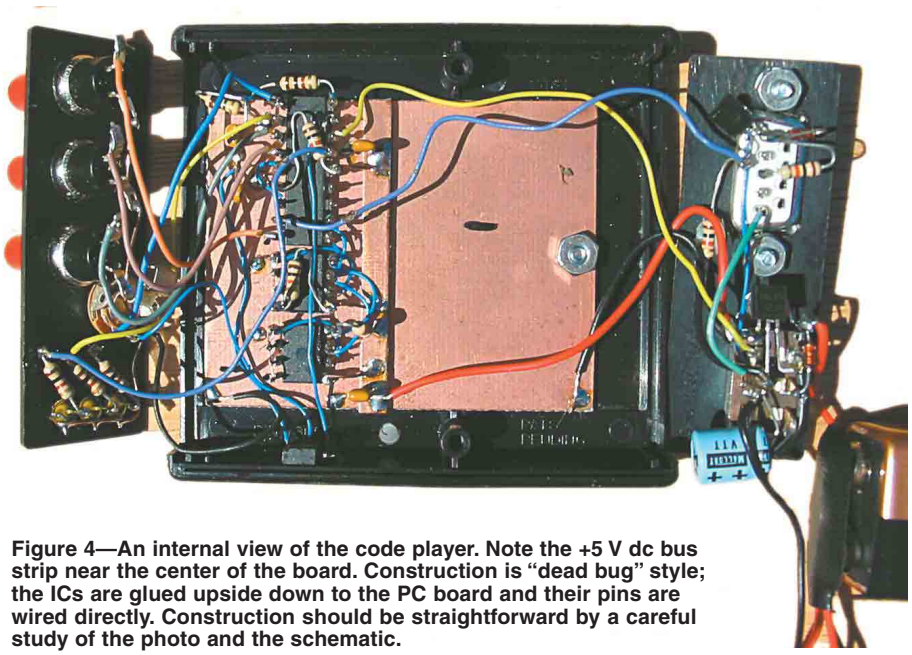

Figure 4—An internal view of the code player. Note the +5 V dc bus strip near the center of the board. Construction is "dead bug" style; the ICs are glued upside down to the PC board and their pins are wired directly. Construction should be straightforward by a careful study of the photo and the schematic.

the end panel rectangles as shown in Figure 3. I originally planned on laying out a PC board for the code player but found that the "dead bug" method of construction yielded a more compact package. After you drill the end panels, install the push-button switches, phone jack, DB9 connector and power switch. Epoxy the LEDs in place. Place a piece of insulation over the negative lead of C1 and solder C1 and U4 to the DPDT switch as shown in Figure 4. Solder R8, R9, Q1 and D1 to the DB9 connector. Solder R4, R5 and R10 to the LEDs as shown.

Cut a 1.90 × 2.4 inch rectangular board from printed circuit board stock. Also cut a strip 0.20 × 1.90 inches. Place the rectangle in the Pac Tec case section that has the tapped holes. Position the board against the end panel with the LEDs and drill the mounting hole as shown in Figure 4. Place the end panel with the DPST switch in the case and place the battery about $^{1}/_{8}$ inch from the switch solder lugs.

Epoxy the PC board strip to just clear the battery, on the side of the battery opposite the DPST switch, as shown. This strip will be the +5 V bus. Epoxy U1, U2 and U3 to the PC board, making sure that pin 1 on each IC is positioned on the side opposite the +5 V strip.

Connect a 3 inch piece of 30 gauge wire wrap wire as described in the next paragraph to each bottom pin of a 3 pin header strip. Epoxy this header to the side of the Pac Tec case. This is used to select either 800 Hz tone or voltage level output to the phone jack.

Solder the remaining components to ICs and main PC board as shown in Figure 4. The bypass capacitors at each end of the +5 V strip are C2 and C3. To connect components on the main board, use 30 gauge wire wrap wire. Strip about $^{3}/_{16}$ inch from each end of wire and use a wire wrap tool to make a couple of wraps around each pin and then solder. This is much easier than trying to attach a larger stranded wire with needle nose pliers and it also makes a cleaner, more compact layout. Use 26 gauge stranded insulated wire to make connections from the main board to components on end panels. Old computer and printer cables are a good source for this wire in assorted colors.

The top of the main board will be ground and should be connected to the voltage regulator ground on the DPDT switch lug as shown (Figure 4). Connect the negative side of the +9 V battery clip to the regulator ground on the switch lug. The positive side of the +9 V battery clip connects to the diode on the regulator input, which is connected to the DPDT switch lug, as per Figures 2 and 4. The SX28 can be programmed in-circuit by

making temporary connections to the OSC1 and OSC2 pins.[3]

Operation

The three control push buttons (Figure 1) are MENU, GO/+ and – and the three LEDs are labeled Dnld, SPEED and Tpos. The MENU button is used to cycle through the four menu functions:

Send CW

All LEDs are OFF for this function. Pressing GO/+ will start code transmission at current file position and current sending speed. Pressing MENU will terminate sending and move to the next menu function.

Download File from PC

The Dnld LED is ON for this function. When the PC is ready to send, press GO/+, then send the text file from the PC. Any size file can be sent from the PC as long as it is terminated with the character "$." Files larger than the 16 k capacity of the code player will be truncated. When the file has been received the Dnld LED will turn off. If something goes wrong, turn the power off and back on to reset and start over again.

To configure *HyperTerminal* to send to the CW player, select FILE then NEW CONNECTION. Enter a name and select a symbol for the connection. Then select DIRECT TO whichever COM port you are using (COM1, COM2, etc) in the CONNECT TO form. In the COM PROPERTIES form select 1200 BITS PER SECOND, PARITY: NONE, STOP BITS: 1, and FLOW CONTROL: NONE. To have characters being sent by *HyperTerminal* echoed to the computer screen, open the connect file set up previously, by selecting FILE then OPEN and select the appropriate connection. Then select FILE, PROPERTIES, SETTINGS, ASCII SET, ECHO TYPED CHARS. To send a text file from *HyperTerminal*, select TRANSFER, then SEND TEXT. Browse to the desired text file and double click on the file name to start sending.

Change CW Sending Speed

The SPEED LED will be on. Press GO/+ momentarily to increment the sending speed by 1. Press the – button momentarily to decrement sending speed by 1. Press both GO/+ and the – button simultaneously and the code player will send the current speed in words per minute. Sending speed can be adjusted from 5 to 60 WPM.

Change Sending Position in Text File

The Tpos LED will be on. Press GO/+ momentarily to increment file position by 256 characters and press the – button momentarily to decrement file position by 256 characters. If you press both the GO/+ and the – button simultaneously, the code player will send a number between 00 to 63—representing the 256 character segment of the current file sending position.

Whenever a "%" occurs in the text file, the code player will stop sending until GO/+ is pressed momentarily. This is useful for contest exchanges or call sign practice where a pause allows time to write down the information. Be careful that files downloaded to the Code Player do not have extraneous "%" pause characters or extraneous "$" end of file characters.

Allowed characters are all letters (upper and lower case), numbers, % (pause), $ (end of file), comma, period, question mark, * (SK), + (AR), and – (BT). All other characters in a text file are ignored by the code player software.

Code Practice Text Files

I've found that conventional code tapes and CDs are not challenging enough to increase proficiency, particularly when learning to copy in one's head. To make things more challenging, I downloaded some difficult word files from the Internet that are composed of uncommon words from both the British and US form of English. The common letter groupings that should be copied are all used. The words are varied and somewhat obscure, and that keeps you on your toes when copying. When combined with a few random letter, number and call sign groups, the resulting text files are very good for code practice. Files can also be made to simulate the exchanges used in contests.

Code practice files can be found on the ARRL Web site.[4] The source code, for those wishing to program their own controller, can be found here as well. Tuff1.txt through tuff5.txt are uncommon words with random call signs and numbers. Field1.txt through field2.txt are random Field Day exchanges with the % character inserted to pause sending. Sweep1.txt through Sweep2.txt are random contest exchanges with % inserted to pause sending. Calls1.txt through calls3.txt are random call signs with % inserted to pause. The pause character % can be removed from any of the text files by using the find and delete feature in any commonly used word processing programs.

The Moment of Truth

After construction is complete, turn power on and verify +5 V on pin 2 of the SX28 and pin 8 on both 24LC64s. Press the MENU button to cycle through the menu while watching for proper indications on menu LEDs. SEND mode is indicated by all LEDs off. Dnld, Tpos and SPEED LEDs should each turn on individually. Using the MENU button, select DOWNLOAD (Dnld LED on). Connect the RS-232 cable from the PC into the DB9 connector, press the GO/+ button and send a text file from the PC. When the EEPROMs are full or a $ (end of file) character is received the Dnld LED will turn off. Plug an earpiece into the phone jack, select SEND using the menu button (all LEDs off), then press GO/+. You should hear your text sent at the default speed of 20 WPM. Adjust sending speed as desired using the SPEED menu selection.

A good shareware program called *CwGet* (**www.dxsoft.com/micwget.htm**) was used to test the code player for both correct dot/dash sequences and character timing. *CwGet* is also useful when used to practice sending code with correct timing between characters and words. A screen display shows the dot and dash tone timings as they are being sent. It is easy to spot incorrect timing using this screen.

In Conclusion

Aside from just being fun, Morse code represents a proficiency challenge and, in my opinion, is equivalent to learning to play the piano or a foreign language. I've found that, as a result of learning to copy in my head, I can now read a phone number out of the phone book and remember it while I dial. That's something I previously had difficulty doing. Courtesy and friendliness are still the rule on the CW frequencies. Generally speaking, more CQ calls are heard on the CW bands than on the phone bands, so it is usually easier to initiate a contact on this mode. It would be a sad day for Amateur Radio if Morse proficiency became a lost art. The code player helps to make learning and refining a major part of our heritage a pleasure.

Notes

[1]ARRL Technical Information Service, Morse Transmission Timing Standard, File: **codestd.txt**.

[2]**www.arrl.org/files/qst-binaries/code_player.zip** in the file **cplayer.zip**.

[3]The author can provide programmed SX28 chips. Contact him via e-mail or postal mail for details.

[4]See Note 2.

Photos by the author.

Bob Adams, W6BEG, was first licensed in 1964 for one year, then relicensed in 1994. Bob received an MSEE degree from the University of Arizona and has worked in the areas of telecommunications, software, controls and microcontrollers. He can be reached at 6597 Lucerne Ct, Redding, CA 96001; **w6beg@arrl.net**.

By Michael Tracy, KC1SX

QST Product Reviews—In Depth, In English

Our lead test engineer describes product review testing to help readers make the best use of this popular column.

So why do reviews? Some of the reasons are obvious, some not so obvious. Most folks want to get the best possible equipment for their hard-earned cash. Others might be satisfied if they find something that fits their needs as long as it doesn't have any serious problems.

In one form or another *QST* has been "reviewing" Amateur Radio equipment since the early 1930s. The first investigations were pretty basic, giving block diagrams and circuit descriptions. In 1975, Recent Equipment saw the addition of test results from the ARRL Lab, and the column was subsequently renamed Product Review.

In the pages that follow, the process of Product Review will be described, and the Lab test data will be explained in a manner that will aid in providing a better understanding of these large collections of numbers.

Figure 1—ARRL Test Engineer Michael Tracy, KC1SX, testing IMD performance in ARRL Lab screen room.

The Process

Selection

The Product Review Editor selects equipment for review, and selects an appropriate person to perform the review. The editor may choose to do the review himself or may select a writer knowledgeable in the field from among the licensed members of the Headquarters staff (with the exception of the Advertising Department), Technical Advisors and Contributing Editors.

Purchase

After an item is chosen, procurement must be made. To ensure that the equipment is as close to "typical" as possible, purchases are made from Amateur Radio dealers or indirectly by third parties. In effect, we purchase equipment the same way our members do. Indeed manufacturers are often not aware that a review is in process until the "wrap-up" (described later).

Laboratory Testing

When new equipment arrives, its first stop is in the ARRL Lab. The equipment is inspected for any possible shipping damage, inventoried for completeness, and then run through a series of performance tests (in most cases—some review items do not require any bench testing).

Hands-on Testing, Writing and Editing

After the Lab testing, the item is handed over (or shipped) to the designated *reviewer*, who is then responsible for putting it through its paces in real world situations. The reviewer is responsible for writing the actual review text. The Product Review Editor then edits the completed text in order to make it fit the available space and comply with *QST* style.

Afterward

Equipment that has been reviewed is generally auctioned off to members via the **prauctions** page on the ARRL Web site.

Lab Testing—Overview

Types of Testing

Although the types of equipment that generate the most interest are transceivers, receivers and amplifiers, the ARRL Lab often tests station accessories as well. These include items such as transverters, power supplies, SWR meters and just about anything else that can be tested on a bench. Antennas are not sub-

ject to Lab tests because the ARRL does not have the calibrated test range required to obtain proper gain and pattern figures.

Accessories and Specialty Items

The testing that is performed on accessories depends on the type of equipment. For example, SWR meters are checked for power accuracy and SWR, plus insertion loss, return loss (measures SWR of the meter input when the output is a proper load) and frequency range. These are all important for optimum operation.

Radio Equipment

Judging by inquiries to the ARRL Technical Information Service, transceivers create an enormous amount of interest. Of course, they are usually the first thing that comes to mind as soon as "the ticket" is on its way from the FCC. Some folks hold onto their first transceiver for decades; others trade rigs every few months. Most of us fall somewhere between these two extremes, but all of us seem to be interested in the new ones. Receivers also tend to create a lot of interest.

Lab Testing Up Close (and What the Numbers Really Mean)[1]

RECEIVER TESTING

Sensitivity

Sensitivity is a measure of a receiver's ability to make use of weak signals. One common measurement standard is called minimum discernible signal (MDS), although this is more aptly known as the receiver's *noise floor* because the human ear can often discern signals that are weaker.

The noise floor is the amount of power present in the receiver's internal noise, determined by measuring a signal level equal in power to that noise. The output of the receiver consists of the receiver's internal noise, plus the constant unmodulated tone from the signal generator. This is the "stick" by which all radios are measured for *QST*'s Product Review data tables. Typical noise floor figures for modern transceivers can be anywhere from –120 to –140 dBm. The term dBm refers to decibels relative to a milliwatt. If you think these are very small signals indeed, you are correct! Receiving a level of –120 dBm is somewhat akin to trying to view a 4 W night light at a distance of several miles without the aid of a telescope.

Unfortunately, it is impossible to duplicate "real world" conditions on the test bench—an approximation is all that can be achieved. To further complicate matters, real world conditions are different for everyone, so any attempt to duplicate a given set of conditions would only be useful to a fraction of hams. The best that can be hoped for is a consistent "yardstick" for making measurements that allow meaningful comparisons.

In the shack, the radio is connected to an antenna, and what you hear from the speaker is a combination of receiver noise and local noise (atmospheric and man-made). In some circumstances in HF and most in VHF, the receiver noise might dominate, but in the vast majority of cases, on HF the local noise predominates (even on a "quiet" band in winter). While atmospheric noise is very random (similar to the receiver internal noise), man-made noise sources are often pulse-type or otherwise very periodic in their characteristics.

The noise from the receiver that is heard by the ear is proportional to the bandwidth. Reducing the (effective or "noise") bandwidth from 500 Hz to 50 Hz will result in a 10 dB or ten times reduction in noise power. Narrow bandwidths can make a dramatic difference in how weak a signal can be copied by the ear. Most rigs do not have the capability to get that narrow, but for many to shift from a 2 kHz to a 500 Hz filter will make a noticeable improvement in the received signal to noise (S/N) for a CW signal. We use a 500 Hz filter for such measurements, when available.

Other types of sensitivity measurements include signal to noise (S/N), signal plus noise to noise (S+N)/N and signal plus noise and distortion to noise and distortion (SINAD). These are all ratios so they are measured in dB. For AM, sensitivity is often specified by manufacturers as 10 dB S/N, a level where the signal is 10 dB greater than the noise. In the Lab, we measure AM as (S+N)/N at a level of 10 dB so that all receivers can be readily compared.

On FM, the measurement standard is 12 dB SINAD. Although 12 dB might sound like a fairly high signal level, FM signals are difficult to discern with noise levels higher than this, so it is the level of minimum practical signal strength. This can be measured on a special instrument known as a SINADDER, but it can also be measured by looking at distortion on a sine-wave modulated signal because the noise is also distortion (relative to a constant-amplitude single-tone waveform).

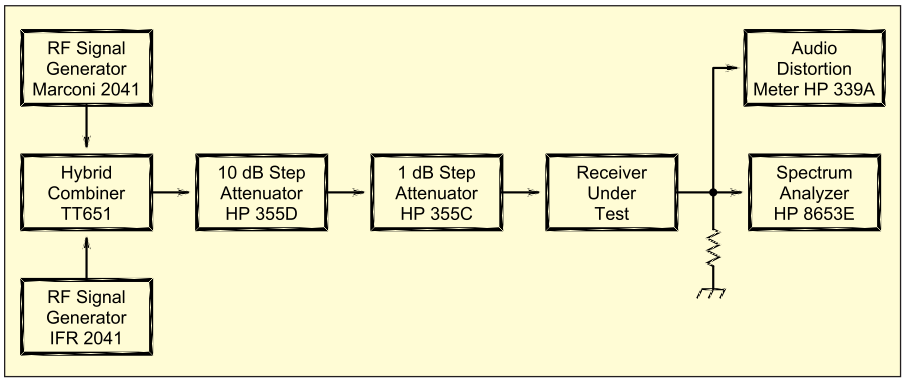

Figure 2—The test setup for measuring receiver dynamic range.

Dynamic Range

Dynamic range is generally the difference between the weakest signal that can be perceived and the strongest signal that can be present without adversely affecting that weakest signal.

Specific to receivers and transceivers, dynamic range is the difference between the receiver's noise floor and the level of strong signals that are close in frequency yet outside the receiver's passband (therefore assumed to be undesired). While receive dynamic range is a critical issue to contest operating, it can be important even to casual weak-signal DXers if they have to share a crowded band with strong local stations. Stations with high gain antenna systems are also prone to dynamic range issues.

When problems do occur, a rig's attenuator can be of help. If a particular receiver has a noise floor of –140 dBm and the local noise level is –130 dBm, adding 10 dB of attenuation will not make any difference in the weakest signals that can be perceived, yet it will reduce problems from the interfering strong signals.

Actually, it should be noted that –140 is typical only of a rig with a preamp on. It is preferable to turn the preamp off prior to adding attenuation because the preamp adds some noise of its own as well as generating undesired products. Under circumstances when the band

[1]Notes appear on page 36.

abounds with moderate signals (assuming they are ones you want to work), you can even increase the attenuation even more. A good example is operating the lower bands during the early portions of Field Day. Of course, it is usually better to have a rig with too much gain and capable of reduction rather than having not enough gain in the first place.

Blocking Dynamic Range

Blocking dynamic range (BDR) refers to a condition in which the weak signal is "blocked" or suppressed. You'll often hear this described as *desense* because the strong signal reduces the effective sensitivity of the receiver.

BDR as a lab measurement normally refers to the point at which the weak (presumed desired) signal is reduced by 1.0 dB ("blocked") by the presence of a strong (presumed undesired) signal at a frequency above or below the desired signal. The frequency difference between the two is the *spacing*. Thus, blocking dynamic range is a measure of the difference between the receiver's noise floor and the level of the signal that caused the blocking condition.

A measurement that is *noise-limited* is one in which the undesired blocking signal caused an increase in receiver noise output before the desense effect was observed. Usually, this is caused by interaction of the signal with the phase noise of the receiver's internal oscillators. It is often the case that a transceiver that has high transmit composite noise will be noise-limited on receive since the same oscillators are used for each. Some consider this to mean that a *real* BDR measurement cannot be made for that rig. The ARRL Lab considers that the effective blocking dynamic range on a noise-limited measurement is the point at which the noise increases by 1.0 dB. That point results in the same change in the signal to noise ratio as would occur had the desired signal decreased by 1.0 dB.

So, for a receiver where the noise floor is –140 dBm and the 20 kHz spacing blocking dynamic range is 125 dB, the level of signal that caused blocking effect would have been –15 dBm. To relate that to something that may be observed on a receiver, it is convenient to use S-units for discussion purposes. However, it should be noted that few transceivers follow the established S-meter standard. In that standard, S9 = –73 dBm (or 50 microvolts, for a 50 Ω system). Therefore, –15 dBm would be close to S9+60—quite a strong signal, but certainly a level that might be observed under the right conditions. Also, it should be mentioned that many radios do not have a blocking dynamic range that is that high.

Two-Tone Third-Order IMD Dynamic Range

Intermodulation describes the effect of two or more signals mixing (modulating) each other, if you will, thereby creating undesired signals on other frequencies. These signals are referred to as *intermodulation distortion* (IMD) products and they are most often created in the amplification or mixer stages of a receiver, although they can be generated in any non-linear element. In the ARRL Lab we simulate this with two carefully selected signals, as described below.

IMD dynamic range is the difference between the receiver's noise floor and the level of the unwanted signals that caused an undesired signal to appear right on the listening frequency. The process of mixing makes the largest of such signals appear at a frequency spacing equal to the difference of the two signals. For example, if the receiver is tuned to 14,020 kHz and there are strong signals at 14,040 and 14,060 kHz, a false signal may be heard because the second harmonic of 14,040 (28,080 kHz, generated in a nonlinear stage) beats with the 14,060 kHz signal to produce a difference signal at 14,020 kHz, right where we are trying to listen. Because the signal is the result of a product of a second order term and a first order term, it is referred to as a third order response. If the receiver were tuned to 14,080 kHz, it would also hear the other third order combination.

As with blocking dynamic range, IMD dynamic range can be noise-limited. In this case, the effect on the frequency that the receiver is tuned to is created entirely by the interaction of the nearest frequency strong signal and the receiver's phase noise. This results in a noise "signal" that is equal in strength to the receiver's noise floor. In this case, when the more distant signal is removed after the IMD noise is observed, then the noise would still be there. In the case of non-noise limited measurements, if you remove either signal the intermodulation ceases.

It is important to note that these lab measurements don't duplicate real-world conditions because unmodulated carriers are used for the measurements. On the air, there are usually many more than two undesired signals for the receiver to contend with. However, these tests provide an excellent means by which to compare different receivers.

Intercept Points (Third Order and Second Order)

Third-order intercept is related, as you might expect, to two-tone, third-order IMD. Now, if receivers behaved in an ideal fashion, the signals that you intend to listen to would produce a linear receiver response—that is, as the signal gets stronger, the output would get louder and as it gets weaker, the output would decrease, exactly in proportion. A 3 dB change (a doubling or halving) of the input signal power would produce the same 3 dB change in the output. Of course, real receivers don't behave quite this way. In fact, the whole purpose of automatic gain control (AGC) is to prevent changes in output with sudden input changes, helping to preserve the listener's hearing. Nonetheless, a significant portion of the receiver's response is indeed intended to be linear.

This applies only to desired signals within the passband of the receiver. Because IMD products are created by a non-linear mixing process, they change at a faster rate than the desired signal. As the undesired signals go up, the third-order distortion products also go up, but three times as fast. Likewise, when the undesired signals get weaker, the distortion products decrease three times as fast. Sharp readers will conclude that this response change is also linear—indeed that is so, but this line (if plotted) would have a slope three times the response plot of the desired signal. If these two responses were plotted on the same graph, the two lines would intersect at a point. This point is known as the third-order intercept. Actually, because the value stated is the input signal level, this is technically the third-order input intercept.

As stated earlier, real receivers are not linear over their whole input range. As a result, the third-order intercept can never be reached (or measured) because the receiver always goes into gain compression or desense before that can happen. For that reason, the third-order intercept is, strictly, a theoretical point. While its usefulness may not be immediately obvious, this figure gives a good indication of a receiver's overall strong signal performance.

The second-order intercept is similar to the third-order intercept. Second-order IMD products are produced directly from the sum and difference of the undesired signals. So while the third-order products are produced by signals that are near the desired frequency, the second-order products are often quite distant in frequency. For example, if a receiver is tuned to 14,020 kHz, then the frequency of two signals (note that there are many more possibilities) that would cause a second-order response at 14,020 are 6020 and 8000 kHz. The rate of change in the second-order products is twice that of the

desired signal. The second-order intercept is then the point at which the second-order response plot would intersect the desired signal response.

IF and Image Rejection

As if the effects of multiple undesired signals were not bad enough, receivers also can experience problems created by the influence of external signals over frequencies that are intentionally present within the receiver. One such internal frequency is the receiver's first intermediate frequency (IF). In general-coverage HF receivers, this is usually a frequency higher than 30 MHz, such as 45 MHz. Even with robust filtering before the first conversion stage, some energy from strong external signals that coincide with the receiver's first IF can still find its way into the first mixer. To measure IF rejection in the lab, a signal generator set to the receiver's IF is connected to the antenna jack, and the generator output is increased until a signal appears at the receiver output that is equal to the receiver's noise floor. The difference between the noise floor and the generator level is the amount of rejection.

In many receivers, good IF rejection can be provided by sharp filter skirts at the RF stages. In wideband VHF and UHF receivers, however, particularly handheld units, the IF is often within the receiver's normal operating range or very close to it. On bands that are close to the IF, the rejection is often poor because of the modest rejection provided by the filter skirts at close frequencies.

Another example of the influence of external signals on internal ones is *image rejection*. One of the characteristics of mixers is that they produce many different products in addition to the intended one. Filtering following the mixer is intended to attenuate these undesired products, leaving only the desired IF signal. Some RF frequencies can produce images in the first mixer such that the images coincide with the IF and are therefore not attenuated after the mixing process. These signals are measured in the test of image rejection.

Testing image rejection is much the same as testing IF rejection—a signal at the image frequency is dialed up on the signal generator, and the level is adjusted for a noise floor signal on the output of the receiver. Because images are usually far removed from the tuned frequency, image rejection is often excellent, perhaps 80 to 100 dB or more. On the higher UHF bands, however, the image rejection in a handheld wideband receiver may be poor because of the very broad front-end filtering often used at those frequencies.

Other Tests (Audio Output, IF/AF BW, etc)

The tests described so far cover the "meat" of a receiver's performance, and they are usually given the most weight when comparing different models. Of course, there are other receiver performance issues that interest different folks, and these are covered in the comprehensive set of tests performed for *QST*'s Product Reviews. The audio output test gives information about the transceiver's audio performance—useful to know if you plan on using the receiver in a noisy environment. The IF/AF bandwidth test gives the net bandwidth of the receiver's cascaded IF and AF stages using its nominal filter widths. The squelch sensitivity test tells the strength of a signal that will "break through" the squelch at its minimum setting (called the threshold). The S-meter test notes the strength of a signal that indicates S9 on the receiver's S-meter. This reveals how different S-meters can be on various receivers.

TRANSMITTER TESTING

Power Output

Power output, the most straightforward of transmitter tests, gives an easily understood result. The aim in this test is simply to determine the actual power output from a transmitter in watts. While most MF/HF transceivers are designed for a nominal output of 100 W, they will sometimes exceed this figure by a few watts, or in some cases, fall just shy of the mark. Maximum output often varies from band to band as well.

Those who like to dabble in low power (QRP) operating from time to time will also want to know a transmitter's minimum output power. The ARRL Awards program defines QRP as 5 W or less power output. Many transceivers can be "throttled back" to less, but some exceed that level and that is useful knowledge for this type of operating.

Spectral Purity

FCC rules have strict requirements for spectral purity on the HF and VHF bands—these are outlined in *The ARRL's FCC Rule Book*,[2] and they are also described in detail in *The ARRL RFI Book*.[3] In addition to rules compliance, it is useful to know the amount of a transmitter's harmonic and spurious output to prevent interference to other radio services and other amateur bands—a chief reason that our allocations are generally harmonically related.

Two-Tone IMD

Transmit two-tone intermodulation distortion, or two-tone IMD, is a measure of spurious output close to the desired audio of a transmitter being operated in SSB mode. This spurious output is often created in the audio stages of a transceiver, but any amplification stage can contribute.

If you've ever heard someone causing "splatter," the noisy audio that extends beyond a normal 3 kHz nominal SSB bandwidth, then you have heard the effects of transmit IMD. Frequencies close to the transmit signal are affected the most, but depending on the amount of IMD, large portions of the band can suffer from one poor transmitter.

Carrier and Unwanted Sideband Suppression

One of the main benefits of single sideband operation is that the required frequency spectrum is greatly reduced compared to AM. It allows stations to operate close together without interfering with each other. This assumes that the reduction in the carrier and opposite sideband is sufficient to prevent interference. Thus, it pays to know the amount of suppression instead of just taking it for granted. The level of suppression is measured relative to the desired sideband. In the ARRL Lab, this is done by feeding a sine wave at a known audio frequency into the microphone input, and adjusting the amplitude level until the transceiver is operating at its rated output. Although having more suppression is almost always better, 45-50 dB or so is generally adequate.

Keying Waveform

The CW keying waveform can tell quite a bit about the way your transmitter will sound in someone else's receiver. The ARRL Lab test for this is performed using a custom-built keying generator (basically a precision timing circuit with a switching transistor output). The generator is set up to send a string of dits at a rate of 60 WPM, and the output of the very first dit and second dit are captured on a storage oscilloscope. Subsequent dits are usually identical to the second dit. This test shows whether there is any dit shortening in break-in (QSK) operation (usually there is some), it also shows the waveform shape (which can indicate a tendency to produce key clicks) and indicates the keying delay—the time from when the key is depressed until RF actually starts to appear.

The top trace in these photos is the voltage on the transceiver's key jack, as determined by the transceiver itself (since the keying generator does not put out any voltage). When the transceiver is key

down, the voltage on this line will be close to zero (as it would be if you were using a straight key). When the transceiver is key up the voltage goes up to whatever value the transmitter's circuit produces while in receive. Sometimes this key line voltage can be oddly shaped (such as having a curved rise time on key up), but this is not of any consequence.

Turnaround Time Tests

The turnaround time test measures the delay between receive and transmit, and the delay between transmit and receive. This test is performed in the SSB mode (important for folks who like to operate digital modes), and in the FM mode (important for packet operators and in some cases for FM repeater operation). A transmit-to-receive delay of 35 ms or less in SSB indicates that a rig is suitable for digital operation. In FM, the receive-transmit delay determines the appropriate TNC settings for packet. If the delay (either T-R or R-T) on FM is long enough (200 ms or more), it starts to become noticeable to folks operating on repeaters—the T-R delay can cause loss of the first syllable (or part of it) of some words. The R-T delay can cause the loss of some syllables unless you remember to add a short pause between PTT and start of speaking. Long R-T delays can also lead to "doubling" in group conversations if other listeners are not aware of it.

Composite Transmitted Noise

In some receiver dynamic range measurements, you'll see a "noise-limited" figure, as discussed above. Often this is the result of an internal oscillator (such as the primary VFO) that is "noisy." All oscillators have some minor variations in their output that can be in either amplitude or frequency or both. This variation, which results in noise appearing close to the oscillator's intended frequency, is referred to as *phase noise* because it is manifested as short-term changes in the phase of the oscillation frequency.

Measuring the transmit phase noise can be done at any frequency by comparing to the output of a low noise signal generator. *QST* Product Reviews include a performance figure of composite transmitter noise. The majority of this is usually also the receiver's phase noise, but since other noise sources can also contribute, the name is a little different. If the noise level of a transmitter is high enough, it can even show up in a receiver that is close in frequency; however, the receiver's dynamic range performance is often affected at lower signal levels.

Expanded Testing (and reporting)

In the latter half of 1995, the ARRL Lab staff considered a number of ideas on how to give ARRL members more value without changing the way *QST* Product Reviews were presented. The result of this was the introduction of an expanded set of Lab tests, with the results to be included in special Expanded Test Result Reports. These are available on the ARRL Member's Web Pages (or by mail for those without Web access). The expanded reports include data on all the bands for which it is taken (*QST* reviews only report worst case figures), and includes some new tests that were not previously performed. In addition, some background on the test methods are given. More information on these expanded reports can be found in the April 1996 *QST* article, "Under the Microscope—The ARRL Laboratory's Expanded Test Result Report," by Dean Straw, N6BV. A copy of this article appears on the Product Reviews section of the Member's Pages. Because of their time-intensive nature, only some of the products that go through Product Review are selected for the expanded testing.

Hands-On Testing and Writing

After the ARRL Lab has put a piece of equipment through its paces on the bench, it goes to the reviewer. The reviewer must become familiar with the equipment by checking out all the features and functions in order to assess its ease of operation. Next, the reviewer will "put it through its paces" in real world situations, usually at a home station, to see how the equipment behaves in a practical sense. A reviewer must be thorough, and use the equipment in as wide a range of operating conditions as possible. Although the idea is to attempt to replicate the same situations that most readers will encounter there is, of course, a limit to the degree that this is possible. It is one of the reasons some Product Review items are evaluated by multiple reviewers.

Once a reviewer is finished with the new equipment, he or she must actually write about it. The reviewer must be thorough here, too, touching on all aspects of the equipment and documentation. Reviewers must be as objective as possible, avoiding the bias of personal preferences or opinion. At the same time, the reviewer may add some creativity and style (and anecdotal experiences) to make the review more readable than dry technical text.

Editing and Wrap-Up

The editing and wrap-up phases take place after the equipment has been completely evaluated. However well written, every Product Review must still undergo some amount of editing. Aside from typographical or grammatical correction, the text must also be double-checked for completeness and technical consistency.

Before the finished review is approved for publication, a copy is provided to the equipment manufacturer. This is done so that any technical errors or omissions that may have been missed in the earlier review stages can be corrected or issues resolved. Manufacturers do not have a free hand, however—only objective comments are considered for inclusion.

The last step before publication is the final editing—this is where the graphics, figures, tables and text all come together to form a "final" version of the review. This is the job of ARRL's Graphics, Production and Editorial staff (of course, they prepare *all* articles for *QST* and other publications).

What Happens Afterward

Equipment used for reviews is retained in the ARRL Lab for at least 30 days after publication of the review in *QST* to allow a retest if needed. It may then be retained by the ARRL, but most often the items are sold on the basis of competitive bids. A minimum bid is established, below current market price, and invitations to bid are published at **www.arrl.org/members-only/prodrev/prauctions**.

Where Do We Go From Here?

Over the past two decades, the Product Review column has continued to expand and improve, and testing in the ARRL Lab has followed suit. This process continues even today. As the ARRL Lab receives input on test methods from professionals in the field, we try to incorporate the latest measurement techniques while maintaining as consistent a process as possible to allow meaningful comparisons.

Notes

[1]For details of the ARRL Lab test procedures, see the ARRL Lab Test Procedures Manual at **www.arrl.org/members-only/prodrev/testproc.pdf**.

[2]*The ARRL FCC Rule Book*, Thirteenth Edition Chapter 4, pp 44-48. Available from ARRL dealers or the ARRL Bookstore for $12.95 plus shipping. Order number 9000. See **www.arrl.org/shop/** or call toll-free in the US 888-277-5289, or 860-594-0303.

[3]*The ARRL RFI Book*, Chapter 17, pp 9-11. Available from ARRL dealers or the ARRL Bookstore for $24.95 plus shipping. Order number 6834. See **www.arrl.org/shop/** or call toll-free in the US 888-277-5289, or 860-594-0303.

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By Geoff Haines, N1LGI

Homebrewing a Desk Microphone

N1LGI cooks up new use for an old frying pan.

This project started with the desire to have a new desk microphone to use with my Yaesu FT-747GX HF transceiver. A quick look in the catalogs for several purveyors of ham radio gear and an even quicker look in my wallet convinced me to think about some kind of alternative. The desk mic went on the back burner.

Then one day, my wife asked me to remove the handle from an old frying pan that had seen better days. The non-stick coating was toast, so she wanted to use the pan (without the handle) under a flower pot. The task was done and I was about to toss the handle when inspiration struck. Well—it was either inspiration or indigestion—but I had an idea.

I had a hand mic lying around the radio room with a 1000 Ω electret element and a good coiled cord. A new PTT switch was not going to empty the wallet, and I had already purchased the 8 pin mic input plug at the last hamfest. The pot handle, when held in the vertical position, appeared somewhat similar to one of the fancier desk mics that are out there…a plan was beginning to form.

The first order of business was to create a base for the pot handle/desk mic. Since I am also an amateur woodworker, a simple frame of pine (see Figure 1) was easy to build from scrap. Its shape was dictated by the need to tip the pot handle to a back angle for a desk mic. The top and bottom of the base were made from plastic sheet that I have been dragging around for the last several years. Thin plywood, sheet aluminum or any other material that can be drilled for the switches can be used if you don't have the same material I did. The top and bottom pieces were secured to the base with screws, and RadioShack rubber feet were glued to the bottom. The pot handle was secured through a rectangular hole in the top with hot glue. A small piece of black fabric (thanks to my wife—she said it was black bias tape—whatever that is) was hot glued inside the hanger opening in the end of the pot handle.

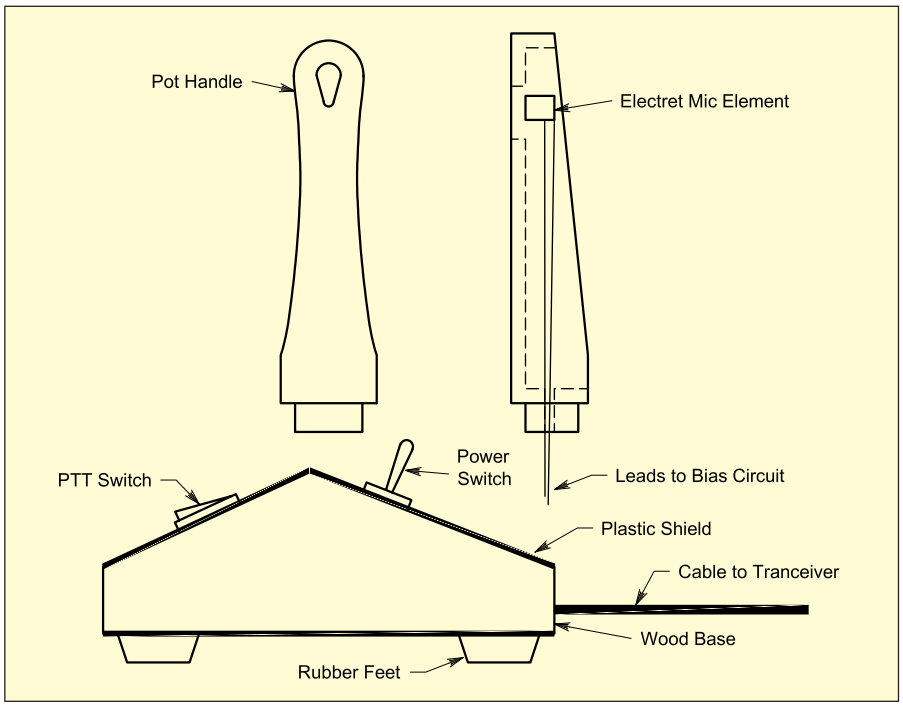


Figure 1—The layout of the base for the homebrew electret microphone. Note that the base materials can be wood, aluminum or plastic.

The basic layout of the microphone is shown in Figure 2. With the non-electronic components out of the way, it was time to turn to the wire and solder side of the project. The electret mic element wires to the PTT switch were extended with about 4 inches of hookup wire. The coiled cord was placed in a notch at the back of the base so it would be secured when the bottom panel was screwed into place. So far, so good. Then it hit me—I have to power this mic somehow![1] My Yaesu transceiver normally uses a dynamic microphone and has no provision for an electret cartridge. Oops!

Getting on the local repeater and asking around for help, I was able to find a circuit to power the mic element with a 9 V battery. I'm grateful to all those who helped this "appliance operator" with his homebrew project. The circuit I used is very simple. It consists of a 9 V battery with the positive side running through a 1 kΩ resistor to the "hot" side of the mic and the negative side of the battery to the ground side of the mic. A capacitor then connects the mic to the PTT switch and from there to the microphone plug. Figure 3 shows the schematic for the microphone circuit.

I inserted a switch in the positive line from the battery to allow turning off the mic when the radio was not in use. The PTT circuit runs through one side of the PTT switch and the mic output line through the other switch pole. A DPST momentary switch was used because it

[1]Notes appear on page 38.

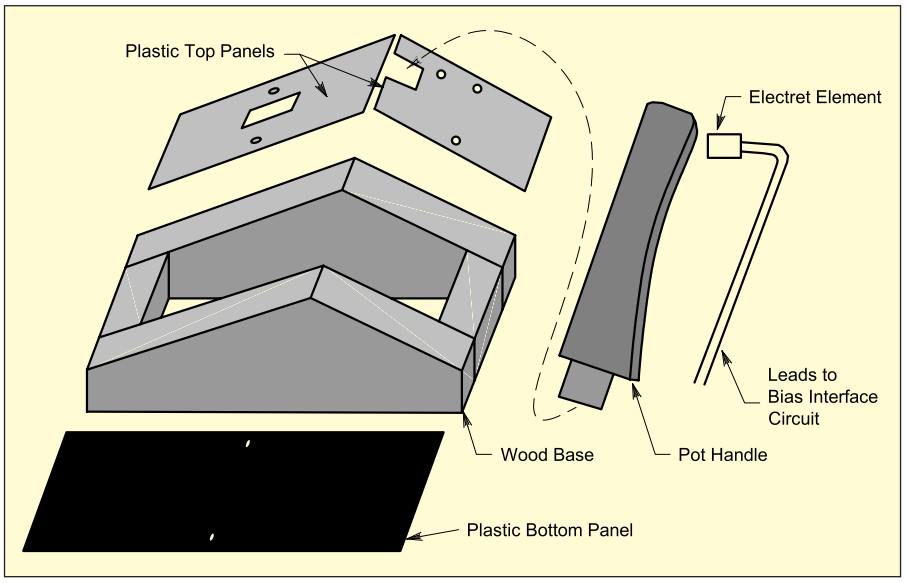


Figure 2—The microphone assembly details. The power switch turns off voltage to the mic element when not in use. The PTT switch is a front-mounted momentary switch.

Figure 4—The completed homebrew microphone—ready for use.

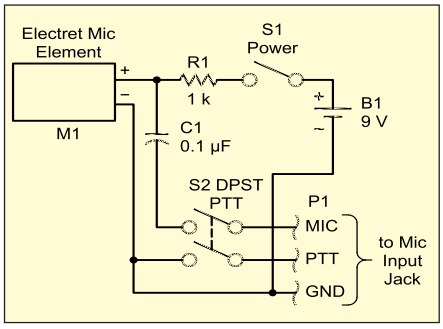


Figure 3—Schematic of the homebrew microphone. The microphone element is a commonly available electret cartridge (RS=RadioShack, www.radioshack.com; OS=Ocean State Electronics, www.oselectronics.com).
B1—9 V battery.
C1— 0.1 µF, 25 V (see text) (RS 272-1053).
M1—Electret microphone element, 2-10 V dc (RS 270-090, 270-092; OS 10-83).
P1—Transceiver microphone plug (select for proper configuration).
R1—1000 Ω, 1/4 W resistor (RS 271-1321).
S1—SPST or SPDT miniature toggle switch (OS 10002).
S2—DPST momentary toggle or push-button switch (OS 10020).

was best suited to mounting on the microphone base. (The switch, S2, shown in the parts list, has both a momentary and locking feature so it doesn't have to be held down during long transmissions.) I didn't bother with switches or wiring for the various UP, DN or FAST/SLOW switches on the stock Yaesu hand mic because I rarely make use of them.

With the mic completed, it was time for a telltale "on-air" test. The first reports were of the "good news/bad news" sort. Yes, the mic worked, the PTT switch turned the transmitter on and off as it was supposed to, and the element modulated the transmitter—but I was told that "…it sounds very sharp—no lows, great highs, some mid range. Perhaps a good DX mic, but you wouldn't want to listen to it all day long." Hmm…it was back to the drawing board.

I compared all the various circuits that I found in my search on the repeater and the Internet. I discovered that there were many different values indicated for the resistor and the capacitor even though the basic circuit was the same. No one I talked to could tell me what values to use to improve the audio quality, so I resorted to the old cut and try method.

Success seemed to come on the first try. I changed the coupling capacitor from 10 µF to 0.1 µF and tested again. Reports indicated good intelligibility—still a "peaked" response—but better than before. I have a feeling that the proper values will vary with the specific radio and the microphone element used.[2] I plan to do more experimentation with other values for both the resistor and the capacitor to see if I can accomplish even better audio tailoring. I might even add another switch to be able to go from a setting best for DX (high intelligibility) to one better suited to casual operating (wider frequency response). For now, however, the microphone works and I can say with pride that I built it. The completed microphone can be seen in Figure 4.

I learned many things from this project. It was clear that even a neophyte can homebrew equipment. Take things slowly and don't overwhelm yourself (by trying to build a better all-mode HF transceiver, for instance!). Read and research your project thoroughly and, when all else fails, be aware that the "cut and try" approach still works. The satisfaction of saying "I built it myself" is worth a lot more than that $300 desk microphone.

I had lots of help from many other amateurs with the microphone's design and construction. Some I knew from local clubs and on-the-air contacts but hams from as far away as New Jersey, Ohio and Jamaica, whom I had never met before, helped out. They came to my aid with suggestions, signal and audio reports and, most of all, encouragement to stick with the project. Thank you all.

Notes

[1]*Editor's Note:* Electret microphones are variants of condenser microphones, which require a bias, or polarizing, voltage. The electret capsule carries its own charge and is self-biased, but most electret cartridges require external voltage to power an FET impedance converter contained within the cartridge. The FET converts the high impedance current source to a voltage. See the editor's notes (p 32) in S. Kennedy Jr, K4TQW, "A Hombrew Condenser Microphone," *QST*, Dec 2003, pp 28-32.

[2]*Editor's Note:* The rolloff characteristics and response will vary directly with the output impedance of the particular cartridge used and the input impedance of the mic preamplifier in the transceiver.

Geoff Haines, N1LGI, has been a ham since 1992. He upgraded to a General class ticket after retiring to Florida and has become very active in Amateur Radio. Currently, he serves as the Assistant Public Information Coordinator for the ARRL West Central Florida Section and also is net manager for three different nets. He also is a net control station for the WCF Eagle (NTS) net. Geoff is active in ARES and CERT in Manatee County. He retired after 20+ years in the Civil Air Patrol and 35 years as a respiratory therapist. You can reach him at 708 52nd Ave Ln W, Bradenton, FL 34207; **n1lgi@arrl.net**.

By J. Keith Carter, VE3JKC

The Single Band G5RV

VE3JKC tells how he modified this popular antenna for 17 meters and got multi-lobe performance compared to a dipole.

Deciding on an antenna to augment your "antenna farm" can be quite a challenge. Such was my plight when I needed something to provide multi-lobe 17 meter coverage. First, it had to be cheap. Second, it had to provide good world coverage. The first ruled out a beam but the second almost dictated one. Fortunately, my memory bank, after 52 years in the hobby, along with a well-stocked library of ARRL publications, provided the solution—a single band G5RV antenna.

When the late Louis Varney, G5RV, conceived his now famous antenna just after WW II, his requirements were essentially the same as mine. A 20 meter resonant wire antenna with multiple lobes—covering his areas of interest—with each lobe having the gain approximately equal to that of a half wave dipole. Three half waves in length, fed at the center, did just that. Oriented in the right direction, the antenna could be designed to put the lobes right in those areas of interest.[1] Varney's original design used low impedance parallel feed line back to his antenna tuner to provide the match to his transmitter. Later, Varney used his tuner to load the system on other bands and the rest is history—the famous G5RV antenna was born.

I modeled the G5RV using the popular *EZNEC* software.[2] Resizing the antenna for 18.120 MHz gave me a length of approximately 80 feet at 35 feet of elevation. I had to juggle the length a couple of times but an SWR sweep in *EZNEC* indicated a resonance at 18.112 MHz, and a feed point impedance of [103 – *j*0.11] Ω. The impedance was high, but the pattern indicated six nicely spaced lobes. It was just what I wanted. The four major lobes were slightly higher in gain than that of a reference dipole, and the other two were just under, as shown in Figure 1.

The problem now was the feed-point impedance. My tower, which was to provide the support, is 100 feet from the house. A homebrew relay box mounted at the base selects the antenna for my underground RG-213/U (50 Ω) feed line. It was back to my library. *The ARRL Antenna Book* provided the solution (Chapter 26).[3] A quarter-wave length of 75 Ω coax, used as a series matching transformer, would transform the 120 Ω at the antenna to just about 50 Ω.

I used Dean Straw's *TLW* software from the package that comes with the 20th edition of *The ARRL Antenna Book*. Not only did it verify my calculations, it gave me the exact length of the RG-59/U I'd need, taking into account the velocity factor of the cable. Talk about a piece of cake. My tower supports a Cushcraft A4 antenna at 60 feet, a 15 element 2 meter beam at 70 feet, and a crossarm with pulleys for other various dipoles at 50 feet. Everything is full. This was probably fortunate, because I don't have a climbing belt and I'm getting too old for climbing. I did have a 30 foot aluminum ladder, however, and that would get me to my design height of 35 feet to secure another crossarm and pulley.

I wound the RG-59/U into a 5 inch diameter coil to act as a coaxial choke. I then only had to make up a 35 foot length of coax to get to my relay switching box. That's when curiosity took over again. All of the feed-point information was

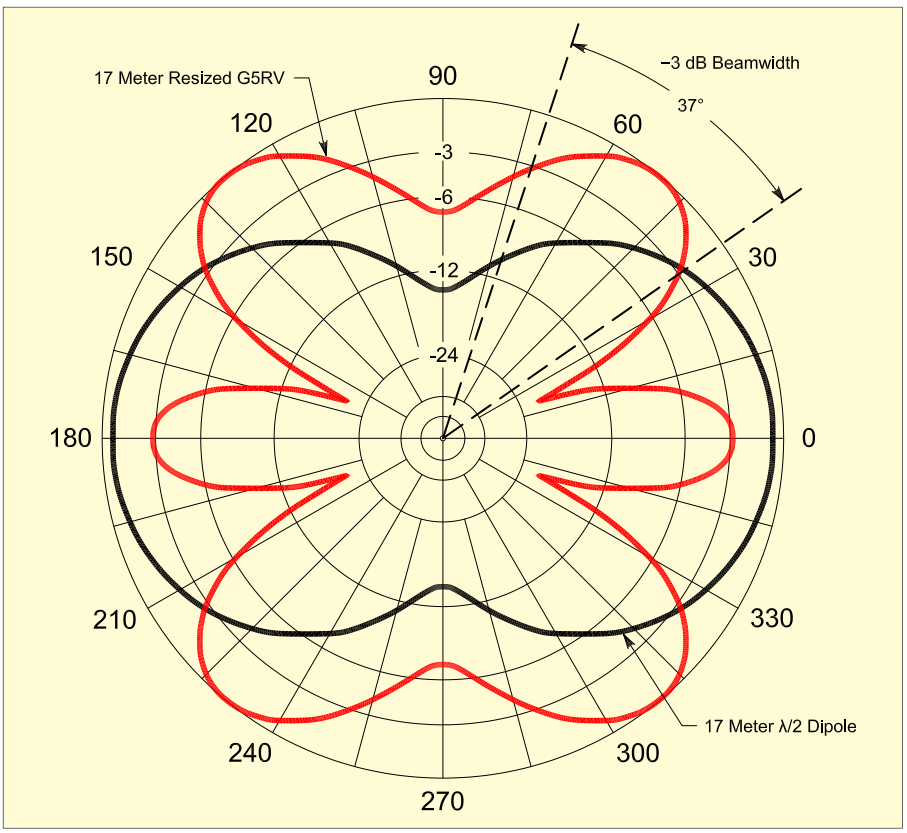


Figure 1—Azimuth pattern of the resized 17 meter G5RV antenna compared to a half-wave dipole. Note the multi-lobe pattern compared to the standard dipole. The half-power (–3 dB) beamwidth of one of the major lobes is 37°.

[1]Notes appear on page 40.

J. KEITH CARTER, VE3JKC

Figure 2—The center of the modified antenna is shown hanging from a tower cross arm. Note the matching length of transmission line (described in the text) wound into a coil to produce a coaxial choke.

The "Standard" G5RV

Undoubtedly there are those who are asking, Why not use the standard 102 foot G5RV with its 34 feet of 450 Ω ladder line and coax feed?

The G5RV was designed for the 14 MHz band and is resonant only at that frequency. Operating at 18 MHz produces a 4-lobe pattern as its length-to-frequency ratio approaches that of a long wire. Also, being nonresonant at 18 MHz, the feed-point exhibits a complex impedance, with a resulting high SWR when connected to a 50 Ω transmission line. While your transmitter may indicate 100 W out after your tuner has resonated the system, the line losses can be staggering. I calculated the feed-point impedance of the standard G5RV when operating at 18 MHz to be [1723 + *j*23] Ω. At the end of the 34 feet of ladder line it is modified by the series transformer to [60 – *j*221] Ω and, at the end of my 100 feet of RG-213/U, it is modified again, to [10 + *j*24] Ω... for an SWR of 6.33:1. Total line loss amounts to 5 dB, or a power loss of 67 W. In other words, only 33 W is being delivered to the antenna for radiation. It is a point often overlooked when selecting and using the "standard" G5RV antenna for use on frequencies other than its resonant design frequency.

based on computer-generated data. I wanted to take accurate measurements right at ground level. Based on the length of the quarter wave series line transformer of 9 feet, a quick mental calculation told me that a full wavelength of coax, which would repeat the input impedance at its output, should be about 36 feet long. Again, a quick check with *TLW* gave me the length and the expected impedance figures.

I could now use my Autek VA-1 analyzer at ground level and get accurate readings.[4] I used RG-58/U coax here because I happened to have a length handy. I would recommend that anyone duplicating this approach use RG-213/U to reduce the line loss. Figure 2 shows the center of the antenna hung from a cross arm mounted to the tower.

The hardest part of any antenna project is getting the antenna to the correct length for resonance at frequency. I started with 80 feet total length and used the VA-1 as a guide to measure the SWR. It took four raises and drops before I got to the lowest point—a length of 77 feet, 6 inches. But what results! My Autek VA-1 analyzer read an SWR of 1.04:1 at 18.1 MHz and an impedance of [52 – *j*3] Ω, and I later verified these readings with a Bird 43 wattmeter. I am fortunate, in that I have 2 treed acres with the tower near the center, so I could select antenna placement to suit my desired direction of radiation. I used the software *AZIMUTH* to generate and print an azimuthal world map centered on my location.[5] I then took a print of the azimuth pattern generated by *EZNEC* and rotated it over the world map to determine the direction to run the antenna. The six lobes fell over the continents just where I wanted them to.

Did it work? My first contact was to Jamaica with an S9 report. Since then 17 meters has been a joy to operate. But don't expect beam type performance. There is no front to back ratio and signals come in almost equally from all directions. But for a little bit of wire, some coax and a little sweat, you have great world coverage.

A Few Comments

The antenna design is not specific to 17 meters. Resizing will work from 10 to 20 meters. For 40 and 80 meters the inability to get the antenna up high enough causes the radiation pattern to change drastically.

I have looked at numerous pictures in *QST* of hams using slingshots to put antenna halyards in trees. I bought a professional one at a yard sale for 50 cents and put the necessary guide on to hold the line. Retirement has the advantage of free time because it took me over an hour per end to put the line where I wanted it.

While I used antenna-modeling software to come up with this design, any edition of *The ARRL Antenna Book* and a fairly basic calculator will provide you with the same results. But, a personal computer and about $100 will buy you *The ARRL Antenna Book* with software and *EZNEC*. And, you won't have to be a rocket scientist to understand either one of them. You'll be pleasantly surprised at what you can design and model with these tools.

I would like to thank Roy Lewallen, W7EL, for his fantastic antenna modeling software, *EZNEC*, which provided me with the background and knowledge to generate this data, and for responding to my queries when the help files didn't quite sink in. Thanks also to Dean Straw, N6BV, editor of *The ARRL Antenna Book* (that includes *TLW*, which takes raw data and translates it into working antenna hardware), for answers to questions that cropped up during my design exercises.

Notes

[1]L. Varney, G5RV, "The G5RV Multiband Antenna...Up-to-Date," *The ARRL Antenna Compendium*, Volume 1, Newington: ARRL, 1985. Available from your local dealer or the ARRL Bookstore. Order no. 0194. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

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

[3]*TLW* is supplied with *The ARRL Antenna Book*. The book is available from your local dealer or the ARRL Bookstore. Order no. 9043. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[4]Autek Research, PO Box 8772, Madeira Beach, FL 33738.

[5]**www.qsl.net/ve6yp/**.

J. Keith Carter, VE3JKC, was first exposed to radio in 1946, at age 15, when he and his dad purchased a copy of the 1946 edition of The ARRL Handbook *(which he still has!). Keith was first licensed in 1950 with the call VE2ANC. He retired from Pratt & Whitney Canada in 1988 after 15 years in Electronic Instrumentation and 21 years in Customer Technical Relations. He received his present call in 1989, after moving to Jasper, Ontario. Active on 160 through 2 meters, Keith is interested in operating, homebrewing and antenna design. He attended the Montreal Technical Institute, where he received a diploma in electronics. You can reach him at 709 Kitley Line 3, RR #2, Jasper, ON, Canada K0G 1G0;* **j.keith.carter@sympatico.ca**.

By Paul S. Rittenhouse Jr, WA3TIU

A Compact Low Frequency Loop Stick Antenna

Ever wonder what's below the broadcast band? You'll need a low frequency (LF) converter and an antenna. WA3TIU gives us the antenna details.

A number of years ago I became interested in finding out what types of signals existed below the AM broadcast band. Later, reading that an amateur low frequency allocation may be in the offing, I decided that a good receiving antenna would be in order. Something small, directional and compact was necessary. I liked the idea of having the directional capability that a ferrite loop stick could provide, rather than running a coax cable to an outdoor whip antenna. When the loop is rotated, the sensitivity null at either end can be positioned to reduce the noise emanating from a source. In some cases, this will allow weak stations to be heard.

