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November 2000

QST reviews

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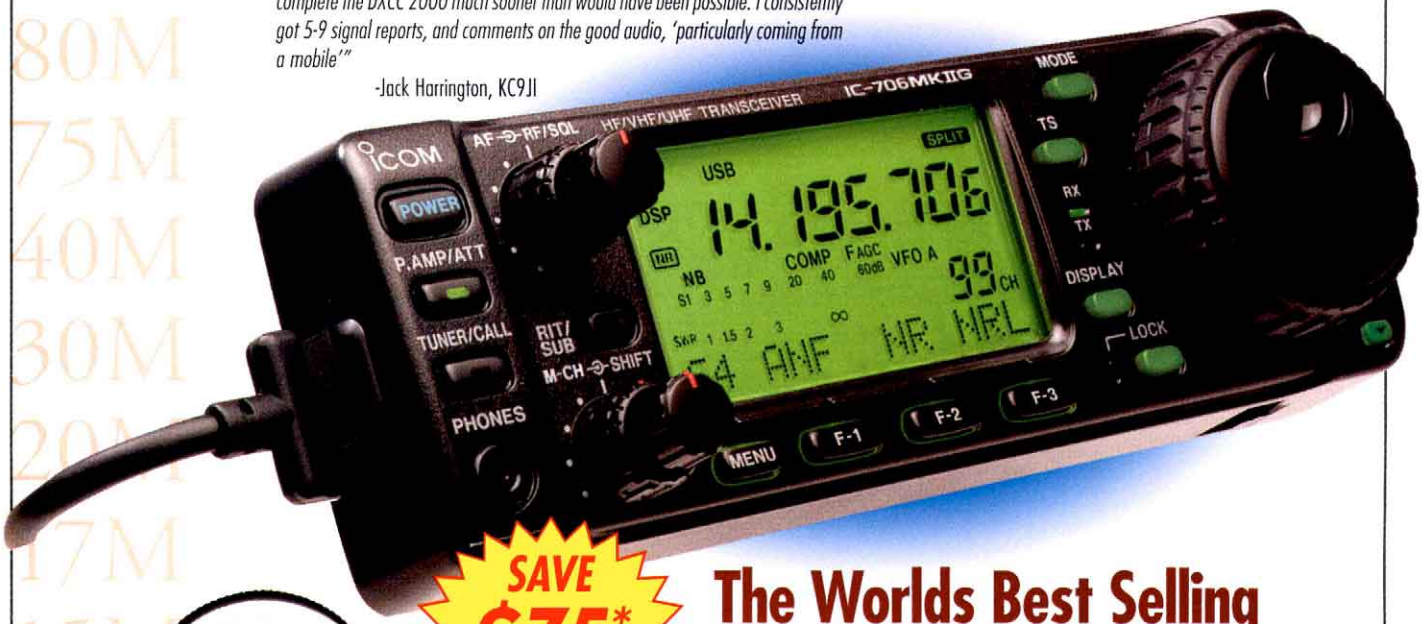

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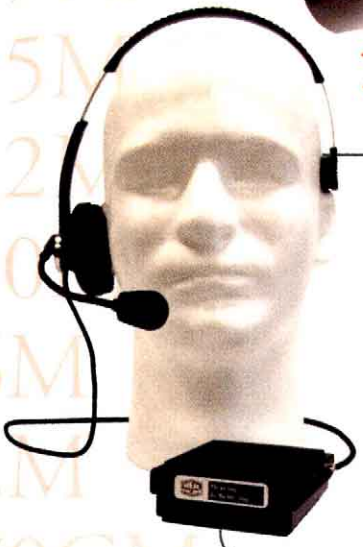

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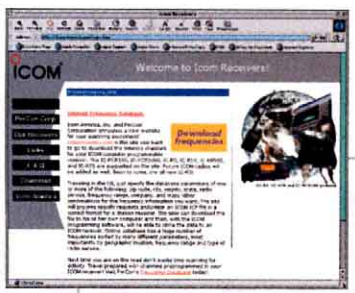

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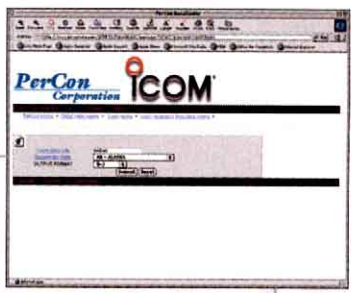

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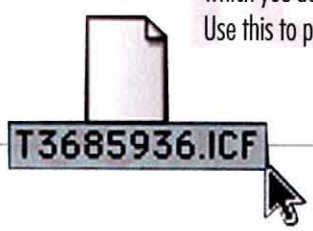

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November 2000 ♦ Volume 84 Number 11

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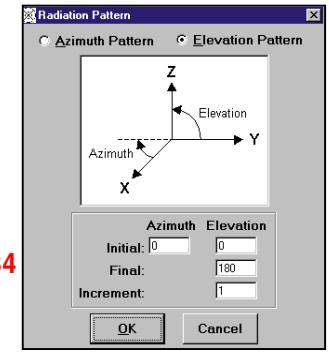

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News and Features

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494. ARRL yearly membership dues (including a subscription to *QST*), are $34 worldwide. To compensate for additional postage for mailing outside the US, please remit $47 for Canada and $54 for other countries. Complete membership information is shown on page 5. Periodicals postage paid at Hartford, CT, and at additional mailing offices.

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QST Workbench

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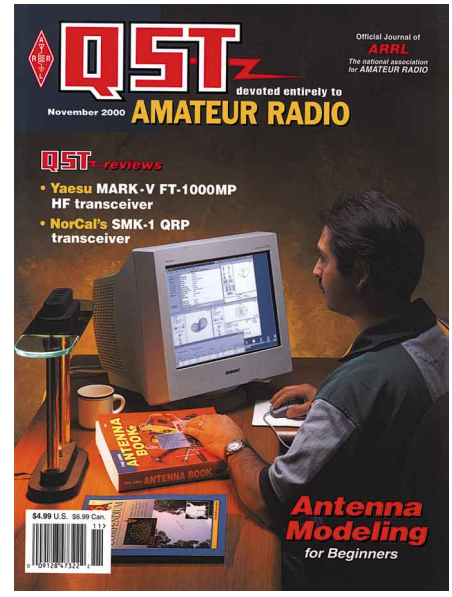
Operating

Departments



Our Cover

The mere mention of "antenna modeling" is enough to chill the blood of many amateurs, but this software approach to designing antennas is now easier than ever. Learn how in the first of our four-part series, "A Beginner's Guide to Modeling with NEC" by L. B. Cebik, W4RNL, on page 34. In our cover photo, Joe Carcia, NJ1Q, W1AW Station Manager, works with *EZNEC* for *Windows*.

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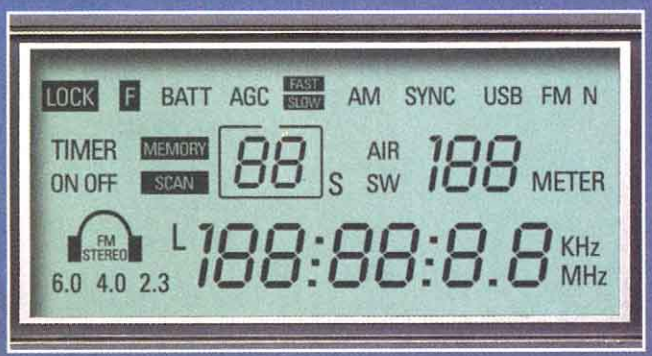

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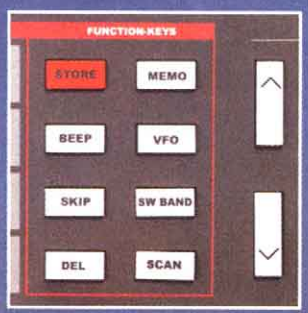

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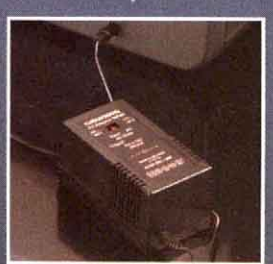

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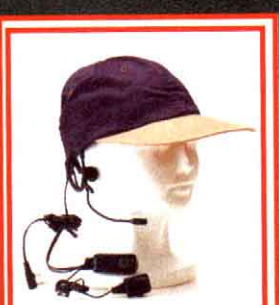

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"IT SEEMS TO US..."