After not finding anything for sale or to construct, a design was found in the *Low and Medium Frequency Scrap Book,* 5th edition, by Ken Cornell, W2IMB (SK).[1] His description was of a ferrite rod loop antenna with a unique tapped coil design. In his configuration, eight switches are opened and closed in a binary fashion so as to add or remove coil windings in a tuned circuit. This changes the resonant frequency along with a broadcast band radio tuning capacitor connected in parallel with it.

But what about that capacitor? The original design only had a variable with a maximum capacitance of 355 pF. This limited the tuning range at the low frequency end of its band. To make the coil resonate at lower frequencies, a 12 position selector switch filled with capacitors was added. Each step of the selector provided additional capacitance across the variable and that extended its lower tuning range. This created a variable capacitor with a range of about 65 to 8420 pF. The tuning capacitor was from an old broadcast radio with a tuned RF amplifier stage. This unit had three sets of plates ganged together on a single shaft and provided a total of about 770 pF. The capacitor selector schematic is shown in Figure 1.

The antenna requires a high impedance input amplifier to function correctly. These types of inputs are found on long wave upconverters and LF active antenna amplifiers. Connecting the antenna directly to a 52 Ω receiver input is not recommended.

Another requirement for successful

[1]Self-published by Ken Cornell, W2IMB (SK). This may be available through a local radio club, a used book dealer or through any of the LF reflector sites on the Internet (a good site is **www.lwca.org/**, the Longwave Club of America).

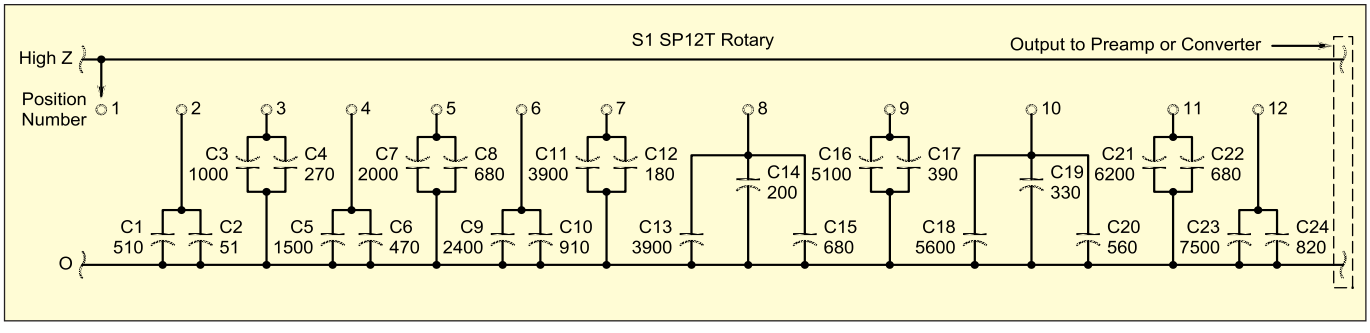
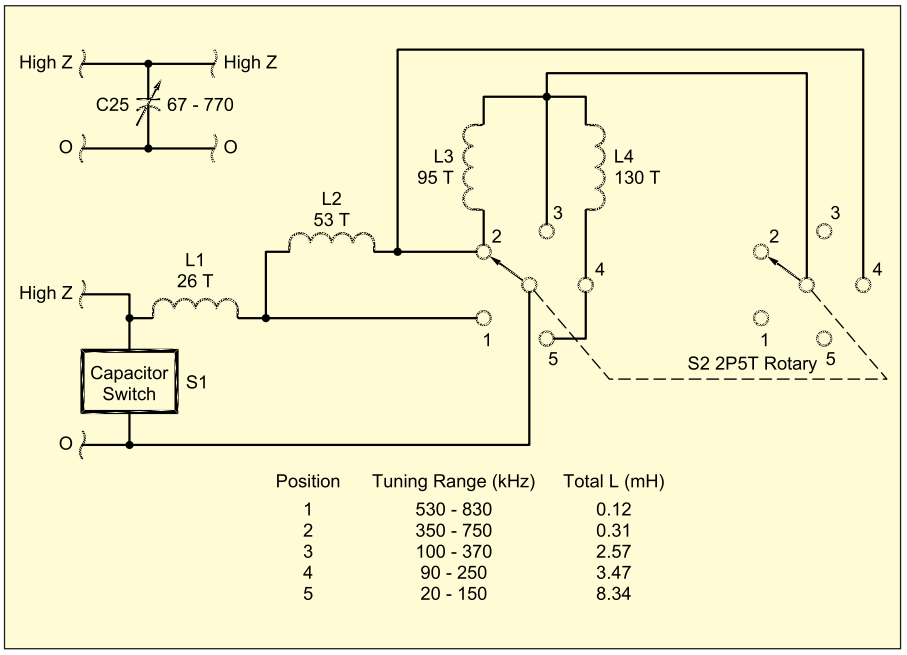


Figure 1—Capacitor switch for the LF antenna. S1 is a 12 position, single pole rotary switch. All fixed capacitors are dipped silver mica, 5%. The capacitor voltage rating is not critical. Components are available from various sources including Mouser Electronics (www.mouser.com), Ocean State Electronics (www.oselectronics.com) and RadioShack (www.radioshack.com).

C1—510 pF.
C2—51 pF.
C3—1000 pF.
C4—270 pF.
C5—1500 pF.
C6—470 pF.
C7—2000 pF.
C8, C15, C22—680 pF.
C9—2400 pF.
C10—910 pF.
C11, C13—3900 pF.
C12—180 pF.
C14—200 pF.
C16—5100 pF.
C17—390 pF.
C18—5600 pF.
C19—330 pF.
C20—560 pF.
C21—6200 pF.
C23—7500 pF.
C24—820 pF.
S1—Single pole, 12 position rotary wafer switch.



Position	Tuning Range (kHz)	Total L (mH)
1	530 - 830	0.12
2	350 - 750	0.31
3	100 - 370	2.57
4	90 - 250	3.47
5	20 - 150	8.34

Figure 2—Inductor switching of the LF antenna. S2 is a 2 pole, 5 position rotary wafer switch. C25 is a 67-770 pF (approximate) broadcast-type 2 or 3 gang variable capacitor with the sections paralleled. The coils, L1-L4. are wound on a bundled core made of 3 ferrite rods, described in the text and specified in Table 1. Coil spacing is not critical. The coil wire is Litz-type wire, 7/44.

C25—67-770 pF broadcast-type variable capacitor.
L1-L4—See text and Table 1. Wound with Litz wire on 3 ferrite rod bundled core (Amidon R33-050-750). Core is 7.5 × 0.5 inches, permeability = 800.
S2—2 pole, 5 position rotary wafer switch.

Miscellaneous

Plastic box, 7.75 × 4.375 × 2.5 inches.
100 foot spool Litz wire, 7/44, Amidon.
Fiberglass tape, Scotch brand (3M) #27, Amidon.
Tube of epoxy cement.
3-sided aluminum shield, 6.5 × 2 inches.
3 knobs.
2 banana jacks (high-Z output to preamplifier or converter).

operation is antenna tuning. Whenever the receiver frequency is changed, the antenna must also be retuned. Peaking the receiver's background noise by retuning the antenna will verify that the antenna is tuned correctly. Line noise can be minimized by rotating the antenna to a new position (a camera tripod is recommended). The range of frequencies chosen was dependent on the number of switch positions available for the coils. In this case, the switch used permitted five steps. More attention was paid to covering the lower frequencies because the R33 core material with a permeability of 800 provided a frequency range of 1 kHz to 1 MHz. The tuning ranges were established starting with the highest frequency. Each successive range was made lower and overlapped the previous. Tuning starts at 20 kHz, relying heavily on the selector switch; fine tuning with the variable capacitor and ending at 800 kHz, with the selector switch in the open position. Frequency coverage could have been extended to 1600 kHz, but gaps in tuning would have resulted. Be aware that changes to one coil may affect the other tuning ranges as well. The inductor switching schematic is shown in Figure 2.

While visiting a local RadioShack store, I found a plastic box measuring $7^3/_4 \times 4^3/_8 \times 2^1/_2$ inches with an aluminum lid. Metal lids are favored over plastic for the mounting of grounded RF components. The metal eliminates detuning from stray hand capacitance. To eliminate electrostatic interference and detuning from hand capacitance, an aluminum shield that

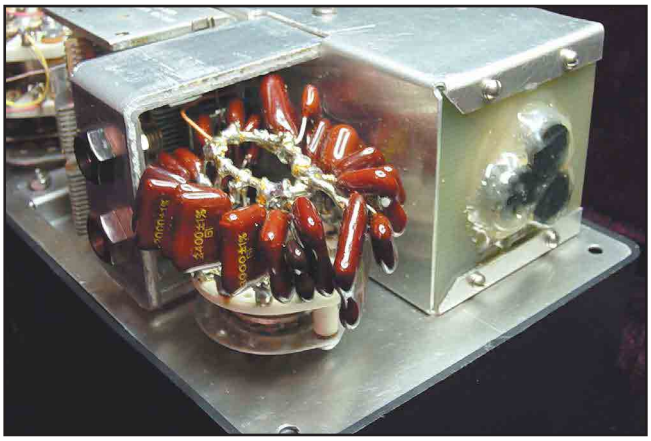


Figure 3—Details of the capacitor selector switch, a single pole, 12 position wafer switch. The capacitors are 5% silver mica, dipped.

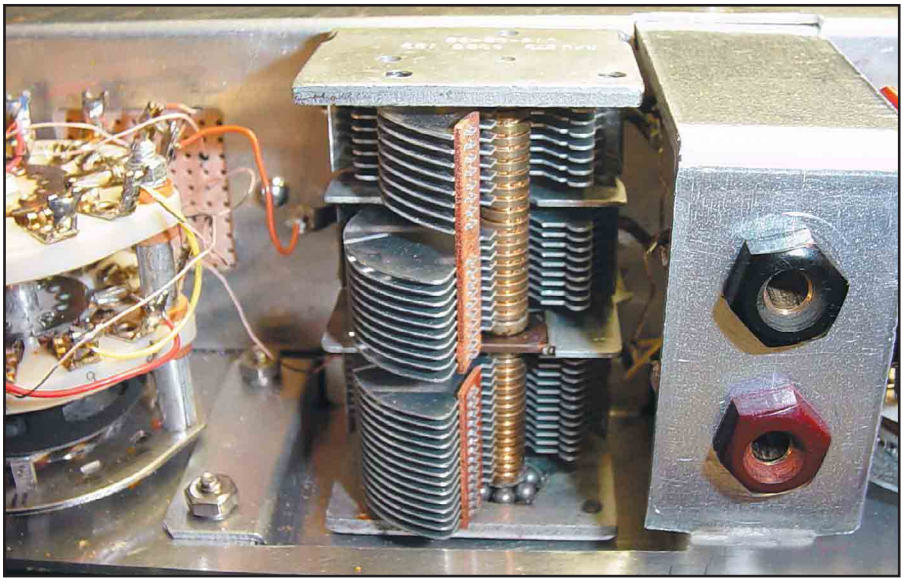


Figure 4—The main tuning capacitor is a 770 pF broadcast variable, with its 3 sections paralleled.

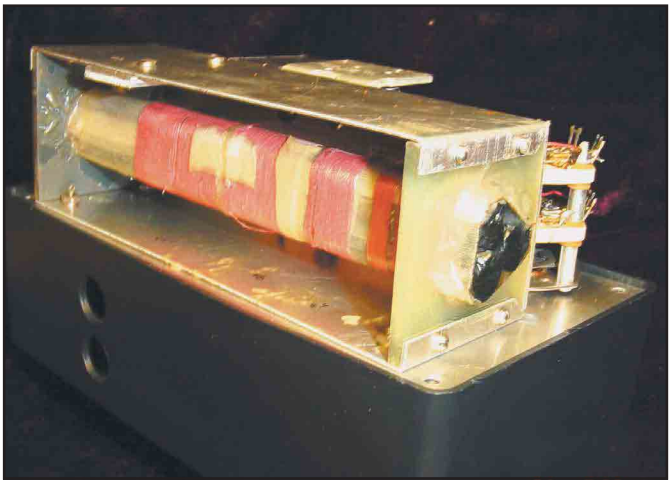


Figure 5—The inductances are wound on a bundled 3 ferrite core which is prepared using fiberglass tape. After it is wound, the coil assembly is coated with epoxy.

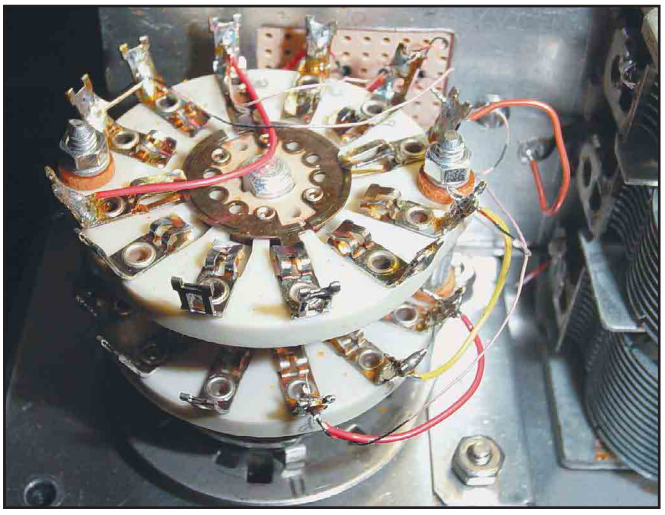


Figure 6—The coil selection switch is a 2 pole, 5 position wafer switch.

wraps partially around the coil is strongly recommended. The shield was bent from scratch, but part of a manufactured aluminum box could have been used. Plastic rod supports are recommended over wood, as they do not absorb moisture and act as a resistive single turn. This condition would broaden the tuning and lower the quality of the tuned circuit and its output voltage.

To capture the largest signal voltage as possible, the 3 ferrite rods were held tightly together with Scotch #27 glass tape. Glass tape can be identified as having a white woven fiberglass appearance with an adhesive back. This taped structure was later coated with epoxy; creating one solid core.

With the core completed, it was then wrapped with four separate windings of 7/44 *Litzendraht* (Litz) wire. The number 7/44 refers to seven strands of 44 gauge insulated wire. It is recommended that 100 feet of Litz wire be purchased to allow for error, as this material can be easily kinked. The reason for using Litz wire is that radio frequencies travel on the surface of a wire, therefore increasing the surface area of the wire is desirable. Litz wire accomplishes this by adding parallel conductors to the wire. [It also results in a higher ratio of reactance to resistance, thus increasing the coil Q.—*Ed.*] Care must be taken to wrap all windings in the same direction. Each coil was wound with some extra wire left hanging so more turns could be added later. This was done for tuning range adjustment. Insulation removal for connection to the wafer switch is best accomplished by tinning the wire with a hot iron. Carefully remove the insulation with heat and solder, being careful to ensure that all the strands are tinned together. Table 1 gives the coil winding details. Table 2 shows the total capacitance available at the various switch positions.

The capacitor switch (S1) and its network of capacitors is shunted (wired in parallel) across the variable capacitor (C25) and the ferrite inductor network. Banana jacks facilitate the high impedance output connection to a LF preamplifier or converter. After the coils were wound, glass tape was applied to secure the windings. The tuning ranges were then tested by connecting the tuning

Table 1
Coil Winding Data

Switch Position	*Coil*	*Tuning Range (kHz)*	*Total Inductance (mH)*	*Resistance (Ω)*
1	1	830-530	0.12	2.2
2	1 + 2	750-350	0.31	6.2
3	1 + 2 + 3	370-100	2.57	13.4
4	1 + 2 + 4	250-90	3.47	15.9
5	1 + 2 + 3 + 4	150-20	8.34	23.1

Coil	*Number of Turns*
L1	26
L2	53
L3	95
L4	130

Coils wound on ferrite rod bundle, consisting of 3 Amidon R33-050-750 ferrite rods (see parts list and text).
Core circumference = 3.5 inches
The total number of turns = 304
Length of Litz wire needed = 1064 inches (88 feet, 8 inches)

Table 2
Measured Total Capacitance

Switch Position	*C (Minimum, pF)*	*C (Maximum, pF)*
1	67	770
2	630	1333
3	1338	2000
4	1966	2670
5	2770	3460
6	3370	4070
7	4150	4860
8	4870	5570
9	5590	6300
10	6280	6985
11	7050	7750
12	7690	8400

Figure 7—Front panel of the completed LF antenna. The coil selection switch is on the right, the tuning capacitor is in the center and the capacitor selector switch is to the left.

PHOTOS BY THE AUTHOR.

Figure 8—The complete LF receiving setup. The box below the antenna is a 20 dB high impedance preamplifier. The box to the left is the receiving upconverter. Above the converter is a power adapter for the upconverter. The converter and preamplifier are available from several suppliers (see text).

capacitor to a five pole wafer switch and using the receiver's frequency dial for calibration. Finally, the coils were coated with epoxy to prevent their unwinding.

The operation of the antenna is simplified by using two rotary selector switches. They provide the ability to make rapid circuit changes to quickly find resonance. The antenna can be fed to a high impedance 20 dB active antenna amplifier. My experience was with a kit formerly available from *Q-Sat*. [No longer available. See LF Engineering Co (**www.lfengineering.com**) for a selection of LF preamplifiers and converters.—*Ed.*] The LF upconverter I used was a kit from North Country Radio (**www.northcountryradio.com**) working into a Sony *ICF-2010* receiver, but any receiver with a 4 MHz tuning range can be used. The capacitor selector switch is shown in Figure 3, while Figure 4 shows a view of the main variable tuning capacitor. The completed ferrite core assembly can be seen in Figure 5. Figure 6 shows the coil selector switch used to change the antenna inductance. The front panel of the completed LF antenna is shown in Figure 7.

With the antenna sitting on a desk in a third floor room of my house, various RTTY stations were received starting at 25 kHz, time station WWVB, beacon stations such as TUK, and numerous aero beacon stations. No AM broadcast interference could be heard due to the selective nature of the antenna. My complete LF receiving arrangement is shown in Figure 8. This consists of the LF antenna, a 20 dB high impedance preamplifier and an LF upconverter. Any standard shortwave receiver can be used.

If there were any area of improvement, I could have simplified the capacitor selector switch by using a binary arrangement. That would have reduced the number of capacitors required. Enjoy your new found frequencies and happy listening!

Paul Rittenhouse, WA3TIU, was first licensed in 1973 and now holds an Amateur Extra class license. He is a graduate of Penn State University with an Associate's Degree in electrical engineering technology. Paul has worked in electronics for over 25 years and is currently employed at Agere Systems. He can be contacted at 306 Marshall Dr, Reading, PA 19607; **wa3tiu@aol.com**.

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By Don Field, G3XTT

3B9C, Project Star Reach

The Five Star DXers Association DXpedition to Rodrigues Island, March/April 2004.

DXpeditions take on many flavors, from small holiday operations to major feats of endurance, setting up and operating from remote Antarctic islands. Each has its place in the enjoyment of our hobby. The UK-based Five Star DXers Association, established after the successful 9MØC Spratly Islands DXpedition of 1998, recognized a need for large-scale operations from moderately rare (Top 100 Most Wanted) DXCC entities.

These are the sort of places that are activated from time to time, and may even have one or two resident amateurs, but are tough to work on more than a few bands or modes. Usually this is because expedition groups are limited in what they take, often as a result of airline baggage restrictions, and have to compromise on antennas and/or equipment. We felt that, by shipping equipment ahead by sea, we could cater to all those needed band/mode combinations.

Of course, shipping a 20 foot container with several tons of equipment is expensive, and this dictates to a large extent the overall size of the expedition in terms of participants (needed for assembling all that kit on site, and then operating it!) and, almost inevitably, means that sponsorship will be required to help defray the high costs.

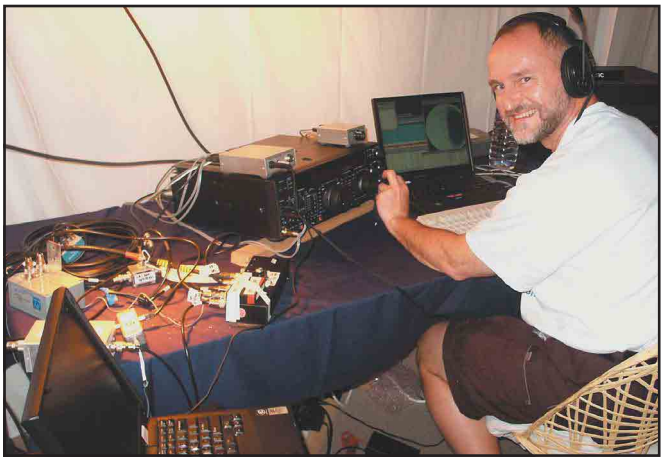
This approach worked well again in 2001, with our D68C Comoros expedition, where we made a record 168,000 QSOs. Not wanting to spoil a successful formula, we set out to do something similar in 2004, from Rodrigues Island in the Indian Ocean. Politically, Rodrigues is part of Mauritius, but unfamiliar to most holidaymakers to Mauritius, as it lies about 600 km and one and a half flying hours to the northeast. For DXCC purposes and for IOTA (Islands on the Air), it counts separately from Mauritius.

The Location

Rodrigues is volcanic, rising to almost 1300 feet at its highest point. Vegetation is

A street market in Port Mathurin.

Unloading the hardware.



Eric, K3NA, operating 3B9C.

sparse, but cattle and sheep eke out an existence and provide meat for export. The island is just 11 miles long and 5 miles wide. Its population is around 35,000 of whom 5000 live in Port Mathurin, the island's capital and major port.

The main sources of income are agriculture, fishing and handicrafts. Unemployment runs around 25% and the government is keen to develop tourism to help increase employment and to generate the funds necessary to maintain and improve the island's infrastructure. Mauritius subsidizes Rodrigues quite heavily. The roads are good, facilities such as schooling and health are excellent and the whole island exudes an air of prosperity.

Not everyone on Rodrigues welcomes the idea of more tourism, but economic necessity suggests there is no alternative. Right now, there are just four hotels, and the majority of visitors come from La Reunion (a French island territory) or from France. The foundation stones have already been laid for a few new hotels, but care is being taken to avoid overdevelopment. The local inhabitants speak competent French and English, their local language being a French-derived Creole, but schooling being in English.

The foregoing gives you some of the facts and figures about Rodrigues, but doesn't really do justice to the experience of being there. This is a wonderful place, with a genuine welcome from everyone, without the jaded cynicism that seems to pervade many tourist destinations. And despite its small size, there is plenty to see and do. There's not so much in the way of nightclubs and discos, but if you enjoy exploring a truly unspoiled island, with its own unique flora and fauna, or snorkeling or diving on one of the most extensive reefs in the Indian Ocean, then Rodrigues is truly a tropical paradise. Many likened it to Mauritius 20 years ago, before the advent of mass tourism.

Table 1
QSO Totals
(Numbers in bold are new all-time records)

By Mode	*Total*
CW total	77,610
SSB total	66,826
RTTY total	**5280**
PSK-31 total	**2172**
Others (FM, SSTV, EME, Sat.)	1,225

By Band	*Total*
1.8 MHz	2288
3.5 MHz	**7509**
7 MHz	**18,366**
10.1 MHz	**11,375**
14 MHz	21,594
18 MHz	**20,154**
21 MHz	29,920
24.9 MHz	16,858
28 MHz	23,535
50 MHz	1448
70-cm, EME and Satellite	66

By Geographic Area	*Total*
Africa	1001
Antarctica	3
Asia	27,609
Europe	92,099
North America	29,809
Oceania	1866
South America	670
United Kingdom	8582

Unique Calls in log	**37,040**
Total QSO count	**153,113**

Table 2
3B9C North American QSOs

Band	*CW*	*SSB*	*FM*	*RTTY*	*PSK31*
160	535	28	0	0	0
80	1215	930	0	0	0
40	3449	1319	0	133	8
30	3196	0	0	61	1
20	2328	3890	0	261	23
17	1829	2194	0	78	17
15	1882	2497	0	222	0
12	751	954	0	3	0
10	881	1023	50	40	11
Total	**16066**	**12835**	**50**	**798**	**60**

Getting Started

Thirty of us flew into Rodrigues on March 16, which involved a long-haul flight to Mauritius, followed almost immediately by the onward hop in a small turboprop aircraft. We were 23 operators, plus wives, partners and children (some of us would fly out after two and a half weeks, with a further group flying in). Robert, 3B9FR, was waiting for us at the airport, along with Maury, W3EF, who had flown in earlier.

We were staying at the Cotton Bay Hotel at Point Cotton. It is on the north coast of the island, with an uninterrupted sea take-off to Japan, Europe and most of North America. This was an excellent choice. Throughout our visit the staff were happy to cater to our every need (for example, they installed extra power lines to our operating rooms prior to our arrival), and many of them came to visit our stations and follow our progress. A chalkboard in the bar area was kept up-to-date with the QSO totals so that guests and staff alike could follow our progress!

The following morning, half the team went to town to empty the shipping container and supervise the loading of our equipment onto trucks (there were no facilities to transport the container directly to the hotel), while the remainder started preparing the shacks and marking antenna locations. The container team encountered our first problem at this stage, in that the local customs staff were unfamiliar with the *carnet de passage* documentation routinely used for shipping international freight, but this was quickly solved and unpacking began in earnest in the hot sun.

By early afternoon most of the equipment had arrived at the hotel, and we could start collecting what was needed for each individual antenna, mast, cable run, etc. One team set up the stations (some 16 in all), one set up the computer network (one per station, plus server machine, and additional PCs in the team room, making 20 PCs in all) and three antenna teams set to work outside.

On the Air

Station building went smoothly, although we had to relocate some of the antennas, in some cases because it became clear that we would suffer from interactions. In the case of the 160 meter vertical, we were warned that that the seafront location we had chosen would probably result in its being washed away! We were very fortunate in the weather, which remained dry and not too hot for almost all of our stay.

We had told the waiting world that we hoped to become active at midnight local time on the Friday, which we did. Every HF band was open, and we started simultaneously on all of them. It wasn't long before the global DX Cluster system was alive with spots, and the pile-ups were quite incredible.

If you have never been on the sharp end of a DXpedition, it is hard to imagine how things must be. A successful DXpedition is like a good film or play, entertaining its audience while hiding all the legwork that goes on behind the scenes. At the daily meetings, for example, we usually managed to draw up a list of several antenna projects, which often involved taking down one of the antennas to fix a feed point problem or maybe a loose clamp. We also had to restake many of the guy ropes, as the force of the wind plus the effect of rain in softening the ground meant that the pegs we had originally used started to work free. We got some longer stakes made up locally from angle iron.

Indoors, the technical team was faced with continual problems of interactions between stations, requiring them to make up stub filters, reroute coaxial feeders, and whatever else might help to effect a cure. It seemed that whenever such a problem was solved, a change of operat-

Kazu, JA1RJU, operating 6 meters.

David, GØMRF, and Dave, WW2R, assemble the 70-cm EME array.

ing frequency or antenna heading could easily bring a completely new set of headaches. We also had to abandon plans to operate simultaneously on SSB and CW on 80 and 20 meters, interstation interference being too much of a problem. We did manage this on 10 and 15 meters with reduced transmit power, however.

On the computer side, although the Star Software suite of programs had been beta tested before heading out to Rodrigues, it is only when software is used in a live situation that some of the bugs come to light. G3WGV, its developer, was kept busy, at least in the early days, in tracking them down and recompiling the code. This never interfered with station logging and the production of management statistics, though. However, our network became infected at one stage with a virus, finding its way in via our Internet connection. This took the best part of a day to isolate and fix, and could easily have had major implications. Truly a modern-day scourge! There were occasional non-radio problems to be solved, too, such as keeping cows and horses out of the antenna field!

DON BEATTIE, G3BJ

The complete Rodrigues team. Standing, from left to right: Paul, EI5DI; John, G3WKL; Ivan, G3IZD; Jens, DL7AKC; Falk, DK7YY; Chris, G3NHL; Robert, F5VHN; Hilary, G4JKS; John, N7CQQ; Mike, G4IUF; Jim, KF7E; Nigel, G4KIU; Danny, MØGMT; Eric, K3NA; David, GØMRF; Maury, W3EF; Dave, G4FRE; Meg, MØFRE; Justin, G4TSH; Derek, G3RAU; Robert, 3B9FR, and Tim, G4VXE. Sitting, from left to right: Jun, JH4RHF; Mike, G3SED; Bob, GU4YOX; John, G3WGV; Neville, G3NUG; Don, G3BJ; Don, G3XTT; Tony, GØOPB, and Kazu, JA1RJU.

The Bands

As expected, 10 and 12 meter propagation was well down from what we had experienced three years earlier from the Comoros. However, the north-south path to Europe was very reliable and there were some great US openings at times, including a 10 meter long-path to the West Coast. We managed plenty of contacts on 10 meter FM, too. Perhaps even more surprising was our success on 6 meters. We had a daily path to Japan, Central Asia and Southern Europe. Of course, the fact that we had been able to set up a stack of two 6 element Yagis right on the water's edge did us no harm.

Operating from close to the equator, the pattern is for high absorption in the middle of the day, with only the highest bands open. The LF bands start to open around local dusk and stay open right through the night, however, dropping out quickly around dawn (of course, there is really no such thing as twilight at those latitudes). As expected, 15 and 17 meters proved to be the mainstay, with good worldwide propagation, while 30 meters again showed its mettle, to the extent that by the end of our expedition we really had "worked it dry" with continuing good propagation but few callers.

Fortunately, the noise level on the LF bands was lower than we had expected. On 80 meters we had set up two pairs of phased quarter-wave verticals, one optimized for the top (SSB) end of the band and one for the bottom (CW) end. This proved to be a good idea, as swapping them around showed a big difference in sent and received signal strengths. We were pleased with our LF QSO totals, although we know that not everyone made it into the log.

The good news is that many stations worked 3B9C on all nine HF bands. Propagation on 160 meters was remarkable, extending almost daily to the West Coast, both long and short-path. One heartening tale is of the Midwestern amateur, a keen 160 meter operator who, when he realized we were actually seeing 160 meter openings to his area, rigged up a two-element wire Yagi between the walls of a local canyon and worked us

with his station set up in his pickup truck. If you think about the size of a 160 meter beam, and the height required for it to work, the effort he put in to achieve that one contact takes on monumental proportions! At the other end of the scale, at least one European amateur worked us on HF using an FT-817 on battery power and a Miracle Whip antenna.

We did manage one 6 meter moonbounce contact, and several on 70 cm. The AO-40 satellite remained out of commission, but we did manage some satellite contacts via FO-29. On HF, we made Rodrigues available on SSTV for the first time. The other datamodes (RTTY and PSK31) proved immensely popular, reflecting the ease of activating these modes nowadays using a PC sound card and software.

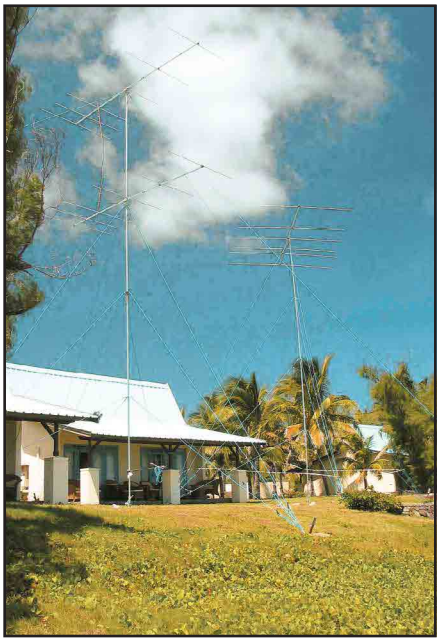
As well as the huge QSO total (see Table 1), we worked 214 DXCC entities and comfortably managed DXCC on 80 through 10, as well as 88 entities on Topband and 27 on 6 meters.

In the space of an article like this, it isn't possible to give more than a flavor of how things went, but many hams took advantage of our Web pages to follow the story. At its peak, we were seeing over 50,000 page hits a day. The Web pages are still up and you can read the story if you didn't do so at the time. They also have some fascinating history about previous ham activity from Rodrigues, going right back to 1957, and including the 1967 Don Miller operation.

Non-Radio Activities

DXpedition write-ups almost invariably manage to give the impression that life is one long round of eating, sleeping and running pileups. Some of the hotel staff and visitors certainly found it hard to comprehend why we would come all that way to do something we could equally well do at home! But we enjoyed ourselves in other ways, too. The ladies managed many excursions, and were frequently joined by other members of the team, whether to ramble to the next bay, take a boat trip, or catch the local bus into town for some shopping.

For those who had been largely confined to barracks, we organized a minibus tour in the third week, taking in the major sights, leaving a few volunteers to keep the radios manned. At the hotel, there was music and dancing most evenings, and GU4YOX our "entertainment king" took his role seriously enough to MC, sing and even spend some time on the drums! After the second group had flown in, but before the first leavers flew out, the hotel laid on an excellent buffet supper, and we closed down the station



The 6-element, 10-meter Yagi and the 6-over-6 6-meter array, in front of the operating shacks.

for a few hours so that we could all enjoy this together. There was champagne, great local food and, of course, musical accompaniment. Those who stayed until the end of the trip enjoyed a similar farewell banquet. Indeed, throughout the whole expedition the Cotton Bay Hotel staff treated us royally.

Our expedition generated a high level of local interest. Local press and TV came to cover our activities, and local dignitaries including the island Chief Commissioner, its Chief Executive and others in high office also visited us. They were all delighted to hear that tens of thousands of people around the world now knew of Rodrigues and many would be receiving a commemorative QSL card with more information about the island.

Thanks

The team extends their thanks to all who made this expedition possible. This includes our major sponsors, headed by Yaesu but including many others, some of whom are listed at the end of this article. Thanks are also due to all the clubs and individuals, too numerous to mention here, but listed in full on our Web page and recognized on the QSL card. Naturally, all the participants paid for their travel and accommodation, as well as making a contribution to shared expenses. Our thanks also to the management and staff of the Cotton Bay Hotel, to Robert, 3B9FR, to Jacky, 3B8CF, to the various officials who were involved in arranging permits, custom carnets, etc. and, of course, to our families who allowed us to take part in this unique experience. The team also wishes to thank Neville, G3NUG; Don, G3BJ, and John, G3WGV, our coleaders, who collectively put in a huge amount of effort to make Project Star Reach a reality.

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You can find more information about this lovely island on the Web.

3B9C Web site: **www.fsdxa.com/3b9c**

About Rodrigues: **www.eng.uct.ac.za/~chnste010/rodrigues.html**

All photos by Justin Snow, G4TSH, except as noted otherwise.

G3XTT was first licensed in 1968 after a brief spell as a BC and MW DXer and then as an amateur SWL. His main interests have always been in the competitive side of Amateur Radio, especially DXing on the LF bands. Don is a past editor of the RSGB's DX News Sheet a*nd has been a columnist for various Amateur Radio magazines since 1983. He currently writes the HF column for the RSGB's magazine* RadCom. *Don has also served on many Amateur Radio committees, and is Manager of the IOTA contest. He has operated from 24 DXCC entities on all continents and holds the US call NK1G. Don worked in the telecommunications industry for almost 30 years, before taking early retirement. He now focuses on his Amateur Radio interests, which he combines with other travel and social activities. He is married to Janet, and they have children, Helena and Edward.*

By Bill Wageman, K5MAT

What to Expect on 6

Summer is sporadic E season…but the Magic Band can be magical any time—often when you least expect it.

All license classes except Novice are permitted access to 6 meters, but many of us pay little, if any, attention to this wonderful band. It is the lowest frequency ham band in the VHF spectrum, and shows many of the same characteristics as the most popular VHF ham band, 2 meters. The magic comes when 6 behaves more like an HF band with nationwide or even worldwide propagation. Although 2 meters can and does support this type of propagation in a limited way, worldwide contacts are rare without EME (moonbounce), which requires heavy duty equipment.

The 6 meter band is more readily available than it's ever been, since it has been routinely included in many transceivers of recent vintage designed primarily for HF. Some equipment puts out 100 W, more than enough for almost any kind of work on 6. EME would be extremely difficult at that power level, but all other HF and VHF propagation modes are within reach. One can do a great deal with only 10 W and a decent antenna. There are also some FM only, SSB/CW only, and so-called all mode single band rigs for this band. Some buy commercial transverters, or even "roll their own."

The 50 MHz Band

SSB is widely used from 50.100 to about 50.300 MHz, and that is where much local and DX (countrywide and worldwide) communication takes place. The calling frequency to monitor while waiting for an opening is 50.125. 50.110 MHz can be monitored for worldwide DX stations, and 50.100 to 50.125 is used as a DX window, with W/VE to W/VE contacts discouraged.

A relatively small group uses CW between 50.0 and 50.1 MHz, and CW is the only mode that may be used in that range. Although you might hear some CW above 50.1 at times, except for the DX window, it's usually not done. There is also another window just above 51.0 MHz where New Zealand might be heard and worked!

FM in the upper part of the band can be used for DX as well, but because of the capture effect it is much more difficult to get information through. The national simplex frequency for this band is 52.525 MHz. FM repeaters are mostly found above 53 MHz, with an input 1 MHz lower. There is some radio control operation, but one should talk with local RC enthusiasts to determine the best frequencies. A complete band plan can be found in Table 1.

Getting Out

The types of propagation found on 6

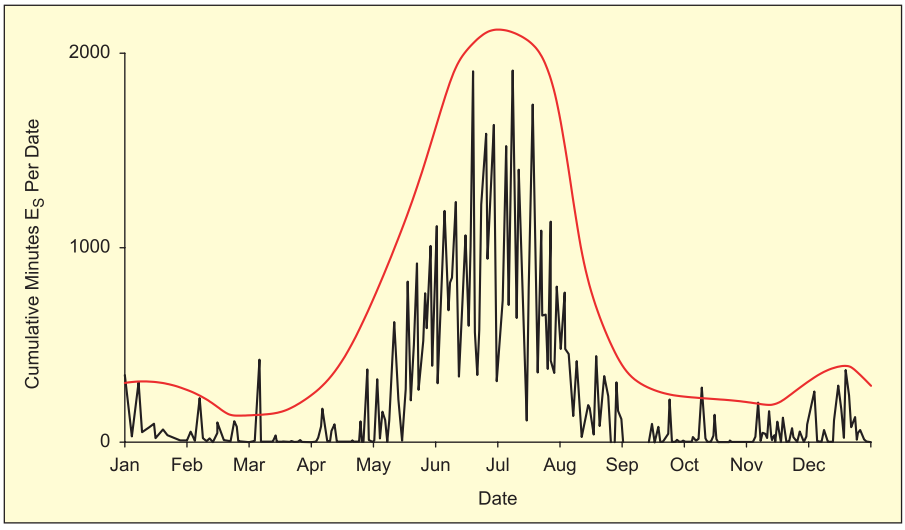

Figure 1—The data for this figure was taken by Patrick J. Dyer over a period of 11 years on the FM broadcast band. It was reported in an article entitled "Eleven Years of Sporadic E" in the March 1992 issue of *QST*, written by Emil Pocock, W3EP, and Pat. The smoothed curve has been added by me to give an idea of what can be expected when. Note the E_s is more frequent at 50 MHz than on the FM broadcast band.

Table 1
6 Meter Band Plan (50-54 MHz)

50.0-50.1	CW, beacons
50.060-50.080	Beacon subband
50.1-50.3	SSB, CW
50.10-50.125	DX window
50.125	SSB calling
50.3-50.6	All modes
50.6-50.8	Nonvoice communications
50.62	Digital (packet) calling
50.8-51.0	Radio remote control (20-kHz channels)
51.0-51.1	Pacific DX window
51.12-51.48	Repeater inputs (19 channels)
51.12-51.18	Digital repeater inputs
51.62-51.98	Repeater outputs (19 channels)
51.62-51.68	Digital repeater outputs
52.0-52.48	Repeater inputs (except as noted; 23 channels)
52.02, 52.04	FM simplex
52.2	TEST PAIR (input)
52.5-52.98	Repeater output (except as noted; 23 channels)
52.525	Primary FM simplex
52.54	Secondary FM simplex
52.7	TEST PAIR (output)
53.0-53.48	Repeater inputs (except as noted; 19 channels)
53.0	Remote base FM simplex
53.02	Simplex
53.1, 53.2, 53.3, 53.4	Radio remote control
53.5-53.98	Repeater outputs (except as noted; 19 channels)
53.5, 53.6, 53.7, 53.8	Radio remote control
53.52, 53.9	Simplex

range from local groundwave to E_s (sporadic E) and F-layer contacts. Included are tropo, aurora, forward scatter, meteor scatter, transequatorial and backscatter that are frequently used for stateside DXing on 2 meters. A few hardy souls are using EME to boost their country and grid totals, but that mode is not for the faint-hearted!

So when you acquire a fancy, chrome plated 6 meter special with all the bells and whistles and a new antenna, what should you expect when you first fire it up? Except on FM, you should be braced for a lot of white noise coming from the speaker. At some point, if you're persistent, you will hear the magic when E_s signals come pouring through. That can be quite exciting, and even after over 25 years on the band it still gives me quite a kick.


DICK STROUD, W9SR

Figure 2—Before and after photos of W9SR's creative use of an old lawn chair. Dick worked 47 grids during a VHF contest with his antenna at 20 feet above ground.

Antennas for 6

What sort of antennas are required? Your 40 or 80 meter dipole is a good place to start, regardless of its orientation. If you're going to operate only FM, a vertical is the answer because all the FM is vertically polarized. But if you want to work folks on SSB and CW, your antenna should be horizontal because all SSB/CW stations are horizontally polarized. A simple dipole would work, but even a small beam is much better.

When the sunspots are low there will be periods when you may not hear anything outside the local area for months at a time. Don't give up! E_s causes fairly frequent short skip openings, some as far out as 2500 or more miles, beginning in May and lasting into August and maybe September in the northern hemisphere. Another much shorter and weaker season in December and January. See Figure 1 for an idea of how E_s can be expected throughout the year. As you can see, there can be strong openings at random times of the year. F-layer propagation is rare, unless there are lots of sunspots—and even then 6 doesn't open to international DX very often. When 10 meters is really hopping, it might be worthwhile to check out 6 to see if you can pick up some of that wonderful DX.

Squelch the Urge to Use Your Squelch

But you're curious and don't want to listen to hiss coming from the speaker all the time. Just turn up the squelch, right? Wrong! I have yet to find a squelch circuit that will open on extremely weak signals, and you might miss that contact with Hawaii unless a local station has contacted him and opened your squelch for you. If you're serious about picking up those marginal signals, keep the squelch off. There have been a number of cases when a rare DX station came up out of the noise and was worked by someone, only to go back down below the noise—all in a matter of 20 or 30 seconds!

Much of the operation on SSB and CW is ragchewing, but chasing states and grids is also quite popular. Over the years I have had the pleasure of making many good friends on this band, and we are sometimes able to see each other at some of the VHF conferences that are held around the country. Since I have been on the band for so long some of those friends have become Silent Keys. At one time chasing SMIRK numbers was partly responsible for keeping the band active, and there are still a few people who collect them. There are also some VHF operating contests that liven up the band when it is open, especially in the summer months, for those who like competition or are trying to increase their state or grid count.

VHF operators use grids—an area on the surface of the earth that is 1° high in latitude by 2° wide in longitude. They are usually called "grid squares," even though they are not really even rectangular, since they are on the surface of a sphere. Some examples: Denver is in DM79, while San Antonio is in EL09 and Boston is in FN42. Maps and computer programs are available so anyone can figure out their grid as long as they know their own latitude and longitude. Some GPS receivers actually give these grids directly. There's more about the grid locator system at **www.arrl.org/locate/gridinfo.html**.

Earlier I mentioned that one can have a lot of fun even with low power, and my own experiences confirm that statement. You should know that my single band transceiver does not have FM capability. I feel fairly certain that I have worked a couple of thousand different hams on the band with 10 W output to a small 4 element homebrew Yagi that was up about 65 feet or so. Even with only 10 W, but also with a bit of perseverance, I have been lucky enough to win some VHF contests for New Mexico.

The 6 meter band furnished lots of multipliers and contacts to help my combined scores from other bands, but more importantly I have had lots of fun on the Magic Band. My current station is that same beam on a small (9 foot) roof-mounted tower on the roof of my one story home. In the 2003 ARRL VHF contest, that same 10 W transceiver and small beam managed to work Alaska (albeit on CW). There was too much interference for my simple setup to get through all the high powered contesters on the phone frequencies. Even if you don't use CW, you can still have a great deal of fun.

Awards

A common goal is to try to work all 50 states. It's relatively easy to get the lower 48 on 6, but Alaska and Hawaii do come in to the rest of the country at times. It took a fair amount of time, but I finally managed to get WAS on 6 meter CW. My grid total is less than 300, but others have worked every single grid in the lower 48, a total of nearly 500. Some have over 1000 worldwide at this time, but they have put in a lot of time doing it, and they have high power besides (1000 W or more) and big antennas. Quite a few stations have earned DXCC (100 countries) on 6. Even with my QRP setup, I managed to work all 6 continents and 25 or so countries with a bit of luck. One memorable DX contact came about when I called CQ on CW one day on what appeared to be a dead band, and was answered by a very weak station in Japan. I never heard another station on the remainder of the day!

What about simple antennas? You

WSJT—A Different Way to Enjoy 6 Meters

Most people think of meteors in terms of meteor showers, those amazing events that happen at certain times of the year. Truth is, space debris is falling into our atmosphere *constantly*. Much of it arrives as tiny particles that burn up rapidly as they plummet earthward.

You can ricochet radio signals off the short-lived trails these tiny meteors leave behind. By using their ionized remnants as radio "mirrors," your signal can span a thousand miles or more. The trick, however, is to communicate *very* quickly. We're talking fractions of a second, perhaps a couple of seconds if you are lucky.

Joe Taylor, K1JT, developed a software package designed to take advantage of these brief windows of opportunity: *WSJT*. The software is sound card based, so all you need is a sound-card interface such as those made by West Mountain Radio, TigerTronics, MFJ and others.

With *WSJT* installed on your *Windows* PC, you can communicate via digital *meteor scatter* almost any time of the day or night. Six meters is one of the best bands for hams who are new to this activity. You can make meteor contacts on the Magic Band with little more than a 100-W transceiver and a dipole antenna—big beams and high power are not necessary.

Digital meteor scatter contacts are not conversations in the traditional sense. They are signal confirmation reports and little else. QSOs can take up to 30 minutes or longer to complete, thanks to the capricious communication pathway you are attempting to use. The thrill of digital meteor scatter with *WSJT* is the fact that you can communicate at all. There is something profound about bouncing signals off bits of space dust that has traveled for millions or even billions of years.

To get started, download and install *WSJT* (and the *WSJT User's Guide*) from Joe's Web site at **pulsar.princeton.edu/~joe/K1JT/index.htm**. Then go to the NØUK's Ping Jockey Web site at **www.pingjockey.net/**. That's where you'll find the page where *WSJT* operators make contact schedules, or simply announce that they are on the air. Most 6-meter digital meteor-scatter activity takes place between 50.260 and 50.270 MHz using the FSK441 mode.—*Steve Ford, WB8IMY*

should know that I have had many 6 meter contacts with my 10 W rig and an 80 meter drooping dipole fed through an antenna tuner. Do not think it was as easy to work people with such a setup as it would have been with a beam, but the point is that it was much better than the proverbial wet noodle. A person can have much enjoyment on the Magic Band with a simple antenna as long as you can keep the rig happy with an unreal sort of load. A simple 6 meter antenna will provide a lot of fun, while a comparable antenna for 144 MHz would probably be an exercise in frustration.

Six is a great band for the antenna experimenter because they are smaller and relatively easy to build compared with lower frequency antennas, and they are much more forgiving of small errors than higher frequency antennas would be. One antenna that is easy to build and works quite well on 6 is the Moxon. A recent *QST* article showed how to build a 6 meter antenna from an aluminum folding chair (see Figure 2).

If you have 6 on your transceiver, why not put up a simple antenna and have some fun? If the band turns you on, you can graduate to a big Yagi on a 200 foot tower, driven with 1500 W, and become famous all over the world. Or maybe something more modest would be more reasonable. In any case, the band is there for the taking, so why not give it a try, especially if you already have a rig with 50 MHz on it?

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Bill Wageman, K5MAT, was first licensed as WØBUR in 1950 in the village of Mead, Nebraska. His interest in ham radio was part of the reason he decided to major in Physics when he attended college that fall. Shortly after earning his Amateur Extra class license, he worked Carol, WNØHQH (now W5TIK and his bride of 50 years). Bill has had articles published in QST, Ham Radio, Communications Quarterly, CQVHF, CQ *and* 73. *Operating awards include CP-40, 5BWAS, 5BDXCC, WAC on 50 MHz (10 W), and VUCC on 50 and 144. All of his children and their spouses and one grandchild are licensed amateurs. You can reach the author at 7309 Avenida La Costa NE, Albuquerque, NM 87109-3900.*

NEW BOOKS

YASME—THE DANNY WEIL AND COLVIN RADIO EXPEDITIONS

By James D. Cain, K1TN

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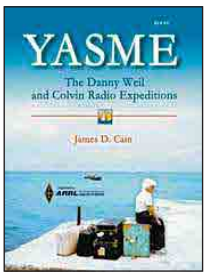
Reviewed by H. Ward Silver, NØAX

◊ When I first started DXing in the early 1970s, Danny Weil, VP2VB, and his YASME sailboats had been off the air for 10 years. A certain Lloyd, W6KG, and Iris, W6QL, were gallivanting around the globe on journeys far and wide. Arguments about a mysterious "Don Miller, W9WNV," were still simmering over events a half-dozen years before. I had read in the old *QST*, *CQ*, and *73* magazines about the exploits of these expeditioners and others, including Gus Browning, W4BPD. Who were these people, really?



At the time, I didn't "get it" or understand the relationships and the competitiveness of these seminal DXers. If I scratched a "Niner" (my term for the crop of hams who experienced the 1959 peak of solar Cycle 19 and the glory years of DXing in the 1960s) I would certainly get strong opinions and vivid recollections. But, I also found a lot of disagreement among Niners. After years of confusion, I figured that it was just one of those things that I would never get to the bottom of. That is, until the YASME Foundation and Jim Cain, K1TN, got together to produce *YASME*.

When you consider the strong personalities involved, a conflagration was inevitable. With the skill of a nuclear physicist, Cain teases apart the tracks of the protagonists, their collisions, and the subsequent chaos in the aftermath. Remnants of DXing's Big Bang echo across the HF bands even today.

Read this book and learn the whole twisted and turning tale from which the legends are made. You'll meet in their protean form every character present on the modern stage, giving DXing today's shape. Danny Weil, VP2VB, died in October 2003, Iris Colvin in 1998, and Lloyd Colvin in 1993 during an expedition to Turkey, leaving only Don Miller, now AE6IY, on the scene in 2004, released from his long prison term in 2002. Budding DXers should read this fascinating history better to understand their pursuits. Veterans of the DX pileups will want to relive those fabled days and reminisce about friends and enemies long gone.

YASME is a 12 course meal of detail, blended with the seasoned touch of a master chef. When the bands are closed and the clock is striking a late hour, this is the book to open while you wait for the watery signals of the latest expedition to surface in the sea of receiver hiss.

By Harry W. Lewis, W7JWJ

Mentoring in the On-Line World

There is more to learning than tests and memorization. The success of ARRL on-line courses is built on a simple, ancient concept: *mentoring*.

Some 3500 years ago, Odysseus the King of Ithaca was engaged in fighting the Trojan War. The king left his son with an entrusted friend for care and counsel. That friend, named *Mentor,* was assigned the task of imparting his knowledge and wisdom to the boy student.

Socrates has been reported as saying that for learning to occur the mentor must have "a student willing to learn and a log to sit on." In this century, that log is being replaced by the phenomenon of the Internet.

Mentoring in Cyberspace

The ARRL has taken a leadership position in offering a number of on-line courses ranging from emergency communications to antenna design and construction. There is even a course for nonhams who wish to obtain their Technician licenses.

Course writers, editors, students and mentors are now sharing in this new self-learning experience that brings forth leadership development and personal empowerment. Think of it as electronic Elmering. Thanks to the Internet, time and distance are of little concern. Student and teacher are as close as their respective keyboards. The experience is rich and rewarding, and not without humorous moments.

In one of the ARRL Emergency Communications courses, the student is assigned, as an activity, to an imaginary emergency shelter during an imaginary ice storm. One of my bewildered students, who lived on an island that straddled the equator, asked, "What is an ice storm?"

In the Antenna Design course, the student is asked to research and compare propagation between several stations midday and midnight. That brought a concerned e-mail from a student living in northern Alaska who stated that he would have to wait two more months for night to occur. (We created an alternative activity for him!)

Which way do you point your antenna when working DX via the aurora? The answer is north, right? But what if your student lives north of the aurora belt or south of the equator? Think about it.

A good mentor can guide students to creative thinking. For example, another activity in one of the Emergency Communications courses suggests that the student outline the procedure to follow when arriving at a served agency. A typical response might be to report to the person in charge and to place Amateur Radio equipment on an unused desk. The operator should then tidy up upon leaving and thank the supervisor. As a mentor, I ask students to consider how they might respond if they arrived to find the agency building destroyed, the person in charge seriously injured and a temporary operation being established in the parking lot. Or, what if the only communication with a nearby emergency operations center is on HF and the student's jump kit does not contain antenna wire? Even psychological factors can be explored. For instance, students usually invoke the male gender as they visualize the scene of an incident. I ask if their response would be different if the person in charge were female? Why or why not?

The Internet circles the world and directions vary at each student location. West is not the same direction on the far side of the planet. Words also have different meanings. While mentoring a student from the former Soviet Union, I was shocked and perplexed when he demanded to know why the United States would kill its amateurs! When I asked him where he received such information, he replied, "From the study questions in the course."

The actual course question was, "For how long is an Amateur license valid?" My student had stumbled over the word "valid" and looked it up in his translation dictionary: "Valid: to validate, to *execute* for or with just cause." Oops!

ARRL Certification and Continuing Education Courses

You can enrich your Amateur Radio knowledge from the comfort of your home, any time of day with an ARRL on-line course. Current course offerings include...

- Emergency Communications (3 levels)
- Antenna Modeling
- HF Digital Communications
- Radio Frequency Interference
- Beyond Repeaters (how to enjoy everything VHF and UHF hamming has to offer)
- Technician License Course
- Radio Frequency Propagation

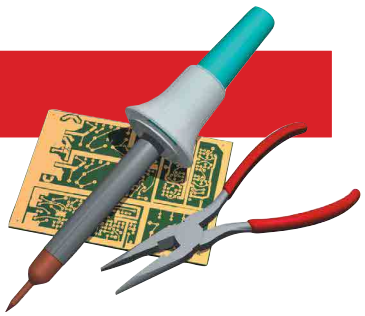
More courses are coming soon. Find one that suits your interests and begin expanding your horizons today. You'll find more information on the ARRLWeb at **www.arrl.org/cce/**.

Share the "Log"

It is not necessary for the mentor to instruct, but it is appropriate to offer advice within your expertise. Of course, it is a two-way exchange. As a mentor, I find that I learn a great deal from my students. The more students I mentor, the faster I learn!

ARRL on-line courses are attracting students from throughout the world, but good mentors are not so easy to find. Why not put your Amateur Radio experience to work? Share the "log" of Internet learning, and the log of Internet mentoring. Contact the CCE Program staff at **cce@arrl.org** and become an on-line mentor.

You can contact the author at 10352 Sand Point Way NE, Seattle, WA 98125-8156; **w7jwj@arrl.net**.



The Doctor is IN

The Doctor had quite a few comments to his reply to Harry Woods, W2PAL, relative to finding the unknown height of a tree (June 2004, p 56). Representative of the many replies was this one received from Larry, WR1B, and Dan Wolfgang, of ARRL HQ. Thanks go to Larry and Dan and to all the other readers who offered similar comments on the Doctor's tree height solutions. The Doctor must confess—he was never a Boy Scout!

With mild amusement, we read your June 2004 column in *QST*. The question from Harry Woods, W2PAL about how to estimate the height of a tree, tower or other structure is indeed a practical one. Obviously, neither W2PAL nor the good Doctor was ever a Boy Scout, or at least not a First Class Scout.

I would suggest that W2PAL contact a Boy Scout troop in his area and ask the Scoutmaster to bring the Troop to his location for some height-measuring practice. The Scouts will use one of two techniques to estimate the height of his tree. Once that contact is made, perhaps he would like to invite the Scouts back to his station during the third weekend in October for the Jamboree on the Air (JOTA), October 15 to 17, this year.

The first method the Scouts might use is called "The Stick Method." Start with someone of known height. (It is easiest if you can find someone who is 5 feet tall, although four footers or six footers will work equally well.) Have this person stand at the base of the tree. If you can't find anyone to help with the task, pick a board, post or other straight object of known length and stand it at the base of the tree.

Back up some reasonable distance (that does not have to be measured) and hold a short, straight stick at arm's length in front of you. Close one eye and sight along the top of the stick, moving your arm so the top of the stick is even with the top of your helper's head. Place your thumb at a spot on the stick that aligns with the base of the tree and your helper's feet. Now simply move your arm with the stick up until your thumb aligns with the top of the helper's head and note where the top of the stick seems to touch the tree. Move your arm up again until your thumb touches the new spot and again note where the top of the stick seems to touch. Continue this procedure until you reach the top of the tree. See Figure 1.

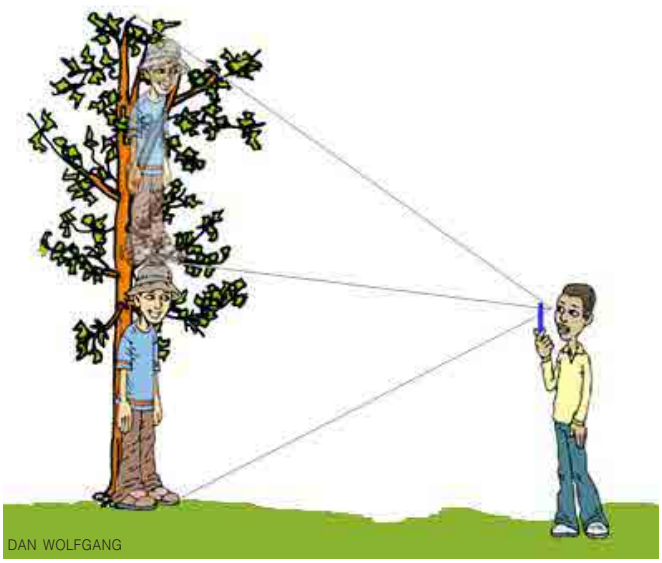


Figure 1—The "Stick Method" of estimating heights involves counting the number of times a known height will fit into the total height of the object. The "Felling Method" is described in the text.