Forty Meters: A Gordian Knot?

On this page in August we explained how the 40-meter band got the way it is, with amateurs having to compete with powerful broadcasting stations outside the Americas in the upper two-thirds of the band. We reported that WRC-2000 in Istanbul had recommended that the realignment of the amateur and broadcasting services allocations around 7 MHz be placed on the agenda of the next such conference, in 2003.

As expected, the ITU Council accepted this recommendation. Also on the WRC-2003 agenda are two related items: Changes necessary to implement digital modulation techniques in HF broadcasting, and examination of the adequacy of HF broadcasting allocations between 4 and 10 MHz. Inclusion of the latter item is something of a surprise. It was on a short list of items that WRC-2000 had recommended if additional budgetary and conference resources could be provided, but few thought that Council would be able to do so in the prevailing "no budget increase" environment.

The long-standing IARU objective is an exclusive, worldwide amateur allocation of no less than 300 kHz in the vicinity of 7 MHz, as was the case prior to 1938. While the WRC-2003 agenda offers the possibility of achieving this objective, let's not kid ourselves: It will not be easy. Inclusion of the other HF broadcasting items makes it more difficult to resolve the 7-MHz issue. Here's why.

This will be the third attempt to fix 40 meters. The first, in 1979, was a part of a bottom-to-top review of the international radio regulations and the table of frequency allocations. Several administrations proposed separate 7-MHz amateur and broadcasting allocations at WARC-79, but most of these proposals required reductions in the adjacent allocations to the fixed service. At the time, the international broadcasters encountered strenuous opposition to expansion from developing countries, many of whom relied on HF fixed links for basic telecommunications services. The failure to find a 40-meter solution satisfactory to amateurs and broadcasters was not unique; international broadcasters' gains at WARC-79 were limited to the bands above 9500 kHz, which are less useful for domestic fixed services. Below that frequency, they were shut out.

Broadcasters were only slightly more successful in 1992. At that conference, they obtained future access to an additional 200 kHz below 10 MHz: 5900-5950, 7300-7350, and 9400-9500 kHz. However, the new bands came with strings attached. They (along with an additional 590 kHz above 10 MHz) were only to be used for single-sideband (SSB) emissions. HF broadcasters were also required to complete the transition from double-sideband to SSB with *all* double-sideband transmissions to cease by the end of 2015.

The SSB envisioned for broadcasting was not the same SSB that has been the dominant amateur HF voice mode for the past 35 years. Instead of completely suppressing the carrier, broadcasters were to transmit a pilot carrier at a level about 12 dB below peak envelope power. The plan was for receiver manufacturers to design and market SSB receivers with synchronous detectors.

That was the plan, but somehow it never quite came together. Most broadcasters' hearts were never in it. They didn't like the idea of having to buy new transmitters (HF transmitters have an extremely long service life) and they didn't like listeners having to buy new receivers in exchange for what they generally regarded as marginal improvements in reception quality. A WRC-2000 report said: "No SSB receiver equipped with a synchronous demodulator has been identified in the price range up to $200. Even in the price range from $200 to $600, only 15% of the HF receiver models identified are equipped with a synchronous detector." While exact figures are not available, it is clear that only a tiny percentage of the estimated 500 million to 700 million HF receivers in the world are equipped for SSB.

In recent years, some HF broadcasters have become enthusiastic about digital modulation. An international consortium, Digital Radio Mondiale (DRM), has made considerable progress toward developing a proposed worldwide standard for digital sound broadcasting below 30 MHz. An ITU Task Group meeting in Geneva in mid-October (around the time this issue of *QST* is mailed) is expected to approve such a standard. This will set the stage for its early adoption as an ITU-R Recommendation as well as for WRC-2003 proposals to abandon the mandatory transition to SSB in favor of digital. No doubt some broadcasters will argue that WRC-2003 should drop the mandate entirely on the grounds that no one knows how quickly digital receivers will be available at reasonable prices.

Thus, HF broadcasters go into WRC-2003 with three objectives. The first is similar to ours: Separating amateurs from broadcasters at 7100-7300 kHz. For this to be achieved, broadcasters will have to be accommodated above 7350 kHz or amateurs will have accommodated below 7000 kHz (or both).

While they (and we) seek concessions from fixed and mobile interests (including the military) above 7350 kHz and possibly below 7000 kHz, broadcasters also will be seeking access to other bands below 10 MHz. Fixed and mobile interests will be less willing to cooperate to solve the 7-MHz problem if they feel they are under the gun elsewhere.

On top of that, HF broadcasters will be defining their spectrum requirements to include both digital and double-sideband. And while there may be advantages to digital broadcasting, narrow bandwidth is not among them: The DRM system envisions a bandwidth of 9 or 10 kHz, with 18 to 20 kHz for stereo. The objective of the transition to SSB was to reduce the bandwidth required for each HF broadcast; it remains to be seen whether the rest of the world will sit still for this objective being turned on its head.

All this notwithstanding, fixing 40 meters is not an impossible mission. It is an exceptional challenge—one that is worthy of our best efforts, now as in 1979 and 1992. May the third time be the charm!—*David Sumner, K1ZZ*

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The 15 divisions of the League are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. These news items could find their way into the pages of *QST*! If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists).Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. If your ARRL section has a Web site, the address can be found at **http://www.arrl.org/field/org/smlist.html**.

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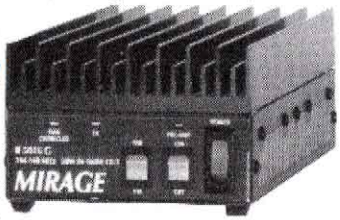
Turn your mobile, base or handheld into 160 Watt powerhouses and talk further, longer, clearer . . . All modes: FM, SSB, CW . . . Superb GaAsFET preamp . . . Overdrive, high SWR, Over-temperature protection . . . Remote controllable . . .

MIRAGE RUGGED!

B-5016-G **$299** Suggested Retail



Power Curve -- typical B-5016-G output power								
Watts Out	130	135	140	145	150	155	160	165
Watts In	20	25	30	35	40	45	50	55

The MIRAGE B-5016-G gives you 160 Watts of brute power for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 20 to 60 Watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard*™.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

Draws 17-22 Amps at 13.8 VDC. 12x3x5½ in.

RC-1B, $45. Remote Control. On/Off, preamp On/Off, selects SSB/FM. With 18 foot cable.

More 160 Watt, 2 Meter Amplifiers . . .

B-2516-G, $299. For 10 to 35 Watt mobile or base stations. 160 Watts out for 25 Watts in.

B-1016-G, $379. MIRAGE's most popular *dual purpose* HT or mobile/base amplifier. 160 Watts out for 10 Watts in. For 0.2-15 Watt transceivers.

B-1016-G Great for ICOM IC-706!

B-215-G, $379. MIRAGE's most popular *handheld* amp. 150 Watts out with 2 watts in; 160 watts out with 3½ Watts in. For 0.25 to 5 Watt handhelds radios.

100 Watts for 2 Meter HTs

B-310-G **$199** Suggested Retail

MIRAGE RUGGED!