To estimate the height of the tree, simply multiply your helper's height by the number of times you moved the stick upward. For instance, if you started with a 5 foot helper and measured the tree to be 10 "stick lengths," you have a 50 foot tree.

The second method the Scouts may use is called the "Felling Method." This will probably result in a more accurate measurement than the stick method. In fact, it could be at least as accurate as the date, time, location and Sun angle from the "Internet Method," as originally proposed by the Doctor.

You will still need a straight stick (probably a bit longer than that used with the other method) and a cooperative helper. Again, you will step back some reasonable (unmeasured) distance from the tree. Holding the stick at arm's length in front of you, close one eye again, and sight over the stick at the tree. Position the top of the stick so it appears to touch the top of the tree and then position your thumb along the stick so it appears to touch the ground at the base of the tree.

Now, rotate your wrist so the stick is horizontal, along the ground. Keeping your thumb at the base of the tree, have your helper move so he or she is standing where the top of the stick now touches the ground. Mark this spot. The most critical part of this measurement technique is ensuring that the line from you to the tree and then to your helper forms a 90° angle along the ground. The Scouts will now count their steps between the mark and the tree, multiply by the length of their stride, and give you the height of the tree with a fair degree of accuracy. (If your step is 2 feet and it takes 50 steps to cover the distance between the mark and the tree, you have a 100 foot tall tree.) If you need even better accuracy for your measurement, stretch a tape measure along the ground and measure that distance. Before the Doctor's computer can dial up the Internet and access the US Naval Observatory Web site, you will know the height of the tree at least as accurately as the Sun angle, shadow measurement and trigonometry calculation will provide!

We might point out that either of these methods works at any time, whether or not the sun is shining. You may need a powerful flashlight to make the measurements at night, but they will certainly work on rainy, snowy and cloudy days when there is no sunlight to cast a shadow. The methods also work well in a forest, where it may be difficult or impossible to find the entire shadow of that one tree you want to measure. There are similar methods for estimating distances, such as the width of a stream or river, although those become a bit more elaborate. Ask your friendly Scouts to demonstrate that technique.

Q Bob Smith, KC4WJO, asks: I am building the "Quick and Easy CW With Your PC" project, from page 22.22 of the 2004 edition of *The ARRL Handbook*.[1] I have not been able to locate the NE567CN tone decoder IC. It's not listed in the Allied, Newark or Digi-Key catalogs or at their Web sites. Can you tell me where I can find this device or if an alternate part number is available?

A Both the Doctor and the ARRL Technical Information Service (TIS) frequently receive questions about parts and their generic equivalents, and this is a perfect example. An IC may not be able to be found under its manufacturer specific part number, but it may be available under its generic name. In this case, the NE567CN, a phase locked loop tone decoder, is available from several sources as a different part number. It can be found at JDR Micro Devices (**www.jdr.com**) as an LM567, at Mouser Electronics (**www.mouser.com**) as a 513-NJM567D, at Ocean State Electronics (**www.oselectronics.com**) as an NE567N and at Digi-Key (**www.digikey.com**) as an LM567CN-ND.

If you're having difficulty locating a specific part, try searching for it under its generic part number. As an example, the National Semiconductor LM78M05CT TO-220 voltage regulator can be located by entering "7805" into a standard Internet search engine, then looking for the respective part data sheets.

Q From Sergio R. Rubio, KP4L, comes the following: I have had an Amp Supply LK-500ZB amplifier for over 15 years. It has a big ammeter to read plate current and it has slowly been collecting condensation behind the front glass, to the point that it is impossible to use. The meter is in the left side of the front panel; at the right side there is another meter that reads grid current and plate voltage, where condensation is not present. For your information, the power supply (3 kV, 1 A) is located at the left side of the amplifier, where the condensation is present, while at the right side is a pair of 3-500Z tubes, where the temperature is higher, but there is no meter condensation.

What can be done to eliminate the condensation, short of taking out the meter and cleaning it periodically? I have tried several remedies with no result, including the use of a hair dryer.

A The relative humidty of the air within the meter is apparently high and the temperature of that air is reaching the dew point. The air is then condensing on the cooler surface of the meter glass. It is probably condensing on the interior of the meter case, as well. The condensation is the result of warm, moist air coming into contact with a cooler surface.

The problem can be attacked two ways. Keep the glass surface warmer than the air it contacts, or lower the relative humidity of the internal air by ventilation or by the use of a dessicant (silica gel) within the meter. To keep the surface warmer than the air it contacts, you could put a heat source inside the meter, such as a resistor or a light bulb, and keep it on continuously. A light bulb could be powered from a separate wall supply or transformer, but run at a lower voltage for increased life. A 12 V bulb powered from a 6.3 V transformer would probably furnish sufficient heat to the meter interior. That would prevent the meter surface from getting cooler than the air within it and thus keep that air from condensing. A heat source near the meter should also help—but may not be as effective. That could account for the fact that the meter nearer the tubes is not condensing.

Condensation, such as you describe, may also suggest a ventilation problem. Once a significant amount moisture gets into the meter (as vapor), that moisture-laden air can condense on the inside meter surface if it reaches the dew point. Because natural ventilation of the meter seems inadequate to get the moisture out of the meter, I would suggest that you remove the meter glass, or open up the meter so that it can dry out (in an air-conditioned room).

Try placing a small dessicant bag within the meter housing and then re-close the meter. A semi-sealed container will often draw cooler air inside as it cools down. This moisture-laden air will then be trapped inside the meter case without an easy exit path. It may also be advisable to carefully drill a small ventilation hole in the meter case. This will require disassembly of the meter—something you'll have to do in any case.

The object is either to rid the interior of the meter of moisture-laden air by ventilation or the use of a dessicant within the meter or prevent that air from reaching the dew point by warming the interior meter surface. I hope some of these remedies help and, good luck!

Q Doug Poppa, KD7LFS, asks: I would like to monitor the modulation output from my linear amplifier on an oscilloscope while I am transmitting. What do I connect to the amplifier output line to get into the input of the oscilloscope? Are there any commercially made units available or do I have to build one?

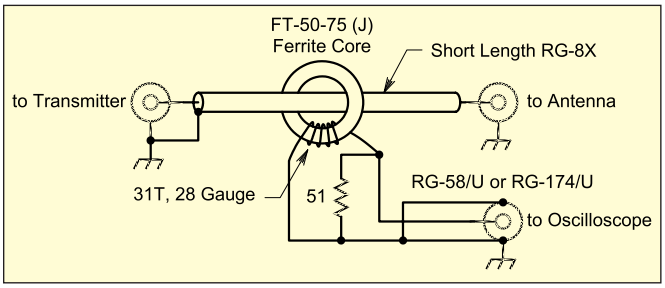


Figure 2—A coaxial line sampler for oscilloscope monitoring of a transmitted signal. The transformer is an FT-37-75 ferrite core wound with 28 gauge enamel wire. The primary is a short section of RG-8X coaxial cable passed directly through the core. This wide-band RF line sampler has a ratio of 30 dB. Thin 50 Ω coaxial line can be run directly to the monitoring oscilloscope. The line should be terminated in its characteristic impedance, either at the coupler or at the oscilloscope.

A Perhaps the most convenient monitoring method is to build a line sampler or a line coupler with a fixed wide-band coupling ratio. Page 26.31 of the 2004 *ARRL Handbook*[2] describes a simple version—31 turns of 28 gauge wire wound on an FT-50-75(J) ferrite core for the connection to the scope and RG-8X passed through the core for the transmitter connection. This coupler has a fixed ratio of 30 dB and is flat from 0.5-100 MHz. It is shown in Figure 2.

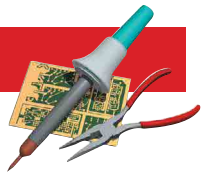
Bear in mind that the oscilloscope will have to have a vertical amplifier bandwidth wide enough to view the sampled signal. If the cable run to the 'scope is short, place a terminating resistor (51 Ω) directly at the coupler, as shown, and do not terminate at the 'scope. If the run to the 'scope is long, place the terminating resistor directly at the oscilloscope input and don't terminate at the coupler. In any case, do not double-terminate the sample line.

There are commercial units available (Bird, et al), but be careful. Many of these are frequency sensitive and will produce an output level that is dependent on the input frequency. These would have to be adjusted for operation on different bands to give equal response at all frequencies.

[2]See Note 1.

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/.

[1]Available from your local dealer or the ARRL Bookstore. Order no. 1964. Telephone toll-free in the US 888-277-5289, or 860-594-0355, fax 860-594-0303; **www.arrl.org/shop/**; **pubsales@arrl.org**.



MixW RigExpert

If you spend much time around personal computers, you know how ubiquitous USB (Universal Serial Bus) has become. We plug the device of the moment into a thumbnail-sized receptacle and the computer immediately recognizes the new component and configures itself accordingly. Thanks to USB, we no longer have to struggle with serial (COM) and parallel (LPT) ports. In fact, many laptop computers no longer offer such ports.

Amateur Radio manufacturers, however, have been slow to embrace USB. It's easy to understand why. Adding USB capability to a product adds cost, which can be a serious liability in a highly competitive market. Despite this reluctance, we're finally beginning to see USB devices for hams. Among the first is the MixW RigExpert transceiver interface.

MixW RigExpert (shown with optional transceiver cables).

Plug and Go

The MixW RigExpert is a USB transceiver interface that allows you to operate several sound-card-based digital modes, key your rig on CW and even perform basic transceiver control (such as changing frequency). The MixW RigExpert *doesn't* use your computer's sound card to work its DSP magic. Instead, it includes its own AC '97 sound-processing chipset. Considering the tiny enclosure (about size of a pack of cigarettes), that's a pretty neat feat.

The front of the enclosure sports a socket for the USB cable. On the rear you find a DB-25 connector for the cables to your transceiver. For this review we purchased pre-wired transceiver cables from the RigExpert distributor.

The MixW RigExpert we tested only works with *MixW* multimode software (version 2.11 and higher), or version 1.8 *DigiPan* PSK31 software. However, a new driver has just been released that allows other programs to use the MixW RigExpert. The driver is available free of charge at **www.mixw.net/RigExpert/reaudio.html**.

You begin by popping the MixW RigExpert CD into your PC and connecting the RigExpert's USB cable to an available USB port. There is no need for a dc power cable; the RigExpert obtains its power from the USB port.

Within a few seconds *Windows* detects the MixW RigExpert and starts the driver installation wizard. A few mouse clicks later, the MixW RigExpert driver is good to go. It sets itself up as a "virtual COM port" (COM 4, in my case).

With the driver installed, I updated my *MixW* software to the most recent version and gave the RigExpert a try. The result was an immediate *MixW* error message. The message told me that *MixW* couldn't use COM 4 to control my Yaesu radio. With a little trial and error I discovered that you don't need to specify a COM port in *MixW* for rig control when you are using the RigExpert. You simply set the CAT (Computer-Aided Transceiver) port to "unspecified" and the RigExpert takes it from there.

I started *MixW* again, and was greeted with yet another error message. This time it declared that the RigExpert sound hardware was unavailable. The RigExpert's AC '97 chipset was communicating on the USB virtual COM 4, but the *MixW* software was looking for RigExpert sound hardware on COM *13*. Ah-hah! I opened the sound card dialog in *MixW*, selected COM 4 for RigExpert sound, and all was right with the world.

When I finally ironed out the software glitches, MixW RigExpert performed like a champ. I had a blast working PSK31, MFSK16, RTTY (it can do AFSK *and* FSK), SSTV and several other modes. I set up MixW RigExpert on my laptop and discovered that swapping between the desktop and laptop was a breeze. I simply unplugged the USB cable from the desktop PC and inserted it into the laptop. There was no need to use scarce COM port resources and their attendant cables. Best of all, the sound cards in both computers were free for other applications.

The MixW RigExpert has more than enough audio output to drive any transceiver. In fact, I had to carefully adjust the RigExpert output to avoid overdriving.

MixW RigExpert performed flawlessly as I switched from mode to mode. The only problem I noticed was some RFI on certain bands. The worst was a strong signal that spanned 10 kHz between about 14.095 and 14.105 MHz. I applied ferrite cores to the USB cable and the transceiver harness. They cured the RFI on all bands in short order.

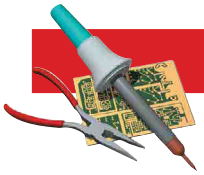
More to Come?

Is MixW RigExpert the vanguard of more Amateur Radio USB devices to come? I certainly hope so. The convenience of USB may attract more hams to digital operating and digital communication in general. (How about a software-defined radio with a USB interface?) To achieve a smooth implementation of USB, however, the Amateur Radio software in our computers will need to become "smarter." For instance, the hassles I endured with the *MixW* software wouldn't have happened if *MixW* had been able to detect the MixW RigExpert configuration and change its own settings to match.

MixW RigExpert is a fine start on the road to plug-and-play digital hamming. It is well crafted and performs beyond expectations. The companion CD is professionally executed—it supplies as much information as possible to lead you through the installation. The MixW RigExpert CD even includes *Linux* source code for savvy developers who want to create *Linux*-based applications for the RigExpert.

Distributed in North America by UZ Tech, 66 Cavell Ave, Etobicoke, ON M8V 1P2, Canada; **mixw@sympatico.net**; **www3.sympatico.ca/va3uz/uztech.html**. *RigExpert interface, $219. Generic transceiver cable set, $12; rig-specific pre-wired cables, $45.*

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



By Keith Austermiller, KB9STR

An RF Driven On-Air Indicator

A fun and useful accessory for the shack.

Ever wish you had a way to show others around your shack that you're on the air? Commercial radio and television stations have ON AIR signs. Your amateur station should have one as well. The sign could be used to promote Amateur Radio, dress up your station or prevent interruptions while making a long CW contact.

The ideal sign should light up at the presence of RF and turn off after the transmission has ended. The sign should work without having to be connected to the station's transmitter and work on all modes, including AM, FM, SSB and CW. The circuit built to do this also needs to be sensitive enough to work with a VHF handheld transceiver yet still be able to handle a high powered HF rig. With all these things in mind, I set out to design a circuit that would be as simple as possible to build and use readily available parts.

After reading "The No Fibbin' RF Field Strength Meter" in *QST*,[1] I was convinced this was the type of circuit I was looking for. Most field strength meter circuits use a diode detector feeding a sensitive microammeter. I got out my breadboard and began experimenting with some diodes taken out of an old CB radio. I keyed my handheld transceiver and noticed a very small current reading on my multimeter. Positioning the transceiver antenna closer to the circuit brought better results; I added a transistor to the circuit to drive a relay that would ultimately switch and light a 12 V dc lamp. This worked well, as long as the transceiver antenna was close to the circuit's detector.

Trying the same experiment using my HF rig on SSB yielded poor results. Lengthening the "antenna" to the diodes and wrapping it around the rig's feed line to try to increase the amount of RF seen by the detector still worked poorly. Things didn't seem too promising until I reread that article and realized that germanium diodes were used as detectors. The diodes I had been using were silicon, and were not as suitable for use as RF detectors. I decided to make another detector circuit, this time using 1N34A germanium diodes. The only problem was that I didn't have any in my parts junk box and none of the local electronic stores had any stock either. A mail-order supplier came to the rescue, and an order was placed.

In the meantime, I decided to look for a better amplifier circuit. I needed a way to get more gain than I was realizing in my previous circuit. Luckily, I came across an experiment in the "Hands-On Radio" series in the April 2003 issue of *QST* that had a good explanation of operational amplifier circuits.[3] The noninverting op-amp seemed to be perfect for my circuit. And, sure enough, a detector circuit designed around germanium diodes with an op-amp gave great results with SSB, CW and FM. The handheld transceiver now no longer had to be right next to the detector to activate it and the circuit also worked well with an HF rig.

The final circuit is shown in Figure 1. RF enters through the antenna, which can be as simple as a piece of wire. The germanium diodes D1 and D2 and capacitors C1 and C2 make up a voltage-doubling detector circuit. The output voltage from the diodes is fed to op-amp U1, an LM324. U1 needs only a single-ended power supply. R1 adjusts the amount of voltage fed to the op-amp and serves as an RF sensitivity control. Resistors R2 and R3 determine the amplifier voltage gain which, in this case, is about 50. The output from the op-amp is fed to Q1 and Q2,

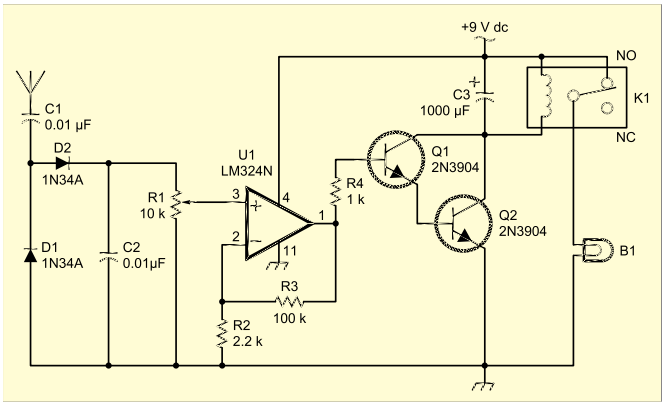


Figure 1—The schematic and parts list for the on-air indicator. (RS=RadioShack, www.radioshack.com; M=Mouser Electronics, www.mouser.com.)

C1, C2—0.01 µF capacitor (RS 272-131).
C3—1000 µF, 35 V (RS 272-1019).
D1, D2—1N34A germanium diode (M 526-1N34A) (see Note 2).
K1—SPDT relay, 12 V, 30 mA, 400 Ω coil (RS 275-248).
Q1, Q2—2N3904 transistor (RS 276-1617).
R1—10 kΩ potentiometer (RS 271-282).
R2—2200 Ω resistor (RS 271-1121).
R3—100 kΩ resistor (RS 271-1131).
R4—1000 Ω resistor (RS 271-1118).
U1—LM324N operational amplifier (RS 276-1711).
Misc
9 V dc, 1 A ac/dc adapter (RS 273-1771).
B1—Automotive side marker lamp (see text).
Wood, Lucite and plastic stock for housing (see text).

[1]Notes appear on page 57.

KEITH AUSTERMILLER, KB9STR

Figure 2—The on-air sign installed in the author's shack. Note the RF sense antenna at the top left.

which are configured as a Darlington pair. The Darlington ensures that the op-amp load impedance is relatively high and also that the current gain of the relay driver is high.

When the transistor pair is driven high, Q2 allows current through its collector to energize the relay coil, switching on the incandescent lamp or lamps. I used 12 V dc automotive lamps in my circuit. A turn signal or side-marker lamp found at any auto parts store works fine. Depending on the size of the sign and how brightly you want to illuminate it, more than one incandescent lamp can be used. Additional lamps may be added in parallel to the existing lamp; just make sure the power supply can source the additional current required. A holding capacitor, C3, is used to keep the relay coil energized during SSB and CW use. Otherwise the ON AIR sign would be flashing on while you are sending code or speaking. An additional 1000 µF capacitor can be paralleled with C3 to lengthen the hold time. To power the circuit I used a 9 V ac to dc wall adapter capable of supplying at least 1 A. You will need to ensure it can supply enough current for the number of lamps used. The entire circuit can be easily built on a small piece of perf board.

After the circuit is completed, all that's left is to find a suitable enclosure. The enclosure needs to be able to house the circuit and make a suitable sign. A shadow box or a deep picture frame would work nicely. I came across a large digital clock that was no longer working and used it for my enclosure. A red piece of plastic, Plexiglas or Lucite may be used as a lens for the front of your sign. This will disguise the circuitry inside the sign when it lights. Find a piece of dark-colored poster board, stencil it and cut out the words "ON AIR." This will allow the light to shine only through the letters and the red lens. Figure 2 shows the sign prominently positioned in my shack.

Operation is pretty simple. First, double-check all the connections and polarity. Place the circuit's antenna near your transmitter's feed line and apply power. The sign should light when you key the transmitter on AM, FM or CW. Because it is RF driven, however, the sign will not light on SSB until you begin speaking. If the circuit doesn't detect RF at first, try moving its antenna to another location. Some adjustment of R1 may be necessary to provide enough input to the amplifier.

This is a fun project that is sure to enhance operation for you and for visitors to the station. It's a good RF indicator for the transmitter and it adds a personal touch that's sure to illuminate your shack.

Notes

[1]J. D. Noakes, VE7NI, "The No Fibbin' RF Field Strength Meter," *QST*, Aug 2002, pp 28-29.

[2]The 1N34A diode is available from several sources including: Mouser Electronics, 1000 N Main, Mansfield, TX 76063; 800-346-6873; **www.mouser.com**, Ocean State Electronics, PO Box 1458, 6 Industrial Dr, Westerly, RI 02891; 800-866-6626; **www.oselectronics.com**, Circuit Specialists, 220 S Country Club Dr #2, Mesa, AZ 85210; 800-528-1417; **www.circuitspecialists.com**.

[3]H. Ward Silver, NØAX, "Hands-On Radio, Experiment #3—Basic Operational Amplifiers," *QST*, Apr 2003, pp 63-64.

Keith Austermiller, KB9STR, was first licensed in 1998 and received his Extra Class license and an FCC General Radiotelephone license in 2000. Keith develops software for cellular phones, pagers and PDA devices. Ham radio is in the family; his dad is KB9STQ. Keith has an Associate's degree in electronics from Indiana Vocational Technical College. You can reach him at 141 Lewis Dr, Mooresville, IN 46158; **kb9str@arrl.net**.

NEW PRODUCTS

YO-YO-VEE PORTABLE DIPOLE

◊ DWM Communication has announced their Yo-Yo-Vee line of portable dipoles. These antennas consist of a center insulator with SO-239 coaxial cable connector terminating one, two or three roll-up dipoles. Each dipole can cover any frequency from 40 meters to 2 meters depending on how much wire is rolled out. A single vertical center support, a run of coax and a pair of attachment points will thus provide operation on one or more bands for vacation or emergency use. Instructions are included, along with tips on inexpensive portable center supports. The Yo-Yo-Vee single band version is priced at $40, the Yo-Yo-Vee Model 4 two band parallel dipole is $50 and the three dipole Yo-Yo-Vee Model 6 is $60. For more information see **qth.com/dwm,** or contact DWM at PO Box 87 Hanover, MI 49241; tel 517-563-2613.

ANTENNA ARRAYS, ROTATORS FROM ARRAY SOLUTIONS

◊ Array solutions has announced five new antennas in their OptiBeam series ranging from the flagship of their line, the OB17-4, with 17 elements on 40, 20, 15 and 10 meters through the OB10-3W, 10 element triband Yagi for 20, 17 and 15 meters. They have also added to their heavy duty Pro.Sis.Tel rotator line with units said to provide higher torque through the use of new 12 and 42 V dc motors. The controller allows programming and calibration via the RS232 port of a PC.

These and other antenna, phasing, tower and control systems can be examined at **www.arraysolutions.com** or call 972-203-2008.

Experiment #19: Current Sources

You may be familiar with the voltage source—a power source that maintains a constant voltage regardless of the current drawn—but its cousin, the current source, is nearly unknown. The current source is a mighty handy tool to have in your designer's toolbox and can be constructed in a number of different ways.

Terms to Learn

- *Compliance*—the range of output voltages over which a current source can maintain constant current.
- *Current-voltage characteristics*—a graph showing all of the combinations of voltage and current a power source can produce.
- *Internal impedance*—the power consuming elements inside a power source, usually shown as a single, equivalent resistance.

Background

Voltage and current sources are the twin power sources of electronics. Batteries and power supplies do a credible imitation of an ideal voltage source. They deliver nearly constant voltage over a wide range of load currents. The current source that delivers a constant current independent of output voltage isn't used to power equipment but is, nevertheless, quite common. Current sources are found in battery chargers, transistor bias and load circuits, and resistance meters, to name just three uses. We'll learn how to make a current source with a transistor, an op-amp or a voltage regulator, and I'll explain one of my favorite circuits, the current mirror.

Current-Voltage Characteristics

Practical power sources have limits: They can only supply so many watts, volts or amps. Figure 1 shows the *current-voltage characteristics* of ideal (dashed line) and real (red line) voltage (VS) and current sources (CS). An *ideal* voltage source's output voltage, V_S, is the same at any current, whereas a real source's internal impedance, Z_{INT}, causes a voltage drop that gets bigger with current ($V_O = V_S - I_O \times Z_{INT}$). The sloping red line, shown in Figure 1, gets farther from V_S as current increases. Power supplies usually also have a maximum current, I_{LIMIT}, at which they either shut down or blow up!

The ideal current source's internal impedance is infinite—it pumps out the same current no matter what the resulting output voltage has to be. For a real current source, as output voltage rises, more and more current flows through Z_{INT}, as shown by the sloping red line of Figure 1 labeled CS_{REAL}, leaving less for the load until the voltage limit is reached.

You'll never see the most common use for current sources—biasing transistors in analog ICs. This is an important function, as we saw in Experiments #1 and #2. You might use a current source every time you sit down at your workbench. Voltmeters send a known current through an unknown resistance and measure the resulting voltage, using Ohm's Law to calculate the resistance. Current sources are also used for battery charging where a constant current is required for trickle charging. Current sources—they're everywhere!

A Single Transistor Current Source

Figure 2A shows how a single PNP transistor can be wired to provide a relatively constant current. Because collector current (the load current) equals $I_B \times \beta$, the load current can be set with a single resistor, R. Base voltage equals $V_{CC} - V_{EB}$ (assumed to be 0.7 V), so $I_B = (V_{CC} - 0.7) / R$. Load current is also dependent

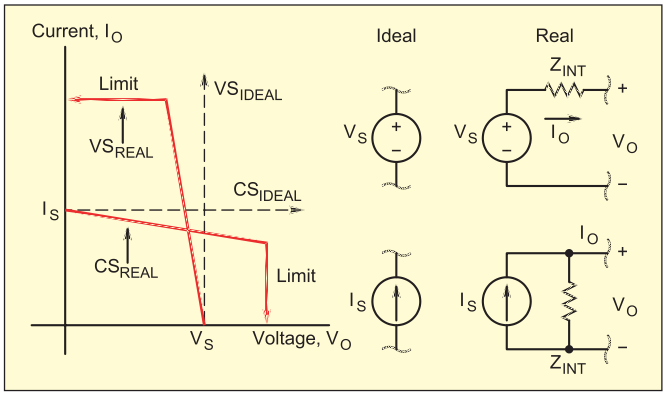


Figure 1—The current-voltage characteristics of ideal (dashed) and practical (red) voltage and current sources. The symbols and equivalent circuits for the sources are shown to the right.

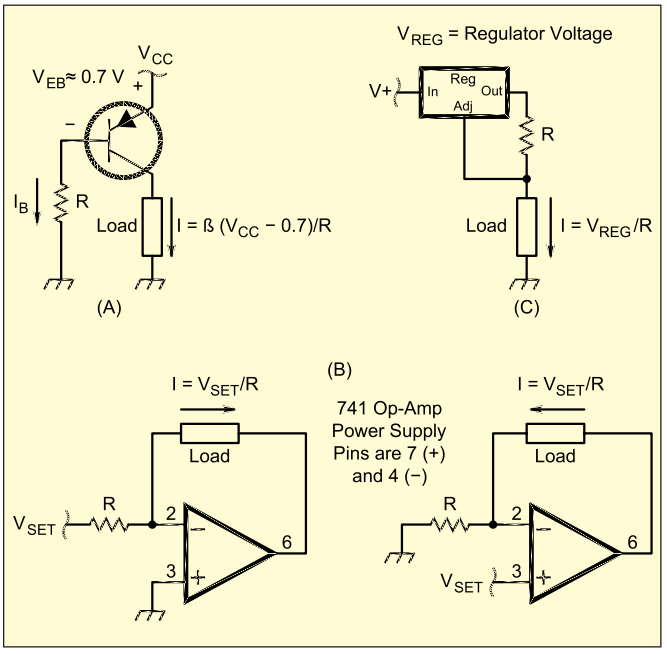


Figure 2—Three current source circuits. A single resistor sets the current for all three circuits. The circuit in A is quite dependent on V_{cc}, but those in B and C offer excellent current regulation.

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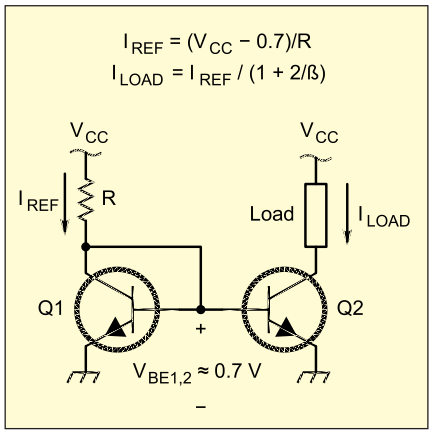


Figure 3—The current mirror's collector currents are matched by making V_{BE} the same value in both transistors.

on V_{CC}, so a well-regulated supply must be used for this circuit.

Measure your transistor's beta if you can; otherwise, assume a value of 200 and we'll recalculate it. Let's design for a load current of 5 mA using a 12 V power supply. From the equation for I_B,

$R = \beta (V_{CC} - 0.7) / 5\text{ mA} = 452\text{ k}\Omega$ (for $\beta = 200$)

Use a value of 470 kΩ and build the circuit with a 1 kΩ load resistor. Measure current through the load resistor by either connecting your meter in series with it (remember to switch the leads to the current terminals) or by measuring voltage across it and using Ohm's Law.

If you assumed a value of 200 for β, load current is probably not exactly 5 mA. The actual value of beta can be calculated, using your measured base resistance and load current:

$\beta = I_{LOAD} R / (V_{CC} - 0.7)$

Vary the load resistance and make a graph of load current and voltage. Raise the load resistance until the voltage across it limits near V_{CC}. You can even short-circuit the load and the transistor will still put out only 5 mA!

Building a Floating Current Source

Sometimes, the load may not be grounded and that's when a *floating* current source is required, such as for a voltmeter. Figure 2B shows how to make such a current source by using an op-amp. The key is to remember that the high-gain of the op-amp forces the voltage at both the non-inverting (+) and inverting (–) terminals to be almost exactly the same, while allowing very little current to flow into its input pins.

In the right-hand circuit, the op-amp forces the voltage at pin 2 to V_{SET}. By Ohm's Law, the current through R must be V_{SET} / R. Because no current flows into the op-amp's inverting input, the same current must flow in the load. The op-amp raises its output voltage until load current just balances the current through R. Both terminals of the load are thus above ground potential.

In the left-hand circuit, current is balanced through the load in the other direction. The input current is V_{SET} / R. The op-amp lowers its output voltage until the load current balances the input current. This leaves one terminal of the load at ground potential (not grounded, just kept equal to ground) and the other at a negative voltage, requiring a ±12 V supply for this circuit.

When you build these circuits, V_{SET} can be generated by a second power supply (be sure to connect the power supply common connections together) or by a battery. Aim, once again, for 5 mA of load current. Measure V_{SET} and divide by 5 mA to get R, using the closest standard value. Confirm that both op-amp inputs are at the same voltage. Measure load current with a meter in series with the load or by measuring the load voltage and using Ohm's Law. If you can vary V_{SET} or R, observe the effect on load current. Don't reduce R so much that it or the load dissipate too much power: $P = V_{SET}^2 / R$. Vary the load resistance, including an open and a short circuit, to see what happens.

Using a Voltage Regulator

A common three-terminal regulator can be tricked into putting out constant current instead of constant voltage! The regulator does its best to maintain a fixed voltage between its output and ground terminals. When a fixed-value resistor is connected between them, the current through the resistor is constant, as shown in Figure 2C. The regulator's ground terminal draws little current, so the current flows through the load, regardless of what the load voltage is.

The 7805 is a good choice for regulator-based current sources; it handles high current and is easy to attach to a heat sink. The only caveat is that the current set resistor, R, must be able to dissipate $(I_{LOAD}^2 R)$ W. If 5 mA is the desired load current, R must be 5 V / 5 mA = 1 kΩ. The regulator will dissipate power equal to the load current times the voltage between its input and output pins. If you are using a 12 V supply, at 5 mA load current, the regulator dissipates $(12 - 5) \times 5$ mA = 35 mW. Try various values of R and load resistance, again trying the open and short circuits.

The Current Mirror

The circuit in Figure 3 can throw you for a loop with Q1's base and collector shorted together. This is the current mirror, so named because the collector current of Q2 mirrors that in Q1. The current mirror is used when the reference current must be kept separate from the load current or when more than one load current must be controlled by a single reference current.

Current mirrors work because of the bipolar transistor's property that matched transistors with the same base-to-emitter voltage will have the same collector currents. Since the bases and emitters are connected together, V_{BE} must be the same. Matching two transistors means that they usually are made of the same materials, have equal current gains (β) and operate at the same temperature. This is the usual case inside an IC or in a multiple-transistor package such as the MPQ2222—four 2N2222 transistors in a 16 pin DIP package.

Build the current mirror by using a pair of 2N3904 transistors (or an MPQ2222). If you can measure β, pick a pair of transistors with β within a few percent of each other. Set I_{REF} to 5 mA by calculating the value for $R = (V_{CC} - 0.7) / 5$ mA. With a 1 kΩ load, verify that I_{LOAD} is close to 5 mA. Vary R to change I_{REF} while observing load current, and vary the load resistance while monitoring I_{LOAD}.

Suggested Reading

The Art of Electronics, by Horowitz and Hill, includes extensive material on current sources and current mirrors, including a number of variations on the mirror. A good on-line discussion can be found at **www.4qdtec.com/csm.html**.

Shopping List

- MPS2907 or 2N3906 PNP transistor (RadioShack 276-2023 or 276-1604).
- 2N3904 NPN transistor (RadioShack 276-2016).
- 741 operational amplifier (RadioShack 276-007).
- 7805 voltage regulator (RadioShack 276-1770).
- Various values of 1/4 W resistors.

Next Month

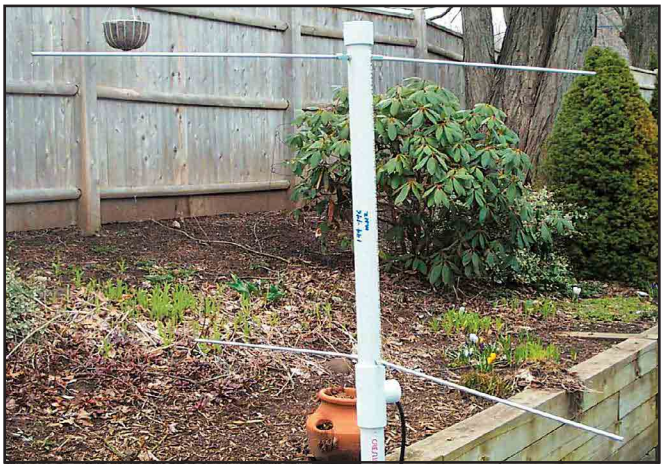
In September, we're going to meet the DA. Not the district attorney—the differential amplifier—a key element of the op-amp. You'll also learn about common-mode signals and the DA's ability to reject them. See you next month!

QHTenna 2 Meter and 70 cm Turnstiles

The turnstile antenna is an old favorite for VHF and UHF work. In its simplest form, a turnstile consists of two dipoles mounted at right angles to each other and fed 90° out of phase. The result is a horizontally polarized omnidirectional radiation pattern without an overhead *null*. A null is a sharp decrease in gain (nearly to zero in some instances), which is not a good thing when the object of your desire is a satellite. Turnstile antennas are also good for terrestrial use when your goal is a smooth omnidirectional pattern (net operation comes to mind).

Turnstile antennas can be somewhat tricky to design. To achieve the proper pattern, along with an impedance to match your coaxial cable, the $^1/_4$-wavelength phasing line that connects the two dipoles must be trimmed to a specific length according to the velocity factor of the coax used in the making of the line itself. The dipoles must be cut to the proper length and mounted so that they are not in contact with each other.

Lyle Dysinger, N4QH, has designed a line of turnstile antennas with models that span 6 meters to 70 cm. His QHTenna turnstiles offer an affordable alternative for satellite and terrestrial operating. Each antenna is rated at 400 W. For this review, we chose the 2-meter and 70-cm models.



The 2-meter QHTenna turnstile.

The 70-cm QHTenna turnstile.

Assembly and Testing

The QHTennas are crafted from Schedule 40 PVC tubes and $^3/_{16}$-inch machined aluminum rods. When you open the shipping box, it looks more like a package from Home Depot than an Amateur Radio antenna.

The phasing line is already installed inside the PVC tube, connected at either end to bolts and nuts that protrude through the tube wall. To attach the rods that comprise the dipole elements, you need to remove the nuts, reverse the bolts (so that the threaded ends face outward) and reapply the nuts. The rods then screw onto the exposed bolt threads.

The only difficult part of this operation is making sure the bolts pass back through the lugs that attach to the phasing line. In addition, you'll need to attach the center conductor and shield of your coaxial cable to the bottom set of bolts. I accomplished this by soldering lugs to my coax, then slipping the lugs onto the bolts.

With the coax in place and the elements attached, you seal the top of the tube with the PVC cap supplied. The bottom is open, so you need to use a PVC coupler or some other means to attach the antenna to the mast of your choice. I used a PVC "T" that allowed me to thread the coax out the side while coupling the bottom of the "T" to a PVC mast for testing. I managed to assemble both antennas in about 20 minutes.

Test results were impressive. With both QHTennas in place, I had consistently good reports working through the OSCAR 27 and 29 satellites. As the birds cruised overhead, I noticed only minimal signal dropouts—nothing compared to the wild up-and-down results I achieved while using a vertically polarized groundplane. The consistent downlink signals were also a big advantage when copying the NOAA weather satellites using the 2-meter QHTenna turnstile.

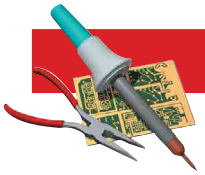
On 2 meters, the QHTenna turnstile exhibited a 1.3:1 SWR throughout the band. On 70 cm, the lowest SWR was 1.4:1 at 440 MHz, rising to 2:1 at the band edges.

Nothing Fancy, But...

QHTenna turnstiles are not slick, mass-produced products. When you take them out of the box, you might be tempted to say, "Hey, I could have built this just by taking a trip to the hardware store." Of course, you'd be right, but you could also make the same statement about nearly any antenna. In the case of the QHTenna turnstiles, what you're buying is Lyle's time and expertise to cut the phasing line to just the right length, trim and machine the dipole elements, assemble and test the antenna and so on. Considering the cost and performance, QHTenna turnstiles are a good value.

Manufacturer: QHtenna, 275 Davis School Rd, Martin, GA 30557; tel 706-356-2662; **www.qth.com/qhtenna/**. *2-meter turnstile: $29.95; 70-cm turnstile: $19.95.* QST

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



By Bob Shrader, W6BNB

Fun With QSK

Try spicing up your next CW contact with a little QSK. It's like VOX for CW—only better.

We tend to think of a CW conversation as an exchange of little monologues. First I "speak," sending various comments. Then you comment on my comments, send more information and so on. Back and forth it goes, each transmission being several minutes in length.

But a friendly face-to-face chat wouldn't normally proceed that way. Casual conversations flow with bursts of thought, fragments of sentences and occasional interruptions. We already do this with VOX on SSB. Is such a thing possible with CW?

Whenever you are using CW, and if your rig is capable of shifting rapidly from transmit to receive and back again, here is something to try. Set up your equipment so it is capable of "full break-in" operation—so you can hear signals in between the dits and dahs you are sending. Then try using the Q signal "QSK" when you call CQ. QSK means, "I can hear you in between my dots and dashes." If QSK is followed by a question mark as "QSK?" it means, "Can you hear me in between your dots and dashes?"

When you hook up with another full break-in station, the result will be a conversation where the exchanges are brief—short sentences or even just a word or two. One station may even interrupt the other in mid-sentence to insert a quick comment. The QSK "dance" is as close as you can get to a face-to-face using CW. It is also quite fun!

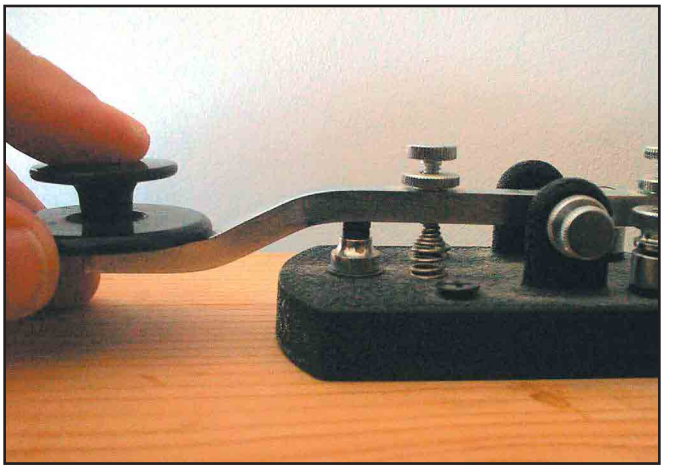
Seeking a QSK Chat

Try sending a group of three to five CQs, then DE, then your call sign once, followed by $\overline{\text{BK}}$. (Be sure to space at least a half-second between your call sign and the QSK.) After about a second, send another similar group of CQs-call sign-$\overline{\text{BK}}$. Continue this calling until you hear someone drop his or her call sign between the characters you are sending. If you hear a breaking signal, immediately send DE and your call sign at least twice, followed by K, which tells the other person to start transmitting.

On a relatively dead band, it may take several complete series of CQs-call-$\overline{\text{BK}}$ before someone tunes across your frequency and hears you. I have had answers on the first CQ sent, and I have sent a dozen groups with no breakers. By leaving only 5 or 6 seconds between strings of CQs, you stand a good chance of being heard by someone who happens to be tuning slowly across the band.

Tips and Techniques

For good QSK operation set your receiver to fast AGC, RF gain at maximum and adjust the controls for "full break-in" operation—assuming your rig allows you to adjust AGC, break-in, etc. For best QSK you want to minimize the transmit/receive delay. With some transceivers, a specific control or menu function allows you to reduce the delay to nearly zero. Consult your manual.



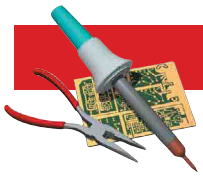
If your transceiver doesn't allow you to make these adjustments, try QSK anyway. At its fastest VOX setting, your transmit/receive switching may still be up to the task.

When operating QSK, you'll know right away if another station begins interfering because you'll hear the interference between your dits and dahs. Your partner's signal should be within a few hertz of your frequency if you are communicating properly. Stations operating a few hundred hertz apart are taking up two places on the band, instead of one. During "normal" CW conversations, while you are sending on one frequency, the other frequency is not being used and is just sitting there inviting someone to operate on it. With QSK, both frequencies are occupied most of the time. This tends to discourage interlopers.

If a station you are working suddenly wants to break in to tell you something, all he has to do is hold his key down for 1 second. When you hear such a break signal, stop and immediately send "di-dit" and listen for his transmission.

Many amateurs consider QSK to be the only way to fly on CW. Try it and you may agree!

You can contact the author at 11911 Barnett Valley Rd, Sebastopol, CA 95472-9264; **w6bnb@aol.com**.



HINTS & KINKS

A NOVEL MICROPHONE HOLDER

◊ I recently installed a new dual-band rig in my truck. Not desiring to drill a series of holes to mount the microphone holder, I contented myself with simply laying the microphone in the vehicle's cup holder. This proved not totally satisfactory, and I began searching for a "no-holes" method to mount the microphone. The first thing I tried was commercial Velcro. This didn't stick and I was back to the cup holder. A few weeks later, I spotted a product in a local discount store called *Phone-On-Hold* (see Figure 1). This is simply a powerful magnet mounted to the dash with 3M foam tape. I installed this after cleaning the dash area with alcohol, as instructed. It appears to be very powerful and can easily hold a cellular telephone, as shown on its package.

In order to mount the microphone, I removed the holder button and replaced it with two $^5/_8$ inch fender washers. Unlike standard washers, these have very small holes. I countersunk the hole on the outside washer. After removing the standard holder button, I installed the two washers over the opening by using the same screw that originally held the holder. I placed the countersunk washer to the outside, so that the screw would draw up tight and flush with the washers.

This arrangement works well and might be of some benefit to others looking for a way to mount a microphone neatly and securely without drilling holes. Should the washer modification not be possible, the device does come with a small ferrous metal strip that could be mounted to the microphone.—*William D. Cleveland, WD5IBY, 501 E Adoue, Baytown, TX 77520*

Figure 1—The "Phone-On-Hold" magnetic holder. While designed for cell phone use, it's ideal for microphone stowage.

QUICK AND EASY CIRCUIT BOARD PREPARATION

◊ For the past 30 years, I've been making printed circuit boards using a method that is both simple and inexpensive, although it is only suitable for a few boards. It's very simple and works beautifully every time. There's no need for computers or programs. I've never seen anyone else use this method (at least in print). A quick step-by-step description follows:

1) Make a 1:1 scale drawing of the board.
2) Photocopy the scale drawing.
3) Cut the PC board to size.
4) Coat the PC board with a thin coat of rubber glue.
5) Cut out the photocopy, which should fit the PC board, and coat it with rubber glue. Wait for both the PC board and photocopy to dry.
6) Carefully place the photocopy on the PC board copper and rub it down.
7) Using a hobby knife, cut out the tracings. Even unsteady hands become steady because the knife is always on the paper.
8) Peel the cut tracings off.
9) Rub off the excess dried rubber glue.
10) Coat the exposed copper with fingernail polish. I use red because it's easy to see.
11) Peel off the rest of the photocopy paper.
12) Etch!

I've been able to make dozens of boards using this method with no mistakes and no badly etched boards. Lines as close as 1 millimeter can be accommodated.

Try it and you'll see that it's simple, easy, and costs little, particularly when you keep the rubber glue. I've used it for all varieties of circuitry.—*Jack Thomas, 3008 Westfield Ave, Baltimore, MD 21214*

INSTALLING GROUND RODS—THE EASY WAY

◊ In all of the instructions I've seen on how to "drive" a ground rod, usually the easiest way to get it in at least $^3/_4$ of the way is left out—you simply push or pump it in. Assuming that the ground is not rock or frozen, put some water on the spot that you want the ground rod to go into. Then start pumping the rod up and down like you are churning butter and continue to add water slowly to the spot. A trickling water hose is best. Keep pumping the rod up and down easily and slowly. You should be able to get it down almost $^3/_4$ of the way or more. What little you have left to drive in the conventional way (a sledge hammer) very seldom flattens the top of the rod. Fancy devices are not required. I spent a summer putting in ground rods for Memphis Light, Gas and Water and was quite successful. I just assumed everyone did it that way.—*Stewart Nelson, KD5LBE, 8 Deerwood Dr, Morrilton, AR 72110*

A QUIET FAN

◊ I always objected to the high noise level from the cooling fan inside my Kenwood TS-570. I decided to position a small, external 12 V dc fan, pointed at the heat sink on the back panel of the transceiver. When connected to 12 V dc, however, the little

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fan screamed at a level nearly as obnoxious as the internal fan.

In my junk box, I found an old "wall wart," a dc power supply originally intended to be a battery charger for a Black & Decker electric drill. It is rated to deliver 7.5 V dc at 400 mA with a supply voltage of 120 V ac. The 7.5 V drives the little fan at a lesser RPM than it would run on 12 V, but it still puts out lots of air.

The wall wart case runs cool to the touch and provides enough cooling air on the transceiver heat sink that the internal fan never comes on. I power the wall wart from the same power strip that supplies ac to my transceiver power supply, so the fan runs whenever the rig has power.—*Steve Swaim, W5LXG, 219 La Costa Dr, Montgomery, TX 77356*

A MICROPHONE A-B SWITCH

◊ When I first connected my new headset with its boom microphone to my ICOM 706 MKIIG, I had to disconnect my ICOM SM-20 desk mic. Both microphones have 8 pin round connectors, so I have an ICOM OPC-589 adapter cable to interface them with the modular connector on the radio. I purchased the headset for DX work and continue to use the desk microphone for ragchewing and casual contacts. I did not want to spend $35 for another adapter, or play with cables and connectors when I wanted to switch from one mic to the other.

Figure 2—The data port switch configured as an A-B microphone switch. A front view.

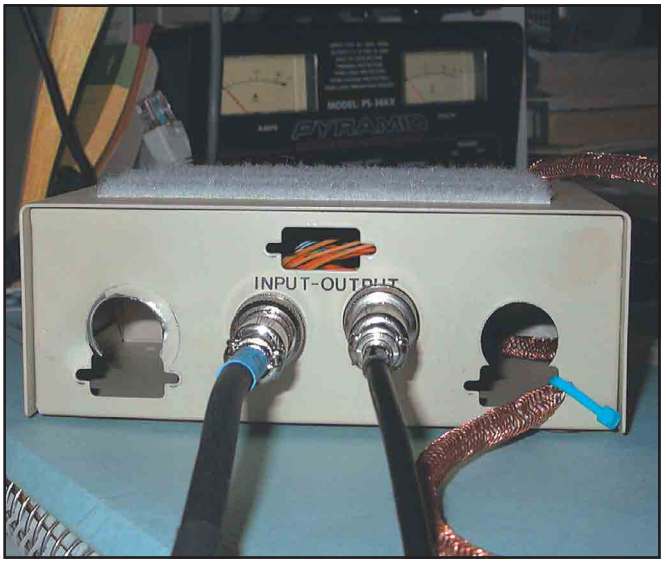

Figure 3—The rear of the data port switch. Both microphone inputs and an output cable can be seen.

What I really wanted was a microphone A-B switch. A search for one made it clear that I would have to build it myself. I determined that I would need an 8 pole, double throw switch, a couple of 8 pin mic connectors, a cable with a modular RJ45 connector and an enclosure. I looked around the shack to see what I already had and what I needed to buy.

I found an old 2 position computer serial port data switch with two 9 pin D-type connectors on it taking up space on a shelf. That provided me with the switch and the enclosure. I also found half of a computer network jumper cable with an RJ45 connector still on it, left over from another project. I even came across an 8 pin round microphone connector. So, all I needed to buy was another mic connector.

There is plenty of real estate on the back flange of the data port switch box to accommodate a couple of microphone connectors. Indeed, enough room, so that when I punched holes slightly too big for the connectors, I had plenty of extra room to try again!

The switch already had perfectly cut, stripped and tinned wires that I reused. I did remove the leads that went to the input/output connector and replaced them with the open end of the network cable. I also removed the A and B D-connectors and reused the wires on the microphone connectors. The result of my efforts is shown in Figures 2 and 3.

I learned by trial and error that mapping of the round and modular connector pins was necessary. I could not find the pinout on the Internet, which forced me to look at my radio and microphone instructions. Each provided me with their respective pinouts, which I mapped to each other.

This was a simple, low cost project that makes switching microphones very convenient.—*Howard S. Robins, W1HSR, 380 Hitchcock Rd, Waterbury, CT 06705*

BE CAREFUL AROUND TV RECEIVER SCREENS

◊ We have an entertainment center cabinet in our family room that holds assorted equipment, including a VCR and a TV receiver. Our VCR has both rear and front panel video/audio connectors and is located directly above the TV receiver. We take home movies with our video camera that we eventually transfer over to standard VHS tapes by using a patch cable between the video camera and the VCR. I previously used the front panel input to the VCR, leaving the cable plugged into the VCR all the time. I stored the rest of the cable beside the VCR when not in use.

One time, the cable end that plugs into the camera fell down and touched the TV screen cathode ray tube (CRT). Apparently the HV static discharge on the CRT faceplate was enough to destroy the input stage of the VCR. It no longer worked! Luckily we had a rear input to use. I still leave the cable plugged into the rear of the VCR but it exits out the rear of the entertainment center and is short enough that it cannot possibly touch the TV screen. A word to the wise: Don't let any of your equipment cables touch the front of an operating TV CRT screen as that CRT HV charge could damage the sensitive input circuitry of a handheld transceiver, microphone or data port.—*Jim Kocsis, WA9PYH, 53180 Flicker Ln, South Bend, IN 46637*

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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-7800 HF and 6 Meter Transceiver

Joel R. Hallas, W1ZR
Assistant Technical Editor

The ICOM IC-7800 has been the subject of much speculation and discussion since it was announced at the 2003 Dayton Hamvention. This radio fills the spot at the top of ICOM's Amateur Radio lineup formerly held by the now aging IC-781. In our view the somewhat larger and heavier than usual enclosure contains more than just a *radio*. Included are a 200 W HF and 6 meter multimode transceiver, power supply, antenna tuner, RTTY and PSK31 transmit and receive terminal units, and *two* DSP-based high performance receivers. These are all coupled with a multifunction automated display and control system presented on a 7 inch color TFT display.

In consideration of the multiple facets, we brought together a team of reviewers to push at the edges of multiple performance envelopes of the IC-7800. Overall performance specifications have been first measured and recorded by ARRL Lab Engineer Michael Tracy, KC1SX. The receiver performance and system operability in a harsh environment have been evaluated by Dave Patton, NN1N, a top contester. Digital mode performance has been checked out by Steve Ford, WB8IMY, and the 6 meter capabilities have been evaluated by 6 meter aficionado Dennis Motschenbacher, K7BV. Each of these "specialists" has described their experiences to give you an indication of how the equipment performs in their specialized environments.

First Impressions

On first impression this radio stands out from the crowd in a number of respects. First there's the price, more in the neighborhood of a compact car than typical ham equipment. Next there's the size and weight—this is a large and heavy radio that won't be confused with the recent trend toward pocket-sized models. Then there's the display, a knockout of color and information a step beyond other ham radio transceivers.

Perhaps the second impression is even more stunning. ICOM has made an attempt to set a new level of performance and offer features well beyond those of other radios. In the area of performance, ICOM has set a new standard in the important dynamic range area. In the feature department, ICOM has included almost every operating mode and convenience imaginable.

Getting a Grip On It

This is a serious radio, at 55 pounds, it outweighs its predecessor by 4 pounds. The manual recommends using two people to move it, and that might be a good idea, especially if you have tight corners. Fortunately a pair of easily removable heavy cast combination handles and rack mounts are provided that make moving it somewhat easier, although they made me wish it could be put it down on its back panel without breaking connectors. It also takes up some serious space, although considering all that's included in the single box it is a reasonable implementation. I put it in my shack in place of my full-size transceiver and had to move neighbor equipment to make space. One nice feature: This radio doesn't slide when you push a button or plug in the phones!

So What Does it Do?

What *doesn't* it do might be easier to answer.

That Display!

I mentioned the stunning display as a major contributor to first impressions. Its beauty is a lot more than skin deep and is well worth a detailed look. ICOM has dedicated one of the four DSP chips to display functions, and it pays off, as shown in Figure 1. What caught almost every observer's eye early on was the ICOM implementation of virtual D'Arsonval moving coil meters. We've all seen the various attempts at metering on display screens, going from the group of dashes to meter shaped curved display elements. You wouldn't confuse any of these with a real meter, although it can be argued that for many functions they are adequate.

ICOM spent a long time studying and emulating the ballistics of a moving coil meter with the result that you almost can't tell that their meters aren't real. Only by looking from the side and realizing that there isn't any space between the "needle" and the scale do you understand that you're not seeing what you thought. According to ICOM, this is not just a matter of vanity. They are preparing for the time when mechanical meters will no longer be available. There is another advantage—meters are often the most fragile part of a radio and you'll never bend this needle around the pin! If you don't like the pair of large "meters" provided, you can select narrow edge type or bar meters instead (Figure 2).

Other display functions are notable. The fully functional real-time spectrum scope can be set to work on either receiver, so you can monitor activity on 10 meters while you work 20, for example. The spectrum width can be adjusted and the display can stay fixed or track your tuning. In either case cursors show you where you are on each receiver, if within range. The transmitted spectrum can be monitored as well. Menu selections are not just in text, but in many cases also show the shape of what you are adjusting.

If you find the 7 inch display too small, perhaps due to vision limitations, or if you

Bottom Line

ICOM delivers its entry into the top of the line transceiver sweepstakes with a radio that seems to do it all.

Joel R. Hallas, W1ZR ♦ Assistant Technical Editor ♦ w1zr@arrl.org

Figure 1—The normal IC-7800 display showing the emulated D'Arsonval meters above the spectrum scope.

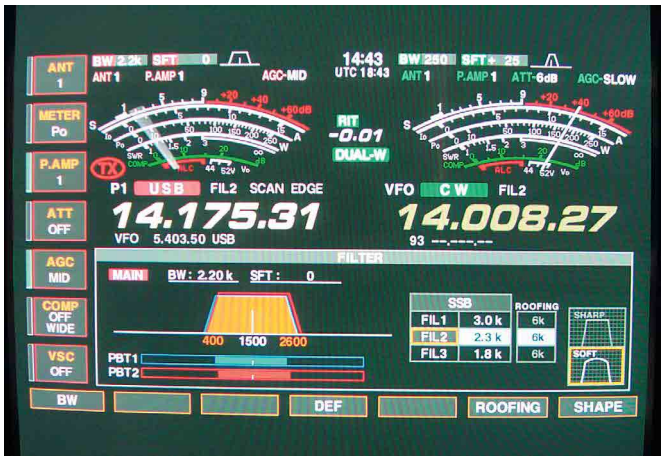


Figure 3—The graphical menu for setting preferred bandwidths for the DSP IF filters.

want to demonstrate to multiple users—or even if you just want to watch band conditions from across the room—there's a jack on the back for a standard computer monitor hookup. When the monitor is connected, the standard display still functions, so you can use both. I found that this worked well for the screen photos for this article, for example.

Receivers

This radio includes two identical fully competent receivers, each with a dedicated 32 bit DSP covering 30 kHz to 60 MHz. ICOM says that the design objectives of this receiver were to improve upon the state of the art. Our measurements confirm this in most respects. The important third-order intercept, a measure of dynamic range, came out better than we have seen at +37 dBm, close to ICOM's advertised 40 dBm (10 W!). We must confess that if there's much more improvement in this area it will become hard to verify with our current Lab equipment.

The two-tone third-order IMD, an indication of the capability to receive a weak signal near a strong one, was measured at 98 dB at 14.1 MHz with 20 kHz spacing and a respectable but not quite the best we've seen of 89 dB at 5 kHz spacing. Again, this data is representative of both receivers in or outside of the ham bands. We show the 20 kHz blocking dynamic range noise limited at an astounding 139 dB, among the best we've seen.

The receivers are completely independent, so each can be tuned to any frequency within the range and each can be set to the same or different antenna ports (four are available). There are speaker outputs for each channel, and with stereo headphones or speakers you can have one receiver pointed at each ear if you wish. Each has its own S-meter, so you can watch signal strength and switch between receivers as

Figure 2—Selecting the edge-view metering for variety (no you can't have one of each!).

appropriate, providing a kind of manually switched diversity, if your ears don't work well independently. Alternately, the audio can be combined with their separate audio gain controls into a single channel in phones or speakers. The internal speaker is an acoustic suspension unit that works very well.

Most receiver parameters can be set up to your liking using set and forget menus. Following your customization, selection is generally made using just the primary knobs and buttons. For example, receive selectivity can be preset for three values for each mode (including data, but not FM). Each filter is defined in a screen as shown in Figure 3, both in terms of bandwidth (in 100 Hz increments) and slope of skirts. Once set, a push of a button cycles among the three presets for that receiver and mode. While it's quite easy to change the definition, a temporary change can be made by adjusting the high or low edges of any filter using the dual PASSBAND TUNING knobs or the passband can be moved around to avoid interference using the same knobs. In addition to selectivity, the receiver DSPs can be used to set adjustable level NOISE BLANKING or NOISE REDUCTION independently. In addition an effective automatic notch filter that can notch three tones or heterodynes is provided.

Some receiver functions are set using mode-dependent button definitions appearing on the left edge and bottom of the display. These include selecting premixer gain with two levels or no preamp, selecting among the eight values of attenuation, changing the tuning speed to 1/4 the usual step size among others. The screen definitions are visible in Figure 3. As would be anticipated, the receiver includes the usual transceive control functions such as RIT/XIT (±10 kHz), split operation, reverse.... The dual receiver architecture makes it easy to listen to both transmit and receive frequencies while working split. Back in 1976, I used to do that with stereo phones, a Heath HW-101 transceiver and Drake 2B receiver. The IC-7800 makes this much easier and both receivers are a whole lot better!

Transmitter

The transmitter provides an effortless 200 W on all bands without an indication of working hard. I received good reports on both CW and SSB during my usual weekly skeds, confirming the data taken by Michael, KC1SX, in our Lab (Figures 4, 5 and 6). Once I had the gain and compression settings worked out, I received excellent reports on SSB using a loaner ICOM SM-20 desk microphone (no microphone is provided). The multiple metering option (shown in Figure 7) makes it easy to watch compression level and power output at the same time, so setup can be accomplished without the usual guesswork. Since DSP is used on the transmit as well as the receive side, it is possible to set the transmit speech bandwidth and shift the high or low response to tailor to conditions.

CW operation was a breeze with smooth and quiet full-break-in operation. The filter choices and passband tuning

made it easy to pull out the weak signals and the dynamic range paid off when there were strong signals in the vicinity.

I used the '7800 to check into the weekly Antique Wireless Association 75 meter AM net (Sundays at 4:30 PM EST on 3837 kHz), but conditions were so bad that my signal wasn't far enough above the noise in the Rochester, New York area to obtain an informative report, even with the linear on-line. Bob Heil and Joe Walsh had good results on AM during their visit to W1AW, so I'm sure it works fine on that mode if conditions permit. I didn't try the '7800 on FM. To make voice contesting easier, four voice message memories can be easily recorded as shown in Figure 8.

Odds and Ends

A nice feature of this radio is that once you have the settings set up the way you like, you can write them to a flash memory card that can be inserted in a slot on the front panel. This lets you not only allow others to use the rig without fear of losing your settings, but also lets you move to any '7800 (at a multi-position station, for example) without having to lose time setting it up your way.

I mentioned that this radio doesn't come with a microphone (or a keyboard, for that matter) and some reviewers were surprised, especially since a hand mic comes with the radios at the bottom of the ICOM line. On reflection this makes sense to me. I would be surprised if any '7800 purchaser would actually use a hand mic, preferring a tailored desk mic or headset. With all the usual hand mics, you just end up with a desk drawer full of unused ones such as I have, even with my modest station.

All in all, this is one very nice radio. I have a lot of trouble imagining any needed improvements, and if price were no object and I needed a new radio I would have a '7800 in my shack. Of course my current transceiver is only about 15 years old, so I should be set for a while yet!

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 425-454-8155; **www.icomamerica.com**. Street price: $10,599.

Table 1
ICOM IC-7800, serial number 0201062

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60; transmit, 1.8-2, 3.5-4, 5.33, 5.35, 5.37, 5.40, 7-7.3, 10.1-10.15,14-14.35,18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive and transmit, as specified.
Power requirement: 85-265 V ac.	Receive, 210 VA (max audio); transmit, 800 VA (200 W out).
Operating modes: SSB, CW, AM, FM, FSK, AFSK.	As specified.

Receiver	Receiver Dymanic Testing
SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, 0.5 µV; 1.8-30 MHz, <0.16 µV; 50-54 MHz, <0.13 µV.	Noise Floor (MDS), 500 Hz filter: Preamp off / one / two 1.0 MHz –123 / –129 / –130 dBm 3.5 MHz –128 / –138 / –141 dBm 14 MHz –127 / –138 / –142 dBm 50 MHz –129 / –140 / –142 dBm
AM sensitivity, 6 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, <6.3 µV; 1.8-30 MHz, <2 µV; 50-54 MHz, <1 µV.	10 dB (S+N)/N, 1-kHz tone, 30% mod. Preamp off/one/two 1.0 MHz 3.7 / 1.2 /1.0 µV 3.8 MHz 1.9 / 0.56 / 0.43 µV 50 MHz 2.0 / 0.63 / 0.52 µV
FM sensitivity, 12 dB SINAD: 28-30 MHz, <0.5 µV; 50-54 MHz, <0.32 µV.	For 12 dB SINAD: Preamp off/one/two 29 MHz 0.93 / 0.23 / 0.17 µV 52 MHz 0.69 / 0.22 / 0.18 µV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: 20 kHz Preamp off/one/two / 5 kHz Preamp off/one/two 3.5 MHz 139*/139*/135* / 114/113/107 dB 14 MHz 137*/138*/135* / 115/112/110 dB 50 MHz 139*/139*/136* / 111/105/102 dB
Two-tone, third-order IMD dynamic range: Not specified, 500 Hz filter.	Two-tone, third-order IMD dynamic range: 20 kHz Preamp off/one/two / 5 kHz Preamp off/one/two 3.5 MHz 105/104/101 dB / 88/86/84 dB 14 MHz 104/103/102 dB / 89/84/83 dB 50 MHz 93/90/90 dB / 83/82/80 dB
Third-order intercept: Not specified.	20 kHz Preamp off/one/two / 5 kHz Preamp off/one/two 3.5 MHz +37/23/11 / +19/8.6/0.75 dBm 14 MHz +37/21/11 / +22/7.7/0.5 dBm 50 MHz +20/8.0/4.6 / +14/0.5/–4.4 dBm

HF DIGITAL WITH THE IC-7800

Steve Ford, WB8IMY
Editor, QST

The IC-7800 is unique among amateur transceivers in its ability to transmit *and decode* RTTY and PSK31. A push of a button along the bottom of the LCD screen puts you in either the PSK or RTTY modes. When you press the DECODE button, you see a spectral display appropriate to the mode, along with an area for receive and transmit text.

PSK31

In the PSK mode, the receive audio spectrum display appears directly above a corresponding waterfall display. To the left is a circular phase indicator.

Anyone who has been around Amateur Radio long enough to remember the original PSK31 program for *Windows* created by Peter Martinez, G3PLX, will recognize the operation of the IC-7800 in the PSK mode. Although there is a waterfall display that looks quite a bit like *DigiPan* and similar programs, receiving a PSK31 signal with the IC-7800 is not as simple as clicking on the waterfall line of your choice. With the IC-7800, you are back to using the VFO knob to tune the signal. With the 1 Hz step mode active, you must carefully tune the IC-7800 until the signal lines up in either the spectral or waterfall displays. Even then, decoding may not begin until you tweak the knob a bit more to bring the lines in the phase circle into a more-or-less vertical orientation.

Once you have the signal properly tuned, the received text begins to flow. The type is small, so good eyesight is helpful (the alternative is to make use of the '7800's ability to send its display to a larger external monitor). The IC-7800's automatic frequency control (AFC) is aggressive enough to maintain solid copy under difficult conditions. By pressing the FILTER button, you can narrow the IF passband in steps down to as low as 50 Hz. My technique was to

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept: Not specified.	Preamp off/one/two, +98/+87/+84 dBm.
FM adjacent channel rejection: Not specified.	20 kHz chan. spacing, both preamps on: 29 MHz, 81 dB; 52 MHz, 78 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz chan. spacing, both preamps on: 29 MHz, 66 dB; 52 MHz, 65 dB. 10 MHz chan. spacing: 52 MHz, 103 dB.
S-meter sensitivity: Not specified.	S9 signal, 14.2 MHz: preamp off, 58 µV; preamp one, 16 µV; preamp two, 7.2 µV.
Squelch sensitivity: SSB, CW, RTTY, <5.6 µV; FM, <1 µV.	At threshold, preamp on: SSB, 0.68 µV; FM, 29 MHz, 0.07 µV; 52 MHz, 0.08 µV.
Receiver audio out: 2.6 W into 8 Ω at 10% THD.	2.7 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW (500 Hz bw): 316-883 Hz (567 Hz)[1] USB: 82-2883 Hz (2801 Hz); LSB: 83-2885 Hz (2802 Hz); AM: 134-3110 Hz (2976 Hz).
Spurious and image rejection: HF & 50 MHz, (except IF rejection on 50 MHz): 70 dB.	First IF rejection, 14 MHz, 118 dB; 50 MHz, 111 dB; image rejection, 14 MHz, 121 dB; 50 MHz, 80 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: HF & 50 MHz: SSB, CW, FM, 200 W (high), 5 W (low); AM, 50 W (high), 5 W (low).	HF: CW, SSB, FM, typ. 205 W, <2 W low; AM, typically 52 W high, <2 W low; 50 MHz: CW,SSB, FM, typ. 195 W, <2 W low; AM, typically 54 W, <2 W low.
Spurious-signal, harmonic suppression: ≥60 dB on HF, (≥70 dB on 50 MHz.	HF, 63 dB; 50 MHz, 70 dB. Meets FCC requirements.
SSB carrier suppression: ≥63 dB on HF, ≥73 dB on 50 MHz.	As specified.
Undesired sideband suppression: ≥80 dB.	As specified.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 4.
CW keyer speed range: Not specified.	6 to 48 WPM.
CW keying characteristics: Not specified.	See Figure 5.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 18 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 12 ms; FM, 12 ms. Unit is suitable for use on digital modes.
Composite transmitted noise: Not specified.	See Figure 6.

Size (height, width, depth): 5.9×16.7×17.2 inches; weight, 55 pounds.

Third-order intercept points were determined using S5 reference.

*Measurement was noise-limited at the value indicated.
[1]Varies with PBT and Pitch control settings.

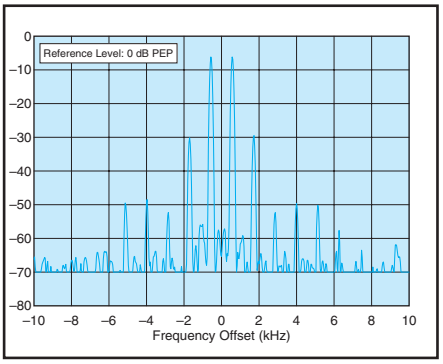


Figure 4—Worst-case spectral display of the ICOM IC-7800 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 30 dB below PEP output, and the worst-case higher order products are down approximately 50 dB. The transmitter was being operated at 200 W PEP output at 14.250 MHz.

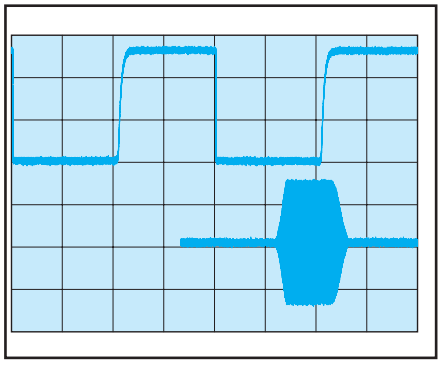


Figure 5—CW keying waveform for the ICOM IC-7800 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure (starting at left edge of plot); the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output at 14.02 MHz.

tune in a station calling CQ, and then narrow the IF to 250 Hz once the conversation was underway. This had a dramatic effect on nearby interference.

Using an attached keyboard, I was able to easily fill the type-ahead buffer as the other station was transmitting. The text scrolls up and out of view as you type. When you're ready, you press the F12 button on the keyboard to transmit, and then press F12 again to toggle back to receive.

The IC-7800 also offers macros that you can set up to automatically transmit strings of text (such as a CQ) at will. You can also alter the text font color and other parameters.

RTTY

RTTY operation is similar to PSK31. When you select the RTTY mode, the spectral and waterfall displays remain, but they include two vertical lines to indicate the mark and space frequencies as shown in Figure 9.

The IC-7800 seemed to perform well with weak RTTY signals. For example, it was able to decode a very weak signal from RN6AH/P on 20 meters that was otherwise barely visible in the display. Weak-signal reception is greatly enhanced when you activate the Twin Peak Filter (TPF). This tight filter specifically peaks the 2125 and 2295 Hz mark/space frequencies. The effect was impressive!

As with PSK31, you also have macro memories available in the RTTY mode. It is interesting to note that in both the RTTY and PSK modes the received text

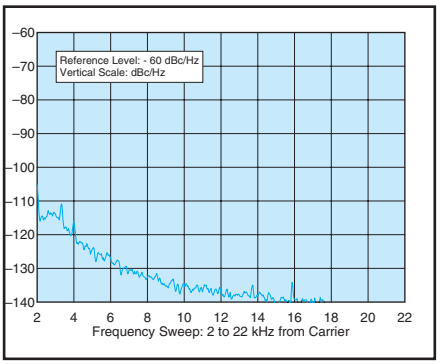


Figure 6—Worst-case spectral display of the ICOM IC-7800 transmitter output during composite-noise testing. Power output is 200 W at 50.02 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

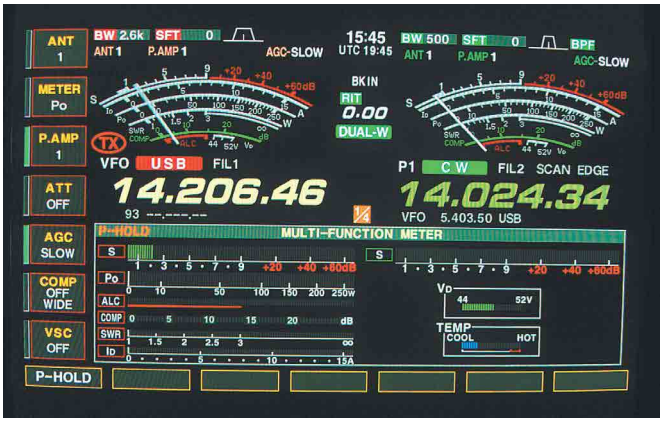


Figure 7—The display providing a view to all metering functions simultaneously.

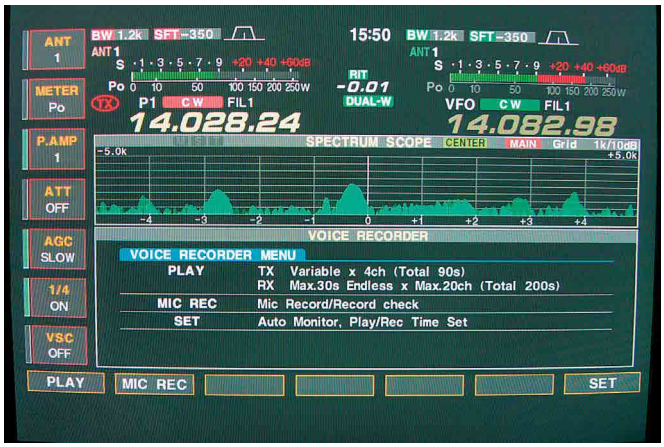


Figure 8—Voice recorder setup menu.

can be saved to the memory card. The manual doesn't state the card's capacity, but it is probably considerable.

With both AFSK and FSK capability, the IC-7800 would make an excellent RTTY contest rig, especially with its dual receivers (SO2R, anyone?). Of course, to use the IC-7800 with popular RTTY contesting software such as *WriteLog*, you'll need to use a separate computer.

HF Digital With a Separate Computer

Most HF digital enthusiasts use sound card-based software to operate their favorite modes. The computer sound card not only generates the transmit signal, it decodes the receive signal. All you have to do is provide a path for audio to and from the radio, as well as a means for allowing the computer to switch the radio between transmit and receive.

If you want to operate modes other than RTTY or PSK31, or if you want to use software for special RTTY or PSK31 applications such as contesting, you'll need to connect your computer to the radio. The IC-7800 offers the usual analog audio inputs and outputs, but it also offers something unique in the ham world: *fiber-optic* S/P-DIF (Sony/Philips Digital Interchange Format) ports. I was eager to try them for this review, so I managed to get my hands on a Creative Labs MP3+ external USB sound card for use with my laptop. The MP3+ is a small sound-card box with both analog *and* fiber-optic inputs and outputs.

The fiber optic cables connected easily to the S/P-DIF ports on the back of the IC-7800. (With the radio on, you see an eerie red glow at the other end of the output cable.) With the MP3+ connected to my laptop, I booted up my *MixW* multimode software and switched the '7800 to PSK mode.

What I saw on the *MixW* waterfall display was astonishing. The receive audio showed up in the usual blue texture, but beyond the scrolling "wall" there was nothing but blackness—no odd artifacts, no indications of ground-loop-induced hum. See Figure 10 for that view.

I tuned a PSK31 signal on the '7800 display, then did the same in *MixW*. Watching them side-by-side, it seemed as though *MixW* was a little bit better in signal decoding than the IC-7800's built-in decoder, but the difference was marginal.

During RTTY operation, the performance of both the IC-7800 decoder and *MixW* were essentially identical. I tried *MMTTY* against the IC-7800 and the result was the same.

The only gripe I have about using an external computer with the IC-7800 is the fact that you must use an interface to implement transmit/receive switching. Although there is an RS-232 jack on the back of the IC-7800, you can't use it to key the transmitter without a "level converter" such as the optional ICOM CT-17. The VOX circuit in the IC-7800 will not respond to audio on the accessory jacks, or data on the S/P-DIF input, so that switching possibility is unavailable as well. Your only remaining option is manual transmit/receive using the MOX button on the '7800 front panel.

If you want to use the IC-7800 with your HF digital software, you'll still need a switching interface between your computer's COM or USB port and the IC-7800. This is a common state of affairs for most transceivers, but I didn't expect to encounter it in the IC-7800.

THE IC-7800 IN WPX CW

Dave Patton, NN1N
Special Assistant to the ARRL CEO

It had been a long time since I hauled Amateur Radio equipment from my vehicle to my shack, knowing that the equipment was more valuable than the vehicle. It was 1984 then, and my new Kenwood TS-930SAT and companion TL-922 overpowered my 1980 Datsun. Last week, when ARRL's new IC-7800 found its way to my shack, it slightly overpowered my 2003 Pontiac.

I still have and use my Kenwood equipment, and frankly, have found few rigs that were better than the TS-930 overall. I love that radio, and how great it sounds, hears and looks, and how easily it is operated. I slid it over on the desk and hefted the IC-7800 up next to it. The IC-7800 weighs about the same as the '930, but it is larger. It takes up much more of the depth of the desktop.

After making some simple hook-ups to the radio, and powering it on, I sat back and stared at it for a few minutes. Then I couldn't help it. I went upstairs and found my wife Carol, KB1GAT, and dragged her downstairs to simply look at this rig. It is gorgeous. It feels and looks and plays like a $10,599 radio should. Your attention is drawn to the 7 inch TFT screen like a moth to a light. Carol wanted to know how I was going to come up with $10,599.

I planned to spend some time with the '7800 during the CQ WPX CW Contest. My plan also included not using the rather extensive looking manual, and just see how I could get along with the rig based on my background using most of the rigs on the market over the past 20 years. I have used the ICOM IC-756 and '756PRO radios for a few contests, and I think that helped, because I had no trouble whatsoever using the '7800. I turned it on, hooked it up to the AL-1200 amplifier, and called a CQ. Then I ran the resulting pileup easily and efficiently. I started with my outboard keyer. After an hour I hooked up my Bencher paddle directly to the rig and used the internal keyer. No problems making that adjustment.

The abstract for this little article can be summed up in one sentence: I can't find anything wrong with this radio, and it is so easy to use, and sounds so good and hears so well that it is the best radio I have ever used. To be complete, I should mention I haven't yet used the new Ten-Tec Orion, another contender.

K9EID and WB6ACU Test the '7800 in the DX 'Test

Bob Heil, K9EID, and Joe Walsh, WB6ACU, were able to operate the IC-7800 from W1AW during the 2004 ARRL Phone DX Contest. Here are Bob's impressions of the radio:

Joe and I were able to really put the IC-7800 through its paces while we were there. There were never fewer than six stations operating simultaneously and it was important to me to pay close attention to how the '7800 receiver handled itself under those serious conditions. It passed my tests with flying colors.

The one thing that Joe and I kept coming up with was how smoothly it operated. The controls are all in the right place and they *feel* good. The controls feel like good old time Allen Bradley pots that we used in mixing consoles in the '70s. Nice and smooth. Larger knobs, laid out conveniently—I liked that.

The receiver was very sensitive and yet with all of the filter selections, you can narrow it down and it doesn't sound like an accordion. It has a robust sound to it compared to other receivers I have used. The same goes for the transmit audio. The Heil Classic sounded beautiful on it as did my new Heil Pro-Set Quiet Phone with the HC-5 element.

On Saturday night, Joe and I began operating on AM and worked nearly 100 AM stations in about 6 hours. It was the most fun we had the entire weekend. Each and every one of the heavy duty AM operators from the East Coast raved about the transmit audio. With the 12 (that's twelve!) equalizers (EQ) in the '7800, we were able to dial in just the right response and it stood right beside the plate modulated signals on the band. I loved the fact that they (finally) listened to some of our suggestions when planning the '7800—one being that the *receiver* should have EQ as well as the transmitter. Well, this receiver does—three of them. One is for SSB, one for AM and one for FM. The transmitter has the same—separate EQ for SSB, AM and FM. Two band EQ on each bringing the total number of EQ controls to 12. Just wonderful and about time!

Joe and I also experimented with the second receiver as a diversity receiver and found this useful, although with antennas farther apart than at W1AW it would have been even better. We also noted that the '7800 ran for 24 hours and never got more than lukewarm—*never hot*—and that included six hours of AM carrier at about 80 W!

The '7800's notch filter was superb. The twin pass band tuning is excellent as well. Operating in the contest, the triple stacking of the band memories coupled with the read and write functions as on prior ICOM rigs is invaluable. You can switch between three and four stations in split seconds without ever having to turn the main dial. A feature for contesting that is most appreciated. The band scope also goes along with that and is so very handy.

The other great situation with the '7800 is that we *never* had to refer to the operating manual. If you can operate their PRO, you can dive right into the '7800.

All in all, I found this to be an excellent transceiver with wonderful features—many that we haven't found or used yet. It certainly answers the quest of anyone who wants or needs this higher quality radio.—*Bob Heil, K9EID*

Bob Heil, K9EID (foreground), and Joe Walsh, WB6ACU, operating from W1AW with the IC-7800 and Heil Classic Pro microphone during the ARRL DX Contest.

Before the contest, and while setting up the rig, the first thing that struck me as positive was the fact that in order to hook up my AL-1200 amp to the '7800, all I had to do was connect an audio cable with RCA plugs to each box. That was it. No DIN plugs or external relays needed.

The second thing that drew my attention was the sensitivity of the receiver. Tuning up 20 meters at the slowest tuning rate, I marveled at what I could hear. Stopping and listening to the pileup calling OJØVR, I was able to hear calling US stations on back scatter that I don't believe I would have heard on the '930. The pile-up wasn't very big, but I sensed a "depth" to the frequency that made me feel like I was hearing layers of signals that normally fall into a "mush layer." I tried changing the AGC attack speed, and was happy to notice that it didn't make any noticeable difference in how well I could hear stations calling. So then I decided to work OJØVR myself. He was operating split and listening 1 kHz higher. I turned on the DUAL WATCH so I could listen to the calling frequency as well as his transmit frequency, and hit the split button. Wow! Cool. There is a narrow, somewhat bright, white LED that is dead-in-the-middle of the rig right on top of the monitor screen. There is no way you can miss that you are operating split. And the radio also spells it out for you on the screen. I worked the OJØ on one call with the 200 W output. I also noticed at about this time that the radio reported both local and GMT time on the monitor.

The contest started for me on 80 meters at 0000Z. My goal was to tune up the band and find my boss, Dave Sumner, K1ZZ, who was operating from A61AJ. A61AJ was going to be close to sunrise and I thought I had a chance to work him because there weren't very many US stations on the band this early. The band was packed with Europeans for the first 40 kHz! Conditions were good, obviously, as my antenna is just a dipole at 40 feet. There were quite a lot of static crashes from thunderstorms in the region, but they were not rapidly occurring. I easily worked every station I called. I noticed that the '7800's AGC was working perfectly and the static crashes were not an issue. Tuning by a very loud NY4A I also noticed that it was no trouble to copy European stations within a kHz on either side. When I reached about 3.526 MHz, I found and worked A61AJ, who was S9, with one call. No other US stations were calling, but I had no trouble hearing the numerous European stations in the pile-up.

I then moved to 40 meters briefly, and tuned the band. Changing bands is easy. There are 3 band-stacking registers per band, and it was fun to set them every 30 kHz or so, for quick movement across a band. Then I went to 20. The first thing I noticed was received key clicks. With the tuning rate set slow, it seemed like I was hearing key clicks for about 20 kHz as I tuned across the offending stations. The receiver is so sensitive that you can pick up the clicks earlier than I think I would have noticed on the '930 or most other rigs. In reality, I was only tuning about 1-2 kHz around the clicky radios, but it seemed more irritating to me than ever before. I felt that I could have slid right up next to the clicky station and start CQing if there were no clicks. The first frequency I found on which to CQ was just below a station with horrible key clicks. That must have been why it was available. I quickly adjusted the variable passband tuning, which essentially uses the DSP to narrow the passband. At 400 Hz, the frequency was pretty useable. As I started getting answers to CQs, I decided to hit the CW mode button and put the mode into CW reverse. Doing so helped me hear some of the calling stations more easily by reversing the CW carrier point. This was a fun experience. What can I play with next to help me hear? The notch filter also worked brilliantly. I

Figure 9—IC-7800 in RTTY mode, copying with internal decoder.

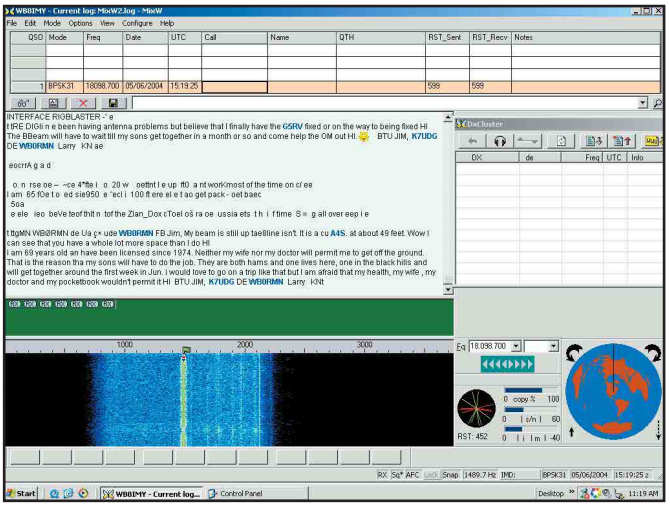


Figure 10—*MixW* waterfall display while connected to IC-7800 via fiber cables. Note the lack of artifacts or ground-loop-induced hum.

felt confident that I could slide into any frequency and get going easily.

The next day I turned the rig on and was looking for signals on 20. The big screen TV upstairs puts out some hash all across the bands and causes problems for me on the high bands because my Yagi is on the roof not far above the TV. When I found a signal that was right at the edge of the S3 hash from the TV, I turned on the noise reduction switch, and suddenly the signal became copiable. The noise wasn't diminished a whole lot, but there was a noticeable improvement on marginal signals. Later, I also learned to use the audio peak filter to pull up that weak CW signal and make it copiable while before it was not. If you hold down the APF button, you can cycle between three passband widths of 80, 160 and 320 Hz. What a difference it makes.

As I ran stations during the contest, I found only one thing that bothered me. Every time I went to clear the RIT back to zero, I discovered that I had to hold the button in for about half a second to make that happen. It was slightly irritating. During my next break I opened up the manual and discovered that you can easily change the function of the RIT CLEAR button to immediately clear upon a touch. The default setting forces the op to hold it in.

While admiring the front panel again after the contest, I decided that the layout of all the buttons and knobs was done perfectly and to maximum advantage. In the places where you can't get your fingers, there aren't any controls. The extendable feet make the front panel easily accessible.

There are many other features to this radio that I haven't tried yet. I want to plug in the keyboard with a USB plug and use it to program the memories for the keyer. I need to listen to 6 meters, and then try the built-in demodulators for PSK31 and RTTY. And the voice keyer and audio recorder, and the flash memory card for storing settings…

"Dear, can we trade the car in on one of these babies?"

THE IC-7800 ON 6 METERS—WEAK SIGNAL

Dennis Motschenbacher, K7BV
ARRL Sales and Marketing Manager

As the current resident 6 meter fanatic at ARRL, I was asked to take the IC-7800 home and see how it performed on its one VHF band. My comments, therefore, are focused on only that band based on my experience in the ARRL June VHF Contest.

I am delighted to report that I was able to not only learn how to effectively employ the IC-7800, I did it by *first* reading the instruction manual. The manual was obviously written for plug and play nontechnical types like me. Setting the rig up to meet my intended usage on 6 meters was not only easy, in the process I was introduced to the many very useful features of the IC-7800 that might have otherwise escaped my attention.

I immediately noted that the IC-7800 dealt nicely with two of my biggest challenges on this VHF band, manmade noise and the multitude of "birdies" (spurious signals) that haunt 6 meter operators. I found the NOISE BLANKER and NOISE REDUCTION controls allowed me to totally eliminate my particular version of local power line noise. I also quickly noted that a birdie from my digital rotor control was not audible when I listened on the IC-7800.

I decided to set up both receivers on the band so that I could keep a constant ear on the international calling frequency (50.110 MHz) while running on another frequency or searching for new stations. The setup of the two receivers was easy and offered a lot of flexibility. The second receiver performed as advertised, picking up a weak signal that alerted me to a short opening to the Caribbean that otherwise would have been missed while I ran much stronger stations elsewhere up the band.

I had arranged meteor scatter contest skeds using a weak signal digital mode (WSJT). The signal "pings," measured in milliseconds, heard off the meteor trails can be very weak but the combination of the sensitive software and extraordinary performance of the IC-7800 made my skeds a cake walk, adding new multipliers with ease.

On the other side of the scale, numerous very strong adjacent signals were encountered. One particularly annoying fact about VHF contesting is the presence of very strong mountain top stations parking themselves only 2 kHz away from the Domestic Calling frequency of 50.125 MHz. That proximity guarantees that any attempt to hear stations calling on the calling frequency will be difficult if not impossible—with most rigs. I had good success silencing the distraction of our local mountain topper, using the PASSBAND TUNING and proper filter selection.

I received unsolicited complementary reports on my audio, some noting that it made me "punch through" even though my signal was weak. In summary, my short test drive with the IC-7800, while not exercising all of the capabilities of this extremely flexible radio, proved to me that, out of the box, it was a true winner. It appears to me that the IC-7800 has a huge amount of performance and fun to offer.

See the Product Review Auction Web at **www.arrl.org/prauction** *for the latest equipment up for bid including the Kenwood TS-480SAT HF and 6 meter transceiver.* QST

Iowa Ham is BPL Interference "Poster Child"

The ARRL has weighed in on behalf of Iowa amateur and ARRL member Jim Spencer, WØSR, of Cedar Rapids—a victim of severe broadband over power line (BPL) interference. A formal complaint to Enforcement Bureau Chief David H. Solomon calls on the FCC not only to order Alliant Energy's BPL field trial system to shut down but to fine the utility $10,000 for violating the Communications Act of 1934 and FCC Part 15 rules. Alleging "ongoing harmful and willful interference to one or more licensed radio stations," the ARRL in mid June asked Solomon to intervene "on an emergency basis." ARRL CEO David Sumner, K1ZZ, who signed the complaint, said Alliant Energy has been aware since March 30—the date it installed Amperion BPL equipment in Spencer's neighborhood—that the BPL system was causing harmful interference.

"It's simply unacceptable for Alliant Energy to continue to cause interference while they're trying to solve the problem," Sumner said. While the utility has been cooperative, mitigation efforts have been only marginally successful.

The complaint cites FCC Part 15 rules prohibiting harmful interference from the operation of an unlicensed intentional, unintentional or incidental radiator to a licensed radio service. "There is simply no room for interpretation that would lead to such harmful interference being permissible for any period of time—certainly not 10 weeks," the complaint said.

The complaint culminates a series of exchanges and actions that were part of an unsuccessful effort to resolve Spencer's BPL interference. Sumner said the ARRL specifically intervened in Spencer's case after United Power Line Council (UPLC) President William R. Moroney invited the League to keep his organization in the loop on any BPL interference cases that were not being satisfactorily addressed. When Spencer's case arose, Sumner said, the League considered it "a good place to start."

Among other approaches, Alliant Energy has tried notching out the HF amateur bands. After notching attempts in late May, Spencer—a retired engineer and former Collins Radio employee—still reported "significant levels" of BPL interference on some bands and power line noise on 160 meter and 80 meters.

An Amperion contractor indicated that the notching—or "power masking" remains a somewhat labor-intensive "beta procedure." The contractor, Tom Luecke, indicated to Spencer in early April that he had cranked down the BPL system's gain "a notch below where I would like to have them" on three units closest to Spencer's home.

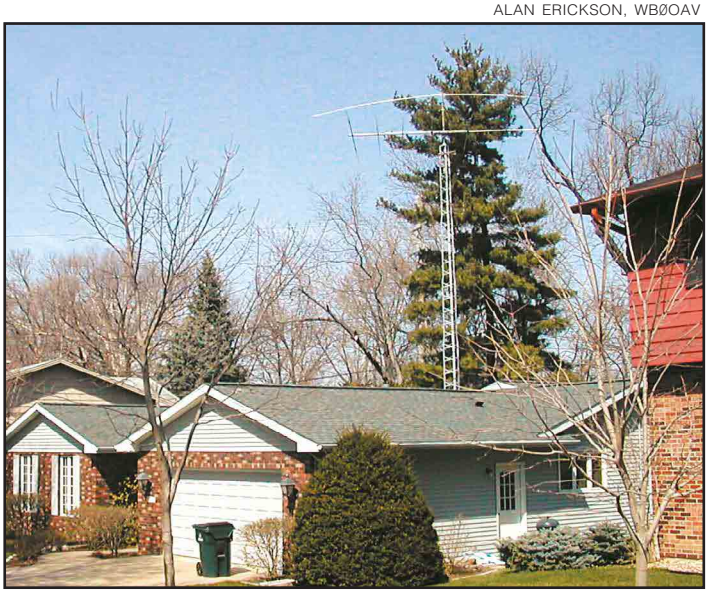
"We are not a radio silent technology, nor do we claim to be," Luecke conceded in an e-mail to Spencer. "Put another way, you can hear our signal, but we strive not to interfere with ham operators on the ham bands." He claims Amperion's equipment complies with FCC Part 15.

Sumner said UPLC representatives have made good-faith efforts to persuade Alliant Energy to comply with the FCC rules. Spencer "has cooperated fully and patiently" with Alliant Energy's and Amperion's fruitless efforts to eliminate the interference, the complaint notes. The BPL partners' best efforts to date notwithstan-ding, Sumner said, the time had come to say enough is enough.

"The situation in Jim's case is egregious," he said. "If this is the best we can expect when a BPL system causes interference, then the only answer is to prevent them from being deployed."

Additional information about BPL and Amateur Radio is on the ARRL Web site, **www.arrl.org/bpl/**.

ALAN ERICKSON, WBØOAV



Spencer's house with his tower and beam in the back yard. Power lines carrying BPL are barely visible in the background.

NTIA Claims BPL Could Help Alleviate Power Line Noise

The National Telecommunications and Information Administration's comments in the BPL *Notice of Proposed Rule Making (NPRM)* more clearly reveal the political face of an agency eager and determined to sell the technology's viability—no matter what its own scientists have concluded. The NTIA is the principal White House adviser on telecommunications policy and administers federal government radio spectrum. Its largely scientific Phase 1 report, which unambiguously established BPL's interference potential, already is part of the proceeding. The agency's formal comments, filed June 4, take pains to depict the technology not only as workable but desirable to all—provided that BPL operators and utilities are willing to jump through additional NTIA-recommended hoops. At one point, the NTIA calls BPL "a win-win proposition," claiming that its widespread deployment could lead to a reduction in power line noise.

"Substitution of BPL emissions for the strong, much wider-bandwidth power line noise emissions will broadly reduce risks of interference to radiocommunications," the agency asserts. The NTIA says it's measured power line noise levels that are

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higher than the proposed BPL emission limits, and existing power line noise poses "greater local interference risks" than BPL. The agency qualified its remarks, however, saying that while it doesn't expect a net, nationwide reduction of interference risks, it believes there will be "at least partial offsetting" of BPL's interference risks.

Missing from the NTIA comments is any acknowledgement that power line noise interference to licensed radio services already contravenes FCC Part 15 rules regulating unintentional radiators—the same rules that apply to power line carrier and BPL systems. The NTIA called reduction of strong power line noise "a basic technical requirement" for acceptable BPL performance at the field strengths the FCC has proposed and the NTIA has endorsed.

The agency does come close to recommending a limit on BPL signal power to compensate for variations in power line noise, however. "Because radio noise on power lines can vary by upwards of 20 dB throughout a day," the comments said, "a rule should require adjustment of BPL signal power to preclude unnecessarily high levels of radiated emissions." The NTIA said reducing Access BPL emissions by about 20 dB (a factor of 100) when noise is at relatively low levels "will substantially reduce interference risks."

Addressing BPL's interference potential is a persistent theme throughout the agency's remarks, and sometimes the NTIA's stance verges on the defensive. In an over-the-top example of "suspected" versus genuine interference, the agency raised the specter of coax-munching rodents.

"For example, rodents sometimes chew coaxial cables or twin-lead transmission lines and cause significant reductions or complete loss of the desired signal power that should reach the receiver," the NTIA said. "In many other cases, interference is realized but not caused by the suspected device."

To reduce BPL's interference risks, the NTIA comments recommend "several new BPL rule elements" to augment the FCC's proposals. "These rules also help ensure that interference from BPL systems would be eliminated expeditiously with little effort needed on the part of any radio operator," the NTIA predicted. Its recommendations, the agency said, shift emphasis away from eliminating interference and toward preventing it—something it said BPL operators have a strong incentive to do.

"NTIA believes that BPL operators, as the parties responsible for eliminating harmful interference, will voluntarily implement equipment, organizational elements, and installation and operating practices that prevent interference and facilitate interference mitigation," the agency predicts. "Market appeal of BPL could quickly evaporate if BPL systems were to endemically cause interference and have to be shut down with operating authorizations swiftly revoked if necessary."

The NTIA's comments also include some key findings of the agency's pending Phase 2 BPL study, set for release later this year. The FCC extended the reply comment deadline by three weeks to allow stakeholders time to review the NTIA's comments.

HAM RADIO-CARRYING ROCKET MAKES IT TO MARGIN OF SPACE

A civilian solid-fuel rocket carrying a ham radio avionics package easily exceeded its primary goal of attaining an altitude of 100 km—62 miles—considered the boundary between Earth's atmosphere and space, its sponsors say. The May 17 Civilian Space Xploration Team (CSXT) (**www.civilianspace.com**) launch took place from Nevada's Black Rock Desert. An Amateur Radio direction finding team later recovered the rocket's avionics package intact. Avionics Team Leader and ARRL member Eric Knight, KB1EHE, told the League that the 21-foot, 10-inch diameter *GoFast* vehicle attained an altitude of 77 miles according to its onboard instruments, making it the first civilian rocket to do so.

"We well shattered any definition of space, and everybody's jubilant here," the Connecticut resident told ARRL from Nevada shortly after the successful flight. "Within two seconds into the flight we were already supersonic." Knight said 75 to 100 people—many of them radio amateurs—witnessed the launch, and some asked how they could become licensed. The launch itself, Knight reported, "went like clockwork."

IAN KLUFT, KO6YQ

The *GoFast* rocket takes off from Nevada's Black Rock Desert.

During the vehicle's descent to Earth, a ballistic parachute deployed to keep it from tumbling, slow its velocity and make it hit the ground nose first. Stratofox (**www.stratofox.org**)—a volunteer aerospace tracking and recovery team of Silicon Valley Amateur Radio operators—zeroed in on signals from the fallen rocket, which came down in rugged, mountainous terrain some 25 miles from the launch site. Tiny bird-tracking transmitters operating in the 224-MHz range were embedded into the parachute shroud lines solely for tracking purposes.

The avionics team's homebuilt patch-type antennas served the 33-cm telemetry downlink and 2.4 GHz Amateur TV transmitters as well as the onboard GPS units. A color ATV system was able to provide some photos during the first several seconds of the flight, but Knight said the rocket's spin—about nine cycles per second—caused the video to blur after that.

The avionics team includes eight Amateur Radio licensees, most of whom also were involved in an unsuccessful 2002 CSXT launch attempt. The 18 member CSXT team is headed by its founder and Program Director Ky Michaelson, a retired Hollywood stunt man.

The United Kingdom Rocketry Association conveyed congratulations to the US team. "It's certainly a major achievement," said John Bonsor, a UKRA founder.

ARRL SUPPORTS COGNITIVE RADIO TECHNOLOGY PROPOSALS, WITH RESERVATIONS

The ARRL says it generally supports proposals contained in an FCC *Notice of Proposed Rule Making and Order* (*NPRM&O*) in ET Docket 03-108 relating to so-called cognitive radio (CR) technology. But the League urged the FCC to avoid large-scale deployment of CR technology—and especially of unlicensed devices in spectrum regularly used by licensed services—until there's been further experience with the technology. The ARRL also strenuously objected to a proposal to allow cognitive radio technology devices to operate under Part 15 in "rural areas" at up to a six-fold increase in the currently permitted power level in several UHF bands that include amateur allocations.

"ARRL opposes increases of power levels for undefined and indefinable 'ru-

White House Assures ARRL Delegation on BPL

ARRL President Jim Haynie, W5JBP, headed an ARRL delegation during a May 20 White House visit to discuss BPL concerns. Haynie, ARRL General Counsel Chris Imlay, W3KD, and Chief Technology Officer Paul Rinaldo, W4RI, met with Richard Russell, the White House associate director for technology in the Office of Science and Technology Policy. The ARRL officials asked the Bush administration to heed its own experts at the NTIA and back away supporting BPL in favor of less troublesome technologies. The NTIA's Phase 1 BPL study acknowledges BPL as an interference source. Haynie characterized the meeting as both revealing and encouraging.

"He assured us that based on the NTIA report, the interference issues would be addressed," Haynie said. "That was one of our main purposes for being there." Haynie added, however, that he remains "absolutely" convinced that a political agenda is driving the BPL proceeding. Russell told the ARRL contingent that the administration is "very excited" about BPL and is committed to finding ways to make it work.

Imlay said the League's main worry is the "rush-to-judgment" approach the FCC seems to be taking in the BPL proceeding. As one example, he cited the timing between the release of the extensive NTIA Phase 1 study and the BPL comment deadline just a few days later, which the FCC declined to extend. While somewhat sympathetic, Russell suggested that his office was in less of a position to influence the FCC than it was the NTIA.

After Rinaldo presented some of the ARRL's BPL interference test findings, Russell asked the League to provide a breakdown of the BPL systems and providers manifesting both lesser and greater degrees of interference.

Rinaldo also told Russell that representatives of the BPL industry have been double-talking their way around interference claims. Imlay pointed out that the FCC has yet to address dozens of BPL-related interference complaints from amateurs.

The administration does not want a flawed technology to result from the BPL proceeding, Russell said at the session's conclusion, and he offered assurances to the League visitors that the NTIA would work to address the interference.

"We did get listened to," Haynie said afterward. "Did I leave there feeling euphoric? No, I didn't, but at least I have a better feeling now of the overall big picture, of where BPL's coming from, and I hope that I can take to the bank the fact that they're going to address—and continue to address aggressively—the interference issues."

Derek Riker, KB3JLF, of Chwat & Company, the ARRL's legislative relations consultant, arranged the meeting and accompanied the delegation on the White House visit.

The ARRL has asked the FCC to put its BPL proceeding on hold to allow more thorough research of its interference potential. In its comments on the February 23 *Notice of Proposed Rule Making* in ET Docket 03-47, the League contended that the FCC's "overly aggressive timetable" to proceed with BPL deployment will effectively preclude the development of cooperative interference avoidance and resolution mechanisms.

ral areas,'" the League commented, "because the practical radio horizon at higher Part 15 power levels makes interference with the Amateur and Amateur-Satellite service operations in many frequency bands inevitable." The FCC seeks to allow a transmitter power increase of up to six times (approximately 8 dB) higher than current Part 15 limits in the 902-928, 2400-2483.5 and 5725-5825 MHz bands and in the 24 GHz band.

The League said the Commission should not view cognitive radio as an opportunity to increase permissible Part 15 power levels and questioned why the FCC was willing to put forth such proposals "without the slightest real-world test deployment" of the systems it wants to authorize.

A cognitive radio is one that "can change its transmitter parameters based on interaction with the environment in which it operates," the FCC's *NPRM&O* said. "This interaction may involve active negotiation or communications with other spectrum users and/or passive sensing and decision making within the radio." Most cognitive radios will be software defined radios (SDRs), the League predicted.

"There is no need for separate rules regarding cognitive and software defined radios," the ARRL said, calling both "an excellent opportunity" to drive technological advancement within Amateur Radio. "They should and can be regulated within the existing rules." The ARRL also urged the FCC to avoid creating regulatory obstacles that would hamper "experimentation and flexibility in conducting amateur operations."

"These technologies will allow ever-greater participation by amateurs in restoration of communications systems following a wide-area emergency or disaster and in conducting disaster relief efforts on site in coordination with served agencies," the League predicted.

OLDEST US AMATEUR BYRL "TEX" BURDICK, W5BQU, SK

Byrl "Tex" Burdick, W5BQU, of El Paso, Texas—died May 30. He was 103. At the time of his death, he was believed to be the oldest Amateur Radio operator in the US. Admired as much for his courteous and kind personality as for his longevity and youthful appearance, Burdick was licensed for nearly three-quarters of a century. During his many years on the air, he took pleasure in meeting new friends and was a regular QSLer.

"A landmark and an icon to our great hobby" is how Kenneth Kuhblank Jr, K5KWK (ex-W6KWK), of El Paso described his friend in the article "A Voice from the Ether—B. H. 'Tex' Burdick, W5BQ," by Steve Barreres, K2CX, in the December 2003 issue of *QST*. "You will not meet a more courteous operator." In the *QST* article, Barreres tells how a passing motorist talking on his mobile ham radio setup piqued Burdick's initial interest in ham radio. Soon, he passed the examination and had a ticket of his own. Burdick says he started out with a homemade transmitter and receiver—each one fitted with a single 201A tube.

Born in San Angelo, Texas, Burdick attended the University of Minnesota. Returning to Texas in the late 1920s, he established a well-drilling, windmill and water supply firm, Burdick & Burdick, which remains in the family. To expedite his business travels throughout the Southwestern US and northern Mexico, Burdick became a licensed pilot in the 1940s and occasionally operated aeronautical mobile on the amateur bands. According to his obituary in the *El Paso Times*, he also was known to deliver newspapers to his cus-

"Tex" Burdick, W5BQU. He sometimes used the phonetics "Big, Quick and Ugly."

FCC News

FCC CHAIRMAN RESPONDS TO REQUEST TO SUPPORT ARRL'S RESTRUCTURING PLAN

FCC Chairman Michael K. Powell has assured US representatives Greg Walden, W7EQI (R-OR), and Mike Ross, WD5DVR (D-AR), that the Commission will act "as expeditiously as possible" on Amateur Radio restructuring. Walden and Ross wrote Powell in April to urge adoption of the ARRL's restructuring *Petition for Rule Making* (RM-10867) "in its entirety" along with rules changes needed to put it into place. Powell said the League's petition was one of many.

"At this time, the Commission staff is reviewing and analyzing carefully all of the petitions, comments and proposed rule changes in this area," Powell responded May 21. "Because this matter is of great importance to you and the almost 700,000 amateur radio operators nationwide, the staff is working diligently to create a comprehensive solution to address the proposals the petitioners have submitted." The next step in the process, he said, will be to prepare a *Notice of Proposed Rule Making* for the Commission's consideration.

FCC

FCC Chairman Michael K. Powell

In addition to the League's filing, Powell pointed out, the Commission received 17 other petitions for rule making that address examination requirements and operating privileges for the Amateur Service. The various proposals attracted more than 5000 comments, he noted—more than 800 of them on the ARRL's petition alone.

In their letter to Powell, Walden and Ross expressed their belief that the ARRL's plan "will encourage the development, refinement and use of new technologies; increase the number of young people involved in Amateur Radio; and provide incentives for Amateur Radio licensees to pursue technical self-training and opportunities for volunteerism in the best traditions of our country."

Other restructuring plans were filed by the Radio Amateur Foundation (RM-10868) and by the National Conference of Volunteer Examiner Coordinators (RM-10870).

Fifteen other petitions for rule making came down on one side or the other of retaining the Amateur Radio Morse code examination requirement to operate on HF. Judging from Powell's letter to Walden and Ross, the FCC plans to address all 18 petitions within the framework of a single rule making proceeding. The chairman did not indicate when an *NPRM* might be released, however.

FCC FINES RESTAURANT FOR LONG-RANGE TELEPHONE USE

The FCC has fined a New Jersey restaurant $10,000 for operating transmitting equipment on 2 meters without a license. The case involves Best Wok in Westville, which, the FCC said, was using a so-called "long-range cordless telephone" to communicate with its delivery vehicle.

The FCC says the telephone in question—said to have been obtained outside the US and not FCC certificated—operated within the 2-meter satellite subband at 145.8376 MHz. Acting on a tip, the FCC conducted an investigation that resulted in the issuance of a *Notice of Apparent Liability for Forfeiture* (*NAL*) February 26 and a *Forfeiture Order* May 21—after Best Wok failed to respond to the *NAL*. The FCC already had issued a couple of warning notices in the case, which dates back to 2001.

In February 2003, an agent from the Commission's Philadelphia office used direction-finding techniques to pin down the source of the transmissions to Best Wok. The restaurant manager told the agent he installed the long-range cordless telephone system so that his employees could answer customers' telephone calls while making deliveries.

Amateur Enforcement

♦ **Pennsylvania ham agrees to short-term renewal:** General class licensee Henry Schott Jr, KA3BMS, of Newtown Square, Pennsylvania, has agreed to a short-term renewal to settle what the FCC called "enforcement issues related to the operation of your station." Although Scott vigorously denied any wrongdoing, FCC Special Counsel for Enforcement Riley Hollingsworth says Schott signed the deal—spelled out in a May 10 letter in which the FCC will grant him a two-year license renewal instead of the normal 10-year term.

"At the end of the two-year period, you may routinely renew your license for a full term if there have been no valid complaints regarding the operation of your station," Hollingsworth told Schott. Last December, the FCC's Wireless Telecommunications Bureau referred Schott's renewal application to the Enforcement Bureau for review based upon what the FCC described as "enforcement issues relating to the operation of your station and questions regarding your qualifications to be a licensee."

Complaints filed with the FCC regarding Schott's operation date back to 2000. In December of that year, the Commission sent him a *Warning Notice* after it received information alleging that Schott—after being asked to stay off two repeaters—had "keyed up the repeaters and interfered with existing communications, failed to identify and used obscenities." The following year, the FCC requested that Schott respond to a complaint from a Canadian amateur alleging inappropriate conduct by Schott on a packet chat room that he subsequently was asked to leave. A 2003 complaint alleged that Schott was interfering with communications in the 40-meter phone band

In January, Hollingsworth wrote Schott to summarize the litany of complaints and asked him to respond to each. Schott maintained that he was a victim of false accusations, but he signed the voluntary agreement, and the FCC renewed his license May 20.

tomers via air drop and to provide transportation for disabled youngsters on behalf of the Lions Club.

Burdick was a charter member of the El Paso Amateur Radio Club, and he donated a windmill tower as the clubhouse antenna support. A similar structure holding a triband Yagi graced his own residence.

His recollections and photographs documenting the early days of his career were the focus of a 1992 book, *Blades in the Sky, Windmilling through the Eyes of B. H. "Tex" Burdick*, by T. Lindsay Baker. After retiring in 1979, Burdick and his wife, Juanita, traveled the world. In addition to ham radio and an early interest in photography, Burdick also enjoyed hunting and fishing and spending his summers in Alaska and Colorado.

The family invites memorial donations to Hospice of El Paso, 1750 Curie Dr, El Paso, TX 79902, or to St Clements Episcopal Church, 600 Montana, El Paso, TX 79902.

VIRGINIAN IS FIRST US HAM TO ACCOMPLISH "TUNA TIN II" WAS

It took him four years, but a ham from Bealeton, Virginia, has become the first US amateur licensee to work all states using a flea-power "Tuna Tin II" transmitter. ARRL member Bob Chapman, W9JOP, completed his "QRPp" (less than 1 W output) achievement this spring and has received his ARRL Worked All States Award.

"Unfortunately, ARRL does not issue a

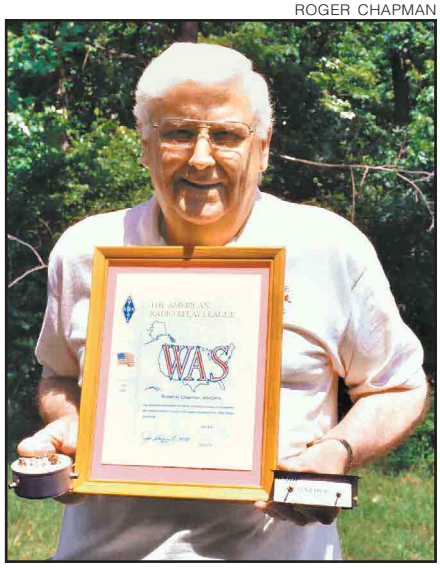
certificate for WAS QRPp," he said. "Mine is endorsed with 'QRP-CW.'" Chapman, 71, says he actually used *two* Tuna Tin-design transmitters to accomplish the feat. He worked and confirmed the contiguous 48 states with a "classic" Tuna Tin, which uses an inverted tuna can as a chassis. Not only was Chapman running just 250 mW, he was crystal controlled on 7043 kHz! Chapman says he snagged the last two states, Hawaii (KH6U) and Alaski (WL7WH) using a homebrew 20-meter transmitter of Tuna Tin design, rockbound on 14,060 kHz and also running 250 mW.

"No QRO here," Chapman says of his setup. "Just a low-power, low-tech station with a G5RV wire antenna at 50 feet and a 'TiCK' keyer." He uses a vintage Collins 51S-1 receiver.

A ham for 50 years, Chapman points out that he accomplished his QRPp WAS without any schedules but "just by waiting for the states to pass within my capture area—namely, on my frequency," he said. He also has a QRP Amateur Radio Club International QRPp Worked All States certificate. His wife, Joy, is KA9TTB.

In 2001 Steve McDonald, VE7SL, in British Columbia, Canada, became the world's first amateur to accomplish QRPp WAS using a Tuna Tin II running about 400 mW.

ROGER CHAPMAN



Bob Chapman, W9JOP, with his WAS certificate. His "classic" Tuna Tin II is at the left, while a transmitter of more conventional construction using the Tuna Tin II circuit is on the right.

ARISS SCHOOL GROUP CONTACT MARKS TWO FIRSTS

NASA Expedition 9 International Space Station Science Officer and Flight Engineer Mike Fincke, KE5AIT, logged what was believed to be his first-ever Amateur Radio contact May 25 from the spacecraft's NA1SS. Fincke got his ticket February 18. The QSO, with students from various schools gathered at Erie Planetarium in Pennsylvania, also marked the first Amateur Radio on the International Space Station (ARISS) school group contact for the Expedition 9 crew. The US astronaut and Russian cosmonaut and Expedition 9 Commander Gennady Padalka, RN3DT, arrived aboard the ISS in late April. Fincke, who's twice visited the Erie Planetarium, told the students he's really enjoying the weightlessness of space, although he noted, some caution is in order.

"I love being weightless," he said. "I can fly around like Superman and pick up very big things." He cautioned, however, that crew members need to "take it nice and easy" in weightlessness to avoid banging into things and injuring themselves.

For fun and recreation, Fincke said, the crew has laptop computers and can watch DVDs—although there's no TV aboard. "The whole space station is a little bit fun to play in and do fun things," he said, "but just being aboard the International Space Station is like a dream come true, so it's all fun—every minute of every day is really fun."