Power Curve -- typical B-310-G output power								
Watts Out	25	50	75	95	100	100	100	100
Watts In	¼	½	1	2	4	6	7	8

- *100 Watts out with all handhelds up to 8 Watts*
- *All modes: FM, SSB, CW*
- *Great for ICOM IC-706*
- *15 dB low noise GaAsFET preamp*
- *Reverse polarity protection*
- *SWR Protection*
- *FREE mobile bracket*
- *Auto T/R Switch*
- *FREE handheld BNC to B-310-G patch cable*
- *Ultra-compact 4¾x1¾x7¾ inches, 2½ pounds*
- *One year MIRAGE warranty*

***Boost** your 2 Meter handheld to 100 Watts!* Ultra-compact all mode B-310-G amp is perfect for all handhelds up to 8 Watts and multimode SSB/CW /FM 2 Meter rigs. *Great for ICOM IC-706!*

35 Watts for 2 Meter HTs

B-34-G **$89.95** Suggested Retail

Power Curve -- typical B-34-G output power							
Watts Out	18	30	33	35	35	35	35+
Watts In	1	2	3	4	5	6	8

- *35 Watts Output on 2 Meters*
- *All modes: FM, SSB, CW*
- *18 dB GaAsFET preamp*
- *Reverse polarity protection*
- *Includes mobile bracket*
- *Auto RF sense T/R switch*
- *Custom heatsink, runs cool*
- *Works with handhelds up to 8 Watts*
- *One year MIRAGE warranty*

MIRAGE RUGGED!

35 Watts, FM only . . . $69.95

B-34, $69.95. 35 Watts out for 2 Watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

MIRAGE Dual Band 144/440 MHz Amp

BD-35 **$159.95** Suggested Retail

Power Curve -- typical BD-35 output power								
Watts Out 2 Meters	30	40	45	45	45	45	45	45+
Watts Out 440 MHz	16	26	32	35	35	35	35	35+
Watts In	1	2	3	4	5	6	7	

- *45 Watts on 2 Meters/35 Watts on 440 MHz*
- *Auto Band Selection*
- *Auto T/R Switch*
- *Full Duplex Operation*
- *5x1¾x5 inches*
- *FREE mobile bracket*
- *"On Air" LEDs*
- *Single Connector for dual band radios and antennas*
- *Reverse polarity protection*
- *Works with all FM handhelds to 7 Watts*
- *One year MIRAGE warranty*

Add this Mirage dual band amp and boost your handheld to a powerful mobile or base -- 45 Watts on 2 Meters or 35 Watts on 440 MHz! Mirage's exclusive *FullDuplexAmp*™ lets you talk on one band and listen on the other band at the same time -- just like a telephone conversation. *(Requires compatible HT).*

6 Meter Amplifier

FCC Type Accepted

The A-1015-G, $389, is the *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out for 10 in. For 1 to 15 Watt transceivers.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $365 -- 100 W out/30 in. For 5 to 45 Watt *mobile/base*. **D-1010-N, $395**, 100 W out/10 in. *Dual purpose* -- for handhelds or mobile/base. **D-26-N, $269**, 60 W out/2 in, for *handhelds*.

Amateur TV Amps

Industry standard ATV amps -- **D-1010-ATVN, $414**, 82 Watts PEP out / 10 in. **D-100-ATVN, $414**, 82 Watts PEP out/2 in. (without sync compression).

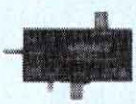
Remote Control Head for Amps

RC-1, $45, remote controls most MIRAGE amps. Check with Mirage for compatibility. Power On/Off, preamp On/Off, switch for SSB/FM. 18 foot cable (longer available). Tiny 1¾x3¾x2½ inches.

Repeater Amps

11 models -- continuous duty all mode FM/SSB/CW repeater amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

Low noise GaAsFET preamps



KP-1

KP-2

High gain ultra low noise GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 100 Watts.

Choose *In-Shack* model or *Mast Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

Frequency (MHz)	In Shack $139	Mast Mount $195
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

1¼ Meter Amps (223-225 MHz)

Choose from 10 models -- 20 to 220 Watts out for 2 to 50 Watts in, $129 to $655.

Commercial Amps ($199 to $395)

FCC Type Accepted

Commercial Amps for 150-174, 450-470 MHz and VHF marine bands, 70-130 Watts out.

Accurate SWR/Wattmeters

Read SWR directly and Forward/Reverse, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

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SB-15 • Tri-band 52/146/446MHz w/fold-over
Wavelength: 52MHz 1/4 wave • 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

SBB-7 **SBB-7NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

SBB-5 **SBB-5NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 120W

THEFT **Z750** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W

THEFT **Z780** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

B-20 **B-20NMO** • Dual-band 146/446MHz w/fold-over
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 30" •
Conn: B-20 PL-259/B-20NMO NMO • Max Pwr: 50W

B-10 **B-10NMO** • Dual-band 146/446MHz cellular look-a-like •
Wavelength: 146MHz 1/4 wave • 446MHz 1/2 wave • Length: 12" •
Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

• The CA-UHV is a 6M/2M/70cm triband antenna. Add 2-3 of the stock or optional coils for 5-6 band operation.
• HF-70cm all in one economical easy to mount antenna.
• Fold-over hinge built in.
• Select the correct duplexer or triplexer for your specific radio (s).
• CF-706A, CF-530, CFX-514N (Ask your dealer)

NEW **CA-UHV** • HF/6M/2M/70cm Mobile Antenna40/*20/*17/15/10/6/2M/70cm **40M Thru 70cm!**
Wavelength: HF-6M 1/4 wave • 2M 5/8 wave • 70cm 1/2 wave • VSWR: HF 1.6:1 or less • 6M-70cm 1.5:1 or less • Length: 6'2" •
Max Pwr: HF 120W SSB • 6M 200W SSB/100W FM • 2M/70cm 100W FM • *L-14 Optional 20M coil • *L-18 Optional 17M coil

* *NEW* **MSG-1900C** • Dual-band 146/446MHz w/spring whip and fold-over
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 39" • Conn: PL-259 • Max Pwr: 120W

* *NEW* **MSG-1100C** • Dual-band 146/446MHz w/spring whip and fold-over
Wavelength: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 43" • Conn: PL-259 • Max Pwr: 150W

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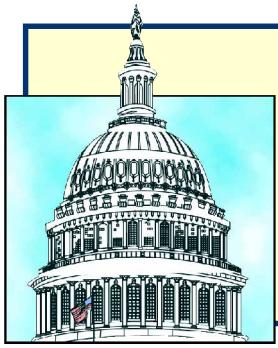

DC Currents

By Steve Mansfield, N1MZA
Manager, Legislative and Public Affairs

Just as radio waves aren't constrained by artificial boundaries, neither is ARRL's government relations effort. "DC Currents" covers behind-the-scenes activity you need to know about in Congress, at the FCC and other regulatory agencies, as well as at worldwide bodies such as the International Telecommunication Union.

ARRL Luncheon Honors Beltway Hams

About 50 hams from the Washington Beltway areas, most of whom are professionally employed in private sector or government telecommunications, met for an ARRL-sponsored buffet lunch in their honor. In addition to fine food, they were treated to a discussion on Amateur Radio issues with ARRL President Jim Haynie and the ARRL staff.

Haynie discussed the League's "Big Project" and, in explaining how Amateur Radio continues to be a spawning ground for potential new RF engineers and other technical careers, asked for help from attendees who can provide additional ideas on how to promote the ARRL's involvement in educational projects. ARRL Technical Relations Manager, Paul Rinaldo, W4RI, gave a presentation on the background and history of the efforts on "harmonization of the 40-meter band" at the upcoming World Radio Conference. Steve Mansfield, ARRL Manager of Legislative & Public Information, discussed progress on the House and Senate versions of the Amateur Radio Spectrum Protection Act.

Attendees included some FCC and NTIA staff, representatives from Capitol Hill and from the State Department, as well as many hams who are professionally employed by several major telecommunications operations headquartered in the Washington area. A number of years ago, the ARRL coordinated similar luncheons on a regular basis, often referred to as the "Washington Watch" group. The group may continue to meet periodically.