On June 2, Fincke told eight physics students at Walton Central High School in New York that the ISS loses some 25 meters (approximately 82 feet) per day in altitude, and the crew needs to adjust the orbit approximately every three months to compensate. Fincke also said the crew has been working with a new ultrasound device to see how the microgravity aboard the ISS might be affecting their internal organs.

Tony Hutchison, VK5ZAI, in South Australia served as the Earth station for the Erie QSO, while ARISS Club Station NN1SS in Maryland handled the Amateur Radio end of the Walton contact. MCI donated teleconference links for both events. ARISS is an international educational outreach program with US participation by ARRL, NASA and AMSAT.

NASA

Astronaut Mike Fincke, KE5AIT, appears to be juggling fresh fruit floating in near-zero gravity aboard the ISS.

JOHN HAMPEL, AB2IC

Walton High School physics students listen to a reply from astronaut Mike Fincke. A microphone is at the far left. Eight juniors and seniors participated in the event.

Media Hits

■ *Sea Kayaker Magazine* ran a ham radio feature story by Ken and Ezzie Brody, AB3BG and KB3EZZ. When the Brodys first started kayaking, they found that keeping tabs on the weather—and on each other—was easier if they took their handheld transceivers along. The article explained the basics of ham radio and the licensing process. Thanks to the Brodys, readers of this publication have learned a bit more about ham radio and how they could use it while enjoying the sport of kayaking.

■ Through a local grant, the American Red Cross chapter in Ardmore, Oklahoma, upgraded its communications center, which bears the name and call sign of Charles Dibrell, W5BLW (SK), who was a local amateur. Members of the Southern Oklahoma ARES group (SOARES) will operate and maintain the station and continue to assist the Red Cross chapter during emergencies. ARRL and SOARES Public Information Officer Kevin O'Dell, NØIRW, was interviewed for an article which appeared in *The Daily Ardmoreite*. O'Dell reports that KKAJ-FM and local CBS television affiliate KXII also covered the story.

■ The *Courier-Post* of Cherry Hill, New Jersey, covered a special event held in commemoration of the battleship *New Jersey*. Harry Bryant, AA2WN, was interviewed and explained how an Amateur Radio special event station works. Bryant is president of the Battleship New Jersey Amateur Radio Station, NJ2BB, which operates from the ship's radio room every Saturday.

■ To help give back to the community and prepare for emergencies, David Bower, K4PZT, joined up with fellow Institute of Electrical and Electronics Engineers members to help build a ham radio station at the American Red Cross offices in Knoxville, Tennessee. The story was covered in IEEE's publication *The Institute*.

In Brief

• **J. D. Harper, K6KSR, wins *QST* Cover Plaque Award for May:** The winner of the *QST* Cover Plaque Award for May was J. D. Harper, K6KSR, for his article "Use the Right Phonetics." Congratulations, J. D.! The winner of the *QST* Cover Plaque award—given to the author or authors of the best article in each issue—is determined by a vote of ARRL members. Voting takes place each month on the *QST* Cover Plaque Poll Web page, **www.arrl.org/members-only/qstvote.html**. Cast a ballot for your favorite article!

• **Oklahoma ham earns first WAS-90 Award:** It took ARRL member Jerry Rochelle, K5QM, of Altus, Oklahoma, only 72 hours to work all 50 US states and submit his application for the new "WAS in the 90th" award commemorating the League's 90th anniversary (**www.arrl.org/awards/#was.90**). ARRL Membership Services Manager Wayne Mills, N7NG, said Rochelle was the first amateur to receive the new award. Valid contacts for WAS-90 must be made between April 3 and December 31, 2004. The award is a mixed band and mode award. No official endorsements are available, but amateurs may "roll their own" by working the 50 states again in any way they wish, and then apply for another award. Each application costs $10. Rochelle submitted his award application electronically via the ARRL Web site at 12:28 AM on April 6.

• **ARRL *2003 Annual Report* now available:** While they last, copies of the ARRL *2003 Annual Report* are available free upon request. Enjoy a look back at ARRL activities, Headquarters staff efforts, messages from ARRL President Jim Haynie, W5JBP, and ARRL Chief Executive Officer David Sumner, K1ZZ and more. To obtain your copy of the ARRL *2003 Annual Report*, contact Media Relations Manager Jennifer Hagy, N1TDY, **jhagy@arrl.org**; 860-594-0328. The *2003 Annual Report* also is available on the ARRL Web site as an Adobe PDF file, **www.arrl.org/announce/annualreport/03ar.pdf**.

• **Elmer stories wanted:** Attention, clubs! Is there someone in your club who is especially good at Elmering (mentoring) new hams? Tell us what this person does that goes above and beyond the ordinary. An ARRL Web feature—"Elmers: A Guiding Ham"—awaits your story. Now's the chance to put your Elmer in the spotlight! Send your information to ARRL Affiliated Club/Mentor Program Manager Norm Fusaro, W3IZ, **w3iz@arrl.org**. Now's the time to publicly praise that special mentor.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the ARRL Eastern Massachusetts, Missouri, Nebraska, New York City-Long Island, Northern New York, South Carolina, Southern New Jersey, West Central Florida and Western Pennsylvania 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 10, 2004. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before October 1, 2004, to full members of record as of September 10, 2004, which is the closing date for nominations. Returns will be counted November 23, 2004. Section Managers elected as a result of the above procedure will take office January 1, 2005. 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, 2005. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the January 2005 *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*

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Michigan Section Manager election by the repeat nomination deadline of March 5, 2004, nominations are herewith resolicited. See the above for details on how to nominate. 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 2005-2007 term in the Pacific, Rocky Mountain, Southeastern, Southwestern and West Gulf 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 15 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, 2005.

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 13, 2004.* 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 20, 2004*. Only original documents can be accepted; *no facsimiles of any kind are acceptable.* On Monday, August 23, 2004, 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, September 3, 2004, 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 Frank Fallon, N2FF (chair), George Isely, W9GIG, and Wade Walstrom, WØEJ.

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, 2004. (You must be a licensed radio amateur to be a full member.) The ballots will be mailed not later than October 1, 2004 and, to be valid, must be received at HQ by noon Eastern Time on Friday, November 19, 2004. 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, 2004, 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, 2004, giving their current *QST* address and the reason that another division is considered home. If your home is in the Pacific, Rocky Mountain, Southeastern, Southwestern or West Gulf divisions but your *QST* goes elsewhere, let the ARRL Secretary know as soon as possible, but no later than September 10, 2004, 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:

Pacific—Bob Vallio, W6RGG and Andy Oppel, N6AJO

Rocky Mountain—Walt Stinson, WØCP and Warren G. "Rev" Morton, WS7W

Southeastern—Frank M. Butler Jr, W4RH and Sandy Donahue, W4RU

Southwestern—Art Goddard, W6XD and Tuck Miller, NZ6T

West Gulf—Coy C. Day, N5OK and Dr David Woolweaver, K5RAV

For the Board of Directors:

May 21, 2004

David Sumner, K1ZZ
Secretary

THE WORLD ABOVE 50 MHZ

The Decline and Fall of Cycle 23

It has now been more than two years since the resurgence of Cycle 23 during the autumn of 2001 and the winter of 2001-02 and its accompanying once in a lifetime conditions on 6 meters. These conditions were described by Emil Pocock, W3EP, in this space in January 2002. Good things never last, and by February 2002 the good times were over.

What's happened in the meantime? And what's in store for the next few years? This column will provide a little history of Cycle 23 and some guesses as to where we are going. *QST* in general and Emil in particular have documented this cycle in great detail, especially in terms of 6 meters. You should look at these references: [in reverse chronological order] the World Above 50 MHz for January 2002, May 2001, October 2000, April 2000, October 1999, November 1998 and December 1997; and full-length articles by Dean Straw N6BV in January 1998 (pp 31-35) and Emil Pocock, W3EP, in January 1997 (pp 42-46). The latter contains a lot of valuable information about sunspot cycles, solar flux and their relationship to propagation.

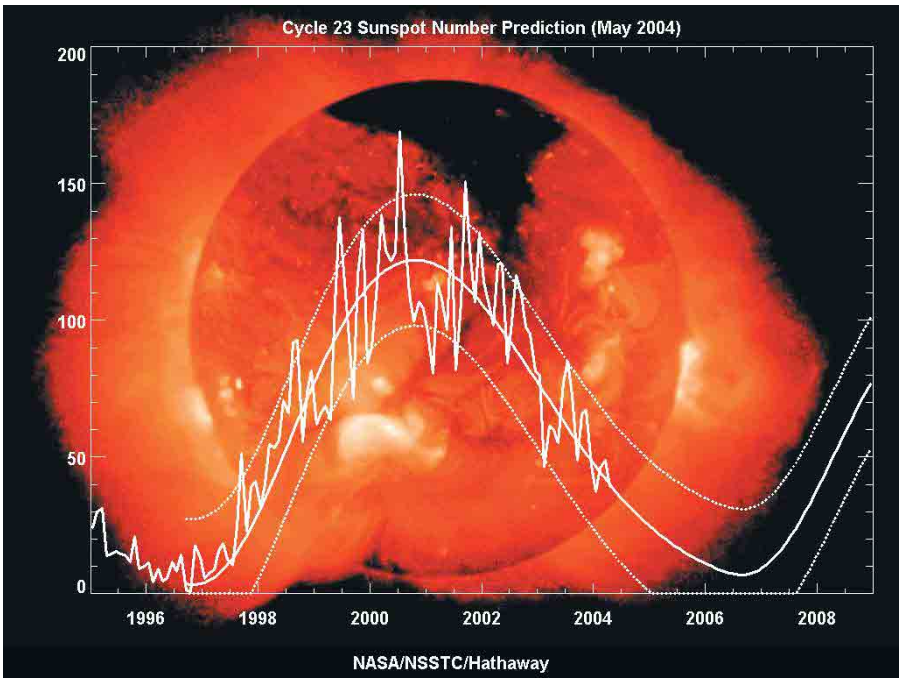


Figure 1—Actual and predicted sunspot numbers for Cycle 23. After David H. Hathaway at science.msfc.nasa.gov/ssl/pad/solar/images/ssn_predict_l.gif.

A (Very Short) History of Cycle 23: May 1996 to the Present

Cycle 23 began in May 1996 at a smoothed minimum of 8 (see Figure 1) with a reasonable degree of fanfare. In general the even numbered cycles such as previous one—Cycle 22—producing positive polarity spots in the northern solar hemisphere, which are oppositely directed to the Earth's dipole field, are less vigorous than the next odd numbered cycle (23). This relationship has held since Cycle 10, which peaked in1860 (Figure 2) and there was no reason to expect it not to hold this time. But as we all know, the sun is very fickle and predicting the size and duration of sunspot cycles is a chancy business at best given how little we really know about the physics that drives the sun's cyclic behavior. So we should not have been surprised when the sun threw us a curveball.

The consensus forecast for Cycle 23 was for a peak smoothed sunspot number (SN) of 160±30 with a peak 10.7 cm Solar Flux of 205±30. Everything proceeded within limits until months 29-35 (the winter spanning 1998-1999) when the SN levels stalled for 7 months at 70. Following this hiatus the cycle fell below the lower prediction limits. Though it began to climb again, it was never as productive as predicted and nowhere nearly as good as Cycles 21 and 22 (Figure 3). Cycle 23 peaked in April 2000 with a maximum smoothed SN of 121 and then in a normal fashion started slowly downward. But having already been disappointing, Cycle 23 had another surprise in store for us. Beginning early in 2001, the numbers stopped dropping and started rising. A secondary peak was reached at a smoothed SN of 116 in November 2001. This was indeed the beginning of the end of the line for Cycle 23. SN numbers have dropped more or less steadily reaching the present number of 41.5 in May 2004 and a smoothed number of 56.7 centered on November 2003.

As sunspot cycles go, Cycle 23 was relatively quiet geomagnetically as indicated by Figure 4. Note that the planetary A values (Ap) during most of the cycle ranged from a low of about 3 to highs ranging in the hundreds. In general this has been a cycle not particularly endowed with large numbers of radio auroras although there were some notable individual storms in August 1998, July 2000, March 2001, May 2003 and October/November 2003 (see below).

Traditionally, the peak of geomagnetic activity is on the downside of the cycle while the sunspot peak is often much more quiet. Note particularly the drop in geomagnetic activity concomitant with the secondary peak in late 2001 and early 2002 associated with the superb 6 meter conditions. In October and November 2003, as described in The World Above 50 MHz, there was an unusual spike of geomagnetic activity with a series of solar flares whose size was essentially as large or larger historically than any that had been observed before. The result was severe auroral conditions in both October and November.

E_s propagation is thought to be influenced by the solar cycle, but the relationship is highly complex. In general, with past sunspot cycles there appears to be a somewhat negative correlation between E_s and sunspot numbers based on the expec-

This Month

August 6-8	11th International EME Conference, Ewing Twp, New Jersey
August 7-8	ARRL UHF Contest
August 21-22	ARRL 10 GHz and Up Cumulative Contest

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

*Moon Data from W5LUU

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 (tel 301-948-2594) ♦ w3zz@arrl.org

Table 1
Number of Minutes of Broadcast Band E_s Propagation, May-August 1996-2003

Year	*Days*	*Minutes*
1996	51	4605
1997	35	2695
1998	32	2630
1999	28	2865
2000	60	7055
2001	58	5890
2002	24	1215
2003	58	7360

From the Web page of Pat Dyer, WA5IYX (**home.swbell.net/pjdyer/iyxfmsum.htm**).

tation that geomagnetic activity is higher at sunspot maxima and this suppresses E_s. In fact as Emil has noted, E_s peaks appear to occur on the rising and falling portions of the cycles at times when geomagnetic activity is higher, suggesting that just the opposite of common speculation is true.

Using data on the FM broadcast band compiled by Pat Dyer, WA5IYX, who undoubtedly has the best dataset for this type of propagation (Table 1), we can see very little correlation between E_s and Cycle 23. Last summer's superb E_s conditions seems even to have confounded the 6 to 7 year cycle that had appeared to exist when Emil published an update of Pat's superb data in the June 2000 World Above 50 MHz column.

The Future of Cycle 23

Sunspot numbers. The double peak is well behind us and Cycle 23 is well on its way to a minimum. Based on previous cycles we should expect the numbers to decline in a more or less direct fashion until the minimum is reached. The average sunspot cycle length is 11 years, but an analysis of many previous cycles such as that the one by Timo Niroma found at **personal.inet.fi/tiede/tilmari/sunspots.html** correctly points out that there appear to be two bimodal clusters of cycle lengths, one of ~10.2 years and another of ~11.9 years. The past century favors cycles of the shorter length. For other reasons involving a speculative effect of the planet Jupiter's magnetic field, Niroma believes that the current cycle may be longer than recent cycles but most observers predict a minimum in late 2006 or 2007 (Figure 1). Indeed, in a comparison of the last three cycles (Figure 3), Cycle 23 demonstrates little deviation from the general pattern of the last two cycles.

Geomagnetic activity. As previously noted, solar storms and radio auroral propagation typically increases on the downward slope of the sunspot cycle. Last year saw some of the largest solar flares on record with an Ap of 9 recorded on several occasions late in October. So far this year auroral activity has been quite diminished, although we still have to experience the autumnal equinox. So good auroral conditions are still possible. As the cycle diminishes in the next few years we can expect less and less auroral activity.

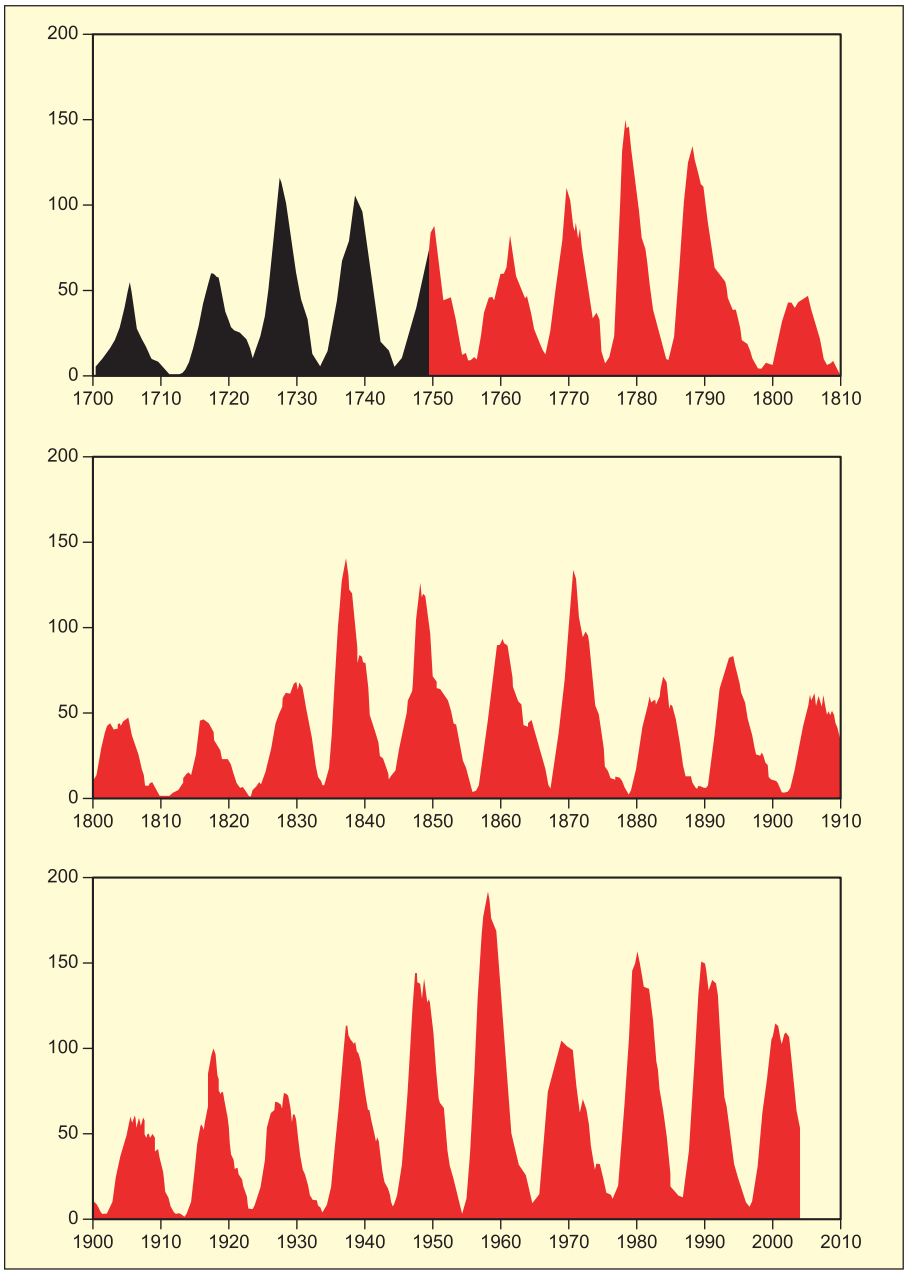


Figure 2—Annual sunspot numbers for the years 1700-2003. From SIDC, RWC Belgium, World Data Center for the Sunspot Index, Royal Observatory of Belgium at sidc.oma.be/html/wolfaml.html. Black is yearly data and red is monthly data.

Sporadic E. Last year was one of the best on record especially for E_s with very high MUFs. This year has started off much slower. Given the relatively poor correlation with sunspot numbers, E_s during the late spring/summer months and to a lesser degree around the winter solstice will likely continue to be the most prominent type of long range propagation, especially for 6 meter DX. Predicting just how good the E_s will be remains a daunting task.

What does This Mean?

As we approach the sunspot minimum in the next few years, all is not lost. True, most if not all of the F2 propagation is gone for this cycle. So we cannot expect an upturn in conditions during the late fall and winter months. Transequatorial (TE) propagation during the equinoxes should also become much less frequent, although the MUFs for the hop across the magnetic equator are generally much higher than seen for normal F2 and thus some TE may remain.

If we were talking about HF propaga-

tion we would be getting ready to say goodbye to 10 meters and later on to 15 meters over the poles. E_s propagation will remain, however, and it is possible that we may see some quite good years even during sunspot minimum periods. E_s-associated DX contacts into the Caribbean, Central and South America are still likely, as are occasional transatlantic contacts into Europe from the East and Midwest and Pacific and even Japan from the West. Tropospheric ducting is driven by weather conditions (and hurricanes in later summer and autumn) that are little influenced by the solar cycle. In the final analysis we will all show up and take what nature has provided for us.

ON THE BANDS

Sporadic E. After essentially no sign of E_s in March and April, 6 meters opened promptly on May 1. To be sure, as Bob, K6QXY, notes, this has been a "terrible E_s season to date." Although openings have tended to be short, even here there have been some bright spots. E_s has been noted on well over half the days in May somewhere in the US. The biggest news was an opening from the northeastern US to Europe on May 9. Based on reports from Matt, WV1K (FN41), Dennis K7BV/1 (FN31), and Dave, N3DB (FM18), New England and eastern W2s had good conditions into the British Isles and Western Europe from just after 1300Z to 1700Z. The first transatlantic E_s contact of the season apparently belongs to Mick, W1JJ (FN41). Countries worked included G, GW, GI, GM, EI, ON, PA, EA and CT. The mid-Atlantic was limited to contacts with EA and CT and few of those to boot. N8CJK (EN84) heard ON4IQ but no contact was made. Dennis notes that according to K1SIX's data on E_s openings from 1990 to the present (at **personalpages.mcttelecom.com/~b_mobile/B_PROB.htm**), this may be an early season record. The other reported European opening came from Gary, N3JPU (FM19), and Russ, K4QI (FM06), who worked some weak CT and EA between 21-23Z on May 14. Conditions to Alaska have been very spotty: KE7V (CN87) reporting KL7NO (BP54) on May 21 via the propagation logger [**dxworld.com/50prop.html**] and K6QXY (CM88) working KL7NO on the 30th. Conditions to the Caribbean and South America were depressed with minimal openings mostly from Florida and the northeast according to Julio, NP3CW (ex-WP4LNY).

The continental US tropo in May did display one odd feature. Typically, the beginning of the E_s season is often rich with north/south propagation. That was less so this month with most of the openings going west and northwest. I experienced several openings to northern MN, VE4 and MT. Tom, KCØIMN (EM28), notes four separate openings to the Pacific Northwest, an unusual occurrence for him, and Roger, K6LMN (DM04), notes a few up that way as well. Jon, NØJK (EM17), suggests that we all give some thought to doing mini-expeditions to nearby rare grids if conditions warrant. He provided contacts from the rare EM08 grid during a strong opening on May 27. Given the mediocre conditions, there were a surprising number of double-hop openings, especially from the east to west/northwest on May 11 and 14. Other double-hop openings were observed on May 9 following the European opening (MD to CO), May 12 (AJ6T to FM17—VA), May 24, 25, 26, 27 (mid-Atlantic to NM, AZ and K4QI to WA on the 27th) and May 31 (NC-CA).

JAN ALVESTAD, DX LISTENERS CLUB (**dxlc.com/solar/cyclcomp.html**)

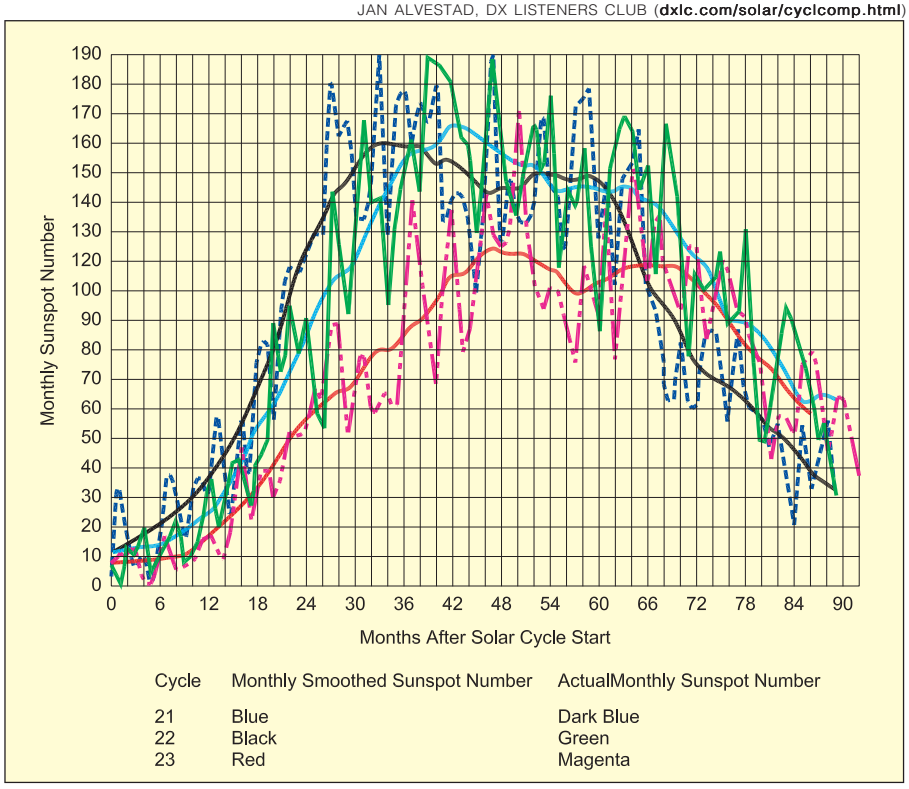


Figure 3—Comparison of Cycles 21, 22 and 23. Monthly sunspot number as a function of time.

NOAA/SEC BOULDER (**www.sec.noaa.gov/solarcycle/**)

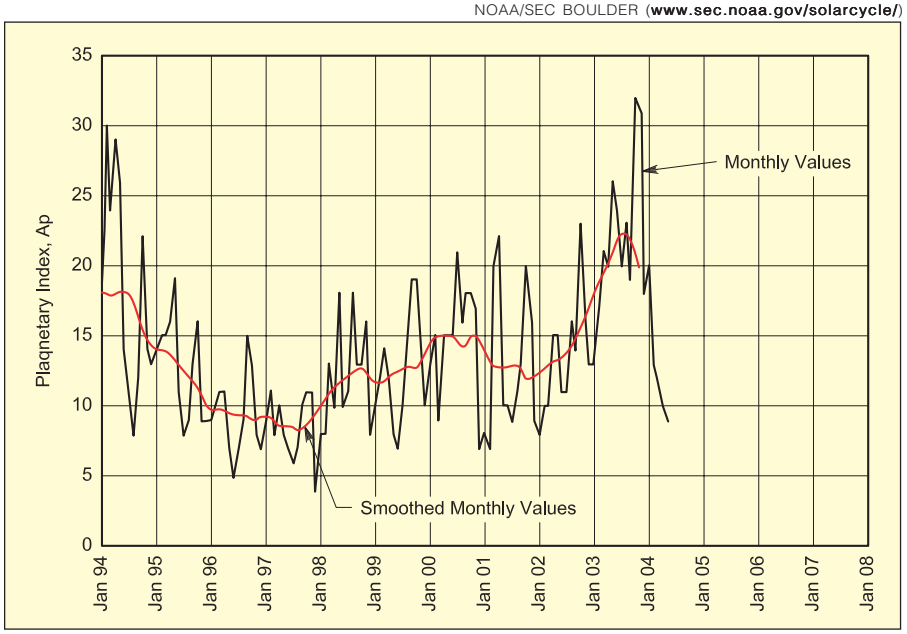


Figure 4—Planetary A Index (Ap) during Cycle 23.

Meanwhile, though not as good as last year, Europe remains the place to be for 2 meter E_s. The DK5YA page reports eight E_s openings and two FAI openings on seven different dates in May. Many were of very short duration but ones on May 16 and 23 lasted 2 hours apiece or more. These long openings and two shorter openings occurred at midday locally, so perhaps there are shorter openings here that are completely missed because our activity levels are so much lower than those in Europe—especially during the middle of the day.

Tropospheric ducting. Tropo along the Gulf Coast north to KS/NE and southern IL and east to the Carolinas, GA and FL returned on May 6. Sam, K5SW (EM35hr), worked north to EM09/EN10 and EM57, southeast to EL39/59, and east to EM84 (SC), EM85 (NC) and EM75 (TN) on 2 meters on the morning of May 6. Steve, N5TEY (EM16), worked east to EM64 and northeast to EM58. Larry, NØLL, reports contacts to the Gulf Coast on 144, 222 and 432, only his second tropo contacts to New Orleans

Table 2
222 MHz Standings

Published 222 MHz standings include call-area leaders as of April 1. For a complete listing, check the Standings Boxes on The World Above 50 MHz Web pages at **www.arrl.org/qst/worldabove/**. To ensure that the Standings Boxes reflect current activity, submit reports at least every two years by e-mail to **standings@arrl.org**. Printed forms are available by sending a request with an SASE to Standings, ARRL, 225 Main St, Newington, CT 06111.

Call sign	State	States Worked	DXCC Entities Worked	Grids Worked	DX (km)
1					
W1JR*	NH	47	4	89	2050
K1TEO	CT	26	2	114	2420
K1UHF	CT	25	2	75	1938
AF1T	NH	24	2	—	2019
W1AIM	VT	20	2	53	2021
K1LPS	VT	17	2	54	1472
WA1ECF	MA	16	2	57	1902
W1GHZ	MA	15	2	31	1207
AA1YN	NH	9	2	18	496
2					
K2AXX	NY	35	2	69	2276
K1JT	NJ	21	2	55	1727
3					
W3ZZ	MD	36	2	105	1871
WA2FGK	PA	22	2	67	—
4					
WA4NJP*	GA	33	2	69	—
AA4H	TN	26	2	75	1737
W4WA	GA	25	1	53	—
W4WTA	GA	23	1	57	1485
KU4WW	AL	20	2	40	1240
KØVXM	FL	9	1	29	1747
W4SW	VA	9	1	23	641
N4UFP	SC	8	1	13	—
5					
W5LUA*	TX	50	—	—	—
K5UR	AR	42	2	199	—
W5RCI	MS	38	2	123	1930
WB5AFY	TX	31	2	83	1504
W5ZN	AR	26	2	83	2250
W5UWB	TX	22	2	55	2197
K5LLL	TX	14	2	42	2213
WA5TKU	TX	14	1	49	—
WD5AGO	OK	12	2	30	1975
N5QGH	TX	8	—	27	—
K5RHR	NM	7	1	28	577
6					
W6TOD	CA	10	2	—	—
KC6ZWT	CA	8	1	31	1371
KR7O	CA	6	3	26	1638
K6QXY	CA	3	2	17	3794
N6PEQ	CA	2	3	9	4031
7					
WA7KYM	WY	16	2	43	1829
W7RV	AZ	9	3	51	1740
W7MEM	ID	6	1	141	1476
8					
W8PAT	OH	35	2	81	2057
N8KOL	OH	28	2	88	1510
K2YAZ	MI	21	2	72	2167
WB8XX	OH	21	2	41	1253
WB8TGY	MI	8	2	20	701
9					
WB9SNR	IL	27	2	61	1745
KA9UVY	IL	25	1	55	1536
N9NJY	IL	23	2	68	1580
W9JN	WI	16	2	71	1981
W9RPM	WI	8	2	15	850
Ø					
KMØA	MO	23	—	70	1350
KØFF	MO	18	1	52	1174
KØAWU	MN	17	2	43	1275
KØRZ	CO	16	2	55	2002
KØVSV	IA	14	2	37	1120
NØUK	MN	13	2	61	1169
KØSQ	MN	13	1	48	1074
WØRT	KS	12	1	—	1455
KØGU	CO	1Ø	1	18	1913
Canada					
VE3DSS	ON	22	2	—	—
VE2PIJ	PQ	8	2	27	694

*Includes EME contacts
— Not given

in 25 years. Matt, N3UUM (EL29pw), worked along the Gulf Coast to FL on 2 meters and north to EM09 through 70 cm the morning of May 6 and then returned that evening to bag EM17, 27 and 45 (W5ZN through 70 cm). Matt also reports that he worked KN4QS on 6 (via tropo) and 2 meters on May 26 and then W4VC (EM81) on 6 meters through 70 cm. Nothing was heard on 1296 on either end. Several stations in FL ended the session.

NØJK comments, and I agree, that this opening was a "wave cyclone" type like the April 17/18 event described in last month's column, though more limited in geographic distribution and shorter in duration. It was more classical, lasting about a day and favoring the north-south paths although as we have seen, some good east-west contacts were made along the Gulf Coast from TX eastward. The opening appeared strongest on the morning of May 6 (local) with weaker signals and less range in the evening. All the enhancement was essentially gone by the local morning of May 7. Path lengths in excess of 1300 km were observed. Jon also observes that the Stuve sounding for Shreveport, Louisiana, showed a strong inversion at 1100 meters altitude on May 6.

Microwaves. Perseverance pays off on the microwaves. Al, K7ICW (DM26ja), reports success on 23 cm on both CW and SSB with WA8UGL (DM45ae—309 km) and W7GBI (DM43am—407 km) over highly occluded mountain paths with no known tropo enhancement. Al was running just 5 W to a modest Yagi and had no preamp. Meanwhile after 2 years of trying Graham, KE4WBO (EL96vv), worked KØVXM (EL98) over an open 295 km path on both 23 and 13 cm. Graham was using low power on both bands to relatively small antennas. Mike, KMØT (EN13vc), provides a late report of a rain scatter contact with KØAWU (EN37ed) on April 18 with the dish elevated. This contact was probably aided by intense storms over Minneapolis.

HERE AND THERE

New North American 5.7 GHz rain scatter record. Taking advantage of heavy rain, Mike KMØT (EN13vc), claims a new rain scatter record with Ron, W9ZIH (EN51nv). On May 24 Mike worked Ron at 2353Z over a 617 km path via forward rain scatter. The CW signals were weak but quite easy copy. The intense parts of the storms were north and south of the direct path but signals peaked up direct with no dish elevation and very little tone distortion. They then worked on 10 GHz (no record) at 0009Z on May 25 with even stronger signals. Congratulations to Mike and Ron!

ARRL UHF Contest. The UHF contest runs from 1800Z August 7 to 1800Z August 8 and includes all bands from 222 MHz up. Rules can be found at **www.arrl.org/contests/rules/2004/uhf.html**. Entry categories are in the high and low power Single Operator, Multioperator and Rover classes. August is often a good time for tropospheric ducting, so fire up your UHF+ gear and have a go. And please, if you do participate please send in a log.

ARRL 10 GHz and Up Cumulative Contest. The clarion call to your favorite hilltop sounds again this year for a total of 24 hours between 0600 local Saturday, August 21 through midnight local Sunday, August 22. The usual liaison frequency at 144.260 MHz should be in use in many places. You can find the rules elsewhere in this issue or at **www.arrl.org/contests/rules/2004/10-ghz.html**.

11th International EME Conference. This biennial gathering of the world's top EMEers returns to the United States August 6-8, 2004 at the College of New Jersey, Ewing Twp. A full program of technical presentations and workshops is planned. For further information please go to **www.qsl.net/eme2004/contact.htm**.

New Beacon in EM69. Brian, W9IND, reports that the Legion of Indianapolis DXers has activated a new beacon on 50.069 MHz in grid EM69WT. The beacon runs 12 W to a horizontally polarized turnstile antenna at 70 feet. Send reports to Brian at **bdsmith@indy.net**. QST

VHF/UHF CENTURY CLUB AWARDS

Compiled by Eileen Sapko
Awards Manager

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs are the assigned award numbers, issued in order of date received. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from April 7 to June 8, 2004

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. If you have questions relating to VUCC, send an e-mail to **vucc@arrl.org**.

50 MHz
100

1370	K4MQG
1371	KW1DX
1372	AAØZP
1373	N8WWM
1374	WB2JIL
VE3XK	150
K1NU	225
KB2TGU	425
W2GKR	450
K6GXO	350
N8KOL	525
K8TL	300
K9MU	275
KB9PJL	250

144 MHz
100

631	WO4DX
632	K1ZE
633	W5LUA
WW2R	125

222 MHz
50

121	W4ZRZ
K1TEO	100

432 MHz
50

K1ZE	70
K1TEO	110
N8KOL	90

1296
25

140	W4ZRZ
141	N9NJY
142	WW2R
K1TEO	50
W5LUA	205
N8KOL	30

2.3 GHz
10

71	WW2R

3.4 GHz
5

69	WW2R
K1TEO	20

5.7 GHz
5

47	K1TEO
48	WW2R

10 GHz
5

151	K1ZE
K1TEO	20
WW2R	15

24 GHz
5

25	WW2R

47 GHz
5

4	KØRZ
5	W6HCC/Ø
6	NØUGY

Satellite
100

136	N9NJY
137	N3VOP

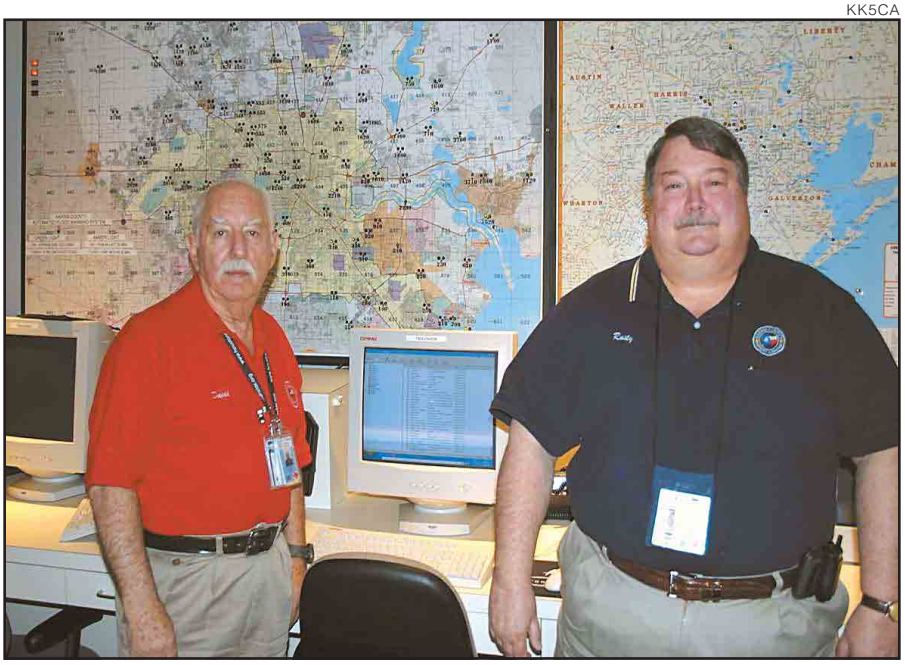
QST

Winlink for ARES

By Jerry Reimer, KK5CA
ARRL South Texas Section Emergency Coordinator

Editor's Note: The concept of using Winlink 2000 on a national basis is under consideration by the ARRL Board of Directors and the ARRL Ad-Hoc Committee on ARES Communications.

KK5CA



Planning Coordinator David Roth (left), and Community Liaison Rusty Cornelius of Harris County Emergency Management enjoying the benefits of the Harris County ARES and Winlink 2000 at the Harris County Emergency Operations Center.

Listen to your Customers!

To be an effective and valued service, Amateur Radio Emergency Service (ARES) volunteers must first listen and respond to their "customers" or served agencies. Such "customers" may include community hospitals, the Red Cross, and other public safety and disaster relief agencies, and especially the local emergency operations center. This, of course, depends on the local area being served.

What do these community served agencies need? Many are now blessed with existing ARES communications, but what do you think they would say if offered an alternate path for e-mail using their *own* e-mail programs on their *own* computers, in their *own* offices without the disruption of other unfamiliar devices? Let's face it, SMTP e-mail is the current medium for written communications, and there is no reason now to attempt to adopt something special during a time when unfamiliarity may be a huge deterrent to their assigned tasks. In Harris County (Houston), Texas, we found this to be a critical need for the agencies we serve.

A Little Background

In May 2002, North West Harris County ARES provided a dozen operators for a two-day "Weapons of Mass Destruction" training exercise involving county and state governments, and the Port of Houston. This functional exercise was developed and conducted by the Texas Engineering Extension Service's National Emergency Response and Rescue Training Center (NERRTC) to enhance these jurisdictions' WMD incident-management capability. During the exercise, it became crystal clear that ARES must provide a reliable and accurate high-speed digital message capability for communications among the served agencies involved with county emergency management. These communications would contain highly detailed instructions and sensitive information requiring wide, yet controlled, distribution, as well as being archived as permanent records. Ideally, such communications would seamlessly integrate into these agencies' already existing e-mail systems.

A steering committee was formed to identify and evaluate existing Amateur Radio packet radio programs, and recommend an optimal system to meet our requirements. After considering many general purpose and specialized packet terminal programs, the committee learned that the Winlink 2000 system with its flexible client programs, Paclink for VHF/UHF packet, and Airmail for HF PACTOR were both very effective, and exist as a part of a greater network configured system that is now used daily to transfer thousands of messages between radio and the Internet.

In January 2003, the Winlink 2000 Telpac VHF/UHF packet-to-Internet gateway module was obtained for testing, and three days later NW Harris County ARES had a station on the air with this exciting new program. Telpac is an easily-installed and configured *Windows* program. It provides a bi-directional e-mail gateway between VHF/UHF packet and the Internet via the existing Winlink 2000 network, using Telnet and any available Internet connection. It may also be co-located on a Winlink 2000 Participating Station (PMBO) to provide local hubbing between users (agencies) with no Internet at all.

Considerable testing of all possible combinations of composing, sending and receiving messages, with and without the use of the increasingly scarce packet networks, continued for several months. We determined that we had what we needed!

The Internet is sufficiently reliable and redundant to be considered by emergency management professionals a valuable adjunct, secure, multi-point, communications network. As long as it functions, those we are serving expect to receive information and resource requests by that route. If the Internet is not available to our served agencies, our Winlink 2000 for ARES system can now provide a system whereby messages can still arrive by traditional packet radio. The solution to meet our customer's needs was within our grasp. All that remained was to physically implement what already exists.

The Plan Goes Public

The digital communications plan for Harris County ARES was prepared in April 2003 by Nelson Livingston, AE5NL,

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

Assistant EC with NW Harris County ARES. Covering an area the size of Delaware and with 3.5 million inhabitants, Harris County is divided into four ARES quadrants, each with an Emergency Coordinator (EC). In effect, there are four autonomous ARES groups in the county. The digital plan calls for a minimum of two VHF Winlink 2000 Telpac gateway stations in each quadrant, physically separated and operating on different Internet topologies (dial-up, cable or DSL).

The VHF Telpac gateway stations in the northern two quadrants operate on 145.07 MHz, while those in the southern two quadrants are on 145.05 MHz. These frequencies were selected to use the sole remaining G8BPQ packet node in each area, greatly extending the range of low antenna equipped Telpac stations. Depending upon the time of day and day of the week, between five and seven of these Telpac gateway stations are available. With overlapping coverage, from nearly any location in the county, one or more of these gateway stations should be accessible from anywhere in the county, with or without the use of a packet node.

The implemented plan was extensively tested during the 2003 Simulated Emergency Test, with stations at the county EOC and Red Cross, and portable stations at multiple hospitals. During the test, lengthy SMTP e-mail messages, with attached binary files, were sent between these locations, with 100 percent accuracy, in considerably less time than a simple 20 word radiogram format message could be sent on the voice network. In addition to the speed and accuracy of delivery, all the information was available for further distribution and as a permanent incident record. Needless to say, we made a hit with our served agencies.

Additional plans have been developed to link the county EOC with other key agencies, such as the City of Houston Emergency Center, regional American Red Cross headquarters, and the state Division of Emergency Management regional headquarters with dedicated 9600 baud UHF packet stations using the Winlink 2000 Paclink client program at each location. One Paclink install will serve multiple computers within each agency. In addition, Airmail will be use for HF longer-range communications to out-of-region PMBOs. Equipment grant requests have been submitted and some purchase orders issued for critical hardware items currently donated by ARES members.

Editor's note: This article will continue next month.

References

Winlink Development Team: Vic Poor, W5SMM, Rick Muething, KN6KB, Steve Waterman, K4CJX, Hans Kessler, N8PGR.

"Introduction to Winlink 2000," *QST*, Jun 2002, p 31.

"TELPAC—Winlink 2000's New Telnet Packet Bridge," *QST*, Oct 2003, p 39.

"Telpac and Paclink—Streamlined AX.25 Packet Radio Server and Client for a Full Service Ham Radio Messaging Network," ARRL/TAPR Digital Communications Conference, Sep 2003.

Check these Web sites or e-mail groups for additional information and resources:

www.winlink.org, www.airmail2000.com, groups.yahoo.com/group/telpac-paclink/ groups.yahoo.com/group/wl2kecomm/

Field Organization Reports

Compiled by Linda Mullally, KB1HSV

Public Service Honor Roll
May 2004

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

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

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

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

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

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

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

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

680 AB2IZ
510 W7TVA N9VE
505 N2LTC
444 W2MTA
435 KC2HUV
375 KC2MBC
360 N2YJZ
345 KZ7T
340 KB2DQ
331 KA2ZNZ
310 K7BFL
280 KB2CCD W2FPG
265 W2LC
263 K9JPS
260 KD4GR
245 WA9ZTY
238 WA1QAA
235 NN2H
226 KK3F
225 N2QZ
215 KB2ETO KA0O W7ARC
210 K2AN WA2ZCM
205 K7EAJ
202 KB2RTZ
200 KD1LE
195 WI2G
194 K2ABX
191 N2YBB
190 KB2KOJ
189 N2HQL K8KHZ
185 AK4EA
181 KA2YKN
180 K2MPE WB8RCR
177 KA2TKS
165 WB7WOW AG9G KB5ILY
160 N2JBA N5KWB
158 KD6YJB
153 W8MMN
150 N8IO W7GHT KB9KEG KE4UOF
145 WB1CHU N1VXP
144 AC5SU
143 KB5JBV KA9RZL
141 KB8NDS
140 KO4SY
139 KA2BCE
136 KA0DBK
135 N7EIE KW1U K9FHI K5DPG N2GJ AD5IS
134 W5OMG
132 KB3GFC
131 KV5AN N1IST
130 W8IM W4EAT W3YVQ KA5KLU AC5XK AI4DV WB5ZED WA9JWL
129 AC5VN K5ER
127 WB2LEZ
125 K9LGU
K4FQU
120 K2UL WA2YL W3BBQ KC5OZT WX4J W1GMF N1LKJ WB0TAQ WA2YBM W6JPH K4IWW AD4XV W4DAC W0UCE AA3SB K6YR W5IM N5OUJ AB4XK
119 K4RLD
118 KB5PGY
117 KO4OL
116 N8OVT
115 KK1A K2JEB W9BHL W3CB
112 WA2GUP
110 N7CM N7YSS WD8Q WB8SIQ W7QM N7YSS W7GB N1IQI N2JWW N3YTD KE4JHJ K8AE W5GKH N3SW KE4OLE K5MC
109 KD5CZM
107 W2DWR KB1CVH N3RB
106 WB2KNS
105 KD5YBS KC1ML K1YCQ N2AKZ
103 K3JL
102 N4FNT
101 W6QZ
100 WA8SSI AF2K KC2EOT WB2QIX W7LG WD8DHC KG4OTL W4CAC N4ABM K0IBS KB4LCI K3SS KB5TCH NR2F WX4H N9MN WN0Y WA2WMJ KA4UIV KC2GOW KB2KLH WA4EIC N5SIG W3ZQN K4SCL
99 N8FXH
98 W4ZJY WB6UZX
97 K7UGT
96 KA4LRM K8ZJU
95 K3CN
AG4DL WD4LSS W2DSX AA4BN
93 KJ7SI KC8QNE
91 K2GW KA7TTY W0HXB KD5OYH N1TPU W0HXB
90 KC2IYC WA2CUW W7RRC KC8UTL KG2D WA2IAX WB2IJH KA8WNO W5UYH K2VX K2YYF K1JPG KF4WIJ K2BCL N3KB W4CKS KA1GWE KA1RMV W4LN AA3GV N3WK N3OR K3IN KF6OIF W3TWV WB4NCW N1JX W2CC
89 W2QOB W7VSE N2VDK W5PY
88 AL7N
85 W3NJ
84 K6DAY
83 W1ALE
82 W7DPW W8CPG W4NTI WA1JVV AE5V
81 W6ABM KD5ONS K6JT W4CC
80 KL7OR KK7TN KD7ZLF AB7AN K7MQF N8IY K7GXZ NV5D AA4YW N3ZOC KG4MLC K8KV W4DLZ W2MTO W5XX
78 WD9FLJ KC8RTW KD5TXD
77 K8SH
76 WB7VYH
74 N2VQA KC0HOX W4DGH W4FAL N9WS K8VFZ
73 K4DND
72 W5NK
71 N0JL KC6NBI
70 KC6SKK N9RGX K4BMH

The following stations qualified for PSHR in previous months, but were not recognized in this column: (April) KE4UOF 140, K4FQU 130, KD4GR 130, KA4FZI 130, WA2YL 110, WA4EIC 100, KG4CHW 89, AA4BN 83, KG4MLC 80, KG4MLD 79.

Section Traffic Manager Reports
May 2004

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

Section Emergency Coordinator Reports
May 2004

The following ARRL Section Emergency Coordinators reported: AK, AZ, CO, EWA, GA, IL, IN, KY, LA, MDC, MN, MO, NC, NE, NFL, NLI, NNJ, NV, SD, SJV, SNJ, STX, SV, TN, VA, VT, WMA, WTX.

Brass Pounders League
May 2004

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

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
W4EAT	0	2130	2105	3	4238
KK3F	46	1866	1800	0	3712
W1GMF	0	1850	1740	14	3604
W4ZJY	0	1152	982	0	2134
N2LTC	0	1000	966	62	2028
N1IQI	0	309	1346	0	1655
KA5KLU	0	732	812	22	1566
KW1U	0	747	650	3	1400
AK6DV	0	727	596	9	1332
K9JPS	0	592	31	568	1191
WX4J	0	463	611	8	1082
W4DAC	15	482	442	48	987
K7BDU	6	462	449	4	921
K7BFL	71	274	332	2	679
KF4WIJ	1	344	288	26	659
N5SIG	11	340	232	41	624
KB5JBV	46	250	258	15	569
W7QM	1	288	227	7	523
N8IXF	–	–	–	–	522

BPL for 100 or more originations plus deliveries: W9IHW 136, KK5GY 123, and N9VE 101.

The following station qualified for BPL in previous months, but was not recognized in this column: (April) WA9VND 580.

T33C: DXpedition to Banaba 2004

By Alan Eshleman, K6SRZ, and David Collingham, K3LP

It's 5:40 AM local time here 50 miles south of the equator in the Central Pacific. We're all excitedly crowding against the starboard rail of *Te Taobe* to get our first view of Banaba Island. In the predawn light, the island looks exactly like the old photos we've been studying—a low, gray, gloomy shape. We're not sure what to expect when we land. Our communication with the island up to this point has been confined to postal mail moving slowly between Banaba, Fiji, Australia, and our homes in Europe and the USA.

We do know that there will be no electricity other than our generators, no telephones and no Internet. We don't know where we'll be sleeping or how we'll be moving our nine tons of gear around the island. We're not even sure how many people live here.

Some of us are seasick, some of us are battling diarrhea and all of us are very tired. It's hard to sleep on a hatchcover, under a tarpaulin, on a rocking, rolling boat. A few hours earlier, a squall had ripped off the tarpaulin and drenched us with rain. The aluminum door to the ship's toilet refuses to latch and swings open whenever we roll toward port. On the first day we tried to wedge the door shut with scraps of cardboard to protect our modesty, but today nobody cares.

Now the sun is up. We move closer to the island, anchor and launch two 16 foot aluminum boats. Now we can see people moving down to the harbor, and behind them rows of abandoned industrial buildings.

It takes us 11 hours to get nine tons of equipment and supplies ashore. We have twenty-seven 200-liter barrels of gasoline, a motorcycle with trailer, 10 generators, dozens of antennas and masts, 7 radios, 7 amplifiers, tools, spools of coax, 45 pieces of personal luggage, a dozen laptop computers, food for 22 people for two weeks, 63 cases of beer, 280 cases of bottled water, and a microwave oven. Day one ends with sore muscles and a better idea of where we are.

By now we've established three operating sites. The Banaba Council helps by supplying a truck and driver. The island's guest house, Banaba House, is the site of the CW camp. The SSB camp and 6 meter station are about a kilometer up the hill from Banaba House, along the sidelines of a soccer field. Two digital stations for RTTY, PSK and SSTV are located 3 km from the harbor in the home of the island's solitary policeman.

AKØA

Wil, K6ND, getting ready to unload some of the nine tons of food and equipment needed by the 22 members of the team who would stay on Banaba for 12 days. The container was shipped from Germany in December 2003, arriving in Tarawa in February 2004 and placed aboard *Te Taobe* at the end of March. Fortunately, nothing was damaged in transit.

IK1PMR

Frank, DL4KQ, and his wife Snjezana at the celebration prepared by the Banaba community to thank the T33C team for their contributions to the island's school and clinic.

Day two is humid and hot. Coming up the road from the harbor the flatbed truck that doubles as the island's school bus is carrying our generators, many cases of bottled water and a dozen local children. Also on the truck are Dave, K3LP, and Wil, K6ND, who are leading the children in a rousing rendition of "Old MacDonald Had a Farm." *E-I-E-I-O* they sing with gusto. The T33C team has arrived and the islanders seem genuinely happy to see us.

T33C is the result of almost two years of planning. The DXpedition represents cooperation among three different groups of amateurs, all with the goal of activating Banaba, which stands high on the list of most wanted DXCC entities. One group, headed by Rob, PA2R, included several members of the recent successful TI9M expedition. Another group was headed by Frank, DL4KQ, who proved to be a meticulous planner. The third group was represented by veteran expeditioner Hrane Milosevic, YT1AD. Our final group includes 19 hams, including K2LEO and three other adventurous women who made the trip.

Most of our equipment was collected 10 months in advance. Frank, DL4KQ; Ron, PA3EWP; Rob, PA2R; Bernd, DL5OAB, and Greg, DF2IC, packed a large steel shipping container with more than 9 tons of supplies. On December 11, 2003 the container left Germany. By February, it was waiting for us on the dock in Tarawa. The packing job was excellent: nothing was damaged in transit.

Considerable advance planning was necessary because Banaba is not an easy place to get to. The nearest airport is on Tarawa (T3Ø) some 420 km NE of Banaba. To reach Banaba, we needed to fly first to Fiji and then on to Tarawa. To get from Tarawa to Banaba, we chartered the rusty, 104 foot interisland freighter *Te Taobe*. Though she is small, *Te Taobe* is still too large to enter Banaba harbor, so all equipment needed to be brought ashore by many trips in small outboards.

Now all our stations are in place. After a "CQ T33C UP" call, the pileups begin. There follows eleven days of continuous operation with 19 operators doing four-hour shifts around the clock. Most of our stations are using K2/100 transceivers, ACOM1000 amplifiers, and SteppIR yagis for 20 through 10 meters. For 30 meters CW we have a two-element ZX-Yagi. For the lower bands we use a variety of wires and loops. Our best performer on 160 meters is an inverted-L with elevated radials. We are helped greatly by a fearless young Banaba man who climbs 70 feet up a tree in his bare feet to place a halyard that we use to raise our low band wires.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

History and Culture

Banaba's first contact with Europeans came in 1801 when the ship *Ocean* "discovered" Banaba. Older maps still show Banaba as "Ocean Island." Banaba was a community of fishermen and farmers, organized by clans and governed by elders. By all accounts, the island community was peaceful and self-sufficient. The outside world did not show much interest in Banaba until 1900 when New Zealander Albert Ellis discovered that the island was a rich source of phosphate of lime, a valuable fertilizer.

By the following year, Ellis and his backers had signed a 999 year mining lease with the islanders. Thousands of miners and their families moved to the island. Paved roads were laid down, workshops and power houses were erected, and homes and apartment houses studded the hillsides of Banaba.

The mining operation was a disaster for the Banabans' traditional way of life. Phosphate mining stripped the soil bare, exposing enormous rocky pinnacles of fossilized coral. By 1979, when mining operations finally ceased, more than 80 percent of the land area of Banaba had been mined down to rock.

In 1941 the Japanese army occupied the island, forcing many of the Banaba men into agricultural labor on other islands and executing more than a hundred others. Following WW II, most Banabans were relocated to Rabi Island in Fiji, 1500 miles to the south of their home island.

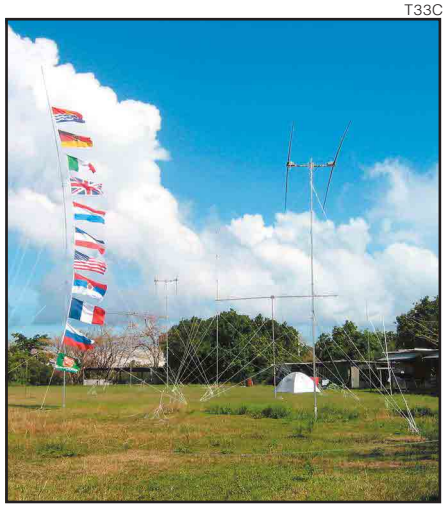
In 1965 the Banabans took Great Britain to court over the environmental damage. The case was settled in 1979, with 10 million Australian dollars put in a trust fund for the island. Today, Banaba is governed by the nation of Kiribati and by a Council of Elders that resides on Rabi, Fiji. To operate from Banaba, our group needed to obtain the approval of the Council of Elders in Rabi and from the resident Banaba Island Council.

Today, the 300 or so Banabans who live on the island support themselves by fishing, subsistence agriculture, and shipments of rice and other staples that arrive from Tarawa.

A small clinic attached to the abandoned hospital and staffed by a medical assistant dispenses medical care. There are no resources to treat serious illness on the island.