Attending ARRL's luncheon in downtown Washington, DC are (left to right) Bill Cross, W3TN; Hal Grigsby, WB4GRW; Frank Williams, N4FK; and Sam Garrett, AA0CR. Cross is from FCC's Private Wireless Bureau, Grigsby and Williams are from the U.S. Department of State, and Garrett is a graduate student at American University.

ARRL President Haynie Visits FCC

● ARRL maintains regular relations with the Federal Communications Commission, but in September ARRL President Jim Haynie brought "word from the ARRL Board" to Commissioners and FCC staff. Much of what Haynie had to say was well received by all.

FCC meetings included a visit with Commissioner Harold Furchtgott-Roth to discuss the League's position on CC&Rs and the ARRL petition to get the FCC to incorporate restrictive covenants as part of its preemption policy known as PRB-1. The Commissioner also listened with some interest to the ARRL's renewed emphasis on Amateur Radio and education. The ARRL team also met with Private Wireless Division Chief D'Wana Terry, Bill Cross, W3TN, and other Wireless Telecommunications Bureau staffers. At that meeting, some of the data from the ARRL's CC&R research project was shared (without names, call signs or other identifying information) to help demonstrate inconsistencies in contract language in CC&Rs around the US.

The ARRL delegation also met with Clint Odom, wireless adviser and legal counsel to FCC Chairman William Kennard, Dale Hatfield, W0IFO, and staff members of the FCC's Office of Engineering and Technology that he heads. Software-defined radios were part of the discussions at OET.

ARRL President and staff discuss "The Big Project" with FCC Commissioner Harold Furchtgott-Roth. (left to right) Brian Tramont, Commissioner's assistant; Commissioner Harold Furchtgott-Roth; ARRL President Jim Haynie, W5JBP; Steve Mansfield, ARRL Manager of Legislative & Public Affairs, N1MZA; and Chris Imlay, ARRL General Counsel, W3KD.

Clint Odom (left), counsel to FCC Chairman William Kennard, listens while ARRL President Jim Haynie, W5JBP, (center) and Steve Mansfield, Manager of Legislative & Public Affairs, N1MZA (right), outline ARRL concerns over CC&Rs and Amateur Radio antennas.

The FCC Office of Engineering and Technology discusses League spectrum issues. Pictured here, around table left to right, are Bureau Chief Dale Hatfield, W0IFO, Karen Rackley, Hugh Van Tuyl and Julius Knapp. Backs to camera are ARRL General Counsel Chris Imlay, W3KD, and ARRL President Jim Haynie, W5JBP.

"I think it's important that Amateur Radio get involved with that because of spectrum crowding," Haynie says. "And besides, we should be looking at these technological advances."

During the meeting, OET staff raised the possibility of ARRL members participating in noise-floor measurement tests in spectrum occupied by Part 15 devices. There will be more word of this as the project develops. Discussions also touched on Amateur Radio exam questions, RF interference issues, spread spectrum and the League's pending petition for a low-frequency allocation.

ARRL MEETS WITH PUBLIC SERVICE GROUPS TO RENEW AGREEMENTS

During a meeting-packed week in Washington, ARRL President Jim Haynie and the ARRL staff met with several groups to renew memoranda of agreement establishing how Amateur Radio works together with served agencies. The first meeting was with Andy Butler, the Chief Engineer for Public Broadcasting (PBS) who is president of the Society of Broadcast Engineers. Butler indicated great interest in the ARRL "Big Project," as some broadcasters are having an increasingly difficult time recruiting RF engineers. Haynie and Butler signed an ARRL/SBE memorandum of agreement on future cooperative efforts. The ARRL group also met with Paul Reid, N4EKW, emergency communications manager with the Federal Emergency Management Agency (FEMA) to discuss renewing the memorandum of agreement between ARRL and FEMA. Later, the group also met with John Perry, N1EOD, Manager of Telecommunications Disaster Services and other representatives of the American Red Cross to review a new memorandum of agreement with them, and to tour the Red Cross's Emergency Communications Center.

ARRL and American Red Cross pause for snapshots during a tour of the Red Cross Emergency Communications Center in Falls Church, Virginia. Left to right: Chris Imlay, W3KD; Bev Hoover, Red Cross Director of External Relations; Steve Mansfield, N1MZA; John Perry, N1EOD, Manager of Red Cross Telecommunications Disaster Services; Jim Haynie, W5JBP; and Bob Bavis, Director of Red Cross Disaster Administration.

DUTCH CONSULATE GENERAL THANKS HAMS FOR HELP

♦ Dutch Consulate General Alexander C. H. van Schelle took the opportunity to visit with ARRL President Jim Haynie while he was in Washington. Van Schelle wanted to express his gratitude and appreciation to Amateur Radio for the role it played in saving the life of Dutch citizen Willem van Tuijl, son of Jacco and Janni van Tuijl, KH2DT and KH2TE, respectively. For those not aware of the story, Willem was shot by "pirates" attempting to board the family's sailboat off the coast of Honduras. Hams monitored the event over the air, got on-the-air medical advice for the van Tuijls, and Haynie eventually got word of the event to Congressman Pete Sessions (D-TX-5th). Congressman Sessions convinced Dallas Children's Hospital to fly Willem from Honduras to its Dallas facility. The Washington meeting was arranged by Sessions' chief of staff, Jeff Koch, NU5Z.

(left to right) Dutch Consulate General Alexander van Schelle discusses Amateur Radio's role in rescue operations with Texas Congressman Pete Sessions and ARRL President Jim Haynie, W5JBP.

Media Hits

- The *New York Times* was in Newington recently to write about the League's efforts to promote Amateur Radio locally. Featured in an article about license classes at ARRL Headquarters were Dan Miller, K3UFG, and Al Cohen, W1FXQ.
- Randy Carter, N4AYS, spotted a familiar name in the *AOPA Pilot*, a magazine devoted to private aircraft flying. It was none other than Dick Rutan, KB6LQS, best known for his nonstop round-the-world flight. In a more recent adventure, Rutan and a flying companion used Amateur Radio to summon help during a flying trip when they were stranded at the North Pole.
- The *Chico Enterprise-Record* featured Chico, California ham operator Allen Sherwood, K6USN, (he's a retired Navy commander) pictured in his radio shack preparing for his next DXpedition to Dunk Island, in the Coral Sea.
- *The Tribune Chronicle*, out of Warren, Ohio, showcased local hams Chris Walker (11 years old), KC8NLR; Bill Craiger, K8UV; Henry, Kay and Ron Parise, NZ8W, N8WER and WA4SIR; Dan and Sue Coe, KB8QVS and KB8UXJ; Steve Marshall, N3TPF; and others at the 43rd annual Warren Amateur Radio Association hamfest. Does the Ron Parise call sign ring a bell? That's right, he's an astronaut!
- The *Romney (West Virginia) Hampshire Review* went "up close and personal" with Tom Viselli, K2UOP, of Romney, whose mountaintop home is an ideal DX location. The paper devoted a page to Tom's pursuit of good DX.
- Hal McClamma, NN4US, president of the Tuscaloosa, Alabama, Amateur Radio Club and Dr Gordon King, W4XI, discussed ham radio on the local WTBC talk radio station recently. The appearance was part of their promotion for a Technician license class.

MFJ *Speech Intelligibility* Enhancer™
gave me back my Ham Radio hobby

MFJ-616 **$169.95**

"As I got older, my high frequency hearing loss was destroying my ham radio for me . . ."

-- Martin F. Jue, K5FLU
President and Founder
MFJ Enterprises, Inc.

I know I'm not the only ham who can't understand all the speech in a QSO caused by high frequency hearing loss. I developed a solution that I want to share with my fellow hams.

I almost gave up my ham radio hobby

I have been a passionate ham radio operator for over 40 years ever since I was a teenager. I loved every minute of it. Still do, but I almost had to give it up.

As I grew older (I'm 56 now) I found myself asking "*What did you say?*" so often it got downright embarrassing. I can hear pretty good most of the time. I just can't always understand what people are saying and my left ear is weaker than my right ear.

It got to where I was having trouble carrying on QSOs. I could hear, but I just couldn't quite make out all the words.

My hearing problem almost put a stop to my lifelong hobby.

There was no way I was going to give up ham radio . . .

Research showed me what to do

I searched the literature and spoke to hearing and speech experts.

According to their research on the intelligibility of speech in hearing English words:

1. The frequencies important for speech intelligibility are the consonant sounds from 500 to 4000 Hz. They contribute 83% of word intelligibility.

Frequencies from 500 to 1000 Hz contributes 35% of word intelligibility and 35% of sound energy.

Frequencies from 1000 to 4000 Hz contributes *48% of intelligibility* but has *only 4% of sound energy!*

2. In contrast, frequencies from 125 to 500 Hz contributes 55% of sound energy but only 4% to word intelligibility.

***In** other words, nearly half the speech intelligibility is contained in 1000 to 4000 Hz frequency range with only 4% of the speech sound energy.*

On the other hand, the low frequencies 125 to 500 Hz have most of the speech energy but contribute very little to intelligibility.

How I improved my ability to hear and understand QSOs

The research showed me what to do.

First, drastically increase the speech energy above 500 Hz where 83% of intelligibility is concentrated.

Second, drastically reduce the speech energy below 500 Hz that contributes only 4% of intelligibility.

Amateur radio communications limit audio to about 300 to 2700 Hz.

I split the audio band into four overlapping octave ranges centered at 300, 600, 1200, 2400 Hz.

I could boost or cut each range by nearly 20 db to give me full control. This let me maximize speech intelligibility for most kinds of frequency loss.

My left ear is weaker than my right ear so I split the output audio into left and right channels with separate 2½ watt amplifiers. A balance control lets me equalize the perceived loudness to each ear. *Now both ears help in improving speech intelligibility!*

I couldn't believe my ears!

I built one and hooked it to my rig.

I boosted the high frequencies, cut the low frequencies, set the volume and adjusted the balanced control so I could hear each side equally loud.

I couldn't believe my ears! Speech that I could hear but barely understand before was now highly understandable. I got my ham radio back!

With this concept, you'll *understand* QSOs better and enjoy ragchewing and contesting more, even if you don't have high frequency hearing loss.

It helped me so much I wanted to share this with my fellow hams

I developed this into an accessory that any ham can use.

I made it immune to RFI, added a front panel phone jack, on/off speaker switch, two selectable transceiver inputs, a bypass switch for in/out comparison and built it into 10Wx2½Hx6D inch aluminum enclosure. Needs 12 VDC.

Other Uses

Replace your rig's audio section for superb audio. Eliminate hum, buzzes, poor frequency response, low audio power.

Works with SSB, FM, AM, CW -- any voice mode. Use any rig -- ham, marine, aircraft, CB. Use for PA systems, internet phone, radio talk shows.

MFJ-616 Accessories

MFJ-392, $19.95. Matching high performance communication headphones.

MFJ-281, $12.95. Mylar cone speaker emphasizes 600-4000 Hz for crystal clear speech fidelity. Requires two.

MFJ-1316, $19.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $58.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

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You get MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ-616 (at our option) no matter what for a full year.

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If great value is what you are looking for in a new dual-band handheld or mobile, look no further. The Kenwood TH-G71A and TM-G707A have what you need. The moment you pick up the TH-G71A you will realize the tremendous quality it offers! The polycarbonate case, large one-piece heat sink, high quality antenna and connector, help make it exceed high MIL-SPECS for shock, dust and water. The large, easy to read and "understand" keypad, makes the TH-G71A the handheld of choice.

The TM-G707A mobile offers the highest quality also, with a one piece die-cast heat-sink, the world's smallest detachable front panel for difficult mounting situations and the largest, easy to read character display available anywhere. Of course each of these models offer built-in CTCSS en-code/de-code, 200 total memory frequencies on the 144/440 MHz bands, FREE PC programming software and complete operators manual over the internet . Oh, and let's not forget the best customer support in the industry to help both new and old Hams alike.

Experience *The G-Force;* because the *"G"* stands for *GREAT* value!

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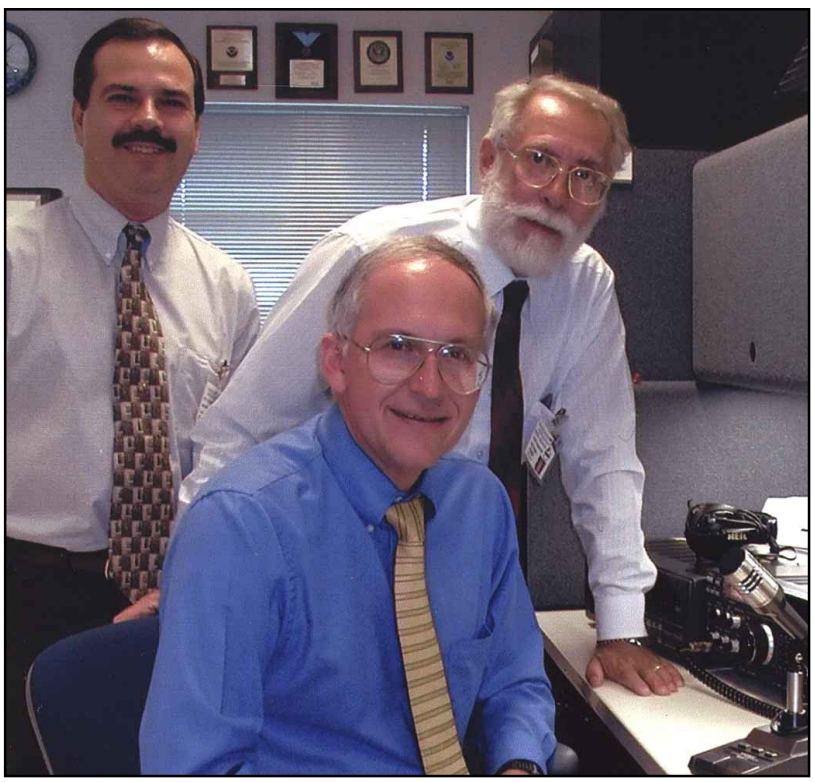
A first day cover to honor 50 years of Amateur Radio in Bosnia-Herzegovina. Although the Bosnia-Herzegovina Amateur Radio Association was founded in 1947, the first amateur contact did not take place until July 6, 1950. Today the ARABiH boasts 3500 very active members.

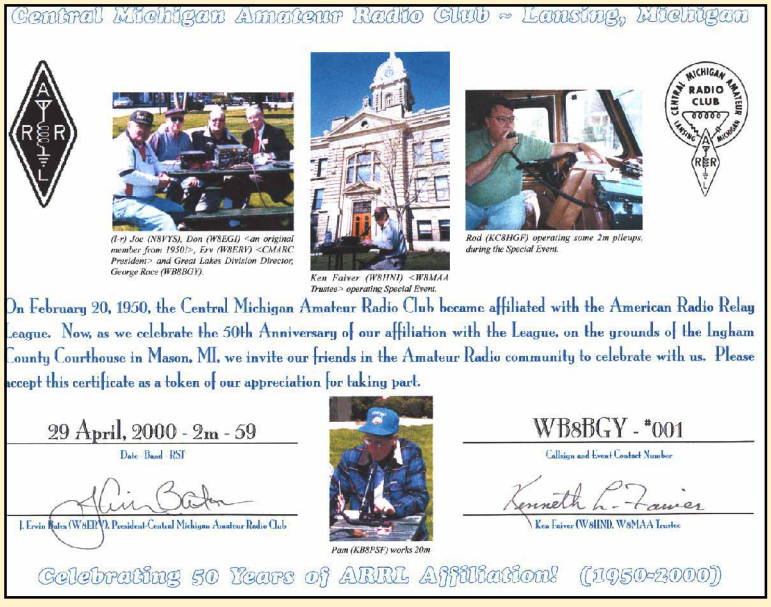


'Tis the season…for hurricanes. W4EHW, the Amateur Radio station at the National Hurricane Center, opened the 2000 hurricane season on June 1 with a special event operation. From left to right, Julio Ripoll, WD4JR; Max Mayfield, director of the Center (seated) and John McHugh, KU4GY.