The remains of the mining operation are all over the island. Everywhere you look are abandoned trucks, bulldozers, and forklifts, rusted and overgrown with lush, tropical vegetation. A crumbling country club has trees growing out of the bottom of its swimming pool and a sagging, termite-riddled dance floor. An abandoned power house with banks of enormous diesel engines and turbines is rusted and silent. Deserted workshops are filled with once excellent power tools, now rusted beyond repair. The hospital is littered with broken equipment. A single large surgical lamp floats over the abandoned operating room. This decaying, industrial landscape made us feel as if we'd stepped onto the set of a post-apocalyptic science fiction drama.

T33C



The flags of Kiribati (topmost) and of the nine nations represented by the T33C crew fly over the SSB camp. The SSB camp was on the edge of the island's soccer field.

DL5OAB

From left to right: Stevan, YZ7AA, Alan, K6SRZ, Frank, DL4KQ. On the last night on Banaba, team members autographed the flags of each other's nations. Alan was team physician for T33C and also treated some of the Banabans. Frank was a master at logistics.

But the people of Banaba are wonderful. Singing is a big part of the Banaba culture. In the evenings, islanders would come to our various camps and sing, and then invite us self-conscious visitors to sing *our* songs. We were invited to the island primary school's Easter program and to a marvelous program of song and dance on a rainy afternoon at the island's Catholic church, a high point for some of us. A lucky few of us were guided through the network of limestone caverns that lie beneath the summit of the island. Others went fishing with island men in their outrigger canoes.

Two days before the antennas came down and all our gear was packed away, the people of Banaba threw a party for the T33C team to thank us for our gifts of school and medical supplies to the community. We returned our thanks to the community, and following that, each member of our team was crowned with a floral halo and led to a festive table of local foods.

After eating, we were serenaded by choirs of local schoolchildren and entertained by troupes of boys and girls performing traditional dances. Videotapes of these performances would make a cultural anthropologist green with envy! Representatives of the school, the Banaba Council and the Rabi Council of Elders all gave welcoming speeches. Katu Jacob, a schoolteacher and a fantastic resource to the entire team, acted as translator.

T33C Team Results

The T33C team made more than 77,000 QSOs from Banaba. Seventy-five thousand were with the T33C call sign and another 2000 with team members using personal T33 calls. Propagation was, unfortunately, poor for several days.

Our primary goal was to give as many hams as possible a new one. At times, QRM from our 80 and 160 meter operations interfered with the high band operations, making it difficult to copy weak European signals on 30 meters and higher bands. Dave, K3LP; Joe, AA4NN, and Alan, K6SRZ, handled most of the limited 160 meter operation. Flo, F5CWU, captained the SSB camp, while Doug, N6TQS, and Bill, AKØA, ran the digital operation. All operators were assigned three four-hour shifts per day on CW and SSB.

Safely back home, we've had a chance to read the comments in our expedition's Web site guest book (**www.dx-pedition.de/banaba2004/**). The comments warmed our hearts. Among the nicest were those from the little pistols of the DXing world—the operators with modest stations running 100 W or less into a dipole or ground plane—who seemed genuinely amazed that we pulled them out of the pileups. W5QM was surely the littlest pistol of all, working us with *250 mW!*

Back in the workaday world, it's hard to keep from daydreaming about the Blue Pacific and the warm hospitality of the Banaba people. And, inevitably, the daydream turns toward thoughts of *where shall we go next?*

Heathkit

Born in 1888 in Brooklyn, New York, Edward Bayard Heath was about 15 when the Wright Brothers flew their homemade plane at Kitty Hawk. From that time on he wanted to fly. So finally at the age of 20, he built an aircraft of his own design in the family's machine shop. On one of his flights during 1910 he was unable to clear a fence at the end of the field, causing considerable damage to the aircraft. To earn money for the repairs, he went to work for Glen Curtiss at Hammondsport, New York. He took the only position open at the time, that of motorcycle mechanic. While there he was able to study aircraft design and absorbed all the information about building aircraft that he could. This information would later help him start his own aircraft business.

In 1913 he moved to Chicago and established the E. B. Heath Aerial Vehicle Company. From his small shop there he specialized in and sold aircraft parts. To help expand his business he developed a catalog and started selling parts by mail.

During this time he built his second, and much improved, airplane. It had pontoons and a 33 foot wingspan, and though underpowered, it flew well. As prices for aircraft and parts rose, his business flourished during World War I.

After the war, the government started to sell off its surplus parts. Heath purchased tons of parts, several aircraft and spare motors. It was the time of the barnstormers, and they all needed parts. Newly renamed, the "Heath Airplane Company" provided what they needed and grew in size.

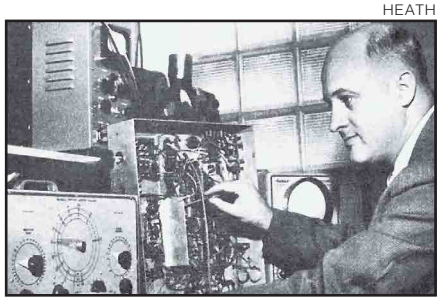
Continuing to design and build his own aircraft, in 1927 he finally designed the "Parasol," a light airplane that anyone could afford. Heath sold plans for $5, or for $595 one could fly a completed Parasol away from the factory. From 1927 through 1930 hundreds of $5 plan sets and $199 aircraft kits were sold. Only a few "factory" manufactured aircraft were sold, however. It looked like "Heath-Kits" were the way to go.

On February 1, 1931 Heath died during a test flight and crash of an experimental low wing design. In 1935 the Heath Company was sold to Howard E. Anthony, whose life would closely parallel Heath's. Anthony had attended Hillsdale College in Michigan and was self-employed as a radio repairman and manufacturer. He is credited with bringing the Heath Company into the electronics business.

It was after World War II, when the government started to sell off excess equipment and spare parts, that the Heath Company started in electronics. One of the early advertisements I have is from the October 1947 *Radio News* magazine. Heath had purchased surplus radios and parts by the tons, and was now selling them. They also started to make up "kits" of similar parts that they sold in that ad. It wasn't long before they designed complete "kits" of parts that would actually build something.

Recently I found a 1955 Heath catalog, which told the story of Howard Anthony and his association with Heath. I have quoted his story, which they titled, "Mr Heathkit."

HEATH



Howard E. Anthony

Mr Heathkit

An airplane crash on July 23, 1954 tragically terminated the brilliant career of Howard E. Anthony, originator of Heathkits, but the momentum of his tremendous enthusiasm will roll on and on for years to come. His record of outstanding personal accomplishment has made history in the field of electronics, and given to countless thousands an otherwise unattainable opportunity to learn and prosper in his chosen field.

Some insight into his background is

1947 Heath Company advertisement.

1950 Heath flyer offering war surplus and Heathkits.

More professional 1952 Heath flyer showing modern kit products.

John Dilks, K2TQN ♦ 125 Wharf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

most important to better understand the motivating forces which carried him to his goal. As a Michigan farm boy he was eternally curious about things mechanical and electrical, particularly aircraft and electronics. At the age of twelve he built and flew his own airplane. In his early twenties he was attracted to the nearby Heath Company, located in Niles, Michigan, then engaged entirely in the aircraft business. Incidentally, this was the same company that designed and sold the famous Heath Parasol kit form airplane, in the mid-twenties.

Keen interest in electronics was responsible for Howard Anthony's operation of a radio sales, service and custom design shop during the period of 1932-35. This practical experience developed a vital appreciation of the radio serviceman's problems and directly influenced his efforts in later years.

In 1935 business circumstances permitted Howard Anthony and his wife, Helen, to purchase the Heath Company and under their guidance a new Heath Company era was launched. In 1936 the Heath Company moved to Benton Harbor and manufacturing proceeded from aircraft parts, first for civilian use and later for wartime contracts, to aircraft radio equipment, and finally to the famous Heathkit electronic instruments.

Oscilloscopes had always attracted Howard Anthony and the principle of their operation was exceedingly fascinating to him. Early in his radio career he had built his own Scope because commercially available models were too costly. This particular instrument always remained his favorite and in a few years he achieved the distinction of having been responsible for the production of more oscilloscopes than any other man in history—well over 100,000 instruments. His present Model 0-10 represents his greatest accomplishment and final contribution to kit oscilloscope design.

In his acquisition of surplus material, Howard Anthony had accumulated many cathode ray tubes, which represented the most expensive oscilloscope component. He was convinced that a definite service could be performed by offering a low-cost kit form Scope. The idea was considered fantastic by many and was freely scoffed at. An initial trial run of 100 Scope kits was offered to Heath Company customers at $39.50. Response was tremendous and furnished all of the encouragement needed to further pursue this phase of operation. Thus were Heathkits born.

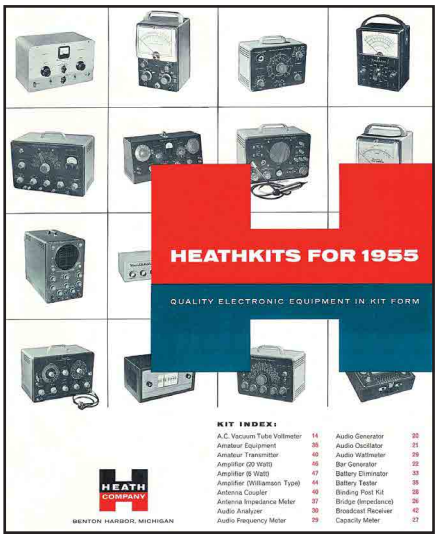
Heath Company progress, from the production of Howard Anthony's first kit, is one of amazing development and pioneering. Other kits rapidly made their appearance. Additional engineering talent was trained, production facilities were enlarged and improved. Art and Editorial Departments were added for efficient manual preparation. Kit packing technique was improved and, in effect, new trails were blazed through all phases of an infant industry. The kit instrument genie from Howard Anthony's magic cathode ray lamp grew and grew.

This is basically the story of Howard Anthony's success in the kit instrument business: Sheer courage to do what many said could not be done, engineering genius, and resourcefulness to provide real service to his fellowman.

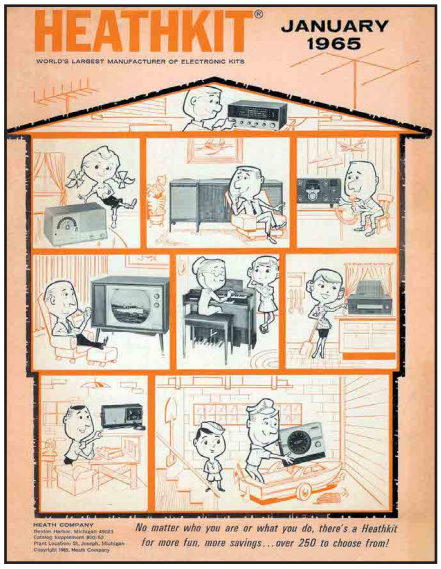
Who can measure the stimulus that Howard Anthony gave to electronics? Who can say how much dissemination of electronic knowledge was made possible through availability of Heathkits to various educational institutions? Certainly radio and T.V. service shops were more complete because Heathkits represented an opportunity for a serviceman to purchase a wide variety of kit instruments for the same amount that would normally be spent for a single factory-built item. This kit instrument availability was further reflected in better and faster service and increased profit to the serviceman and of course a better standard of living. The amateur radio enthusiast and high fidelity fan too have reaped the benefits of Howard Anthony's pioneering.

The only way all of these things can be measured is in Howard Anthony's pride that he had brought the electronic instrument field within the reach of the common man. His reward was the friendly, sincere encouragement he received from you, "his family" of customers.

Heath Company operation will carry on in the Howard Anthony tradition. The pattern has been set and the future program is virtually endless. Whatever the Heath Company may accomplish in future years can be directly attributed to the leadership of Howard Anthony, a man who earned the respect, friendship and admiration of all who knew him. His was the satisfaction of a job well done.



1955 Heathkit catalog showing a wide selection of ham radio kits.



1965 Heathkit catalog showing color TV and expanded home electronics line.

One of the last Heathkit catalogs, showing modern ham radio products.

Catalogs

I have included images of several Heath mail order catalog covers so you can see how they grew over time. The earliest one I have is dated March 1950. It shows the new kits for sale and still listed war surplus radios. By 1952 it was almost all kits, with some electronic parts. They had a short-wave receiver kit, but had not yet started to build ham radio kits, per se.

By their 1955 catalog, you could purchase a complete ham radio station. They featured the Heathkit VFO, the AT-1 transmitter, the AC-1 antenna coupler and an improved short-wave receiver kit, the AR-2. They also offered several pieces of ham radio related test equipment. The rest was history.

The number of products and the size of their catalogs continued to grow until the 1990s, when they decided to end the kit and ham radio business. During these 40-plus years, most of us who were active in ham radio owned at least one Heathkit.

There is much more to the Heathkit story. For some interesting Internet sites about Heath, please check my Web page: **www.eht.com/oldradio/arrl/index.html**. —*K2TQN*

Kenya Simplifies Amateur Licensing Requirements

The Communications Commission of Kenya has announced new, quicker and simpler Amateur Radio licensing requirements. In short, license applicants no longer need security or police vetting, although nonresident applicants must be citizens of countries that have diplomatic relations with Kenya—either directly or through another country. The basic requirement is confirmation of the applicant's validity for a license from the applicant's licensing authority—either via e-mail from the authority or in the form of a notarized photocopy—and a notarized photocopy of the applicant's passport. The Morse requirement has been eliminated. ARSK Chairman/Secretary E.H.M Alleyne, 5Z4NU, says ARSK will be glad to assist new applicants with information and advice. Additional details, including information on required fees, is on the Amateur Radio Society of Kenya Web site, **www.qsl.net/arsk**.—*ARSK*

COURTESY BILL TORRANCE, N7QAX

Pictured left to right are Chief Petty Officer Ray Jeno; Petty Officer Bill Torrance, N7QAX; KARS Director Mohammad Al-Holly, 9K2DR; Petty Officer Joe Skaggs, KE6TBZ, and Petty Officer Gus Vandevelde, KF6RDC.

Briefs

♦ Hams in the Middle East continue to promote friendship and international relations. US Navy reservists deployed to Kuwait visited the Kuwait Amateur Radio Society (KARS). The sailors had a wonderful time visiting and dining with Kuwaiti hams. The group was overwhelmed by the Kuwaiti hospitality. "We even made a few contacts from the KARS well-equipped shack, it was a little strange to be the DX station," said Bill Torrance, N7QAX.

♦ Norwegian clubs experimenting on 60 meters: Norwegian Radio Relay League International Liaison Officer Ole Garpestad, LA2RR, reports that registered club stations there have enjoyed special permission to test on 5 MHz for the past three years. Almost all of these club stations have one-letter call sign suffixes and, in some situations, they may use the LE prefix. The authorization is restricted for use in emergency communication or training, and Norwegian stations may not work stations outside of Norway on 5 MHz. Garpestad said Norway's elongated shape makes it impossible to communicate from one end of the country to the other on 80 meters, while 40 meters "has its shortcomings" during hours of darkness. "We are only allowed to use the two frequencies 5.410 and 5.420 MHz, all modes, 100 W," he said, "but only for communication between Norwegian club stations engaged in emergency communication or training for such communication, so this does not include any station outside of Norway."

In additional news from Norway, amateur stations there were granted access to 7.1 to 7.2 MHz on a secondary basis using 100 W output and bandwidth not to exceed 6 kHz.

♦ Hong Kong, Denmark, Austria, Sweden, France and Iceland dropping Morse requirement: Hong Kong and Denmark have become the latest countries to announce they will drop the requirement for Amateur Radio applicants to pass a Morse code examination for access to frequencies below 30 MHz. In conjunction with its announcement, Hong Kong will cancel all existing amateur station license (ASL) classes (and/or authority to operate), replacing them with a new authorization that does not carry a license class. "The existing Intermediate and Restricted class of ASL holders are allowed similar operational privileges as the existing Full class of ASL holders," the Office of the Telecommunications Authority (OFTA) announced February 11. In Denmark and Austria the CW requirements were removed in February 2004, and in France they were removed in March. Sweden and Iceland eliminated the CW testing requirements in April. All the previously mentioned countries allowed for upgrades to higher classes of license without the CW exam, or granted HF privileges to existing no-code licensees.

♦ San Marino gains additional spectrum on 40 meters: Julian Giacomoni, T77J, president of the Radio Amateur Association of the Republic of San Marino (ARRSM), **www.arrsm.org**, has announced that San Marino amateurs have gained access to 7.1 to 7.2 MHz in the 40 meter band. The change, effective February 25, permits amateur operation on a non-interference, secondary basis from 7.1 to 7.2 MHz. Region 1 amateurs in general have exclusive, primary access to 7.0 to 7.1 MHz. Since December, Croatian amateurs have been permitted to use 7.1 to 7.2 on a secondary, non-interference basis. Delegates to World Radiocommunication Conference 2003 last summer agreed to expand the 40 meter band in Region 1 to 7.2 by 2009.

♦ At the annual general meeting of VERON, Netherlands' national Amateur Radio society held April 24, 2004, the following executives and members of the board were elected:

Frank E. van Dijk, PA7F, President
Dick W. Harms, PA2DW, 1st vice-president, and VHF manager
Hans P. Blondeel Timmerman, PB2T, 2nd vice-president
Peter de Bruijn, PA3CWS, treasurer
Jan Hoek, PAØJNH, general secretary
Board members: PAØGMM, PAØJEB, PA3AGF, PAØWJG, PAØDIN, PAØJMG, PAØSTE, PAØSHY.

♦ In response to an invitation from the administration of the Islamic Republic of Iran, Fred Johnson, ZL2AMJ, representing International Amateur Radio Union (IARU) Region 3, and Daniel Lamoureux, VE2KA, representing the IARU International Secretariat, visited Iran to present a three-day Amateur Radio Administration Course April 26-28. Since the early 1980s this course has been conducted by IARU in various forms all over the world—including at ARRL Headquarters—and in response to invitations from administrations to train regulators and prospective regulators in the administering of the Amateur and Amateur Satellite services. Related objectives include managing disaster relief communications and organizing an Amateur Radio society. The course in Tehran was arranged by the Directorate General of Telecommunications. Presentations included *PowerPoint* displays prepared by the IARU. Each of the 16 participants received printed copies of the displays and many other documents, plus two CD-ROMs containing information about Amateur Radio. The two IARU visitors spoke with many radio amateurs in Tehran, some of whom attended the course. The course participants visited EP3PTT, a station established on the Ministry's premises in Tehran. The equipment in this station was received by Iran from the IARU Region 3 Stars*** program. It may be operated by licensed Iranian operators by arrangement. There have been Amateur Radio societies in Iran in the past, but there has not been an IARU member-society. An Amateur Radio club—a social meeting group—now meets in Tehran. Johnson and Lamoreaux described the course as a memorable experience and said they'd been very warmly received. Contact between IARU and the amateurs and the administration of Iran will continue, and further Amateur Radio information is to be provided.—*IARU*

COMING CONVENTIONS

SETICon TECHNICAL SYMPOSIUM

August 6-8, Ewing Township, NJ

The SETICon Technical Symposium, sponsored by The SETI League, will be held at The College of New Jersey, 2000 Pennington Rd (for directions visit **www.setileague.org/seticon/maps04.htm**). Doors are open Friday 8 AM to Sunday 1 PM. Features include annual membership meeting and annual Board of Trustees meeting (Armstrong Hall, Dept of Engineering), Hospitality Suites, awards banquet with keynote speaker (Saturday, 6 PM, Campus Center; tickets available in advance only, $30), technical sessions, lectures, Hardware Workshop (pre-registration required), panel discussions. Admission is $50 for SETI League members and $75 for non-members in advance; $75 for SETI League members and $100 for non-members at the door. Contact Dr. H. Paul Shuch, N6TX, 121 Florence Dr, Cogan Station, PA 17728; 570-494-2299; **n6tx@setileague.org**; **www.setileague.org/seticon**.

NEW ENGLAND DIVISION CONVENTION

August 13-15, Boxboro, MA

The New England Division Convention, sponsored by FEMARA, will be held at the Boxboro Woods Holiday Inn and Conference Center, 242 Adams Place; Exit 28 off Rte I-495 at Rte 111. Doors are open Friday 2-5 PM, Saturday 9 AM to 5 PM, Sunday 8 AM to 2 PM. Features include giant flea market, major manufacturers, dealers, vendors, commercial booths, exhibits, programs, seminars, forums, contests, VE sessions (Saturday and Sunday, $12 fee, no convention ticket required; Bruce Anderson, W1LUS, 978-851-2886; **W1LUS@arrl.net**), DXCC card checking, DXCC dinner (Friday, 7 PM; cocktail hour 6-7 PM; $30 before Aug 1, $35 after Aug 1; special guest speaker Eric Scace, K3NA), dinner dance (Saturday, 6 PM; $35 before Aug 1, $40 after Aug 1), Wouff Hong ceremony (Saturday night). Talk-in on 146.61 (146.2 Hz), 224.7 (103.5 Hz), 449.925 (88.5 Hz), 53.81 (71.9 Hz), 146.52. Admission is $10 in advance, $12 at the door; under 16 free. Tables are $10 per day (open space), $15 per day (under tent). Contact Mike Raisbeck, K1TWF, 85 High St, Chelmsford, MA 01824; 978-250-1235; **k1twf@arrl.org** or **info@boxboro.org**; **www.boxboro.org**.

KANSAS STATE CONVENTION

August 15, Salina

The Kansas State Convention, sponsored by the Central Kansas ARC, will be held at the Salina Bicentennial Center in Oakdale Park, 800 The Midway; from I-70 take the Ohio St Exit and turn S, at the 3rd stoplight (Greeley Ave) turn W (right), continue W on Greeley to the Bicentennial Center. Doors are open 8 AM to 4 PM. Features include large indoor air-conditioned flea market; vendors; full slate of interesting forums and meetings; special guest Chuck Skolaut, KØBOG, from ARRL HQ; VE sessions (8 AM to noon, walk-ins accepted); free parking; refreshments. Talk-in on 147.03, 443.9. Admission is $5. Tables are $15 ea (includes 1 admission ticket and electricity if needed). Contact Ron Tremblay, WAØPSF, 112 N Douglas Dr, Salina, KS 67401-3516; 785-827-8149; **rtremblay@cox.net**; **www.qsl.net/ckarc**.

NEW MEXICO STATE CONVENTION

August 20-21, Albuquerque

The New Mexico State Convention ("Duke City Hamfest"), sponsored by the New Mexico Hamvention Committee, will be held at the University of New Mexico Continuing Education and Conference Center, 1634 University Blvd NE; ½ mile S of I-40, just N of the intersection of Indian School Rd and University Blvd; take I-40 to the University Blvd Exit, go S on University Blvd past the Conference Center, turn left on Indian School Rd to parking lot entrance. Doors are open Friday 5-9 PM, Saturday 7 AM to 3 PM. Features include flea market, commercial vendors, free tailgating, forums, Special Event Station, contests, DXCC card checking, VE sessions (Saturday 7:30 AM; Darryl Clutter, 505-286-1672), self-contained RV parking ($10, no hookups), banquet (Saturday 6 PM, $15; guest speaker), free parking. Talk-in on 145.33 (100 Hz), 444.0 (100 Hz). Admission is free. Tables are $12 (without power), $18 (with power). Contact Linda Scott, KC7QXO, 4108 Saddlewood Trail SE, Rio Rancho, NM 87124; 505-896-4108; **zippy@zippylady.com**; **www.qsl.net/dchf**.

MISSOURI STATE CONVENTION

August 21, Columbia

The Missouri State Convention, sponsored by the Central Missouri Radio Association, will be held at the National Guard Armory, 5151 Roger Wilson Dr; 4½ miles N of I-70 on US 63 N to Prathersville Exit, follow signs. Doors are open 8 AM to 2 PM. Features include indoor/outdoor flea market, commercial vendors, forum speakers on emergency communications, MARS meeting, VE sessions, awards card checking, plenty of parking, refreshments. Talk-in on 146.76. Admission is $4. Tables are $10 (inside, includes 1 admission); outside space $5. Contact Bob Clinton, WØBUX, 9051 E Highway HH, Hallsville, MO 65255; 573-696-0231; **rhclinton@tranquility.net**; **www.qsl.net/cmra**.

ALABAMA STATE CONVENTION

August 21-22, Huntsville

The Alabama State Convention ("Friendly Family Hamfest"), sponsored by the Huntsville Hamfest Assn, will be held at the Von Braun Civic Center, 301 Williams St; take Governors Dr Exit off I-565, turn left, take first left onto Leaman Ferry Rd to VBC. Doors are open Saturday 9 AM to 4:30 PM, Sunday 9 AM to 2:30 PM. Features include giant dealer/manufacturer show; huge indoor air-conditioned flea market; exhibitors; vendors; wide selection of forums; special guest Dan Henderson, N1ND, from ARRL HQ; DX card checking; DX banquet; VE sessions (10 AM sharp, both days; $10 test fee); Hospitality Rooms (Friday and Saturday nights at the Huntsville Hilton); convenient parking ($4). Talk-in on 146.94, 145.33. Admission is $6, under 12 free. Call for tables rates. Contact Don Tunstill, W4NO, 1215 Dale Dr SE, Huntsville, AL 35801; 256-536-3904; **dontunstill@hamfest.org**; **www.hamfest.org**.

SOUTHWESTERN DIVISION CONVENTION

August 27-29, Phoenix, AZ

The Southwestern Division Convention, sponsored by the Central Arizona DX Assn, will be held at the Sheraton Wild Horse Pass Resort and Spa, located just 15 miles S of downtown Phoenix; 153 S to 143 and I-10 E, continue on I-10 E for 11 miles to Wild Horse Pass Blvd (Exit 162), exit right on Wild Horse Pass Blvd, take 1st right and continue straight, follow signs. Doors are open Friday 1-6 PM, Saturday 9 AM to 5 PM, Sunday 9 AM to noon. Features include poolside cookout (Friday 7-9 PM, $12), flea market, commercial exhibitors, many technical seminars and programs, VE sessions, DXCC card checking, banquet (Saturday 7-10 PM, $35), Wouff Hong ceremony, DX breakfast (Sunday 8-10 AM, $17). Talk-in on 147.2 (162.2 Hz) E of Phoenix, 146.94 (162.2 Hz) W of Phoenix, 443.05 (100 Hz) S of Phoenix. Admission is $17.50 in advance, $20 at the door; under 17 free with paying adult; logo pin included while supplies last. Contact Bob Davies, K7BHM, 1623 N Los Altos Ct, Chandler, AZ 85224-8357; 480-839-3728; **k7bhm@cox.net**; **www.hamradio2004.com**.

WEST VIRGINIA STATE CONVENTION

August 28-29, Weston

The West Virginia State Convention, sponsored by the West Virginia State Amateur Radio Council, will be held at the WVU Convention Center; I-79, Exit 99, W on US Rte 33 to 4th stoplight, N on US Rte 19 to Jackson's Mill. Features include full days of events in a family setting; club activities; forums; educational programs; demonstrations; auction sale; VE sessions; special guest Mark Spencer, WA8SME, from ARRL HQ. Talk-

July 16-17
Oklahoma State, Oklahoma City*

July 16-18
Montana State, East Glacier*
Pacific NW DX, South Everett, WA*

July 30-August 1
3905 Century Club, Wilsonville, OR*

August 6-7
Texas State, Austin*

August 6-8
International EME, Ewing Township, NJ*

August 7-8
Western New York Section, Williamsville*

September 11-12
Alaska State, Anchorage
Maryland/DC Section, Gaithersburg

September 12
Western Pennsylvania Section, Butler

September 17-18
W9DXCC, Elk Grove Village, IL

September 17-19
Illinois State, Peoria

September 18
Arkansas State, Jacksonville

September 18-19
Roanoke Division, Virginia Beach, VA

September 24-25
Nebraska State, Norfolk

September 25
Eastern Washington Section, Spokane

October 1-2
Pacific Northwest VHF, Moses Lake, WA

October 8-9
AR Lighthouse Society, Kill Devil Hills, NC

October 9
Northern New York Section, Lake Placid

October 10
Connecticut State, Wallingford

***See July *QST* for details.**

Gail Iannone ♦ Convention Program Manager ♦ giannone@arrl.org

in on 145.39. Admission is $3. Contact Mac McMillian, W8XF, 2537 Larwood Dr, Charleston, WV 25302; 304-549-4310 or 304-346-6006; **w8xf@arrl.net**; **www.qsl.net/wvsarc/**.

KENTUCKY STATE CONVENTION

September 10-11, Louisville

The Kentucky State Convention, sponsored by the Greater Louisville Hamfest Assn, will be held at the Paroquet Springs Conference Center in Shepherdsville; 15 minutes S of Louisville International Airport, Exit 117 off I-65, watch for signs. Doors are open for banquet and Wouff Hong on Friday 6-12 PM, for setup on Saturday 4:30-8 AM; public Saturday 8 AM to 3 PM. Features include Hamfest/Computer Show, indoor flea market (Bill Bland, KC4OJ, 502-543-4956; **kc4oj@arrl.net**), limited tailgating ($5), major exhibitors (Bob Rufener, 812-944-0037; **ripruf@wcrtc.net**), commercial vendors ($20 per space with tables and electricity), ARRL forum (10 AM), DXCC card checking, VE sessions (10 AM to 1 PM, $12 fee; Gerald Cundiff, KE4LIA, 502-935-6175), APRS and EchoLink demonstration, special displays, free overnight camping (Friday night, no hookups), banquet (Friday, September 10, 7 PM, $20; ARRL guest speakers and awards), Wouff Hong ceremony (Friday, immediately following banquet), free parking, refreshments. Talk-in on 146.7. Admission is $5 in advance, $6 at the door; under 13 free. Tables are $5 (includes table and 2 chairs). Contact Stu Kratz, WX4ME, c/o Greater Louisville Hamfest, Box 34444, Louisville, KY 40232-4444; 502-423-0402; **wx4me@arrl.net**; **www.qsl.net/glha**. QST

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.

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 **August 1** to be listed in the **October** 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.)

Alabama (Huntsville)—Aug 21-22, Alabama State Convention. See "Coming Conventions."

Arizona (Phoenix)—Aug 27-29, Southwestern Division Convention. See "Coming Conventions."

†Colorado (Divide)—Aug 27-29; Friday 4 PM to Sunday noon. *Spr:* Mountain ARC. Golden Bell Resort, 380 County Rd 512; take US Hwy 24 W from Woodland Park to Divide, CR 5 N to CR 512, W on CR 512 to Golden Bell Resort, total of approximately 4 miles from US Hwy 24. Swapfest, tailgating ($5 per space), VE sessions, camping, potluck dinner. *TI:* 146.82 (107.2 Hz). *Adm:* Free. Melinda Wright, KCØQQO, 84 Shavano Dr, Florissant, CO 80816; 719-748-0165; **www.qsl.net/nx0g/**.

†Colorado (Golden)—Aug 22, 8 AM to 2 PM. *Spr:* Denver Radio Club. Jefferson County Fairgrounds, 15200 W 6th Ave; US 6/6th Ave E or W to Indiana St, S to 6th Ave Service Rd, W to Fairgrounds; or I-70 E to 6th Ave E, follow directions from 6th Ave; or I-70 W to Colfax Ave, left on Colfax, right at Indiana, follow directions from 6th Ave. VE sessions. *TI:* 145.49, 448.625 (100 Hz). *Adm:* $5. Tables: $12. Bryan Steinberg, KCØCUA, 1011 S Foothill Dr, Lakewood, CO 80228-3404; 303-987-9596; **kc0cua@arrl.net**; **www.qsl.net/w0tx/**.

†Florida (Fort Pierce)—Aug 14, 8 AM to 2 PM. *Spr:* Fort Pierce ARC. Indian River Community College, 3209 Virginia Ave; US 1 to Virginia Ave, W to 35th St; I-95 to Okeechobee Exit, E to 35th St. All indoor air-conditioned hamfest, vendors, electronics, computers, forums, refreshments. *TI:* 147.345 (107.2 Hz). *Adm:* $2. Tables: without electricity $5, with electricity $8 (first-come, first-served). Bill Sinbine, N4XEO, 17275 Hammock Ln, Ft Pierce, FL 34987; 772-461-7275; **n4xeo@bellsouth.net**; **www.qsl.net/w4akh/**.

†Florida (Tampa)—Aug 28, 8 AM to 1 PM. *Spr:* Tampa ARC. TARC Operations Center, 7801 N 22nd St; I-275 to Sligh Ave Exit, E on Sligh Ave to 22nd St, left (N) on 22nd St, go to end of road. Indoor swap tables, tailgating, VE sessions, refreshments. *TI:* 147.105 (146.2 Hz). *Adm:* $2. Tables: $15. Biff Craine, K4LAW, 13515 Greenleaf Dr, Tampa, FL 33613; 813-265-4812; **k4law@arrl.net**; **www.hamclub.org**.

†Georgia (Ellijay)—Aug 14. *Spr:* Ellijay ARS. Gilmer County Civic Center, 1561 S Main St (old Hwy 5); from Atlanta take I-75 N to I-575 N, GA 515 to Ellijay, follow signs. Indoor spaces, tailgating. *TI:* 146.985 (77.0 Hz). *Adm:* Free. Tables: Free (limited number). Sam Underhill, K4SWU, 446 Sutton Rd, Ellijay, GA 30540; 706-276-4877; **k4swu@ellijay.com**; **www.qsl.net/w4hhh/**.

†Illinois (Joliet)—Aug 15. *Spr:* Bolingbrook ARS. Inwood Recreation Center, 3000 W Jefferson St; I-55 to Rte 52 (Jefferson St), go E on Rte 52 approximately 1½ miles to Joliet Park District. Huge outdoor flea market, VE sessions. *TI:* 147.33, 224.54. *Adm:* advance $5, door $6. Tables: before Aug 7 $10 (main floor, no electricity), $15 (with electricity); after Aug 7 $17 and $25. Tom Ballard, N9LJY, 19 W 609 Dystrup Ave, Lemont, IL 60439; 630-739-3740; **tb1301@comcast.net**; **www.k9bar.org**.

†Indiana (Lafayette)—Aug 15, 8 AM to 2 PM. *Spr:* Tippecanoe ARA. Tippecanoe County Fairgrounds, 1401 Teal Rd (SR 25); located between Indianapolis and Chicago, W of I-65, follow SR 26 or SR 38 to US 52, turn S on US 52, then W on SR 25 (Teal Rd), Fairgrounds are on N (right) side of road. Indoor/outdoor vendors, VE sessions. *TI:* 147.135 (88.5 Hz). *Adm:* $4. Tables: First-come, first-served. David Dull, WB9BRX, 49 Knoll Crest Ct, W Lafayette, IN 47906; 765-743-8305; **wb9brx@arrl.net**; **www.w9reg.org**.

Kansas (Salina)—Aug 15, Kansas State Convention. See "Coming Conventions."

†Kentucky (Lexington)—Aug 15; set up Saturday 6-8 PM, Sunday 6-8 AM; public 8 AM to 4 PM. *Spr:* Bluegrass ARS. Knights of Columbus Hall, 1604 Versailles Rd; from I-75/I-64 Exit 115 follow KY 922 to KY 4 (New Circle Road); take KY 4 west about 5 miles to Exit 5A (Versailles Road); take exit ramp 5A to Lexington and proceed toward downtown about 2 miles, following the hamfest signs posted along Versailles Road. Turn right into the Knights of Columbus driveway. Indoor and outdoor flea market, commercial vendors, tailgating ($5 per vehicle, plus admission for each attendee), forums (ARRL, technical, ATV, ARES, Kentucky), Ernie Farmer Memorial Award presentation, MARS Special Event Station, VE sessions (Fernie Williams, KE4MAI by Aug 3; 859-245-2140 eves; **fernie@ke4mai.com**), handicapped accessible, free parking, free overnight self-contained camping, refreshments. *TI:* 146.76, 444.125 (88.5 Hz). *Adm:* advance $5, door $6. Tables: advance $15, door $25. Jeanie Dalton-Pugh, KB8QLC, Box 24188, Lexington, KY 40524; 859-245-7703 (eves); **kb8qlc@arrl.net** or **jeanie@insightbb.com**; **www.BluegrassARS.org/**.

Kentucky (Louisville)—Sep 10-11, Kentucky State Convention. See "Coming Conventions."

†Louisiana (Leesville)—Aug 14, 7:30 AM to 2:30 PM. *Spr:* West Central Louisiana ARC. Leesville Fairgrounds, Shriner Bldg; turn right on Hwy 171, Hwy 8 W (Texas Hwy) go 2 miles to Chevron Gas Station, turn right on Stevens Blvd, follow to end to Fairgrounds, second building on left. VE sessions, free parking. *TI:* 145.31 (203.5 Hz), 146.52. *Adm:* $5. Tables: $5. Robert Partigianoni, WB5JZP, 101 Nelda St, Leesville, LA 71446; 337-239-7613; **wb5jzp@bellsouth.net**; **www.wclarc.com**.

†Maine (St Albans)—Aug 14, 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@adelphia.net**; **www.qsl.net/parc/**.

†Maryland (Westminster)—Aug 15, 8 AM to 2 PM. *Spr:* Carroll County ARC. Agricultural Center, 700 Agriculture Center Dr; take Rte 140 W to Center St, left on Center St to Gist Rd, right on Gist to Smith Ave, right on Smith Ave, go up the hill to event. All outdoors, 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 (Adams)—Aug 22, 8 AM to 2 PM. *Spr:* Northern Berkshire ARC. Adams Agricultural Fairgrounds, Bowe Field, Old Columbia St; take Rte 8 N or S into Adams, go W onto Butler St at Goodwill Store, left onto Old Colum-

†ARRL Hamfest

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bia St, Fairgrounds on left. Large tent in case of rain, VE sessions, plenty of free parking. *TI:* 146.91. *Adm:* $5. Tables: $5. Alan Vigiard, K1SAV, 25 Upton St, Adams, MA 01220; 413-743-1619; **k1sav@nobarc.org**; **www.nobarc.org.hamfest.htm**.

Massachusetts (Boxboro)—Aug 13-15, New England Division Convention. See "Coming Conventions."

Massachusetts (Cambridge)—Aug 15. Nick Altenbernd, KA1MQX, 617-253-3776.

†Michigan (Jackson)—Aug 14; set up Friday 6-8 PM, Saturday 6-8 AM; public 8 AM to noon. *Spr:* Cascades ARS. Northwest Elementary School, 3757 Lansing Ave; I-94 to US 127 N to Parnall Rd Exit, go E on Parnall Rd for 1 mile to Lansing Ave, go left (N) onto Lansing Ave, go 0.4 mile to school entrance on right. Trunk sales ($10, includes admission), vendors, VE sessions, free seminar on proper station grounding, free parking, refreshments. *TI:* 146.88 (100 Hz). *Adm:* $5, under 12 free with paying adult. Tables: $12 (without electricity) $17 (with electricity); includes admission. Conly George, AB8PW, Box 512, Jackson, MI 49204; 517-782-4007; **ab8pw@arrl.net**; or David Foster, W3IGT, 734-347-8738; **w3igt@arrl.net**; **www.w8jxn.org/swap.htm**.

†Michigan (Lapeer)—Aug 22, 8 AM to 1 PM. *Spr:* Lapeer County ARA. Lapeer County Center Building, 425 County Center Dr; I-69 to Exit 155, go N on M-24 for 1.2 miles, turn right on De Mille Rd (turns into McCormick Dr), go 0.2 miles, turn left onto S Court St, go 0.2 miles, turn left on County Center Dr. VE sessions. *TI:* 146.62 (100 Hz). *Adm:* $5. Tables: $12. Bill Miller, KD8VP, 3605 Pratt Rd, Metamora, MI 48455; 810-797-5329; **kd8vp@juno.com**; **www.w8lap.com**.

†Minnesota (St Cloud)—Aug 28, 9 AM to 2 PM. *Spr:* St Cloud ARC. National Guard Armory, 1710 8th St N (go to Veteran's Dr). VE sessions, refreshments. *TI:* 147.015. *Adm:* $5. Tables: $10. Scott Hall, KAØDAQ, 3001 8th St N, St Cloud, MN 56303; 320-252-4498; **lscotth@aol.com**; **www.w0sv.org**.

Missouri (Columbia)—Aug 21, Missouri State Convention. See "Coming Conventions."

†Missouri (St Charles)—Aug 22, 6:30 AM to 1 PM. *Spr:* St Charles ARC. American Legion Hall, 2500 Raymond Dr; I-70, First Capital exit, N to W Clay, W to Droste, N to Raymond, turn left, hall 1/2 block on right. Flea market, seminars, VE sessions. *TI:* 146.67. *Adm:* advance $2, door $3. Tables: $15. Ray Martin, KØWC, 47 Jean Dr, Florissant, MO 63031-8417; 314-524-1521; **remsr@charter.net** or **k0wc@arrl.net**; **www.wb0hsi.org**.

†Montana (Missoula)—Aug 14, 9 AM to 3 PM. *Spr:* Hellgate ARC. Greenough Park, Monroe St; I-90 to Van Buren St Exit 106, go N 3 blocks to Locust St, W 2 blocks to Monroe St, N ½ mile to Greenough Park Picnic Shelter. Swapmeet, VE sessions (1 PM). *TI:* 147.04. *Adm:* Free. Bob Henderson, N7MSU, 104 Saranac Dr, Missoula, MT 59803; 406-251-4148; **n7msu@arrl.net**; **pweb.amerion.com/k7vk/**.

New Jersey (Ewing Township)—Aug 6-8, SETICon Technical Symposium. See "Coming Conventions."

†New Jersey (Mullica Hill)—Aug 22, 8 AM to 2 PM. *Spr:* Gloucester County ARC. 4-H Fairgrounds, Rte 77, 10 minutes from I-295 and NJ Turnpike. Ham Radio/Electronics/Computer Flea Market, dealer displays, tailgating ($5, plus admission), antique and vintage radios, VE sessions (9:30 AM), DXCC and WAS card checking, free parking, refreshments. *TI:* 146.865 (131.8 Hz). *Adm:* $6, nonham spouses and under 12 free. Tables: $10 (covered pavilion space, plus admission). Harry Bryant, AA2WN, Box 496, Pennsville, NJ 08070; 856-678-6091; **aa2wn@arrl.net**.

†New Mexico (Alamogordo)—Sep 4, 7 AM to 3 PM. *Spr:* Alamogordo ARC. Otero County Fairgrounds, 401 Fairgrounds Rd (Hwys 54/70); N end of town, across from White Sands Mall. Forums (ARRL, MARS, 3939), VE sessions. *TI:* 146.8 (100 Hz). *Adm:* Free. Tables: $5. Bill Leehan, N5SUM, 3101 Thunder Rd, Alamogordo, NM 88310-4024; 505-437-9781; **n5sum@totacc.com**; **www.alamohams.org**.

New Mexico (Albuquerque)—Aug 20-21, New Mexico State Convention (Duke City Hamfest). See "Coming Conventions."

New York (Rome)—Aug 21. Anthony LoVaglio, WA2GBE, 315-337-2293.

†North Carolina (Fayetteville)—Aug 14, 8 AM to noon. *Spr:* Cape Fear ARS. Methodist College, Reeves Auditorium Lobby; 5400 Ramsey St; take Hwy 401 N out of Fayetteville, College is 1 block N of Stacy Weaver Dr. VE sessions. *TI:* 146.91 (100 Hz). *Adm:* Free. Tables: Free (donations are accepted). David Cowart, KR4OE, 637 E Raynor Dr, Fayetteville, NC 28311; 910-237-9097; **kr4oe@nc.rr.com**.

†North Carolina (Shelby)—Sep 4-5; gates 6 AM, buildings 8 AM. *Spr:* Shelby ARC. Cleveland County Fairgrounds, 1751 E Marion St; I-85 S to Hwy 74, W by-pass to E Marion St, Fairgrounds on right, parking on left. Giant flea market, major manufacturers, new equipment dealers, forums (Saturday), VE sessions (both days), QSL card checking, refreshments. *TI:* 146.88. *Adm:* advance $5, door $6. Tables: $10 (flea market space); $20-$35 (tables in buildings, per space per day). John Ledford, W4JL, 9555 Knob View Dr, Vale, NC 28168; 704-462-4910; **w4jl@shelby.net**; **www.shelbyhamfest.com**.

Ohio (Friendship)—Aug 28. Kim Lozier, N8ZW, 740-456-1616.

†Ohio (Warren)—Aug 15, 6 AM to 2 PM. *Spr:* Warren ARA. Kent State University Trumbull Campus (Workforce Development Building), 4314 Mahoning Ave NW; at the intersection of Rtes 5 and 82 Bypass and Rte 45. Storm Chasers, American Red Cross, VE sessions. *TI:* 146.97. *Adm:* $5. Tables: $5 (5-ft). Renee McCaman, KB8SVF, 317 Raymond Ave NW, Warren, OH 44483; 330-847-8478; **rnrmccaman@earthlink.net**; **www.w8vtd.org/**.

†Pennsylvania (Hanover/Pleasant Hill)—Aug 22, 7 AM to noon. *Spr:* Hanover Area Hamming Assn. Pleasant Hill Fire Company Carnival Grounds, on PA Rte 94 (W Manheim Township), 4 miles N of Manchester, MD (MD Rte 30); 4 miles S of Hanover. Tailgating (free spaces), vendors. *TI:* 146.895. *Adm:* $3. Mike Garber, N3KTX, Box 381, Westminster, MD 21102; 443-604-8133; **mgarber@sha.state.md.us**; **www.qsl.net/haha**.

†Pennsylvania (Matamoras)—Aug 15; sellers 7 AM; buyers 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, follow to end. Tailgating ($7 per space). *TI:* 145.35 (100 Hz), 146.52. *Adm:* $5. Tables: $10 (pavilion space). Paul Hild, KD3L, Box 522, Millrift, PA 18340; 570-491-4808; **kd3l@tsara.org**; **www.tsara.org**.

†Pennsylvania (New Kensington)—Aug 29, 8 AM to 1 PM. *Spr:* Skyview Radio Society. Skyview Club House, 2335 Turkey Ridge Rd; from the intersection of Rtes 380 and 366, take 366 W toward New Kensington, go approximately 1 mile, turn right onto Whitten Hollow Rd, go 1/2 mile to stop sign, turn right onto Turkey Ridge Rd, Clubhouse is on left at top of hill. Flea market ($5 per spot), VUCC/WAS card checking. *TI:* 146.64 (131.8 Hz). *Adm:* Free. Robert Livrone, N3WAV, 116 Arizona Dr, Lower Burrell, PA 15068; 412-860-7642; **n3wav@arrl.net**; **www.skyviewradio.net**.

Pennsylvania (Uniontown)—Sep 4. Carl Chuprinko, WA3HQK, 304-594-3779.

†Tennessee (Gladeville)—Aug 28, 8 AM to 2 PM. *Spr:* Short Mountain Repeater Club. Gladeville Community Center, 95 McCreary Rd; from Nashville take I-40 E to I-840 towards Murfreesboro, take Exit 70, turn right, go to first stop, turn left, hamfest at immediate left. Inside and outside vendors, foxhunt, forums, VE sessions. refreshments. *TI:* 146.91. *Adm:* $5. Tables: $10. Keith Harris, K4MHK, 2145 Honey Prong Rd, Hartsville, TN 37074; 615-478-8536 (days) or 615-633-4484 (eves); **keharris@nctc.com**; **www.qsl.net/smrc/index.htm**.

†Texas (Gainesville)—Aug 28, 7 AM. *Spr:* Cooke County ARC. Gainesville Civic Center, 311 S Weaver St; from I-35 N or S exit California St, go E for 2 blocks, turn S onto Weaver St, Civic Center on left. Indoor/outdoor flea market, tailgating ($6, first-come, first-served), commercial vendors, VE sessions, free parking. *TI:* 147.34 (100 Hz), 442.775 (100 Hz). *Adm:* advance $6 (by Aug 16), door $8. Tables: advance $10 (by Aug 16), door $12 (electricity $5 additional). James Floyd, N5ZPU, 1704 E California St, Gainesville, TX 76240; 940-668-7511; **jfloyd54@swbell.net**.

†Washington (Castle Rock)—Aug 21, 9 AM to 1 PM. *Spr:* Lower Columbia ARA of Longview. Castle Rock Fairgrounds, PH 10 near SR 411, 10 miles N of Kelso; if northbound on I-5, take Exit 48, turn left onto Huntington Ave, follow it N into town, turn left at 1st flashing red light (this is "A" St); if southbound on I-5, take Exit 49, turn right onto Huntington Ave, follow it S into town, turn right at 2nd flashing red light (this is "A" St); go W on "A" St, it changes to PH 10 after crossing Cowlitz River Bridge towards SR 411, after crossing river you will see Fairgrounds on left. Tailgating ($5 per space), commercial vendors, computers, electronics, radio clubs, RV overnight parking ($10). *TI:* 147.26 (114.8 Hz). *Adm:* $4. Tables: $9 (6-ft); fixed wall table space $7. Bob Morehouse, KB7ADO, Box 906, Longview, WA 98632; 360-425-6076; **kb7ado@aol.com**; **www.qsl.net/nc7p/swapmeet**.

†Washington (Spanaway)—Aug 14; set up Friday 2-7:30 PM, Saturday 6-8:30 AM; public 9 AM to 3 PM. *Spr:* Radio Club of Tacoma. Bethel Junior High School, 22001 38th Ave E; from I-5 N or S take Exit 127 to SR 512 E to Hwy 7 (Parkland/Mt Rainier) southbound, go approximately 7 miles to 224th, take left turn, go 1 mile to 38th Ave E, turn left, go 1/4 mile to school on right. Commercial displays, vendors, demonstrations, lectures, VE sessions (10 AM; Shirley Murphy, N7QHW, **sundancealso@harbornet.com**), free parking, self-contained RV parking, refreshments. *TI:* 147.38 (103.5 Hz), 147.5. *Adm:* $5, under 17 free with paying adult. Tables: $20 (non-commercial), $30 (commercial); includes 1 admission. Frank Palmer, AC7JY, 3817 169th St, Ct E, Tacoma, WA 98446; 253-539-7772; **ac7jy@msn.com**; **www.w7dk.org**.

†West Virginia (Huntington)—Aug 14. *Spr:* Tri-State ARA. Veteran's Memorial Field House, 2590 Fifth Ave; I-64 to Exit 11, go N (right) on Hal Greer Blvd to Fifth Ave, go E (right) on Fifth Ave to Field House (large facility on N side of street). VE sessions. *TI:* 146.76 (131.8 Hz). *Adm:* advance $5, door $6. Tables: $10. Benny Crittendon, KC8RRH, 2615 Rte 75, Kenova, WV 25530; 304-523-9562; **Bcritter@aol.com**; **www.qsl.net/tara**.

West Virginia (Weston)—Aug 28-29, West Virginia State Convention. See "Coming Conventions."

†Wisconsin (Baraboo)—Aug 14, 7 AM to noon. *Spr:* Yellow Thunder ARC. Sauk County Fairgrounds, located on Hwy 33 (8th Ave), far E side of Baraboo. Eighth Annual Circus City Swapfest. VE sessions. *TI:* 147.315 (123.0 Hz). *Adm:* advance $4, door $5. Tables: $5. Steve Schulze, N9UDO, 1120 City View Rd, Baraboo, WI 53913; 608-356-2313; **n9udo@yahoo.com**; **www.qsl.net/ytarc/hamfest.htm**.

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

N1BTC, Gail E. Scott, Stoneham, MA
K1CWF, Charles W. Fifield, Mason, NH
W1EEL, A. R. Frederickson, Pasadena, CA
W1HIF, Victor S. Peterson, West Springfield, MA
W1JNG, Thomas Edwards Jr, Laconia, NH
*K1OAS, Edward B. Olson, New Canaan, CT
W1QUE, Ralph C. Morris, New Bedford, MA
W1ZMJ, Raymond H. Swain, Reading, MA
WA2ABF, Michael Berezowski, Haddonfield, NJ
WB2EKQ, Joseph J. Woscyna, East Brunswick, NJ
N2ERX, John L. Franceschi, Seneca Falls, NY
K2IQN, Harry F. Hochman, Whitehouse Station, NJ
W2RBC, Herb Sheer, Eatontown, NJ
W2VHX, John Novak, Windsor, NY
N2ZP, Donald M. Ruccia, Mayetta, NJ
W3BO, Herbert B. Spoonts, Phoenixville, PA
W3DAW, David A. Wallner, Reading, PA
W3EAG, Thomas E. Gibson, Plymouth Meeting, PA
W3GJ, John H. Guthrie, Saint Marys, PA
K3OHE, Walter Tucky, Throop, PA
W3TEV, Alphonse A. Sallett, Reading, PA
WA3WUC, Walter W. Crawford, Middletown, PA
K4AIQ, Carolyn W. Haskins, Sparta, GA
N4DKC, Jesse B. Thrasher, Gardendale, AL
WA4DXU, Roy V. Foeman Sr, Louisville, KY
KQ4G, Nicholas Van DeSande, Haysville, KS
‡ex-W4GKA, Curtis C. Jones, Columbia, SC
WD4GOL, Emmett H. Goodman Sr, Casselberry, FL
WA4KIQ, Eugene J. Johns Sr, Cookeville, TN
W4PWT, John R. Hosea, Hopewell, VA
WN4Q, Don Surbaugh, Suwanee, GA
W4RPU, William M. Locke, Kingsport, TN
K4SBE, Frederick Campbell, Valrico, FL
K4STU, Stuart L. Smith, Booneville, KY
K4VDM, John L. Chandler, Johnson City, TN
W4YFV, Walter W. Smith, Radcliff, KY
KC4ZUF, Martha S. Doyle, Mobile, AL
WB5ARY, Morris S. Rogers, Irving, TX
N5BCK, John E. Otis, Houston, TX
W5CZH, H. Joseph Godeaux, Meridian, MS
W5EPW, William P. Gearhiser, Mississippi State, MS
WB5FWR, Albert E. Bean, Fort Stockton, TX
W5GAF, James K. Lamb, Panhandle, TX
W5GBG, Michael F. Kavanaugh, Nixa, MO
K5GB, Geddings P. Barber Jr, Houston, TX
W5GMZ, Bobby G. Bone, Greenville, MS
WA5IDJ, Joe L. Pratt, Austin, TX
WB5IZH, Edwin A. Mann, Amarillo, TX
W5JCV, Dale R. Weaver, Arvada, CO
*W5KLV, Jerry N. Connaway, San Antonio, TX
W5KYC, Milton W. Kirkpatrick, Collins, MS
N5MBC, Leon L. Watzke Sr, New Orleans, LA
N5MNT, Wayne Stovall, Tomball, TX
KC5OD, Joe M. Baker, Ada, OK
**K5RM, Adam F. Bowden, Albuquerque, NM
WB5S, Alton B. Miller, Shubuta, MS
W5VFF, Dallas B. Yeager, Jasper, TX
N5WUO, Margie L. Starnes, Temple, TX
AA5YE, A. G. Gilley, Fort Worth, TX
W6AOF, George S. Parks, Sunnyvale, CA
N6BMM, Burnett Y. Hyer, Lemoore, CA
AH6CS, Charles C. LeGrand, Kaneohe, HI
WA6DUV, Bryce P. Bressler, Thousand Oaks, CA
WA6GFT, Joseph W. Lesniewski, Antioch, CA
AA6GU, David L. Noble, Monte Sereno, CA
WB6KMM, Walter E. Howen, Lodi, CA
K6MYW, Dale C. Benson, San Luis Obispo, CA
*ex-W6NJ, Robert Miller, Gainesville, FL
WT6O, William H. Brownell, Fair Oaks, CA
KB6SNU, Joe A. Bryant, Roseville, CA
KF6WPO, Horace E. Dunbar Jr, Palo Alto, CA
W6YZT, Cecil L. Owens, Dobbins, CA
KF6ZI, Bruce B. Hedrick, Costa Mesa, CA
*W7ELH, Frank G. Burford, Clearwater, ID
KD7FKR, William M. Zinkl, Goodyear, AZ
KA7HXX, Ralph Scheinuk, Colville, WA
W7IKU, Leonard L. Ware, Phoenix, AZ
K7JCI, Robert M. Knight, Elma, WA
WB7RHO, Billie W. Delaney, Salem, OR
KB7SVX, Jean A. Treloar, Puyallup, WA
K7UWB, Stephen B. Page, Redmond, WA
WB7VNH, Robert C. Clemenz, Sedona, AZ
K7VYX, Edward I. Combs, Lacey, WA
*WA7ZVI, William T. Adie, Portland, OR
W8ANK, Arthur L. Baker, Orlando, FL
NW8N, Robert E. Reed Sr, Piqua, OH
W8SEY, Wayne Roe, Portage, MI
WB8SIJ, Earl V. Ramey, Bay City, MI
N8XSH, Stephen Lindenfeld, Saint Joseph, MI
KC9COA, Jeffery K. Hall, Terre Haute, IN
W9CTK, Edwin S. Beach, Fort Wayne, IN
WD9GVC, George M. Janke, Des Plaines, IL
WB9GYI, Tom M. Albright, Chillicothe, IL
*N9HT, Orville Towner, Streator, IL
K9KI, Raymond J. Cronin, Fort Wayne, IN
W9NRI, John P. Denk, Tinley Park, IL
WB9YFQ, Jack B. Neal, Great Bend, KS
WDØDYD, John J. Droney Jr, Saint Louis, MO
WFØF, William Daniel, East Saint Louis, IL
WØKFL, Ronald L. Philippi, Affton, MO
WAØMKE, Forest E. Lichliter, Coffeyville, KS
KØQDC, Herman Stallbaum, Maurice, IA

*Life Member, ARRL
**Charter Life Member, ARRL
‡Call sign has been re-issued through the vanity call sign program.

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Kathy Capodicasa, N1GZO ♦ Silent Key Administrator ♦ n1gzo@arrl.org

QEX INCLUDING: COMMUNICATIONS QUARTERLY

In the July/August Issue:

• Tom McDermott, N5EG, and Karl Ireland present their 100 MHz vector network analyzer design. If you build it, this instrument will bring you capabilities that might otherwise be beyond your means.

• Rob Lytle, N3FT, introduces an improvement to the so-called Jones filter. It allows the center frequency of a variable-bandwidth crystal filter to remain reasonably constant as the bandwidth is changed. Using readily available components,

• Markus Hansen, VE7CA, shows how to fix your HP8640B when its output pre-amplifier fails. We understand that is a fairly common situation with the generator.