Three elements on 80 meters—believe it or not. Seeing is believing! You're looking at the installation of a *full-sized* 80-meter Yagi at the station of Kan Inshu, 7J4AAL, in Hiroshima, Japan. Setting the giant antenna in place on its 140-foot tower required a heavy-duty construction crane and a crew of 12.

You never know where a contact will take you. In this case, it took Joe Stephenson, WA0NUJ, (right) all the way to Provence in the south of France to meet Lars Brolin, SM0RSV, at Lars' vacation home. Their friendship began 20 years ago during a random contact on 20 meters. If you enjoy classical music, you might recognize Lars. He is a member of the world-famous Drottningholm Baroque Ensemble.

When it's Kid's Day, everyone gets in the act! William Wynn, KF6ZFR, thoroughly enjoyed both Kid's Day events in 2000—when he could wrestle the radios away from his grandfather, Larry, W6AXD, (right) and father, David, N6AXD. The next Kid's Day will be coming up in January 2001. Watch *QST* for details.


Central Michigan Amateur Radio Club ~ Lansing, Michigan

(L-r) Joe (N8VYS), Don (W8EGI) <an original member from 1950?>, Erv (W8ERV) <CMARC President> and Great Lakes Division Director, George Race (WB8BGY).

Ken Faiver (W8HNI) <W8MAA Trustee> operating Special Event.

Rod (KC8HGF) operating some 2m pileups during the Special Event.

On February 20, 1950, the Central Michigan Amateur Radio Club became affiliated with the American Radio Relay League. Now, as we celebrate the 50th Anniversary of our affiliation with the League, on the grounds of the Ingham County Courthouse in Mason, MI, we invite our friends in the Amateur Radio community to celebrate with us. Please accept this certificate as a token of our appreciation for taking part.

29 April, 2000 - 2m - 59
Date - Band - RST

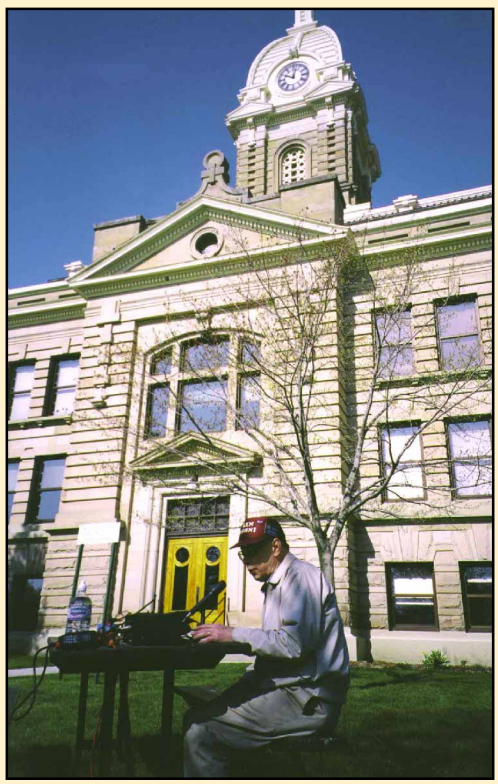
J. Ervin Race (W8ERV), President-Central Michigan Amateur Radio Club

Pam (KB8PSF) works 20m

WB8BGY - *001
Callsign and Event Contact Number

Kenneth L. Faiver
Ken Faiver (W8HNI), W8MAA Trustee

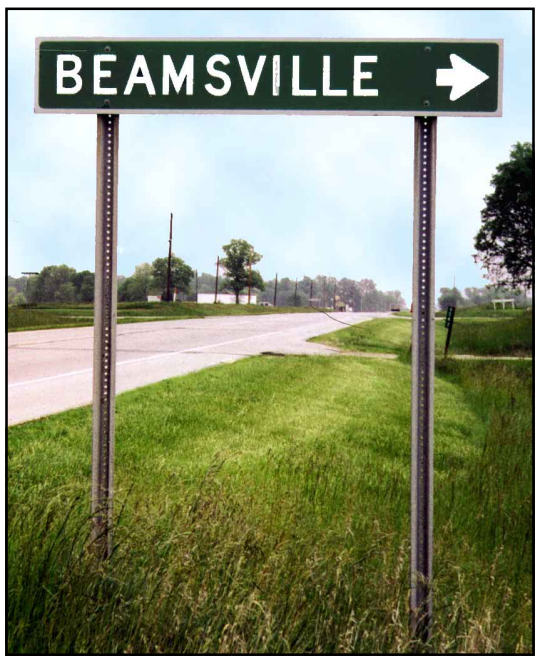
Celebrating 50 Years of ARRL Affiliation! (1950-2000)



Fifty years with the ARRL! Last April the Central Michigan Amateur Radio Club set up a special event station on the grounds of the Ingham County Courthouse in Mason, Michigan (left), to celebrate 50 years of affiliation with the ARRL. Everyone who worked the station received the attractive certificate shown here. ARRL Great Lakes Division director George Race, WB8BGY (above, right), showed up to operate and presented the club with a certificate honoring the event. Among the operators present on the sunny (but chilly) spring day were Ken, W8HNI, and Pam, KB8PSF (bottom, right).

Signs o' the Times!

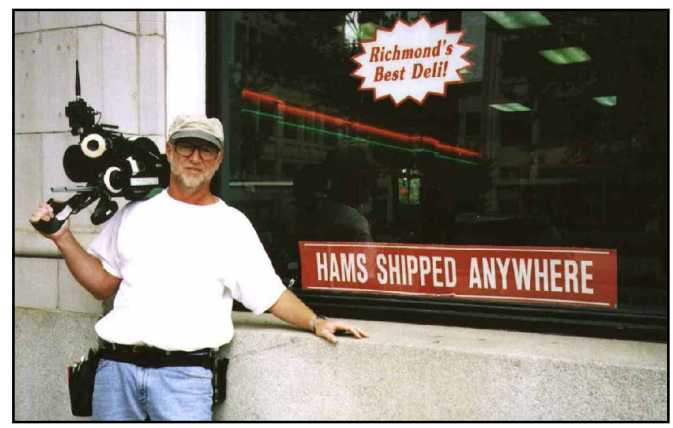
Sumner Weisman, W1VIV, discovered this building in Concord, New Hampshire. As Sumner observes, "It is obvious to me that a facility has finally been built where ham radio operators can resolve their conflicts. Shall it be a duel with 10-meter whips, or perhaps egg insulators at 20 paces?"



If you need a new directional antenna, this may be the logical place to find it. Bob Mann, W8LHP, snapped this gem on the way home from the 2000 Dayton Hamvention.

No, but a "spiral sliced" helical antenna might fit the bill. Someone at the Hercules Fence Company in Ocala, Florida, has a sense of humor, according to Fred Bernquist, N2DCP.

Build your dream home and take your CW exam at the same time. Well, it could happen—especially if the contractor is a VE. Ron Ifferte, WB2CMI, found this near Hanover, Pennsylvania.



Travel inexpensively to your next DXpedition destination! Donn Fuller, AD0N, was shooting a TV commercial in Richmond, Virginia when he spotted this intriguing sign.

MOBILE DX MASTER

Since its introduction over a year ago, Yaesu's FT-100 HF/VHF/UHF Transceiver has been widely acclaimed for its outstanding performance and flexibility. Now the FT-100D builds on this success story, adding the convenience of factory-installed modules for today's Ham on the go!

FT-100D HIGHLIGHTS

The FT-100D is a high-performance, ultra-compact transceiver operating on the 160-10 meter HF bands, plus the 50, 144, and 430 MHz VHF/UHF bands. Known for its outstanding receiver performance, the FT-100D's easy-to-access DSP system is the cornerstone of the outstanding receiver capability. Providing Noise Reduction, Auto-Notch, and Narrow-Bandwidth Filter selection, the DSP system also includes a Microphone Equalizer for the transmit side.

The new and enlarged speaker of the FT-100D (ϕ66 mm) provides spectacularly clean audio output, to help you dig out those weak signals.

Whether at home or away, the fantastic new FT-100D is The Choice of the World's Top DX'ers. Step up to the FT-100D, and enjoy the thrill of the sunspot peak in style!

MICRO MOBILE

FT-100D

Ultra-Compact HF/VHF/UHF Transceiver

YAESU
Choice of the World's top DX'ers℠

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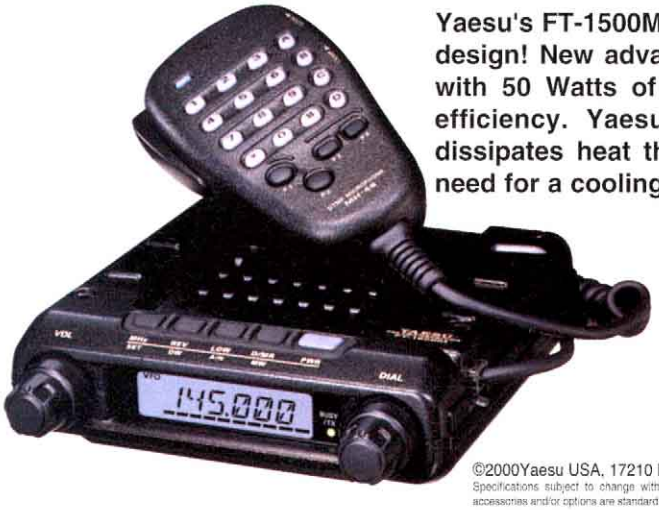
Raising The Standard for Toughness

Solid As A Rock

Actual Size



Yaesu's FT-1500M represents a technological breakthrough in radio transceiver design! New advances in power amplifier technology combine to provide you with 50 Watts of clean transmit power with enhanced current consumption efficiency. Yaesu's patent pending aluminum die-cast shell construction dissipates heat throughout the entire transceiver chassis and eliminates the need for a cooling fan. This allows the FT-1500 to fit in an incredibly small case size: less than 5 inches square X 1.4 inches high and offer superior operating specifications as well!

FT-1500M

50 W 2-m FM Mobile Transceiver

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CORRESPONDENCE

Your opinions count! Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111.
You can also submit letters by fax at 860-594-0259, or via e-mail to: **qst@arrl.org.**
We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

DTV: HYPE OR PROMISE?

♦ Referring to the article by Peter Putman, KT2B, in the August *QST*, I trust he is enjoying his very expensive HDTV installation. As a retired TV engineer following 42 years of broadcast activity, chief engineer of two TV stations and other radio stations and full responsibility from the camera lens to the beacon on the tip of the antenna, I'd like to offer my reactions to his comments.

The transition from NTSC specs to HDTV specs is in no way similar to the transition from black/white TV to color TV. The B/W sets of the early TV days would still, with no modification, display B/W pictures from color broadcasts. A modern NTSC TV set will *not* display a DTV signal. Addition of a converter "box" will *not* change the sweep frequencies of the display. Even if the sync frequency of the broadcast signal is within the range of the set's specs, the vertical resolution will not be improved. The horizontal resolution may be slightly better but very little due to the limited IF bandpass. The picture you will get after spending for the mandated converter "box" will give you about the same quality as you are accustomed to. The FCC has just made obsolete probably 500 million TV sets. But, you say, the cable people will do the conversion for us. Yes, at great expense they will be forced to convert the DTV signals back to NTSC standards and probably the UHF signals back to their chosen channels. Does anyone believe they will do this for free?

The general public is not going to spend $3000, maybe $1000 at least, for a new TV set when their old one is operating perfectly. Reception on computers, with a receiver/converter depends on the sync frequencies of the broadcast signals, of which there are four different standards, at least two of which will not work.

From the broadcaster's standpoint, the FCC has mandated the *complete* junking of all the station equipment, cameras, microwave links, transmitters, antennas—the works. This will bankrupt many stations.

NTSC can broadcast pictures that HDTV cannot. Visualize a screen full of random color pixels filling the 3.5-MHz bandwidth available for NTSC. Now randomly change the color of the pixels 30 times a second. NTSC can do that, compressed HDTV can't.

From an engineering standpoint HDTV is a stroke of genius. From a public acceptance standpoint it is going to be a long, hard climb. From a monetary standpoint it will be a flop. The FCC has just pronounced the death knell of open circuit TV. We will have to depend on satellite and cable services and deep pockets.—*Rowland Medler, W4ANN, Gainesville, Florida*

CONTESTS DO NOT PREPARE OPERATORS FOR EMERGENCIES

♦ A letter from Dave Rosen, K2GM, published in the July, 2000 "Correspondence" addresses a belief that has been circulating within the Amateur Radio community for years. A segment of the Amateur Radio community has long suggested that contesters are "well prepared to deal with the operational demands that arise following disasters." Perhaps the time has come to take a hard look at this belief and offer an alternative viewpoint.

Unlike contesting, in which the information exchanged is often identical and repetitive, true disaster communications is often complex and lengthy. Few emergency communicators are afforded the luxury of transmitting the same message, consisting of just a few words, repeatedly throughout a period of extended operations.

While it may be true that DXpeditions are logistical triumphs, they are nonetheless logistical triumphs that afforded the participants the luxury of months, or perhaps years, of preplanning. Disasters typically arrive with little, if any, notice.

Furthermore, disasters often require the emergency communicator to deploy to a completely unfamiliar location, such as a hospital, shelter or Incident Command Post. Unlike most contesters, few emergency communicators have the luxury of providing disaster communications from home.

There is no doubt that contesting is an honorable activity that offers many significant benefits. However, if one wishes to be fully prepared to provide emergency communications, there are activities that offer specific training for disaster response, including the League's own ARES and NTS programs.

For example, participating in ARES drills and exercises requires one to set up portable equipment at command posts, Emergency Operations Centers, hospitals or shelters. Such equipment may utilize technologies uncommon in contesting, such as APRS, or even ATV. ARES drills require one to transmit unfamiliar data and tactical information, such as chemical names, telephone numbers, addresses, or requests for supplies and personnel.

Consider NTS nets. The dedicated traffic handler must meet on schedule, regardless of conditions. He must receive unfamiliar messages, many of which contain unique addresses, texts and signatures, regardless of propagation conditions or interference. He must be thoroughly familiar with a standard phonetic alphabet, the proper usage of prowords and prosigns, and the mechanics of net procedures.

Whether intended or not, when one suggests that contesters are best qualified to support disaster communications, an implication is made that participation in ARES and NTS activities is unnecessary. Let's encourage every contester to take time to register with his ARRL Emergency Coordinator or his NTS Net Manager instead.—*Jim Wades, WB8SIW, Ypsilanti, Michigan*

EVERYTHING DOESN'T WORK

♦ "Everything Works" by Thomas Schiller, N6BT, in the July *QST*, told an interesting tale, but it might mislead new hams. It describes breaking DX pileups using only a light bulb for an antenna, it being only 18-dB less effective than a dipole. (If the feed line truly doesn't radiate, expect about –100 dB, and not hearing anything at all.) Figure 2 in the article positions triband trap Yagis as, on the average, no better performers than dipoles while according to everyone else, they are 5 to 8 dB better, not to mention being multiband. And while the "enjoyment" axis of the figure suggests the ultimate is using six of the author's Force 12 antennas, many hams expand their pleasure by trying different bands with trap antennas, exploring the MUF, adding amplifiers, trying VHF, exploring low-power portable operation, and by building. Nonetheless, most of us can relate to the article's "path" discussion, and the role of the other ham's station, topics that seem to come up early in a QSO.—*Gary Gordon, K6KV, Saratoga, California*

♦ Judging by the article "Everything Works" in the July, 2000 issue, *QST* has decided to get into the "irritainment" business. What bothers me is the idea that your enjoyment of Amateur Radio is in proportion to the effectiveness of your antenna.