• Sergio Cartoceti, IK4AUY, studies a so-called H-mode mixer based on the FST3125M chip. He fully analyzes and tests his double-balanced mixer for all the usual parameters.

• Ron Barker, G4JNH, returns with a follow-on to his Sep/Oct 2001 article on remote antenna impedance measurement. Ron refines his technique by making good use of the transmission-line equation.

• Walt Maxwell, W2DU, comes with a rebuttal to the series of articles on transmission-line mechanics presented by Steve Best, VE9SRB. (Jan/Feb, Jul/Aug and Nov/Dec 2001). Walt points to what he perceives as errors and provides different solutions.

• In Antenna Options, L.B. Cebik, W4RNL, kicks off a four-part series on Yagi design and optimization. In Tech Notes, Nickolaus Leggett, N3NL, has some words about the use of a protocol that may increase your random microwave contacts. *QEX* Editor Doug Smith, KF6DX, has some observations about resistance and energy conversion.

QEX is edited by Doug Smith, KF6DX (**dsmith@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. For First Class US delivery, it's $37; elsewhere by surface mail (4-8 week delivery) it's $31. In Canada by airmail it's $40. Elsewhere by airmail it's $59. Nonmembers add $12 to these rates.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an *Author's Guide* at: **www.arrl.org/writing.html**. If you prefer postal mail, send an SASE (6×9 inches, minimum) with 60 cents postage (2 ounces) to Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494, and request an *Author's Guide*.

STRAYS

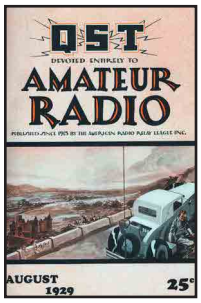
QST congratulates...

◊ Fred Matos, W3ICM, who was presented with the Department of Commerce Gold Medal Award for Distinguished Achievement for his work to help establish telecommunications in Iraq. Over the course of nine months in Baghdad, Fred helped to establish a central telecom authority and also to assign frequencies to local law enforcement groups. Commerce Secretary Don Evans thanked Fred for "expanding freedom around the world."

◊ Hon John T. Hammond, N8OEI, of St Joseph, Michigan, who has been recognized by Michigan Supreme Court Chief Justice Maura Corrigan as the state's longest serving judge. Hammond is a member of the Blossomland ARA.—*tnx Bill Wheeler, W8JBA*

75, 50 AND 25 YEARS AGO

August 1929



♦ The cover drawing shows a modern portable ham station built into the rumble seat of a car. The editorial discusses the Volunteer Communication Naval Reserve, Class V-3, made up mostly of amateur operators, and urges hams to support this effort and the Army-Amateur Radio System. The editor "hopes that it will be a long, long time until there is another war," and opines that "Modern science will make the next war terrible beyond description."

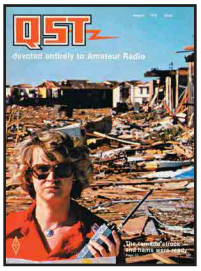
Technical Editor James Lamb, W1CEI, describes a simple device for checking the performance of the phone transmitter, "The Modulometer." R. H. G. Mathews, W9ZN, tells about "The Amateur and the Naval Reserve." Mathews is a former vice-president of the A.R.R.L. and is now a Volunteer Communication Reserve Commander for the U.S. Navy. A. W. McAuly, W8CEO, tells about his three-band tuner, the "Bear-Cat, Model 3B." Assistant Technical Editor Beverly Dudley, W1AL, discusses "Resistance Control of Regeneration." *QST* publishes the fourth entry in the Station Description Contest, "W1WV—A 100 Per Cent 1929 Amateur Station." Alphy Blais, VE2AC/WE2AS, works at "Helping the Beginner" with some troubleshooting tips.

August 1954

♦ The cover photo shows the Paratone, an R.F.-powered monitor for break-in. The editorial discusses ITV—interference to hams from television receivers. The FCC "has now issued a Notice of Proposed Rule Making with some real teeth in it" to reduce this problem. It's good to see the FCC rightfully protecting hams from unnecessary interference!

Jeff Lamb, W6WWM, tells about his compact multiband mobile rig in "Twenty-Five Watts under the Dash." Phil Rand, W1DBM, presents Part I of "A Civil Defense Control-Station Transmitter." Don Klein, W1GKR, and Bill Slusher, W1ZYK, tell about "The 'Paratone'—An R.F.-Powered Monitor for Break-in." Bob Resconsin, W1TRF, describes "The Connecticut Kilowatt," his bandswitching amplifier. Lew McCoy, W1ICP, continues to educate our new Novices, this time telling them how H.F. signals get from one place to another, in "Let's Meet Mr. Ionosphere." Mason Southworth, W1VLR, describes "A Phase-Modulation Exciter for the V.H.F. Man" that is simple and B.C.I.-free. An item in "Strays" tries for the *third* time (this time successfully) to spell Punxsutawney correctly. The original spelling in June was incorrect, and the July "correction" wasn't correct.

August 1979



♦ The cover photo shows Phyllis Engleman, WB5YJO, standing with her handheld in the middle of a scene of tornado devastation. The editorial appeals to members and clubs to work toward the continuing growth of Amateur Radio.

Doug DeMaw, W1FB, urges us to "Build a Simple 'Super' for SSB," a 75-meter superhet receiver. Jay Rusgrove, W1VD, tells us "Spectrum Analysis—One Picture's Worth a...." Jim Bartlett, K1TX, describes how HQ tests equipment in "Anatomy of a Product Review." Ed Tilton, W1HDQ, looks at Solar Cycle 21 and reports on "Propagation—Past and Prospects." "Terrible Tuesday" by Charles Byers, W5GPO, tells about a vicious tornado that struck Wichita Falls, Texas. Alan Clark, WD5IKD, and Jim Davis, WB5VFS, describe severe flooding in Jackson, Mississippi, in "Action in Jackson." Frank Masters, W3ABF, and Bob Josuweit, WA3PZO, tell the story of "Meltdown" at Three Mile Island, Pennsylvania. As always, a lot of hams did great work during and following those disasters. "Maritime Mobile (Almost)" by Michele Bartlett, N1AGD, tells about hams putting the RMS *Queen Mary*'s radio shack on the air in the ham bands as W6RO. The "International News" column reports on "King Hussein and Amateur Radio in Jordan." QST

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	TELEPRINTER BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	TELEPRINTER BULLETIN				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ **Morse code transmissions:**
Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 2001 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by K6YR. See "Contest Corral" in this issue. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The fee structure is $10 for a certificate, and $7.50 for endorsements.

♦ **Teleprinter transmissions:**
Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz. Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.
On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:**
Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Miscellanea:**
On Fridays, UTC, a DX bulletin replaces the regular bulletins.
W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, Presidents' Day (Feb 16), Good Friday (Apr 9), Memorial Day (May 31), Independence Day (Jul 5), Labor Day (Sep 6), Thanksgiving and the following Friday (Nov 25-26), and Christmas Day (Dec 24). QST

AT THE FOUNDATION

The past two months have been busy. After the retirement of longtime Secretary Mary Lau, N1VH, the ARRL Foundation Board consolidated its operations in the ARRL Development Office and moved the key point of contact for Foundation information, scholarships, grant applications and correspondence into the hands of new Secretary Mary Hobart, K1MMH.

The goals of the Foundation remain steadfast—providing scholarships to hams to continue their post high school education and providing grants for Amateur Radio related projects not funded by ARRL. In both of these areas, the Foundation continues to grow.

Three new scholarships will be added for the 2005 round of awards to radio amateurs who are pursuing their education:

The **Albert H. Hix, W8AH Memorial Scholarship**, endowed through the Kanawha ARC, provides a $500 scholarship with preference to applicants residing in the West Virginia section, Roanoke Division and attending school within that West Virginia section.

The IRARC Memorial Joseph P. Rubino WA4MMD Scholarship, supported by the Indian River ARC Memorial Foundation, provides a $750 award to a resident of Brevard County, Florida or, secondarily, to a qualified Florida resident, in memory of Joseph P. Rubino, a technical photographer at the Cape Canaveral rocket launching facility.

The William Bennett, W7PHO, Memorial Scholarship, endowed through the Western Washington DX Club and friends of W7PHO, honors the memory of the late William Bennett, W7PHO, and is awarded to a radio amateur holding a General class license or higher, with preference given to candidates residing in the Northwestern, Pacific and Southwestern Divisions of the ARRL.

Complete details on qualifications for these and other ARRL Foundation scholarships, along with application instructions and forms, can be found on the ARRLWeb at **www.arrl.org/arrlf/#scholgen**.

The second major focus of the ARRL Foundation is to award grants to Amateur Radio clubs and organizations for projects not covered by ARRL programs. New grant guidelines and forms are now on the Web at **www.arrl.org/arrlf/grant-app-instructions.html**, along with a list of previous grant awards.

Support for these ARRL Foundation activities comes from individuals who make contributions and estate plans that include the ARRL Foundation. For complete information on how to support the work of the ARRL Foundation, or to make a contribution, contact:

Mary M. Hobart, K1MMH
Secretary
ARRL Foundation
225 Main St
Newington, CT 06111-1494
Telephone: 860-594-0397
E-mail: **mhobart@arrl.org**

Mary M. Hobart, K1MMH ♦ Secretary, ARRL Foundation Inc. ♦ mhobart@arrl.org

CONTEST CORRAL

W1AW Qualifying Runs are 10 PM EDT Wednesday, August 4 (0200Z August 5), and 4 PM Thursday, August 19 (2000Z August 19). The K6YR West Coast Qualifying Run will be at 9 PM PDT Wednesday, August 11 (0400Z August 12) (10-40 WPM). 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 60, 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 prior publication.

Aug 7-8

ARRL UHF Contest, 1800Z Aug 7-1800Z Aug 8 (see Jul *QST*, p 107 or **www.arrl.org/contests/rules/2004/uhf.html**.)

North American QSO Party—CW—sponsored by the *National Contest Journal*, 1800Z Aug 7-0600Z Aug 8. (see Jan *QST*, page 98 or **www.ncjweb.com**)

SARL HF DX Contest—SSB—sponsored by the Bloemfontein Radio Amateur Club from 1330Z-1730Z Aug 8 (CW is Aug 29). Frequencies: 80-20 meters. Categories: SOAB, MS. Exchange: RS(T) + serial number. QSO points: SSB—1 pt, CW—2 pts. Total score: QSO points + ZS call areas and South African countries (see Web site). For more information: **www.sarl.org.za/public/contests/contestrules.asp#HFCWPHONE**. Logs due 14 days after the contest to **admin@sarl.org.za** or PO Box 1721, Strubensvallei 1735, Republic of South Africa.

Ten-Ten International Summer Phone QSO Party—sponsored by Ten-Ten, International, 0010Z Aug 7-2359Z Aug 8, 10 meters only. Exchange: call, name, state and 10-10 number (if available). QSO points: nonmembers—1 pt, members—2 pts. Total score: sum of QSO points. For more information: **www.ten-ten.org**. Logs due Aug 23 to **tentencontest@alltel.net** or Steve Rasmussen, NØWY, 312 N 6th St, Plattsmouth, NE 68048-1302.

European HF Championship—CW/SSB—sponsored by the Slovenian Contest Club, 1200Z-2359Z, Aug 7. EU to EU contacts only. Frequencies: 160-10 meters. Categories: SOAB only—CW, SSB, and Mixed Modes, HP and LP, and SWL. Exchange: RS(T) and last two digits of first year licensed. Score: QSOs × number of different years received, counted once per band. For more information: **lea.hamradio.si/~scc/euhfcrules-04.htm**. Logs due Aug 31 to **euhfc@hamradio.si** (Cabrillo format preferred) or Slovenia Contest Club, Saveljska 50, 1113 Ljubljana, Slovenia.

TARA "Grid Dip" Contest—PSK and RTTY—sponsored by Troy ARA from 0000Z—2400Z Aug 7. Frequencies: 80-6 meters, work stations once per band, work Rovers again from new locators. Categories: SOAB only—QRP (<5 W), LP (<100 W max), HP (100 W max or RTTY legal limit), Rover (100 W max) operating from more than one Grid Locator, SWL. Exchange: Name and 4-digit grid locator. QSO points: 1 pt/QSO. Total score: QSO points × Grid Locators counted once per band. For more information: **www.n2ty.org/seasons/tara_grid_rules.html**. Scores due Sep 4 via online submission form or **grid-manager@n2ty.org** or Antony Headwomen, N3FX, 11301 Mosley Rd, Damascus, MD 20872-1332.

National Lighthouse-Lightship Weekend—all modes—sponsored by the Amateur Radio Lighthouse Society from 0001Z Aug 7-2359Z Aug 8. Frequencies (MHz): CW—1.830, 3.530, 7.030, 14.030, 21.030, 28.030; SSB—1.970, 3.970, 7.270, 14.270, 21.370, 28.370. Exchange: Serial number or ARLHS member or lighthouse number, name and S/P/C. For more information: **arlhs.com/NLLW-2004-guidelines.html**. Logs due Aug 31 to Dave Ruch, NFØJ, PO Box 20696, Bloomington, MN 55420-0696.

Aug 14-15

50th Anniversary Worked All Europe DX Contest—CW—sponsored by the Deutscher ARC from 0000Z Aug 14-2359Z Aug 15 (phone is Sep 11-12; RTTY is Nov 13-14). Frequencies: 80-10 meters according to Region I band plan. Categories: SOHP, SOLP, MS, SWL. Packet or spotting nets allowed (SO stations not using spotting assistance will be noted). SO operate 36 hrs max, up to three off periods of 1 hour min. Non-EU work EU only except RTTY, where everyone works everyone except own country. Exchange: RS(T) and serial number. Score 1 pt/QSO and 1 pt/QTC. Final score is QSOs + QTCs × weighted multipliers. Multipliers: non-EU use WAE countries, EU use DXCC entities plus call districts in W, VE, VK, ZL, ZS, JA, PY and RA8/9/Ø. (RTTY use WAE + DXCC.) Mults on 80 m count ×4, on 40 m ×3, otherwise ×2. A QTC is a report sent from a non-EU station back to an EU station of QSOs

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that took place earlier in the contest (RTTY QTC can be exchanged between any continents). A QTC contains the time, call sign and QSO number of the station being reported (eg, 1307/DL1AA/346). A QSO may only be reported once and not back to the originating station. A maximum of 10 QTCs can be sent to a single station. The same station can be worked several times to complete this quota, but only the original QSO has QSO point value. Keep a list of QTCs sent. For example, QTC 3/7 would indicate that this is the third series of QTCs sent, and seven QSOs are reported. For more information: **www.waedc.de**. Logs due by Sep 15 (CW), Oct 15 (Phone) or Dec 15 (RTTY) to **waedc@dxhf.darc.de** or to WAEDC Contest Manager, Bernhard Buettner, DL6RAI, Schmidweg 17, 85609 Dornach, Germany.

Maryland-DC QSO Party—CW/Phone—sponsored by the Antietam Radio Association, 1600Z Aug 14-0400Z Aug 15 and 1600Z-2359Z Aug 15. Frequencies (MHz): CW—3.643, 7.060, 14.060, 21.060, 28.035, Phone—1.895, 3.920, 7.230, 14.270, 21.370, 28.370, VHF/UHF—50.150, 52.525, 144.15, 146.55, 146.580, 432.15, 446.000. Categories: Club, Mobile, Novice/Tech, QRP and Standard. Work stations once per band/mode, portable/mobiles can be worked again in each county. Exchange: QTH and category. QSO points: Club—10 pts, Mobile—5 pts, QRP or Novice/Tech—4 pts, CW or RTTY or ATV—3 pts, all others—1 pt. Highest single point value applies. Score: QSO points × MD counties + Baltimore City + DC. (MD-DC stations also count SPC.) For more information: **www.w3cwc.org/rules.html**. Logs due Sep 15 to **wa3eop@arrl.net** (ASCII format) or Antietam Radio Association, PO Box 52, Hagerstown, MD 21741-0052

Aug 21-23

ARRL 10 GHz Cumulative Contest, 0600 local-2000 local Aug 21-2000 local Aug 22 (see announcement this issue, p 107, or **www.arrl.org/contests**).

North American QSO Party—SSB, 1800Z Aug 21-0600Z Aug 22 (see Aug 7-8).

SARTG WW RTTY Contest, sponsored by the Scandinavian Amateur Radio Teleprinter Society, 0000Z-0800Z and 1600Z-2400Z Aug 21 and 0800Z-1600Z Aug 22. Frequencies: 80-10 meters. Categories: SOAB (HP, LP <100 W), SOSB, MS, SWL. Exchange: RST and serial number. QSO points: own country—5 pts, different country on same continent—10 pts, diff cont—15 pts. Score: QSO points × DXCC entities + W/VE/VK/JA call districts. For more information: **www.sartg.com**. Logs due Oct 10 to **contest@sartg.com** or to SARTG Contest Manager, Ewe Håkansson, SM7BHM, Pilspetsvägen 4, SE-291 66 Kristianstad, Sweden.

Keymen's Club of Japan Contest—CW—sponsored by the Keymen's Club of Japan, 1200Z Aug 21-1200Z Aug 22. Frequencies: 160-6 meters (JA allocations on 160 are 1.810- 1.825, 1.908-1.912 MHz). Categories: SOAB, SOSB (JA only), SWL. Exchange: RST and JA prefecture/district or continent. QSO points: 1 pt/QSO (JA count JA/JA—1 pt and JA/DX—5 pts). Score: QSO points × JA pref/dist from each band (JA also count continents). For more information: **www.jarl.com/kcj**. Logs due Sep 30 to **kcjlog@freeml.com** or Yasuo Taneda, JA1DD, 279-233 Mori, Sambu-town, Sambu-gun, Chiba 289-1214, Japan.

New Jersey QSO Party—CW/Phone—sponsored by Englewood ARA, 2000Z Aug 21-0700Z Aug 22 and 1300Z Aug 22-0200Z Aug 23. Frequencies (MHz): 1.810, 3.535, 7.035, 14.035, 21.100, 28.100, SSB—3.950, 7.235, 14.285, 21.355, 28.400, VHF/UHF 50-50.5 and 144-146 MHz. Exchange: QSO number and SPC or NJ county. QSO points: 3 pts/QSO. Score: QSO points × NJ counties. NJ stations use NJ counties + states (except NJ) + provinces, max 83. For more information: **www.qsl.net/w2rj**. Logs due Sep 18 to Englewood Amateur Radio Association, Inc, PO Box 528, Englewood, NJ 07631-0528.

SEANET Contest—CW/SSB/Digital—sponsored by the SEANET Convention, 1200Z Aug 21-1200Z Aug 22. Frequencies (MHz): CW—3.525, 7.025, 14.025, 21.025, 28.025, SSB—7.090, 14.220, 21.320, 28.320. Categories: SO, MS, AB, SB, Mixed and Single Mode combinations. Exchange: RS(T) and serial number. QSO points: SEANET-SEANET—10 pts (5 pts if same country), SEANET-World—10 pts. Score: QSO points × DXCC entities for SEANET entrants, QSO points × SEANET entities for non-SEANET entrants, counted once per band and mode. For more information and list of SEANET countries: **www.seanet2004.com**. Logs due Sep 30 to **seanet2004@rast.or.th** or Ray Gerrard, HSØZDZ, PO Box 69, Bangkok Airport PO, Bangkok 10212, Thailand.

Summer VHF/UHF QSO Party—sponsored by the Colorado QRP Club, from 1600Z Aug 22-2200Z Aug 22. Frequencies: 2 m and 70 cm FM, 5 W output max, use recognized simplex frequencies according to the ARRL band plan; do not use the national simplex frequencies of 146.52 or 446.000 MHz. Categories: Portable, Non-Portable. Exchange: Call sign, Grid square, first name, and CQC member # or power. QSO points: 1 pt/QSO. Total score: QSO points × names beginning with different letters (26 max), counted once per band. 100 point bonus for QSO with WØCQC. For more information: **www.cqc.org/contests/summer04.htm**. Logs due 30 days after the contest to **contest@cqc.org** or CQC Contest, PO Box 17174, Golden, CO 80402-6019.

Aug 28-29

Ohio QSO Party—CW/SSB—sponsored by the Mad River Radio Club, 1600Z Aug 28-0400Z Aug 29. Frequencies (MHz): CW—3.545, 7.045, 14.045, 21.045, 28.045; SSB—3.850, 7.225, 14.250, 21.300, and 28.450. Categories: SO, MM, Mobile and Rover. Exchange: Serial Number and Ohio county, state or province, DX stations send DX. QSO points: CW—2 pts, SSB—1 pt. Score: QSO points × OH counties (OH station count states, provinces, and OH counties) counted once per mode. For more information: **www.oqp.us**. Logs due 30 days after the contest to **logs@oqp.us** or to Ohio QSO Party c/o Jim Stahl, K8MR, 30499 Jackson Rd, Chagrin Falls, OH 44022-1730.

TOEC WW Grid Contest—CW—sponsored by the Top of Europe Contesters (TOEC), 1200Z Aug 28-1200Z Aug 29. Frequencies: 160-10 meters. Categories: SO (no packet) -AB, -SB, Low Power (<100 W, AB only), MS (10 min band change rule), MM, Mobile (SOAB)—work mobiles from each grid field (ie, JP, KO, EM). Exchange: RST + grid square, i.e.—JP73 (log must show all grid fields activated). QSO points: own continent—1 pt, other cont—3 pts, QSOs with mobiles—3 pts. Score: QSO points × two-letter grid fields. For more info—**www.qsl.net/toec/contest.htm**. Logs due 30 days after the contest to **TOEC.contest@pobox.com** or to TOEC, Box 178, SE-83122 Ostersund, Sweden.

Hawaii QSO Party—CW/Phone/RTTY/PSK31 —sponsored by the Koolau ARC, 0700Z Aug 28-2200Z Aug 29. Frequencies: 160-10 meters. Categories: SOAB and MS (single or mixed-mode), MM (mixed-mode only). Spotting nets and packet allowed in all classes. Exchange: RS(T) and SPC, maritime region (1-3), or HI county. QSO points: 20-15-10 meters, Phone—1 pt, CW/Digital—2 pts; 40 meters, Phone—2 pts, CW/Digital 4 pts; 80 meters, Phone—4 pts, CW/Digital—8 pts; 160 meters, Phone 8 pts, CW/Digital 16 pts. Score is total points plus 150 pts for QSO with KH6J. For more information: **www.karc.us/hi_qso_party.html**. Logs due 30 days after contest to **kh6j@karc.us** or Hawaii QSO Party, PO Box 8960788, Wahiawa, HI 96786-0788.

YO-DX Contest—CW/SSB—sponsored by the Romanian Amateur Radio Federation (RARF), 1200Z Aug 28-1200Z Aug 29. Frequencies: 80-10 meters. Categories: SOAB, SOSB, MS. Exchange: RST and serial number, YO stations send county abbreviation. QSO points: different country own continent—2 pts, different continent—4 pts, YO stations—8 pts. Score: QSO points × YO counties and DXCC entities counted once per band. For more information: **www.hamradio.ro/contests/yodx_eng.htm**. Logs due 30 days after the contest to **yodx_contest@hamradio.ro**. YO DX HF Contest, PO Box 22-50, 71100 Bucharest, Romania.

SARL HF DX Contest—CW—from 1330Z-1730Z Aug 31 (see Aug 7-8).

SCC RTTY Championship, sponsored by the Slovenian Contest Club, 1200Z Aug 28-1159Z Aug 29. Frequencies: 80-10 meters. Categories: SOAB-HP, SOAB-LP, SOAB-Assisted, MS. Exchange: RST and 4-digit year first licensed. QSO points: own country—1 pt, different country same continent and between W, VE, VK, ZL, ZS, JA, PY call areas, LU provinces, and UA9/Ø oblasts—2 pts, different continent—3 pts. Score: QSO points × different years from all bands. For more information: **lea.hamradio.si/~scc/rtty/htmlrules.htm**. Logs due Sep 15 to **rtty@hamradio.si** (Cabrillo format preferred) or on diskette to Slovenia Contest Club, Saveljska 50, 1113 Ljubljana, Slovenia.

SPECIAL EVENTS

Wingdale, NY: Steve Jacobson Memorial ARA, N2SJ. 1800Z-2300Z **Jul 18**. Camp Ramah in the Berkshires 2004 Amateur Radio program. 28.350 14.275 7.240. QSL. Bernard Umlas, N2NVU, 30 West 34th St, #3A12, New York, NY 10001.

Indianapolis, IN: Indianapolis Motor Speed Amateur Radio Club, W9IMS. 1500Z **Jul 31**-0300Z **Aug 9**, weekends of Jul 31-Aug 1 and Aug 7-8 and intermittently on week days. Brickyard 400 (NASCAR). 28.340 21.340 14.240 7.240 3.840 PSK31. QSL. Indianapolis Motor Speedway ARC, PO Box 18495, Indianapolis, IN 46218-0495. **www.qrz.com/w9ims**.

Grand Haven, MI: North Ottawa Amateur Radio Club, W8CSO. 1200Z **Aug 5**-1600Z **Aug 6**. Honoring Grand Haven's Coast Guard Festival. 14.240 7.200. QSL. NOARC, Box 44, Ferrysburg, MI 49409. **www.ghcgfest.org**.

Door Peninsula, WI: Wisconsin Lighthouse Expedition, N9L. 1400-2100Z daily **Aug 5-Aug 14**. Activation of Wisconsin Lighthouses, including Eagle Bluff Lighthouse (USA-252). 14.270 7.270. Certificate. Jim Martin, W5AZN, 637 Newberry Dr, Richardson, TX 75080-5622. **www.w5azn.com**.

Burnett, WI: Rock River Radio Club, W9A. 1600Z **Aug 6**-2100Z **Aug 8**. 36th Annual Dodge County Antique Power Show. 14.275 7.250. Certificate. Rock River Radio Club, W9TCH, PO Box 26, Juneau, WI 53039.

Canton, OH: Canton Amateur Radio Club, W8AL. 1300Z **Aug 6**-0200Z **Aug 8**. Annual Pro Football Hall of Fame Festival. 28.365 21.365

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14.265 7.265. Certificate. Donald E. Perry, WQ8J, 968 Culverne Ave NW, Massillon, OH 44647.

Lexington, KY: Aviation Museum of Kentucky, KY4AMK. 1800Z **Aug 6**-2200Z **Aug 8**. Historic Fly-In. 21.320 21.070 14.070 7.238. QSL. Aviation Museum of Kentucky, PO Box 4118, Lexington, KY 40544. **www.aviationky.org**.

Ancona, Italy: Associazione Radioamatori Italiani, IY6GM. 0600Z **Aug 6**-2200Z **Aug 10**. Centenary of experiments by Marconi Cappuccini Mount Ancona (ARLHS Lighthouse ITA104). 28.000 21.000 14.000 7.000. QSL. QSL via Bureau or direct to: Associazione Radioamatori Italiani, PO Box 122, Ancona, ITALY 60100. **antares.fastnet.it/enti/ari-an/**.

Hawley, PA: Science Camp Watonka Amateur Radio Club, KB3BUM. 1330Z-2130Z **Aug 7**. 7th Annual Event. 28.440 21.340 14.240 7.240. Certificate. Camp Watonka ARC, PO Box 127, Hawley, PA 18428.

Indianapolis, IN: Indianapolis Repeater Association, W9Z. 1300Z-1900Z **Aug 7**. Broad Ripple Hamfest, youth operators from Kids only Net (146.700). 28.500 21.375 14.265 7.285. Certificate. Steven Wendt, 9559 Neptune Dr, Indianapolis, IN 46229. **kb9rds.arrl.net**.

Thompson, OH: Geauga Amateur Radio Association, N8T. 1300Z-2200Z **Aug 7**. 20th anniversary of the TRIVA NET. 14.270 7.270 146.940. QSL. Dennis Brostek AB8NI, 7187 Maple St, Mentor, OH 44060.

Townshend, VT: West River Radio Club, K1KU. 1400Z-1900Z **Aug 7**. Grace Cottage Hospital Fair Days—55th year of founding. 14.270. QSL. Darrel Daley, PO Box 445, Putney, VT 05346. **www.westriverradio.net**.

Mathews County, VA: Middle Peninsula Amateur Radio Club, N4P. 1300Z **Aug 7**-1800Z **Aug 8**. Pan-American Lighthouse-Lightship Weekend, Commemorating New Point Comfort Lighthouse, USA-543. 21.370 14.270 7.270 3.970 145.37. Certificate. MPARC/QSL Manager, Carter Clements/WA4CC, PO Box 1121, Gloucester Point, VA 23062. **www.qsl.net/mparc**.

St Augustine, FL: St Augustine Amateur Radio Society, N4AUG. 1400Z **Aug 7**-2200Z **Aug 8**. Activation of St Augustine Lighthouse #789 for NLLW. 21.270 14.270 14.035. QSL. SAARS, PO Box 860084, St Augustine, FL 32086-0084. **www.saars.net**.

Zoar, OH: Tuscarawas Amateur Radio Club, W8ZX. 1400-2100Z daily **Aug 7** and **Aug 8**. 31st Zoar Harvest Festival. 14.275 7.275 146.73 Dpx. Certificate. Tim Ashcraft, 502 Oakdale Dr, Dover, OH 44622. **www.zca.org**.

East Tawas, MI: Hazel Park ARC, K8S. 0000Z **Aug 7**-0000Z **Aug 9**. National Lighthouse-Lightship Weekend from Tawas Point Lighthouse,Tawas Point State Park. 28.370 21.370 14.270 7.270. Certificate. Gary I. Sklar, K8IKW, 7296 Green Farm Rd, West Bloomfield, MI 48322.

Lincoln, MI: Alcona County Amateur Radio Group, K8A. 1600Z **Aug 7**-0400Z **Aug 15**. 33rd Annual Alcona County Fair. 21.345 14.245 7.245 3.945. QSL. Stanley L. Darmofal, W8SZ, PO Box 15, Harrisville, MI 48740. **www.alconaradio.org**.

Rush Springs, OK: FAA Aeronautical Center ARC, W5F. 1400Z-2200Z **Aug 14**. The Rush Springs Watermelon Festival. 10/15/20/40/80 M. QSL. David Begue, K5FOZ, 2155 County Rd, Tuttle, OK 73089-3112. **www.w5paa.org**.

West Union, OH: DeForest Amateur Radio Club, W8S. 1400Z-1900Z **Aug 14**. Ohio Covered Bridges On The Air—Adams County, Ohio. 14.250 7.233. QSL. DeForest Amateur Radio Club, PO Box 73, West Union, OH 45693. **www.qsl.net/ohio-covered-bridges**.

Boxborough, MA: FEMARA, K1A. 0000Z **Aug 14**-2359Z **Aug 15**. 2004 ARRL New England Division Convention. 21.250 14.250 7.250. QSL. Mike Bernock, N1IW, 22 Redfield Circle, Derry, NH 03038.

Kankakee, IL: Kankakee Area Radio Society, W9AZ. 1400Z **Aug 14**-2000Z **Aug 15**. Celebrating KARS 80th anniversary. 14.280 7.280. QSL. James Schreiner, K9BIG, 436 S Prairie Ave, Bradley, IL 60915. **www.w9az.com**.

Newton Falls, OH: Western Reserve Amateur Radio Association, W8T. 1200Z **Aug 14**-2100Z **Aug 15**. Ohio Covered Bridges on the Air. 10 20 49. QSL. Gail Wells, 708 Delaware SW, Warren, OH 44485. **www.qsl.net/ohio-covered-bridges/**. [Work 6 bridges for certificate.]

Window Rock, AZ: Navajo Amateur Radio Club, N7C. 1400Z **Aug 14**-0200Z **Aug 15**. Commemorating Navajo Code Talkers Day. 14.260 14.033 7.260 7.033. QSL. N7HG, PO Box 3611, Window Rock, AZ 86515.

Baltimore, MD: Social Security Employees Amateur Radio Club, W3SSA. 1300Z-2200Z **Aug 15**. 69th Anniverary of The Social Security Act. 14.280 7.280. Certificate. Greg Stec, K3ANG, 1624 Pickett Rd, Lutherville, MD 21093.

Wrightstown/Grange Fair, PA: Warminster Amateur Radio Club, K3DN. 1600Z **Aug 18**-2000Z **Aug 22**. 50th anniversary of the Agricultural Reseach Service and 90th ARRL anniversary. 21.280 14.280 7.280 3.880. Certificate. Warminster ARC, Box 113, Warminster, PA 18974.

Marshfield, MA: Marshfield Fair Radio Club, NN1MF. 1600Z **Aug 20**-2359Z **Aug 29**. 137th annual Marshfield Fair. 18.160 14.260 7.260 3.860 2 m 70 cm. QSL. Robert F. Burns, K1RB, 27 George St, Apt 3, Whitman, MA 02382.

Alliance, OH: Alliance Amateur Radio Club, W8LKY. 1600Z-2100Z **Aug 21**. 100th Anniversary of Scarlet Carnation and Carnation Days. 28.405 14.295 14.045 7.045. Certificate. AARC-W8LKY, PO Box 3344, Alliance, OH 44601.

Saranac Lake, NY: North Country Chapter American Red Cross, W2B. 1400Z-2000Z **Aug 21**. Celebration of Flight, Lake Clear Air Show. 14.257 14.030 7.250 7.045. QSL. Roland Patnode, W2WIZ, 162 Neil St, Saranac Lake, NY 12983.

Buffalo, NY: Western NY DX Association, W2DXA. 1300Z **Aug 21**-1600Z **Aug 22**. International Lighthouse Weekend K2L ARLHS-US-090. 21.040 14.040 HF bands CW and SSB. QSL. Robert Nadolny, WB2YQH, PO Box 73, Springbrook, NY 14140.

Burnt Island Lighthouse, ME: Yankee ARC, KA1RFD. 0001Z **Aug 21**-2359Z **Aug 22**. International Lighthouse/Lightship Weekend. 21.270 14.270 7.270. QSL. Rod Scribner, KA1RFD, RR 4 Box 6770, Gardiner, ME 04345.

Dunkirk, NY: Dunkirk Lighthouse/Lancaster Amateur Radio Club, W2SO. 0001Z **Aug 21**-2359Z **Aug 22**. International Lighthouse Weekend—USA 248 Lake Erie. 21.350 14.250 7.225 3.950. Certificate. Via **dunkirklighthouse.com** or Lancaster Amateur Radio Club, 525 Pavement Rd, Lancaster, NY 14086. **dunkirklighthouse.com**.

Fire Island National Sea Shore, NY: Great South Bay ARC, W2GSB/LH. 1400Z **Aug 21**-2000Z **Aug 22**. International Lighthouse Weekend at Fire Island Lighthouse ARLHS #286. 7.240 14.260 21.260 28.460. QSL. GSBARC, W2GSB/LH, PO Box 1356, West Babylon, NY 11704. **www.gsbarc.org**.

St Augustine, FL: St Augustine Amateur Radio Society, N4AUG. 1400Z **Aug 21**-2200Z **Aug 22**. Activation of St Augustine Lighthouse #789 for ILLW. 21.270 14.270 14.035. QSL. SAARS, PO Box 860084, St Augustine, FL 32086-0084. **www.saars.net**.

Sioux City, IA: Sooland ARA, KØD. 0001Z **Aug 21**-2359Z **Aug 22**. Bicentennial of the Lewis and Clark Corps of Discovery. 14.250 7.250. Certificate. Mike Clayton, WDØCJZ, 3600 Transit Ave, Sioux City, IA 51106.

Spirit Lake, IA: Iowa Great Lakes Amateur Radio Club, WØDOG. 1400Z **Aug 24**-0200Z **Aug 28**. To celebrate 50 years of Club charter. 21.350 14.260 7.250 3.965. Certificate. Bryce Denker, 1818 350th St, Spencer, IA 51301.

Ringoes, NJ: Cherryville Repeater Association II, W4H. 1400Z **Aug 25**-2200Z **Aug 29**. 2004 Hunterdon County 4H & Agricultural Fair, since 1840. 28.375 21.375 14.275 7.275. Certificate. W4H Cherryville Special Event, PO Box 308, Quakertown, NJ 08868-0308. **www.qsl.net/w2cra/**.

Core, WV: Greene County Amatuer Radio Association, N3GC. 2200Z **Aug 27**-2000Z **Aug 29**. Celebration of the "Mason Dixon Line" completion. 14.255 14.055 7.255 7.055. Certificate. Roger Swanson, KC8GOJ, 319 Happy La, Fairview, WV 26570.

Owatonna, MN: Owatonna Steele County Amateur Radio Club, KCØBXJ. 1400Z-2300Z **Aug 28**. 150th anniversary of Owatonna, MN. 14.270 7.270. Certificate. Kris Christenson, 1510 Mineral Springs Rd, Owatonna, MN 55060. **150.owatonna.org**.

Wausau, WI: WVRA, MAARS, RMRA, W4S. 0900Z **Aug 28**-0600Z **Aug 29**. Walk for Sarcoma from Marsfield, WI, to Wausau, WI. 21.360 18.150 14.260 7.260. QSL. Gerald Graebel, 624 E Bridge St, Wausau, WI 54403.

Bedford, VA: Roanoke Valley Amateur Radio Club, W4CA. 1100Z **Aug 28**-2300Z **Aug 29**. Christmas Tree Island, new US Island on the Air. 14.260 7.260. QSL. Ray Crampton, AB4YZ, 1670 Catawba Rd, Troutville, VA 24175. **w4ca.host4www.com**.

Green River, WY: Sweetwater Amateur Radio Club, WY7U. 1800Z **Aug 28**-1800Z **Aug 29**. Butch Cassidy and the Wild Bunch UPRR train robberies. 21.365 14.265 7.265 3.625. QSL. Sweetwater Amateur Radio Club, 1000 South Dakota, Green River, WY 82935. **www.qsl.net/wy7u**. [Special certificate for working both Jun and Aug events.]

Hanover, MI: Jackson County QRP Outlaws, N8H. 1400Z **Aug 28**-2200Z **Aug 29**. Hanover's "Rust -N- Dust" Days. 14.250 7.250 5.403.5 3.975. Certificate. William Lauterbach, PO Box 87, Hanover, MI 49241.

Hanover, KS: Crown Amateur Radio Association, KØASA. 1400Z-2100Z **Aug 29**. Hollenberg Pony Express Station Festival. 18.085 14.245 14.040 7.125. Certificate. Crown Amateur Radio Association, 11551 W 176th Terr, Olathe, KS 66062. **www.kshs.org/places/hollenberg/index.htm**.

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 Oct *QST* would have to be received by Aug 1. Submissions may be mailed (Attn: Maty Weinberg), faxed (860-594-0259) or e-mailed (**events@arrl.org**) to ARRL HQ. QST

DXCC Honor Roll

*Edited by **Bill Moore, NC1L** • DXCC Manager*

The DXCC Honor Roll is earned by amateurs who submit confirmation for contacts reached within the numerical top 10 of the overall number of entities on the DXCC List. There were 335 entities on the list for the period with 326 being required for the Honor Roll. The period for this list is from April 1, 2003 to March 31, 2004. The **boldface** number indicates total current DXCC credits. The number next to the call signs represents an individual's overall total.

MIXED
335
Top of the
Honor Roll
4X1FQ/375
4X4DK/386
4X6UO/341
9A1HDE/353
9A2OM/342
9A7C/341
9A7V/341
9A9A/344
AA1K/346
AA1V/348
AA4H/346
AA4S/358
AA4Z/358
AA7A/348
AB0X/348
AB8K/352
AB9E/346
AF2C/345
AF4Y/342
AJ6V/346
AK1N/344
AL7R/341
CT1BH/363
CT1DRA/341
CT1RM/353
CX4CR/355
DF2IS/341
DF3CB/342
DF3GY/343
DF7NM/343
DF9ZP/342
DF9ZW/341
DJ1ND/345
DJ1OJ/358
DJ2BW/384
DJ2TI/353
DJ2YA/373
DJ3IW/343
DJ4PI/361
DJ4SO/349
DJ4XA/364
DJ5DA/369
DJ5JH/362
DJ6NI/359
DJ6RX/363
DJ6VM/359
DJ7ZG/369
DJ8CG/342
DJ8FW/353
DJ8NK/357
DJ9KG/347
DJ9RQ/352
DJ9RR/344
DK1FW/358
DK2GZ/340
DK5QK/352
DK6ED/344
DK6IP/347
DK6NP/349
DK8NG/349
DK9KX/350
DK9NA/341
DL0WW/352
DL1BO/383
DL1EY/357
DL1PM/370
DL1SDN/341
DL3IE/363
DL3NBL/341
DL3OH/365
DL3ZA/366
DL4MCF/341
DL5MBY/341
DL6MI/341
DL7FT/369
DL7HU/376
DL7MAE/341
DL7OD/356
DL7VEE/345
DL7WL/346
DL8NU/364
DL8YR/351
DU9RG/342
EA2IA/340
EA3NA/360
EA4DO/364
EA4DX/341
EA4GT/344
EA4KD/341
EA4MY/352
EA6NB/341
EA8AKN/341
EA8ZS/341
ES1AR/378
ES1QD/342
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2004 ARRL January VHF Sweepstakes Results

For a change of pace…

Frozen bands and frozen rovers were the name of the game for the 2004 January VHF SS this year. Mother Nature often fools us in winter with some nice weather, leading us to believe that the January contest might be blessed with some reasonable conditions. Not this year! Wind, rain, ice and snow seemed to characterize this event for many operators across the country. Even the magic band (6 meters) was hard pressed to produce a few lazy strings of grid multipliers for many of the big stations.

Cold weather is known for its ability to squeeze any chance for extended propagation out of the troposphere. With layers of cold-dense air closer to the ground, there is much less refraction to bend our precious RF energy back toward the ground as it flies over the earth's curvature. This was painfully obvious to many of us this year. The microwave bands were greeted with many hopeful operators trying their luck, but many of the emitted signals just fell to the ground like a lead balloon.

At times it seemed that the equipment was broken, but then a few close-in stations would show up with weaker-than-normal signals to show that it was not the equipment that was to blame, but rather poor conditions. Nonetheless, the January VHF event is always a good time, as club competition and great activity levels always seem to come to the rescue to generate fun for these high-band enthusiasts.

Even 6 meters was hard-pressed to produce any fireworks for those seeking the elusive DX. With the sunspots on the decline, there was no F2 propagation expected, and the E_s propagation gods were apparently not particularly happy with us either. It was a change-of-pace kind of contest this year, where one could slug it out using operating skill and good equipment to seek the activity for which the January VHF SS is well known. When multipliers are in short supply, *WSJT* can be a welcome boost to your score.

2004 Overview

The number of logs submitted this year was 799, pretty much on par with the past couple of years. The January VHF SS remains the best-attended VHF contest, judging by logs received. Perhaps the heated club competition, along with some fierce rover competition is the magic recipe for activity.

There were 468 SOLP entries, up about 10% from last year. The SOHP participants numbered 162 this time, down from 190 in 2003. Perhaps more stations want to compete in the low power category, and avoid the wrath of the big guns. The limited multioperator logs totaled 39 this year, up from 32 in 2003. There were 26 unlimited multioperator entries this time, along with some big scores from many of the 89 rover entries. The rover category is still growing, which is a testament to this exciting aspect of VHF contesting. How else could you get 89 lunatics to venture out

Expanded Reports Available

For expanded results, participant soapbox and the complete scores in a user-searchable database, 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.

Top Ten

Single Operator Low Power

K2DRH	162,321
WA3GFZ	124,236
W3KJ	113,390
KB8U	102,564
N1DPM	95,700
W4SHG	60,495
N0KP	52,437
AF1T	49,630
N9DG	47,190
WB2SIH	45,522

Single Operator High Power

K1TEO	454,176
AA2UK	436,104
K1RZ	337,824
K2AXX	316,487
WA3NUF	227,666
K2SMN	128,397
W3RJW	126,224
K1GX	120,420
AA3GN	114,982
W0GHZ	106,785

Single Operator Portable

KF0Q	22,920
N8XA	4,066
W9GKA	3,978
K0NR	2,478
WD5AGO	2,378
KQ6EE	1,674
K9BIG	1,210
WB2AMU	960
N0JK	345
KT4GG	165

Limited Multioperator

W3SO	217,888
K8CC	113,328
N3JFM	88,981
AA4ZZ	81,000
W1QK	75,764
N8ZM	53,568
W2MMD	42,903
K2AA	41,616
W2EA	37,312
KB1DFB	30,300

Multioperator

K3EAR	944,064
N2PA	394,487
N3NGE	300,048
K1JT	254,408
N2JMH	130,689
N2BJ	109,200
K3EOD	107,910
N8KOL	90,170
W6TE	52,050
WA3ZKR	32,370

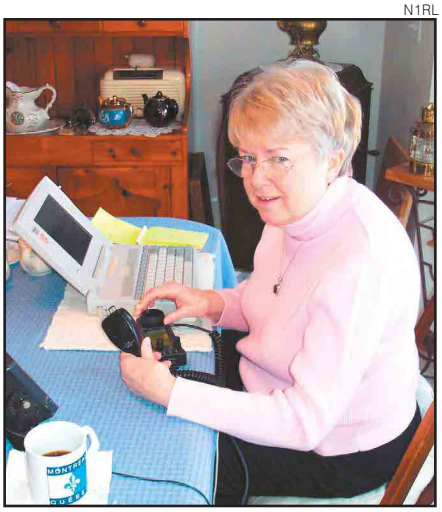
Rover

N6NB (+KG6TOA)	1,097,280
N6MI	1,067,377
N6MU	1,053,582
K2TER (+KV2X)	400,189
N2OPW	371,195
N7WLO (+KL7BK)	370,804
N6TEB (+KE6HPZ)	269,598
N6DN (+AD6HT)	252,636
W3IY (+ON4IY)	171,570
KU7M	164,488

Affiliated Club Competition

	Score	*Entries*
Unlimited Category		
Mt Airy VHF Radio Club	2,856,837	56
Medium Category		
Rochester VHF Group	1,811,680	25
North East Weak Signal Group	1,036,971	28
South Mountain Contest Club	957,064	4
Potomac Valley Radio Club	919,775	21
Northern Lights Radio Society	706,824	51
Society of Midwest Contesters	542,740	21
Pacific Northwest VHF Society	280,109	21
Western States Weak Signal	228,949	10
Badger Contesters	223,046	23
Yankee Clipper Contest Club	164,148	9
Florida Contest Group	155,539	4
Mad River Radio Club	136,194	5
Crawford County ARC	112,484	9
Contest Club Ontario	110,983	11
South Jersey DX Assn	84,504	6
Carolina DX Assn	81,253	3
Northern California Contest	71,855	8
Six Meter Club of Chicago	34,738	18
Bergen ARA	29,224	8
Tennessee Contest Group	16,170	6
Warminster ARC	4,704	3
Mobile Sixers Radio Club	1,443	5
Rochester (MN) ARC	619	3
Local Category		
Delaware Valley VHF Society	249,920	9
Eastern Panhandle ARC	136,280	10
North Texas Microwave Society	121,663	7
Rappahannock Valley Amateur	62,971	3
Roadrunners Microwave Group	55,926	3
Dauberville DX Assn	5,996	3
Medina 2 Meter Group	5,477	4
Meriden ARC	2,811	4

N1RL



Jean, N1MJC, teamed with her OM Rick, N1RL, to learn some of the contesting ropes.

KC8HZM

Marten, KC8HZM, and Jeff, KC8HZQ, freely admit they are starting at the bottom but are looking to climb the ladder of successful roving as far as they can.

into the dead of winter and do battle with all that radio apparatus?

Propagation

If you recall the 2003 ARRL September VHF QSO party, there were not any particularly enhanced conditions. From the perspective of many, however, the warm weather conditions were far better than what was in store for the unseasonably cold weather of January 2004. Tropo was virtually nonexistent, although many stations were fooled into thinking there was tropo when the bands would occasionally go from wintertime-poor to almost normal. It was amazing how difficult it was for many to work the usually easy microwave paths in sub-freezing temperatures.

DX signals just weren't there on the bands above 903, in general, on any extended paths. As for 6 meters, there was possibly F2, but a small amount of E_s propagation, particularly in the South. It was enough to provide some excitement for the watchful operators, although many missed most of it. There seemed to be significant 6 meter propagation for the top DX station, VP9GE, operating in the SOLP category, using only 6 meters. Ed managed to rack up 78 grid multipliers extending from southern Alabama up into Canada, working much of the East Coast in-between. This is an amazing accomplishment, especially considering the 100 W and a single 5 element beam at 12 feet! Perhaps the Bermuda Triangle was unleashing some of its magic on the magic band in this region.

In the East, several big stations managed to add a dozen or so grids on some short-lived E_s propagation, which seemed to produce mainly north-south paths. Ivars, KC4PX, in EL99 shared that "The January VHF contest in Florida is usually slow with minimal 6 meter E_s. However this year, Florida was fortunate to have two significant E_s openings and a quick F2 into Mexico. Saturday afternoon at 2100 to 0000 was excellent into the Northeast VHF corridor from VE9 to W3/W4's but concentrating on New England VHFers. Then on Sunday from 2300 to 0300 a pipeline into Texas built up our grid square count (70 total on 6 meters). This, however, never came close to the June 2003 grid count of 266 on 6 meters." Nice work, Ivars!

The National Scene

How do you generate a big score when there's not much happening in the propagation department? The answer is to work everyone you hear, and find the rovers! Rovers made a huge difference to many stations in the top-10 this year. Living in a high-density heavily ham-populated region like the Northeast corridor helps, but you just can't work many available grids, unless some rovers decide to activate them.

Single Operator

Bob, K9DRH, is no stranger to winning the SOLP category and again he takes the number one spot in this hot operating category, with a score slightly higher than last year of 162k. Second place this year again goes to Paul, WA3GFZ, with a great showing of 124k from Packrats country near Philadelphia. The third place position goes to another Packrat, Joe, W3KJ, with 113k. Joe has done a great job adding bands, and making nice improvements to his station in FN20. Also topping 100k points in the SOLP category is Russ, KB8U, with an excellent performance totaling 102k.

In the SOHP sector, Jeff, K1TEO, continues to dominate the national scene with an incredible 454k points. Being located in a high-activity area doesn't hurt, but Jeff continues to show a keen sense of balancing operations on 10 bands, and making them all pay off! Posting a close second place effort was Bill, AA2UK. Bill continues to improve his station, and does a great job of inspiring a large number of Packrats within range of FM29. Bill's 436k represents a tightening of the race for SOHP honors in the East.

A very strong performance by third place finisher Dave, K1RZ, begins to show that FM19 is within striking distance of a SOHP contest win. Dave added a 1 W station on 3456 this year, and piled up a nice 15 QSOs on 7 grids on this growing microwave band. (The author even had a fun snow-scatter with Dave on 3.4 GHz as white-out conditions blanketed FM19 on the ride home.) Mark, K2AXX, finished in fourth place with an awesome score of 316k with solid totals on 10 bands.

Multioperator

The top unlimited multioperator position this year was taken by K3EAR, setting a new record of 944k from FM19hx. Despite the cold weather, this resourceful group succeeded in racking up points on bands through 76 GHz. N2PA was next in the ranks with a score of 394k operating from FN12, adding QSOs on bands through 24 GHz, and lasers.

Big efforts from the Packrats sector of the country propelled N3NGE and K1JT into third and fourth place respectively nationwide in the MU category. It's great to see experienced operators get together, and put forth such nice multioperator efforts during this cold time of the year. (We rovers really appreciate it!) Inviting lots of friends over for a multioperator weekend, using lots of rigs and amplifiers can help keep the house warm!

The limited multioperator section was

W3SO OPERATORS

It seems the operators at the W3SO limited multi may have taken the challenge to "dig through the pileups" and "sweep the bands for QSOs" a bit too literally. From left to right: W3PAW, W3YOZ, K4VV, KD3SA, W3TEF, W3BTX and WR3Z.

COURTESY K9AKS

Curt, K9AKS, operated the University of Southern California station W6YV with this spectacular view toward downtown LA and the mountains beyond. The Library Tower in the center is the tallest building between Chicago and Taiwan.

led by W3SO in FN00 with a score of 217k. This was a significant accomplishment, with temperatures down to –10°, and 24 inches of snow on the ground, by contest end. The best way to keep your antennas from freezing up is to use them continuously! Second place in LM was captured by the K8CC group, with a total of 113k points!

Rover

The rover category this year saw huge scores and a big well-planned effort from N6NB/R, N6MU/R, and N6MI/R. Pack-roving and grid-circling was exploited to their finest to produce the top 3 rover scores of over 1 million points each. The nationwide winner, Wayne, N6NB/R, put in a fantastic effort to build 3 10-band stations, and carefully planned this big assault on the rover-record. The winning score of 1.097M was dominating, but fell short of the all-time rover record (under the present rules) of 1.392M, set in 1999 by N3IQ/R (ND3F, and K8ISK operators). Other big scores in the rover category were set by K2TER/R, N2OPW/R, N7WLO/R, N6TEB/R and N6DN/R.

Pack-roving and grid-circling powered these rover stations to huge winning scores in their respective regions. Although controversial, these techniques catapult rover scores into the stratosphere, as the QSOs and grids come rolling in, working other rovers rapidly over short distances. The top rover worked only 2 other rover stations for 97% of his QSOs!

Regional Highlights

The regional scores always show interesting aspects of the January VHF SS. This year, with no big E_s openings, the population centers, and areas with good rover activity did well. Detailed division scores can be found on the web report, as usual at **www.arrl.org/contests/results**.

Northeast

Even super-cold temperatures, high noise levels, and howling wind cannot stop the fun in this heavily populated area. In addition to the top scores already mentioned, Fred, N1DPM; Dale, AF1T, and Buff, WB2SIH put forth good efforts to claim the 3rd, 4th and 5th spots in the SOLP category from the Northeast. Veteran contesters Phil, WA3NUF; Roger, K2SMN, and Ron, W3RJW, worked their way into 5th, 6th and 7th place nationwide in SOHP from this division.

N3JFM, and W1QK slugged it out for second and third place in the LM section this year with scores of 89k and 76k. Jim, N2JMH (taking a break from roving), entered the MU category this year, and did well with 131k. Nice job, Jim! Rover extraordinaire Brian, ND3F/R (although not submitting a log), worked over 200k points in just one day of operating!

Southeast

The SOLP leader here was Steve, W4SHG. Making great progress improving the station, Steve keeps adding bands and doing a great job from his less-than-optimum QTH in FM18. K8GUN took second in SOLP, and is becoming a regular big signal in this region from FM09. Jeff, NJ2F; Richard, K4RTS, and Charles, KØVXM, added QSOs to many logs as well in this category. AA4ZZ led the LM efforts with a big 81k from NC. N4HB took the top MU spot, followed by AG4V.

Yours truly, W3IY/R, roved the Outer Banks of NC, VA and MD with copilot Christophe, ON4IY, and found 30 knot winds and sub-freezing temperatures a bit obtuse (but much fun) in the rover category this year. It was amazing how many usual microwave QSOs were not possible with the cold weather this time. Matt, KC3WD/R, persevered against weather and vehicle problems, and turned in a strong rover effort from this region as well. Single operator portable entries included KT4GG and KQ6NO. Your efforts are appreciated by all of us.

Central

Duane, N9DG, from this region, followed by Justin, K9MU, and Bob, KB9PJL, generated a strong SOLP effort. The LM category saw K8CC winning first place with 113k. N8ZM took second place with 54k. N2BJ captured top honors in the MU category with a big 109k points. Not far behind was Keith, N8KOL, with 90k. Russ, VE3OIL/R, provided spirited rover activity in the Central region taking the top spot. The second and third place rover honors were won by Pat, K9ILT/R, and Tim, KØPG/R.

Midwest

Dave, NØKP, captured the winning position in SOLP with a 52k effort. Second place was won by John, WØJT, with 36k points. Multi-Unlimited was dominated by WØEAA with a 25k score. A nice single operator portable effort was made by Larry, KFØQ, winning with a 23k tally. LM was grabbed by WØJH. The biggest score in the region was generated by rover station W9FZ/R (Bruce) with just shy of 94k! Jonathan, WØAMT/R, took second place with John, KCØLBT, assisting. Mike, KMØT, took a break from his usual base station operations and decided to join the rover deep-freeze. It's nice to see how the

Regional Results

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario Section)			Midwest Region (Dakota, Midwest, Rocky Mountain and West Gulf Divisions; Manitoba and Saskatchewan Sections)			West Coast Region (Pacific, Northwestern and Southwestern Divisions; Alberta, British Columbia and NWT Sections)		
WA3GFZ	124,236	A	W4SHG	60,495	A	K2DRH	162,321	A	NØKP	52,437	A	W6YV(K9AKS, op)	23,994	A
W3KJ	113,390	A	K8GUN	43,788	A	KB8U	102,564	A	WØJT	36,314	A	KC6ZWT	21,448	A
N1DPM	95,700	A	NJ2F	27,740	A	N9DG	47,190	A	KØSHF	14,484	A	W6AQ	19,266	A
AF1T	49,630	A	K4RTS	22,847	A	K9MU	29,382	A	W6OAL	11,184	A	KF6YYV	15,336	A
WB2SIH	45,522	A	KØVXM	21,507	A	KB9PJL	25,920	A	NØLL	10,804	A	K7YO	11,685	A
K1TEO	454,176	B	K4QI	87,300	B	WB9Z	91,307	B	WØGHZ	106,785	B	N7EPD	48,184	B
AA2UK	436,104	B	NW5E	64,735	B	W9GA	70,800	B	WØZQ	85,734	B	W6KBX	24,640	B
K1RZ	337,824	B	KC4PX	61,930	B	K8MD	62,920	B	KT8O	54,145	B	N6KN	24,327	B
K2AXX	316,487	B	WA8TTM	56,700	B	WA8RJF	62,694	B	W5LUA	52,546	B	K6TSK	22,842	B
WA3NUF	227,666	B	W4ZRZ	44,642	B	K8TQK	55,896	B	WW2R	50,285	B	WA6KLK	12,788	B
WB2AMU	960	Q	KT4GG	165	Q	N8XA	4,066	Q	KFØQ	22,920	Q	KQ6EE	1,674	Q
N2IM	144	Q	KQ6NO	60	Q	W9GKA	3,978	Q	KØNR	2,478	Q	KG6HSQ	145	Q
K3MKZ/3	72	Q				K9BIG	1,210	Q	WD5AGO	2,378	Q			
									NØJK	345	Q			
									KAØJWC	6	Q			
W3SO	217,888	L	AA4ZZ	81,000	L	K8CC	113,328	L	WØJH	2,838	L	VE7DXG	17,184	L
N3JFM	88,981	L	K4ATM	5,664	L	N8ZM	53,568	L	NØKIS	1,620	L	K6MJU	6,650	L
W1QK	75,764	L	KU4JZ	1,110	L	KC9ETU	12,040	L	KD5JGA	1,175	L	W6SN	3,872	L
W2MMD	42,903	L	WX4MC	90	L	K8RO	6,342	L				KO6JF	3,380	L
K2AA	41,616	L				N9FH	6,028	L				W7DHC	2,470	L
K3EAR	944,064	M	N4HB	19,176	M	N2BJ	109,200	M	WØEEA	24,966	M	W6TE	52,050	M
N2PA	394,487	M	AG4V	11,316	M	N8KOL	90,170	M	KAØMR	3,705	M	K7MDL	11,060	M
N3NGE	300,048	M	K4NGA	3,360	M	W9RVG	14,823	M	W5LCC	2,268	M	K6WLC	9,386	M
K1JT	254,408	M	N4JQQ	2,856	M				K7RJ	780	M			
N2JMH	130,689	M												
K2TER (+KV2X)	400,189	R	W3IY (+ON4IY)	171,570	R	VE3OIL	50,320	R	W9FZ	93,824	R	N6NB (+KG6TOA)	1,097,280	R
N2OPW	371,195	R	KC3WD (+logger)	74,734	R	K9ILT/R	33,865	R	WØAMT(+KCØLBT)	31,430	R	N6MI	1,067,377	R
N1XKT	91,872	R	K1KC (+WA4UJY)	13,504	R	KØPG/R	33,800	R	KCØP	12,144	R	N6MU	1,053,582	R
K1DS	86,255	R	N4OFA (+N4FLM)	13,200	R	NE8I	18,306	R	KMØT	6,929	R	N7WLO (+KL7BK)	370,804	R
K2QO/R	35,206	R	WD4MGB	6,954	R	K9JK/R	15,688	R	KIØSk (+NØBAF)	4,725	R	N6TEB (+KE6HPZ)	269,598	R

other half lives from time to time. Mike reports it was a great learning experience.

West Coast

West Coast contesters W6YV (Curtis, K9AKS op); Norman, KC6ZWT, and Dave, W6AQ, captured 1st, 2nd and 3rd place in the SOLP madness. VE7DXG won the LM category, while W6TE took the top MU spot here with 52k. The rover brigade saw big action from the top nationwide finishers previously mentioned. Roving in 6 land is a unique game, with lots of inaccessible mountain ranges blocking many of the suspected radio paths between population centers. It's great to see the big efforts from rovers in the West Coast region.

Affiliated Club Competition

The January VHF SS continues to be the big draw for club competition in the VHF world. The top club effort this year goes (yet, again) to the Mount Airy VHF Club with 56 entries, and a huge score exceeding 2.8M points! These guys have always made a big effort to encourage and help each other. This year the efforts paid big dividends. It's great to see such camaraderie and expertise in action. I can tell you that it's really fun to be within radio range of such an energetic group of VHF nuts. This club was the only entrant in the unlimited category.

In the medium category, the Rochester VHF Group led the pack with about 1.8M points, and 25 entries. Lots of microwave QSOs and rovers seem to thrive up here, despite the even colder weather than most of us have to deal with. The Northeast Weak Signal Group took a strong second place finish with over 1 million points and 28 participants. Third place in the Medium category goes to the South Mountain Contest Club, led by the record-setting performance of K3EAR. It's hard to compete with a club hosting the top MU effort of any contest.

In the local club category, the Delaware Valley VHF Society captured first place with 250k and 9 participating stations. The Eastern Panhandle Amateur Radio Club took the next spot with 136k and 10 entries. The North Texas Microwave Society took third place in the local club competition with nearly 122k points and 7 entries.

It's nice to see these clubs and organizations working to get their members on the air, contributing to this great operating event. It's important, especially in the dead of winter, to keep our fellow VHF and above amateurs stimulated, and operating. Clubs are a great venue for finding other interested VHFers to share ideas with, and find out what you may be missing on the bands.

The Allure of the January VHF Sweepstakes

We always enjoy seeing the bands come alive, especially when the propagation is less than normal. Working stations on VHF bands is always fun, but a contest in January is an especially welcome opportunity to see what your equipment can do. It's a unique challenge to work the usual DX stations that were so plentiful in warmer weather. Often, it just takes trying several times, as conditions are always changing.

Listen for the weak ones, and see what you can find. Working under adverse conditions make us all grow a little, and helps us to prepare for emergency communications, should the need arise in your area. Tune in next year, and join the excitement. Find out who has new equipment or better antennas, or maybe find a new rover in your area and show him what is possible on this exciting part of the Amateur Radio spectrum. Each QSO has a little more meaning in the January VHF Sweepstakes. Try it for yourself in 2005. Bet you will find a pace that suits you. QST

ARRL 10 GHz and Up Contest Announcement

***Date:* August 21-22 (first weekend) and September 18-19 (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-square locator (such as W1AW FN31US). Information on how to determine your grid square is found on page 86 of the April 1994 issue of *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 moun-taintops or DXpeditions. You might also experiment with unique means of propagation enhancement such as rainscatter.

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: None.

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 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—the distance in km between stations for each successfully completed QSO is calculated. 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 19, 2004. 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, including log sheets for submitting your entry. If you don't have Web access, you can obtain the complete rules and forms by sending an SASE with postage for 2 ounces 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

2004 ARRL September VHF QSO Party Announcement

***Date:* 1800 UTC September 11-0300 UTC September 13**

How to participate: Any amateur station on any band above 50 MHz may be worked. The entry classes for Single Operator are high power, low power or portable. A Limited Multioperator station may either use four bands or fewer. A Multioperator Unlimited uses more than four bands. A Rover is a 1 or 2 person station that moves and operates from two or more grid squares. Any station may be worked once per band, regardless of the mode. You may re-work a rover station each time they move to a new grid square. Use of a spotting network makes your station a Multioperator entry. DX stations may only work W/VE stations for credit.

What to say: All stations give their call sign and four-digit grid-square locator (such as W1AW FN31). Information on how to determine your grid is found on page 86 of the April 1994 *QST* or on-line at **www.arrl.org/locate/gridinfo.html**.

***Special interest:*.** The September VHF QSO party frequently has good tropospheric propagation, and every few years you will get a significant tropospheric event. Be sure to check for openings that can occur unexpectedly.

Quirks: The higher the concentration of amateurs in a region, the larger pool of potential QSOs. A Single Operator Portable station operates from a single location away from home and must use a portable power supply, portable station and a maximum of 10 W PEP output. If you see a high solar flux index, check out activity on 50 MHz. Remember that a rover may also submit a Single Operator entry from their home station if they do not rove the full contest period.

Rule changes this year: You may submit the entry by completing the Web Submission form at **www.b4h.net/cabforms**. This will allow you to complete, on-line, a Cabrillo file for submission.

Best reason to participate: This contest is a good way to build up totals for the ARRL VHF/UHF operating awards such as VUCC. A band opening on 50 MHz could also present opportunities to find new states for an ARRL Worked All States award or add countries to a DXCC total. And if it is a pretty weekend, a rover can enjoy one last taste of summer. The Affiliated Club Competition in September is a good way to encourage newcomers to get on and participate in a VHF contest.

Relative challenge: More so than in June, the higher bands play a significant role in the September VHF QSO Party. It is also possible for someone to participate in this event with modest stations. You will get better results utilizing SSB or CW instead of FM. The more bands you are able to utilize, the better your results.

Scoring: QSOs count 1 point each on 50 and 144 MHz, 2 points on 222 and 432 MHz, 3 points on 902 and 1296 MHz, and 4 points each on 2.3 GHz and higher. On each band, every time you work a different grid square, you receive a multiplier. Your multiplier total is the sum of grids you worked per band. The final score is your QSO point total times your multiplier total. A rover gets one additional multiplier for each grid they activate during the contest.

How to report your score: You must send in your entry by October 15, 2004. E-mail Cabrillo format log to **SeptemberVHF@arrl. org** or send paper logs and complete summary sheet to September VHF QSO Party, ARRL, 225 Main St, Newington, CT 06111. Logs may also be submitted via the Web applet at **www.b4h.net/cabforms**.

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 an SASE with postage for 2 ounces to September VHF QSO Party Rules, ARRL, 225 Main St, Newington, CT 06111.

For more information: e-mail **contests@arrl.org** or phone 860-594-0232. QST

FEEDBACK

◊ In "Give That Drake Receiver a New Lease on Life" [Jun 2004, pp 28-34], please note that up-to-date construction information is available on the author's Web site, **www.geocities.com/hagtronics/r4.html**. The following is a short summary of that information:

The PLL should be a Motorola MC145170D2R2, Newark part number 01C466.

FAR Circuits shipped some boards with the wrong silkscreen. Contact FAR (**www.farcircuits.net**) if you have any questions about the boards you have received.

The VCO can be purchased directly from Mini-Circuits (**www.minicircuits.com**). The short kit obtainable from FAR Circuits also contains this part.

The Grayhill rotary encoder specified was a 25LB45-Q. If that is unobtainable, other substitutes that will work are the 25LB10-Q, 25LB15-Q and 25LB22-Q.

The VFD display specified is now obsolete. Digi-Key (**www.digikey.com**) now carries the Noritake CU16025ECPB-W6J display. This part is a pin-for-pin replacement. The LCD display remains the same.

The PIC16F876A PIC processor may be easier to find than the non-A version, but your programmer must know the difference between the A and the non-A part. Samples of this part may be available from Microchip (**www.microchip.com**).

◊ In the obituary for Byron H. Goodman, W1DX [Jul 2004, p 77], the issue date of his seminal *QST* article, "What is Single-Sideband Telephony?" is January 1948.

◊ The Web site for information on the Gatti-Hallicrafters DXpedition [Jul 2004, p 21] should be **www.qsl.net/pa0abm/ghe/00ghe.htm**.

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- Collins SSB filter built-in
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- 1000+ Memory channels
- WIRES ready

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- 5W @13.8V ext DC • USB, LSB, CW, AM, FM
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- 220 mems, opt. barometer unit
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- CTCSS encode/decode w/tone scan
- Auto repeater • 107 alphanumeric memories

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- 160-6M @ 200W
- Four 32 bit IF-DSPs+ 24 bit AD/DA converters
- Two completely independent receivers
- +40dBm 3rd order intercept point

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- 160-2M* @ 100W
- 32 bit IF-DSP+ 24 bit AD/DA converter
- Selectable IF filter shapes for SSB & CW
- 102 alphanumeric memories
- Enhanced Rx performance

IC-718 HF Transceiver

- 160-10M* @ 100W
- 12V Operation
- Simple to Use
- CW Keyer Built-in
- One Touch Band Switching
- Direct frequency input
- VOX Built-in
- 101 memories

IC-756PROII All Mode Transceiver

- 160-6M* @ 100W
- 32 bit IF DSP
- Enhanced 5 inch color TFT w/spectrum scope
- Selectable IF filter shapes for SSB & CW
- Enhanced Rx performance
- SSB/CW Syncronous tuning
- Multiple DSP controlled AGC loops
- Advanced CW functions
- 101 alphanumeric memories

IC-V8 2M Transceiver

- 5.5W output
- 107 alphanumeric memories
- Customizable keys
- Auto repeater
- PC Programmable
- CTCSS encode/decode w/tone scan
- Drop-in trickle charger included

IC-T7H Dual Band Transceiver

- 2M/70CM
- 70 alphanumeric memories
- 6W output
- CTCSS encode/decode w/tone scan
- Auto repeater
- Easy operation!
- Mil spec 810, C/D/E*1

IC-T90A Triple Band Transceiver

- 6M/2M/70CM @ 5W
- Wide band receiver 495kHz - 999.999MHz**
- 500 alphanumeric memories
- Dynamic memory scan
- Backlit keypad & display
- CTCSS/DTCS encode/decode w/tone scan
- Weather Alert

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 alphanumeric memories

IC-V8000 2M Mobile Transceiver

- 75 watts
- ICOM DMS scanning
- CTCSS/DCS encode/decode w/tone scan
- Weather alert
- Weather channel scan
- 200 alphanumeric memories
- Backlit remote control mic

IC-2720H Dual Band Mobile

- 2M/70CM
- 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

IC-703/703 Plus HF QRP Transceiver

- HF or HF/6M versions
- 10W~0.1W @ 13.5V SSB, CW, RTTY, FM 4W~0.1W @ 13.5V AM
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- VC-H1 Messaging Control

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- Dx Packet Cluster
- Tone Scan • GPS/VC-H1/PC Ports

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- Remotable w/front panel/speaker

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*816-901.995 MHz blocked; unblocked versions available to FCC approved users. FM video range for the IC-R3 is 900-1300 MHz & 2250-2450 MHz

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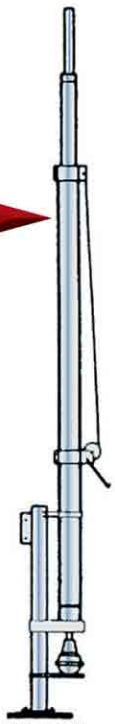

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IC-T22A High performance, easy fit. (right) The 2M T22A provides 3W of communication power. It's packed with 40 memories (expandable to 80), memory back up, alphanumeric pager, CTCSS tone encoder, and mic remote control. 2.25"w x 4.81"h x 1.12"d, 10.9 oz..... Closeout **$179.99**

IC-V8 Quality, simplicity, anywhere. (left) This polycarbonate and die-cast aluminum 144MHz FM transceiver is constructed for durability. The 5.5W V8 offers 16-button keypad and 100 alphanumeric memories. CTCSS, DTCS and DTMF encoder standard. 2.13"w x 5.19"h x 1.38"d, 12.3 oz..... Limited time pricing! **$119.99**

IC-T7H Powerful output and ample receive audio. (middle) A 6W amp circuit provides superior transmit on VHF/UHF when 13.5 V DC is supplied. In addition, 500mW of AF is output from the speaker – easy to copy when noisy. Separate CTCSS tone encoder and enc/decoder standard. This 2M/440 MHz meets MIL SPEC. 2.25"w x 4.34"h x 1.06"d, 10 oz **$179.99**

IC-W32A User-friendly, independent band controls. (right) The full-function, 5W, 2M/440 W32A meets demands of both novice and experienced operators: simple use and advanced features. Separate tune/volume controls per band, simultaneous receive, 200 memories, and tone en/decode. 2.25"w x 5.41"h x 1.31"d, 1 lb **$249.99**

IC-V8000 75W of "base" power. The V8000 also offers 25/10/5W. With the operator-facing speaker, audio is clear even when mobile. The 2M V8000 also features CTCSS and DTCS, standard DTMF encoder, 207 memories, FM narrow, and remote mic. 5.9"w x 1.97"h x 5.9"d, 2.22 lbs..... **$185.99**

IC-2720H Twice the versatility, twice the fun! The 2M/440MHz, 50/35W 2720H offers simultaneous receive capability, independent controls for each band, and Dynamic Memeory Scan with 212 memories. It also features CTCSS and DTCS, wideband receive, weather alert, auto repeater, remote control microphone, and compact remote control head. Mount controller to main unit with the optional MB-85. 5.5"w x 1.56"h x 7.38"d, 3 lbs (main) **$369.99**

IC-208H High power, wideband. This 2M/70cm mobile provides 55/50W, plus reduced power for local. The 208H covers 118-173, 230-549 and 810-999MHz (cell blocked) rx as standard. With improved DMS, detachable front, and 500 memories. 5.56"w x 1.56"h x 7.31"d, 2.65 lbs..... **$299.99**

IC-910H 100/75W stable output. This 2M/440MHz base provides a high performance receiver, 9600bps, satellite support. 99 memories, simultaneous rx. 9.5"w x 3.69"h x 9.4"d, 9.9 lbs **$1119.99**

IC-2100H-25N Durable 2M rig with superior RX IMD, performance. The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. Remote controlled using backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz Limited time pricing! **$164.99**

IC-2200H 65W and new digital features. With a familiar 2100H interface, the 2M 2200H adds optional digital capability providing modulated and demodulated clear voice and data. This mobile also offers 207 alphanumeric memories with DMS, standard CTCSS and DTCS encode/decode, 24 DTMF autodial memories, weather channel with alert, and FM narrow mode switchable. 5.5"w x 1.56"h x 5.75"d, 2.75 lbs..... **$229.99**

IC-706MKIIG Base features, mobile size. The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. Tone squelch, DSP, auto repeater and 107 memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz..... FREE RMK706 **$749.99**

IC-718 Origin of HF. With performance found in the HF all-band 718, such as wide dynamic range, high S/N ratio, and full duty operation, making distant contacts is easy. Experience latest RF and digital technology. 9.44"w x 3.75"h x 9.41"d, 8 lbs, 6 oz FREE UT106 Limited time pricing! **$559.99**

IC-703 For QRP enthusiasts. The 160-10M 703 is capable of 5/10W and focuses on QRP performance. A portable HF unit, it features a relay-type antenna tuner, low current consumption, DSP, memory keyer and 105 memories. Ideal long distance communications. 6.56"w x 2.28"h x 4.88"d, 4.4 lbs **$659.99**

IC-703PLUS The 703, plus 6M..... **$689.99**

IC-746PRO 32-bit DSP takes you higher. 100W, 102 memories, and a multi-function LCD command the HF/50/144 MHz 746PRO. 24-bit AD/DA converter and digital noise reduction. 11.3"w x 4.7"h x 12.5"d, 19 lbs, 13 oz.. FREE PS-125 © **$1299.99**

IC-756PROII Digital leap. All-mode, HF, 50MHz rig adding customer suggestions. The PROII offers 32-bit floating DSP, 24-bit AD/DA converter, selectable IF shape, and adjustable noise blanker. 13.38"w x 4.38"h x 11.2"d, 21 lbs, 1 oz.... FREE PS-125 © **$2199.99**

IC-7800 The big honcho! Icom launches the hottest rig with the most bells and whistles. The 200W, HF/50MHz 7800 is a fusion of 40 years of analog RF design expertise with cutting-edge digital technology. Built-in supply and auto antenna tuner, four 32-bit floating DSPs, TWO identical receivers…the kitchen sink! Be one of the first to own this incredible rig. 16.6"w x 5.9"h x 17.1"d, 55 lbs.... **$10599.99**

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VX-150 Designed to perform under the most difficult conditions. (left) This 2M 5W HT provides exceptional receiver performance with clean, clear transmit. Built to withstand outdoor use, the 150 is also outfitted with commercial-grade speaker and Omni-Glow™ keypad. 4.3"h x 2.3"w x 1"d, 11.5 oz **$119.99**

FT-50RD/41B Commercial-grade, military spec. (middle) It's rugged, reasonably priced, and simple to operate. Boasting 5W, the 50RD covers 144 and 430MHz while also offering the "widest" band receive allowable. Perfect for outdoor activities. Built with 112 memories, DCS/CTCSS encode, and ARTS™. 2.2"w x 3.9"h x 1.2"d, 11.5 oz..... Closeout **$209.99**

VX-1R Power out of the pocket. (right) This 500mW dualband (144/430MHz) HT gives the user wide receiver coverage in a small package. The 1R offers 291 memories, ARTS™, internal speaker, SmartSearch™, and dual watch. Also provides one-touch emergency and built-in CTCSS/DCS while operating for more than 11 hours on a single charge. 1.9"w x 3.2"h x 1"d, 4 oz ..... Closeout **$129.99**

VX-2R Smallest HT dualband! (left) This 1.5/1W dualband (144/440MHz) handheld offers VHF, UHF, shortwave, marine and aircraft bands, or WIRES™ linking. The 2R's wide band receive includes the AM broadcast band, continuous HF shortwave, VHF/UHF up to 729MHz, plus 800-960MHz (cell blocked). It also includes over one thousand memories (20 groups), CTCSS/DCS encode/decode and auto repeater shift. 1.9"w x 3.2"h x 0.9"d..... **$179.99**

VX-5R/VX-5RS Setting water resistance standards. (middle) Offering 5W (4.5W on 430MHz), the 5R/5RS cover 50/144/430MHz while providing short to microwave reception. Great for outdoors with optional barometric pressure unit. Black or silver. 2.3"w x 3.4"h x 1.1"d, 8.9 oz..... **$219.99**

VX-7R/VX-7RB The first submersible amateur HTs. (right) Water protected, the 50/144/430MHz, 5W 7R/7RB are rated for 3', 30-minute submersions. Magnesium bodies make them ideal for outdoors. Include dual/wide-band rx, status strobe, and WIRES™ key. Silver or black. 2.4"w x 3.5"h x 1.1"d, 9.2 oz..... **$309.99**

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FT-7800R Get "back to basics." This FM, 144/430MHz mobile boasts 50 and 40 Watts output and 1000 memories. It also offers one-touch hyper memories, full-featured CTCSS/DCS, WIRES™ internet linking and wide receiver coverage. The 7800R has a large LCD and NOAA weather alert. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs..... **$255.99**

FT-817ND Self-contained, battery-powered, multi-mode portable. The 5W 817ND is designed for operation on HF, plus 6M, 2M, and 70cm. Whether you perfer SSB, CW, AM, FM, Packet, or SSB-based digital modes, it is ready to join you on your next hiking, camping, or search-and-rescue adventure. Includes 1400mAh NiMH battery and charger. 5.3"w x 1.5"h x 6.5"d, 2.6 lbs... **$619.99**

FT-2800M Cool and quiet 65W operation. The most rugged 2M transceiver ever provides 65/25/10/5W with an extensive 221 memories, alphanumerics and CTCSS/DCS. The 2800M also features NOAA with weather alert, WIRES™ access, SmartSearch™, and excellent receive performance. With a bullet-proof front end and direct keypad entry, it's a dream come true. 6.3"w x 2"h x 7.3"d, 4 lbs..... **$154.99**

FT-8900R Leading the way in FM mobile design. The 29/50/144/440MHz 8900R has no peer among mobiles. This quad bander offers leading edge features like VHF/UHF full duplex, cross band repeat, independent operation on two bands, and six "Hyper Memory" keys to store configurations. The 8900R also provides 50W (35 on 440MHz), access to internet linking systems, over 800 memories, CTCSS/DCS, and built-in duplexer. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs..... **$419.99**

FT-8800R Easy operation, ultimate dualband. This 144/430MHz 50/35W mobile offers simultaneous monitoring of one band while operating the other. Besides extended receive, the 8800R provides 1000 memories, cross band repeat, versatile scan and CTCSS/DCS. Looks similar to the FT-8900R above. 5.5"w x 1.6"h x 6.6"d, 2.2 lbs..... **$359.99**

FT-897D All-in-one portable base. The all-mode, multi-band 897D features high output 100W (HF/6M), 50W (2M), 20W (70cm), rugged construction, 200 memories, TCXO and optional internal supply and external antenna tuner. 7.87"w x 3.15"h x 10.3"d, 8.6 lbs ... **$879.99**

FT-1000MP MK V Improving the 1000 series Elite-Class. Building on the success of the 1000 series, the Mark V offers five new developments. This HF all-mode adds 200W of output power and features Class-A PA (75W) operation, interlocked digital bandwidth tracking system, a variable RF front-end filter, and enhanced ergonomics. 16"w x 5.3"h x 13.7"d, 31 lbs **$2049.99**

MK V FIELD Reach the HF Summit! The Mark V Field brings the technology of the 1000D and Mark V to you in a 100W, self-contained design. This HF all-mode features Class-A (25W) PA operation, interlocked digital bandwidth tracking, a variable RF front-end filter and the ergonomics of the Mark V along with an auto antenna tuner and internal switching-regulator power supply. 16"w x 5.3"h x 13.7"d, 33 lbs..... **$1739.99**

FT-840 Performance forward. Blending high performance digital frequency techniques with operating convenience, the 840 is a base station that beginners and seasoned operators will appreciate. In addtion to 100W on 160-10M, it adds a choice of 2 optional remote auto antenna tuners. 9.4"w x 3.7"h x 9.6"d, 12 lbs..... **$579.99**

FT-847 A masterpiece of high-tech design and packaging! Ready for action on SSB, CW, HSCW, AM, FM, Packet, SSTV, and RTTY, the 847 expands your operating horizon beyond HF to 6M, 2M and 70cm, featuring DSP and full-duplex satellite. Advanced DSP enhances signal-to-noise ratio via sophisticated bandpass, noise reduction, and auto notch filters. 10.2"w x 3.4"h x 10.6"d, 14.4 lbs..... **$1569.99**

FT-857D The world's smallest HF/VHF/UHF multimode. The 100W (HF/6M), 50W (2M), 20W (70cm) 857D provides wide frequency coverage, outstanding receive, and convenient remote-head use (optional). Includes 200 memories, ease of access to features, advanced DX features, and CW operating flexibility. The 857D model now offers a built-in DSP. 6.1"w x 2"h x 9.2"d, 4.6 lbs..... **$769.99**

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TH-K2AT A triumph of advanced engineering and design. (middle) This 2M 5W HT is equipped with internal VOX, weather alert/RX, auto simplex checker, auto repeater offset and multiple scans. The K2AT also offers built-in CTCSS, DCS and 1750Hz tone burst. The K2AT charges up to 3X faster than others and meets MIL-STD-810 for resistance to rain, vibration, shock and humidity. 2.44"w x 4.38"h x 1.13"d, 12.5 oz ..... © **$139.99**

TH-G71A The brighter side of handy communications. (right) This FM, 144/440MHz boasts illuminated keypad and LCD, high-performance antenna, and ergonomic design. The 5W G71A also offers convenience with menu mode, PC compatible and 200 memories. 2.31"w x 4.44"h x 1.44"d, 11.6 oz... © **$209.99**

TH-F6A Head-scratching, unique features. (left) The FM 144/220/440MHz F6A offers dual-channel RX capability, 16-key pad, multi-scroll key, 5W, and 435 memories. Other attractive features include built-in ferrite bar antenna for AM, backlit LCD, lithium-ion battery, and a MIL-STD design. 2.3"w x 3.44"h x 1.18"d, 8.8 oz ..... © **$309.99**

TH-D7A(G) Explore APRS opportunities with an HT built for the future. (left) 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 ..... © **$339.99**

TH-22ATH Tailored for utmost efficiency, Palm-Sized! (right) The 144MHz, 5W, FM 22AT is so small and slim, it easily slips into a shirt pocket. Yet, it delivers impressive performance and does not compromise on sound quality with its large speaker, ensuring loud and clear audio. Features include luminescent DTMF keypad, 40 memories plus 1 call, multiple scan functions, DTSS and page. 2.19"w x 4.63"h x 1"d, 10.2 oz..... Closeout **$199.99**

TM-271A All-terrain performance. On or off road, the 144MHz, 60W 271A delivers powerful mobile performance and other features such as multiple scan functions, 200 memories, NOAA weather, and CTCSS/DCS. This MIL-STD transceiver also provides high quality audio, illuminated keys and large LCD ..... © **$169.99**

TM-G707A The essence of ease. From the extra-large panel to Kenwood's Easy Operation mode, the G707A is extraordinarily user-friendly. In addition to its regular profile, it can store four others for instant recall. This 50W/35W, FM dualband (144/440MHz) offers 180 multi-function memories with name function to identify each. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs **$269.99**

TM-V7A Cool Blue: The look of mobile communication. The V7A 144/440MHz FM transceiver marks a departure in ergonomic design with its easy-to-operate control panel and reversible LCD. The "5-in-1" programmable memory, 50/35W, DTSS and pager functions, and dual receive on one band make it a pace-setter. 5.5"w x 1.56"h x 7.44"d, 2.65 lbs..... © **$349.99**

TM-461A Fully equiped, supremely user-friendly 440MHz mobile. The 35/10/5W 461A offers a built-in CTCSS encoder, tone scan and wireless cloning function. For quick access, essential data can be stored in 61 "memory name function" memory channels. Other features include DTSS selective calling, multi-scan capability, and a case built to MIL-STD. 5.5"w x 1.5"h x 6.3"d, 2.2 lbs **$439.99**

TS-570D(G) Affordable DSP. High-end technology doesn't mean high-end budget. With 16-bit DSP, untouchable filtering, tuner and central frequency control, the 570D(G) provides powerful 160-10M use. 10.63"w x 3.75"h x 11"d, 15 lbs ..... © **$939.99**

TS-570S(G) Above, plus 6M..... © **$1049.99**

TS-870S DSP at the IF stage. The all-mode, HF 870S incorporates DSP with a full range of features including 100 memories, built-in keyer, interactive menu function, 4-stage attenuator, noise blanker, automatic antenna tuner and 100W power. 13"w x 4.75"h x 13.13"d, 25.35 lbs **$1999.99**

TS-2000 Distinctive design, packed for performance. The all-mode, HF, 2M, 6M, 70cm 2000's advanced digital technology converts analog into digital. The 2000 also features dual channel receive, IF-DSP combined with AF-DSP, built-in TCXO and auto antenna tuner, IF auto notch, built-in 1200/9600bps TNC, 300 memory channels and DX cluster tune. 10.6"w x 3.8"h x 12.5"d..... © **$1549.99**

TS-2000X Same as the 2000 with the addition of 1.2GHz ..... © **$2049.99**

TS-B2000 2000 with PC software. 10.63"w x 3.75"h x 12.5"d ..... © **$1399.99**

TM-D700A Harnessing APRS®, GPS and SSTV. This FM 144/440MHz mobile features a built-in TNC offering options including simple packet. The brightest spot of the 50/35W D700A is its ability to enable APRS® without a PC. It also has 200 memories, dual receive, built-in CTCSS/DCS, and DX cluster monitoring. 5.5"w x 1.58"h x 7.68"d, 3 lbs © **$499.99**

TM-541A Lightweight, perfect 1.2 GHz mobile. The 10W 541A offers enhanced night time operation with illuminated keys, large LCD and backlit mic. It also features 20 multi-function memories, built-in CTCSS tone encoder and tone alert system. 5.5"w x 1.5"h x 6.3"d, 2.4 lbs... **$449.99**

TS-480SAT New compact all-mode. This 100W HF/50MHz can operate on DC 13.8V and offers two power terminals. The 480SAT also features AF DSP, RX dynamic range, separate LCD control panel with speaker, 100 memories and antenna tuner. Can be controlled from a PC, PSK31 compatible ..© **$969.99**

TS-480HX 200W, without tuner .© **$1079.99**

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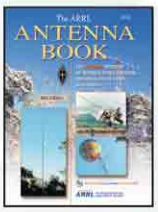

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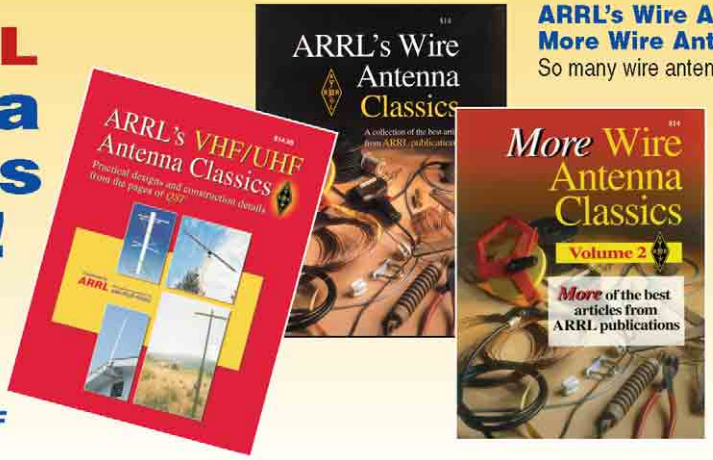

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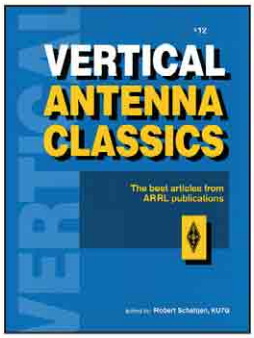

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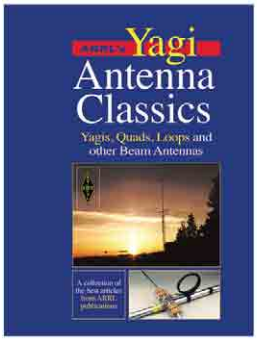

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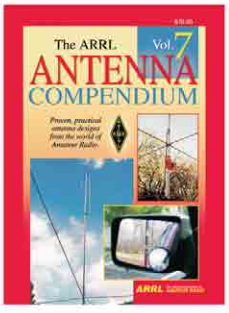

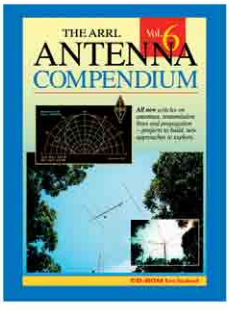

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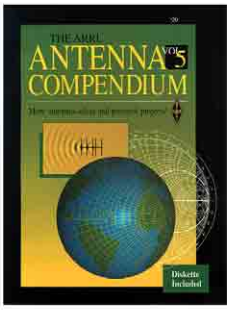

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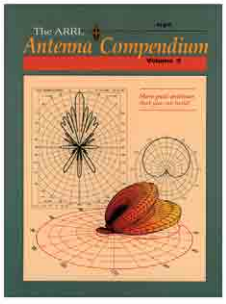

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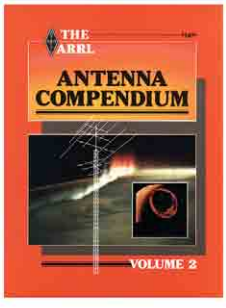

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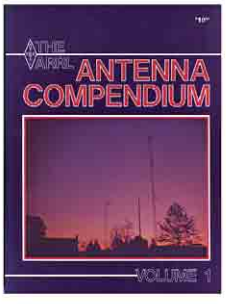

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B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
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Watts In	.25	.5	3	5	8	10	15	25	35	50

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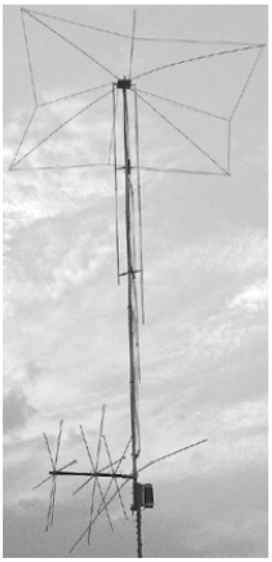

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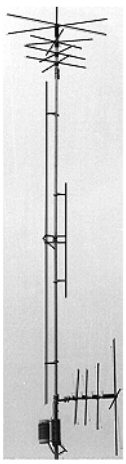

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Antenna Modeling...EC-004

Author: L B Cebik, W4RNL (left)
Editor: Dean Straw, N6BV (right)

In the last decade the science of modeling antennas using computer software has advanced by huge leaps and bounds. While some absolutely unique, brand-new antenna designs have resulted from computer studies, the real progress has been in our understanding of how even common, ordinary antennas work. Consider how our understanding about even a garden-variety antenna like a dipole has significantly been enhanced with modern modeling programs—especially over wide frequency ranges.

Computer modeling has allowed us to optimize a number of types of antennas more exotic than a simple dipole. A modern Yagi is an especially shining example of how computer modeling can be used to optimize coverage over previously unheard of bandwidths. The science of "stacking" Yagis vertically to enhance desirable performance characteristics is another area of great interest to modelers, particularly contesters and DXers. The influence of nearby structures, including other antennas, on the patterns of our antenna systems is another exciting area of study.

Despite the large of amount of science used to model antennas, a certain amount of "art" is still needed. It is, in fact, not difficult to construct computer models that don't even come close to resembling reality! There are subtle things to avoid, as well as straightforward things you should do every time to make sure your model is adequate.

ARRL's on-line **Antenna Modeling Course** is an excellent way to learn the ins and outs and the nitty-gritty details of modeling antennas. The course was written by the well-known author and historian L B Cebik, W4RNL, and edited by ARRL Senior Assistant Technical Editor—and antenna guru—Dean Straw, N6BV. Cebik, a computer-modeling expert, has combined the expertise of his long career as a college professor with his love of antennas and antenna modeling to offer a comprehensive, yet practical, course of study. **Member: $85 / Non-member: $115**

Antenna Design and Construction...EC-009

Students become familiar with antenna design theory and experience hands-on construction techniques. The course includes several optional antenna construction projects for HF, VHF, and UHF. Authored by *QST* Contributing Editor, H. Ward Silver, NØAX. **Member: $65 / Non-member: $95**

HF Digital Communications...EC-005

Understanding HF digital Amateur Radio communications and developing awareness and stronger skills for many HF digital modes. **Member: $65 / Non-member: $95**

Level 1 Amateur Radio Emergency Communications...EC-001

Introduction to Amateur Radio Emergency Communications. A basic course to raise awareness and provide additional knowledge and tools for any emergency communications volunteer. **Member: $45 / Non-member: $75**

Level 2 Amateur Radio Emergency Communications...EC-002

Intermediate Amateur Radio Emergency Communications. A more in-depth study into amateur radio emergency communications to enhance the skills and knowledge received from previous experience. Requires prior completion of EC-001. **Member: $45 / Non-member: $75**

Level 3 Amateur Radio Emergency Communications...EC-003

Advanced Amateur Radio Emergency Communications. Bridging the gap between basic participation and leadership. Requires prior completion of EC-001 and EC-002. **Member: $45 / Non-member: $75**

Radio Frequency Interference...EC-006

Learn to identify sources and victims of interference. Tips and suggestions for solutions and for handling those ticklish problems that crop up with difficult neighbors and other aggrieved parties. Tools to help foster ingenuity, intuition, and determination for solving interference problems. **Member: $65 / Non-member: $95**

VHF/UHF—Life Beyond the Repeater...EC-008

An introduction to Internet linking, amateur satellites, direction finding, APRS, weak signals, VHF contesting, microwaves, amateur television, and high speed multimedia radio. Great for both the newly licensed and more experienced hams. **Member: $65 / Non-member: $95**

Technician License Course...EC-010

The course prepares students to earn their first Amateur Radio license. There are no prerequisites. Individually assigned online mentors assist students as they advance toward successfully completing the course. Registration includes the ARRL book, *Now You're Talking!* and online graduate support. **Member: $99 / Non-member: $139**

Online courses are produced by American Radio Relay League, Inc. and are available through ARRL's partnership with the Connecticut Distance Learning Consortium (CTDLC), a nonprofit organization that specializes in developing on-line courses for Connecticut colleges and universities. Continuing Education Units (CEUs) are available for all ARRL Certification and Continuing Education courses. The ARRL Certification and Continuing Education Program is funded in part by course fees from interested hams who support public service and quality continuing education. For further information, e-mail your questions to **cce@arrl.org**, or write to **ARRL C-CE, 225 Main Street, Newington, CT 06111**.

MFJ *IntelliTuner*™ Automatic Tuner

Automatically tunes any antenna balanced or unbalanced . . . Ultra fast . . . 2000 memories . . . Antenna Switch . . . Efficient L-network . . . Matches 6-1600 Ohms at 300 Watts . . . 1.8-30 MHz . . . 4:1 current balun . . . Cross-Needle and Digital SWR/Wattmeter . . . Aural SWR meter . . . Backlit LCD . . . Remote control port . . . Radio interface . . .

MFJ-993

$259.95 **New!**

The MFJ-993 *IntelliTuner*™ lets you tune any antenna *automatically* balanced or unbalanced -- *ultra fast*.

It's an automatic antenna tuning *console* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJs exclusive *IntelliTuner*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you *ultra fast* automatic tuning with over 2000 *non-volatile* revolving memories.

You get a highly efficient L-network, wide 6-1600 ohm matching at *full* 300 Watts SSB/150 Watts CW, 1.8-30 MHz coverage, Cross-Needle and *digital* meters, aural SWR meter, *backlit* LCD display, remote control port, radio interface, heavy-duty 16 amp/1000 volt relays and more.

It learns while you're having fun

As you're ragchewing, contesting or DXing, *your MFJ-993 is learning!*

When you transmit, the MFJ-993 automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!*

Each of two antennas can learn and remember over a thousand frequencies and tuner settings. They are safely stored in *non-volatile* revolving memory.

Highly Intelligent ultra fast tuning

MFJ *InstantRecall*™ first checks its memory to see if you have operated this frequency before. If so, tuning is instantaneous and you're ready to operate.

If not, MFJ's *IntelliTuner*™ algorithm - - based on MFJ's famous SWR Analyzer technology - - kicks in. It *measures* the complex impedance of your antenna. Next, it *calculates* the components it needs and instantly *snaps* them in. Then, it fine tunes to minimize SWR -- you're ready to operate. It's all done in a *fraction* of a second.

When the impedance is within its measurement range, the MFJ-993 is the *fastest automatic antenna tuner in the world.*

If it can't accurately determine impedance, MFJ's *AdaptiveSearch*™ algorithm goes into action. Frequency is measured and relevant components values are determined. Only those values are searched for ultra-fast tuning.

For even faster searches, you can set the target SWR to 2 (settable 1.0 to 2.0).

You can manually tune when you can't transmit (for listening out of ham bands).

Cross Needle and Digital Meters

Lighted Cross-Needle and *digital* SWR/Wattmeters lets you accurately read SWR, forward and reflected power at a glance.

An *aural* SWR meter lets you *hear* the tuned SWR when you can't see or read the meters.

Turn on a highly visible, instant response SWR LCD bargraph when you need it.

Backlit LCD Display

An easy-to-read *backlit* LCD displays SWR, forward/reflected power, frequency, antenna 1 or 2, L and C tuner values, on/off indicators and other information.

Remote Control Port

Plug in the **MFJ-990RC, $39.95**, remote control and put your tuner at your antenna or elsewhere and control it remotely.

The MFJ-993 supports radio tuner interfaces such as the ICOM 706 series. *Interface cables are available.*

The MFJ-993 is a compact 10Wx2¾ Hx9D inches. Use 12-15 VDC/1 amp or 110 VAC with **MFJ-1316, $19.95**.

Tune any Antenna

You can tune any antenna -- dipoles, verticals, beams, phased arrays, inverted vees, quads, random wires, mobile antennas, limited space antennas -- any antenna.

A 4:1 true current balun lets you tune any *balanced* antenna -- horizontal loops, vertical loops, multi-band doublets, quads, folded dipoles, Zepps.

150 Watt Automatic Tuner

New!

MFJ-991, **$219.95**

MFJ-991, *150 Watt IntelliTuner*™ automatic antenna tuner. Similar to MFJ-993 but handles 150 Watts SSB/100 Watts CW, matches 6-3200 Ohms. Does not have digital SWR/Wattmeter/LCD display, aural SWR meter/audio feedback, antenna switch or 4:1 current balun for balanced lines.

600 Watt MFJ Automatic Tuner

MFJ-994, **$359.95** **New!**

MFJ-994, *600 Watt IntelliTuner*™ automatic antenna tuner. Similar to MFJ-993 but handles 600 Watts SSB/300 Watts CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display, aural SWR meter/audio feedback, antenna switch or 4:1 current balun for balanced lines. Tuning must be done at low transceiver power with the amplifier bypassed.

Free MFJ Catalog

and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

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Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ . . . the World Leader in Ham Radio Accessories!

MFJ *Balanced Line* Antenna Tuner

Superb balance . . . Very wide matching range . . . Covers 1.8-54 MHz . . . Cross-Needle SWR Wattmeter . . . Handles 300 Watts . . . Compact size . . .

The MFJ-974H is a* fully balanced true *balanced line antenna tuner. It gives you superb current balance.

Johnson Matchbox

For decades, the Johnson Matchbox has been the standard of comparison for balanced line antenna tuners. But, it had a severely limited matching range and covered only 80, 40, 20, 15 and 10 Meters.

***The** MFJ-974H is its successor*. It meets today's needs and even surpasses the Johnson Matchbox outstanding performance.

Everything You Need

The MFJ-974H gives you excellent current balance, very wide matching range(12-2000 Ohms) and covers 1.8 through 54 MHz *continuously* including all WARC bands, 160 Meters, 6 Meters and the new 60 Meter band. Handles 300 Watts SSB PEP and 150 Watts CW.

Tuning is fast and easy - - just three tuning controls. You can adjust for highly efficient broadband low-Q operation or use higher Q when you encounter extreme loads.

A large three-inch lighted Cross-Needle SWR/Wattmeter lets you read SWR, peak or average forward and reflected power *all at a glance* on 300/60 or 30/6 Watt ranges.

A ground post is provided to ground one output terminal so you can also tune random wires and coax fed antennas.

Compact 7½Wx6Hx8D in. fits anywhere.

Tunes any Balanced Line

The MFJ-974H tunes any balanced lines including 600 Ohm open wire line, 450/300 Ohm ladder lines, 300/72 Ohm twin lead - - shielded or unshielded.

Superb current balance minimizes feedline radiation that can cause troublesome TVI /RFI, painful RF bites, mysterious RF feedback problems and radiation pattern distortion.

Excellent Balance, Excellent Design

The MFJ-974H is a *fully balanced* wide range T-Network. *Four* 1000 Volt air variable capacitors are gear driven. A high-Q air wound tapped inductor is used for 80-10 Meters with separate inductors for 6 and 160 Meters. The tuning components are mounted symmetrically to insure electrical balance.

A 1:1 *current* balun is placed on the low impedance 50 Ohm input side to convert the balanced T-Net-work to unbalanced operation. An efficient balun is made of 50 ferrite beads on RG-303 *Teflon*™ coax to give very high isolation. It stays cool even at max power.

MFJ-974H **$199.95**

Balanced Line = Extremely Low Loss

Balanced lines give extremely low loss.

Doublet, horizontal loop, vertical loop, quad, double extended Zepp, Lazy H, W8JK antennas all give efficient multi-band operation when fed with balanced lines.

6-80 Meter Balanced Line Tuner

MFJ-974 **$179.95**

MFJ-974, $179.95. Same as MFJ-974H but for 6-80 Meter operation (no 160 Meters).

160-6 Meters All Band Doublet Antenna

MFJ-1777, $49.95. 102 feet doublet antenna covers 160-6 Meters with balanced line tuner. Super strong custom fiberglass center insulator provides stress relief for 450 Ohm ladder line (100 feet included). Authentic *glazed ceramic* end insulators. Handles 1500 Watts.

MFJ *High Current* DC Multi-Outlet Strips

Choose super versatile 5-way binding posts AND/OR Anderson PowerPole® connectors

Anderson PowerPole® is a registered trademark of Anderson Power Products.

Provide multiple high current DC outlets for transceivers and accessories from your main 12 VDC power supply – keeps you neat, organized and safe. Prevents fire hazard. Keeps wires from tangling up and shorting. Outlets are fused and RF bypassed.

All MFJ DC power strips have *built-in* six foot, eight gauge, flexible color-coded cable with ring tongue terminals -- *no extra cost*. *RF-tight* aluminum cabinet has mounting ears and ground post with wing nut.

Choose MFJ's *super versatile* super heavy duty 5-way binding posts (spaced for standard dual banana plugs) and/or *Anderson PowerPole®* outlets.

Each *Anderson PowerPole®* is individually fused as needed. Standard color coded automobile fuses plug in externally. Extra *PowerPole®* connectors, contacts, fuses are included at *no extra cost*.

Versatile 5-Way Binding Posts

MFJ-1118 **$74.95** **Power** two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts with master fuse, ON/OFF switch, and "ON" LED provide 15 Amps for accessories. 12½x2¾x2½ in.

All PowerPoles®

MFJ-1128 **$99.95** ***12 outlets, each fused, 40 Amps total.*** Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match in-cluded fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 12 pairs of *PowerPole®* contacts and *extra* 10 fuses (2 each: 1, 5, 10, 25, 40A) -- *no extra cost*. 12Wx1¼Hx2¾D in.

MFJ-1126 **$79.95** ***8 outlets. each fused, 40 Amps total.*** Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra* 6 pairs of *Anderson PowerPole®* contacts and *extra* 5 fuses (1, 5, 10, 25, 40A) -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles® AND 5-Way Binding Posts

MFJ-1129 **$109.95** *The best of both worlds!* ***10 outlets, each fused, 40 Amps total.*** Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Mix and match included fuses as needed (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes *extra* 7 pairs of *PowerPole®* contacts, and 10 fuses (2 each,1,5,10, 25, 40A) -- *no extra cost*.12½Wx1¼Hx2¾D in.

MFJ-1124 **$59.95**

6 outlets, each fused, 40 Amps total. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair *PowerPole®* contacts, and 5 fuses -- *no extra cost*.

•1 Year *No Matter What*™ warranty •30 day money back guarantee (less s/h) on orders direct from MFJ.

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Sign up my family members, residing at the same address, as ARRL members too! They'll each pay only $8 for a year's membership, have access to ARRL benefits and services (except QST) and also receive a membership card.

Family Member Name _____ Call Sign (if any) _____

Family Member Name _____ Call Sign (if any) _____

❑ Sign up _____ family members @ $8 each = $ _____ .

❑ Total amount enclosed, payable to ARRL $ _____ .

❑ Enclosed is $ _____ ($1.00 minimum) as a donation to the Legal Research and Resource Fund.

❑ Charge to: ❑ VISA ❑ MasterCard ❑ Amex ❑ Discover

Card Number _____ Expiration Date _____

Cardholder's Signature _____

❑ If you do not want your name and address made available for non-ARRL related mailings, please check here.

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QST 7/2004

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).

MFJ AirCore™ Roller Inductor

gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty
MFJ will repair or replace your unit *(at our option)* for 1 year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T* ™

MFJ-986 **$329.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D compact 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 in.

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 in. Simple 2-knob tuning for mobile or base.

MFJ-922 144/440 MHz Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼" 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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FRIEND OF BILL W.?? - Join HAAM net Saturdays at 12:30 Eastern on 14.290; Sundays at 09:30 Pacific on 14.340/2. K6LX

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

1.8-170 MHz *plus* 415-470 MHz
MFJ HF/VHF/UHF Antenna Analyzer

All-in-one handheld antenna test lab lets you quickly check and tune HF, VHF, UHF antennas anywhere. Covers 1.8-170 MHz and 415-470 MHz

Measures: SWR…Return Loss…Reflection Coefficient…Antenna Resistance(R), Reactance(X), Impedance(Z) and Phase Angle(degrees) . . . Coax cable loss(dB) . . . Coax cable length . . . Distance to short or open in coax… Inductance . . . Capacitance . . . Resonant Frequency . . . Bandwidth . . . Q . . . Velocity Factor . . . Attenuation . . . Has: LCD readout . . . frequency counter . . . side-by-side meters . . . Ni-MH/Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . One year No Matter What™ warranty . . .

MFJ-269
$359.95

You can instantly get a complete picture, check and tune any antenna from 1.8 to 170 MHz and 415 to 470 MHz -- an MFJ-269 exclusive -- with this rugged easy-to-use handheld antenna test lab! You can measure virtually every antenna parameter.

You won't believe its capability and versatility. This rugged handheld unit literally replaces a workbench full of expensive delicate test equipment.

SWR Analyzer

You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals, yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Much Better Accuracy

New 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting frequency easy.

Take it anywhere

Take it anywhere - to remote sites, up towers, in cramp places. Fully portable -- battery operated, compact 4Wx2Dx6¾ in., weighs 2 lbs. *Free* "N" to SO-239 adapter.

Has battery saver, low battery warning and built-in charging circuit for rechargeables.

Use 10 AA Ni-MH or Ni-Cad or alkaline batteries (not incl.) or 110VAC with MFJ-1312D, $14.95.

MFJ SWR Analyzer Accessories

Carrying Case. **MFJ-39C, $24.95.** Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

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Dip Coils. **MFJ-66, $19.95.** **Plug** these MFJ dip meter coupling coils into your MFJ-269 and turn it into a sensitive, accurate *band switched* dip meter. Two coils cover 1.8-170 MHz.

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Deluxe Accessory Pack. **MFJ-98B, $77.85. *Save $7!*** Complete accessory pack! MFJ-39C carry case, 10 Ni-MH batteries, MFJ-66 dip coils, MFJ-1312D AC adapter.

MFJ-259B *SWR Analyzer™*

$259.95. Has most of the features of the MFJ-269, but covers 1.8-170 MHz.

Deluxe Accessory Pack **MFJ-99B, $77.85. *Save $7!*** 10 Ni-MH batteries, MFJ-1312D AC adapter, MFJ-29C carrying case, MFJ-66 dip coils.

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MFJ-4035MV
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6-Meter SSB, CW, and FM signals can refracted (skipped) up to 1,500 miles away using an atmospheric phenomena called sporadic-E (Es). This is caused by an ionospheric formation that is compressed into a thin, stratified layer above the earth. Sporadic-E skip peaks during May through July, with a secondary peak in November and December. The best times to catch a band opening on 6-Meters is usually mid-morning and early evening. 6-Meter E-skip is independent of the solar cycle, and several atmospheric phenomena contribute to the almost-common summer and winter band openings over 1,500 miles away.

IC-703 PLUS

HF+ 6-Meters

The easiest way to catch 6-Meter sporadic-E skip with your Icom is selecting upper sideband, and tuning to 50.125 MHz, the calling frequency. Occasionally scan down below 50.100 and listen for CW beacons coming in via skywaves. Then hop back to 50.125, and try a CQ with your Icom. Once you make contact, suggest to the other station QSY to an open frequency above 50.150 MHz. This leaves the calling channel open for other stations to make contact and switch up the band.

Your vertical single-, dual-, or tri-band VHF/UHF antenna will work swell on 6-Meter skywaves. Polarization is not important for E-skip.

All Icom HF+6M equipment comes with continuously adjustable power output – this author has worked across the country on an Icom IC-703 Plus running just 5 Watts into a little mobile whip. SSB has a major advantage over FM during an E-skip contact. Always use upper sideband.

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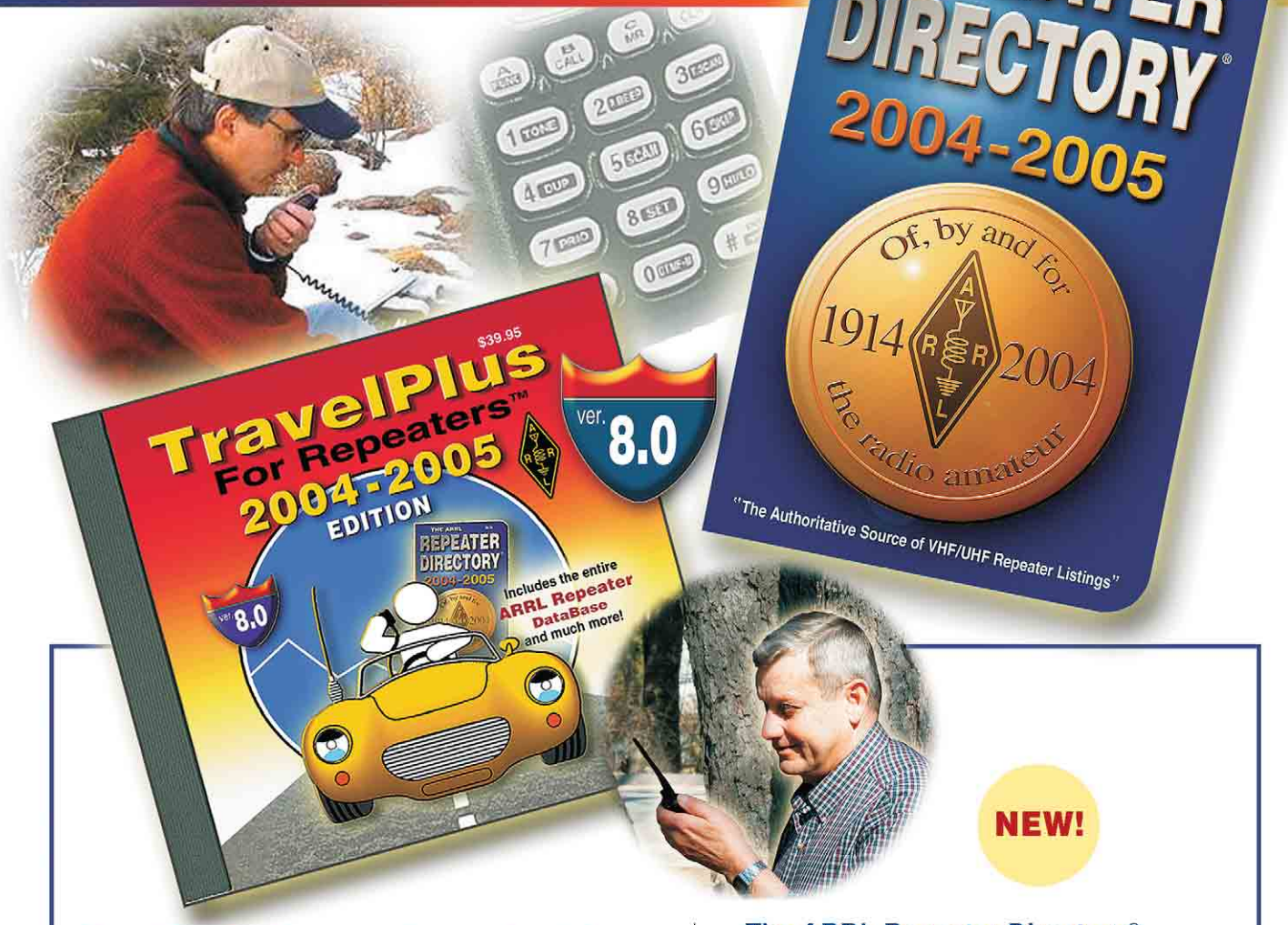

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The Icom IC-703 is a compact HF XCVR, with built-in auto tuner, DSP, and more! The IC-703PLUS adds 6m coverage.

IC-706MK2G..... Icom Special!
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