The article implies that you can't really have much fun with anything less than a full sized dipole in the clear, higher than one-third wavelength, and even then, you are just "beginning to experience the fun of radio."

I have been a ham for 35 years and I have never been able to put up even the "0 dB" antenna as outlined in this article.

I think the overwhelming majority of HF ham installations would fall below this 0-dB mark. Yet I can hear them on the air, and we all seem to be having a lot of fun.

Those of us who enjoy LPCA, QRP or mobile operation either by choice or necessity know that our stations put out signals inferior to those of a station that costs thousands of dollars. But, let's face it, there is a limit to how far you can talk on this planet, and you can do it with a few watts CW to a dipole at a compromise height. I have seen no evidence that hams with monster stations have more fun than the rest of us. There are many ways of enjoying Amateur Radio. Some of us derive a great deal of pleasure from busting DX pileups with our crummy stations. Some of us like learning about baluns and feed lines.

If I were a prospective ham reading this article I would think twice about taking the time to get involved in a hobby that requires such an enormous expenditure to "enjoy fully." On the other hand, it sure seems like N6BT had a lot of fun with his "light bulb."—*Anthony Felino, WN6Q, Santa Barbara, California*

POTENTIALLY DAMAGING RESEARCH

♦ I was quite concerned when I read the story in the *ARRL Letter* regarding the research being conducted by Kenneth Cantor on Amateur Radio and its effects on the human body. I was particularly struck by the remark made by Mr. Cantor regarding his plans to conduct an "inexpensive kind of quick study" that would not yield fine detail. This seems to be potentially damaging to Amateur Radio and the wireless community if not carried out properly.

The lack of dependable, well planned and conclusive research regarding RF exposure would have the potential to send the FDA, FCC, and the public into a tailspin over emission requirements and safeguards for Amateur Radio and other wireless carriers. While the concept of performing this research on the amateur community would be a prime focus group, Mr. Cantor's research plan does not appear to be seeking concrete evidence.

This is not the kind of publicity the wireless community can afford. Regardless of PRB-1 and its provisions, a negative review (research report) could trigger an enormous avalanche of hysteria and litigation. Major SAR and MPE restrictions, antenna structure restrictions, community bans on amateur operations, Citizens' Band scares, and local law enforcement involvement in health and regulatory matters would just be the beginning.

Already the prime time news programs have left irreparable scars on the cellular phone industry by reporting the theories about links between the use of cell phones and brain cancer. One detail that seemed to be underestimated was the average time the cancer patients used their cell phones, and one report even stated that the rate of cancer in noncell phone users versus cell phone users was the same.

Where's the link? The sensationalism of the story seemed to win. I have wondered how many cell phone owners living and traveling in high crime districts of America are now fearful and maybe have even thrown away their phones due to the sensational news stories.

Do we want an "inexpensive kind of quick study" to shape the future of Amateur Radio? I can not safely discard any of the researchers' reports and their findings. Doing anything excessively, whether good or bad, creates a "cause and effect" situation. The difficulty seems to start with the inability to define safe RF exposure limits with regard to our individual body chemistry. We're not created equally!

I propose that the amateur community not only work with Mr. Cantor in finding the facts about RF exposure, but that we insist on an intensive study. If we as amateurs are to be the proving grounds for such research, we owe it to ourselves and the public to ensure that the facts are accurately researched and reported…whatever the results may be!—*John P. Barnard, N4NB, Altavista, Virginia*

The FCC made the ARRL RF Safety Committee aware of Dr. Cantor's epidemiological study of hams while it was in its early stages. We welcomed this study since a similar study performed in the mid-1980s was misrepresented as being conclusive of a connection between Amateur Radio operation and leukemia, something that the study design and its results did not support. We wanted to make sure that the new study was performed as accurately as possible and that its results and their implications would be properly presented. We met with Dr. Cantor at ARRL HQ in Newington in order to assure ourselves that he would be sensitive to the issues that Mr. Barnard so correctly stated. The RFSC continues to maintain contact with Dr. Cantor and has already helped to improve the accuracy of the data. The "inexpensive kind of quick study" is the way this field does its business, and appropriately so. There is no justification for mounting an expensive study if no relationship can be found in a preliminary study. We are satisfied that Dr. Cantor is highly qualified to perform a valid study, and that he is sensitive to the fears of a public that may misunderstand the results.—Dr Gregory D. Lapin, N9GL, Chairperson, ARRL RF Safety Committee QST

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By Shelby Ennis, W8WN

Utilizing the Constant Bombardment of Cosmic Debris for Routine Communication

Thanks to sophisticated software and high-speed CW (HSCW), you can make meteor-scatter QSOs on just about any (and every) day of the year. SSB may reign supreme during meteor showers, but HSCW has made its way from Europe and is now alive and well in North America.

Confidential:

"Your mission, Mr. Phelps, should you choose to accept it, is to complete a contact on 144 MHz over a 600-1000 mile (960-1610 km) path in less than 20 minutes every morning of the year while developing techniques to help others do the same. As always, should you or members of your 2-m force fail, the Secretary will disavow any knowledge of your operation. It is suggested that you recruit a top-notch team for this operation. This tape will self-destruct in 15 seconds. Good luck."

Report—For Eyes Only:

"Mr Secretary: After a slow start, we are now approaching the goal. Between January 1999 and April 2000, 172 out of 215 144-MHz schedules were completed with K0XP, for an 80% completion rate, usually within 15 minutes, over an 813-mile (1308 km) path, which included schedules during the poorest time of the year.

During the period of February through April 2000, 21 of 22 attempts were also completed with K1JT on 144 MHz, and 11 of 11 were completed on 50 MHz over a 650-mile (1050 km) path. Details to follow."

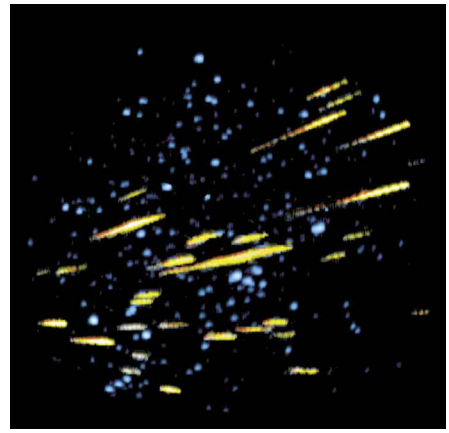
While the above might sound like an opening scene from a *Mission Impossible* episode, it's actually is a brief summary of what's been happening during the past three years. Long-distance 144-MHz contacts have become so routine that we're now surprised when a schedule *isn't* successful. Exotic propagation modes and satellites aren't even in the picture. What we're using is a modern variation of 1950's ham technology—*meteor scatter*.

A Brief History of Meteor Scatter Operation

Meteor-scatter operation began in 1953 when Paul Wilson, W4HHK,[1] (in western Tennessee), and Ross Bateman, W4AO (northeastern Virginia), kept hearing signal bursts while trying to work during a widespread tropospheric opening. They, along with W2UK, W5RCI, W2NLY, W2AZL, W1HDQ, W1FZJ and others were soon running tests to determine how communication could be accomplished using this mode.[2,3]

With the publication of two *QST* articles by Walt Bain, W4LTU,[4,5] meteor scatter soon became a popular mode for making contacts beyond the normal extended-tropo range.

[1]Notes appear on page 32.

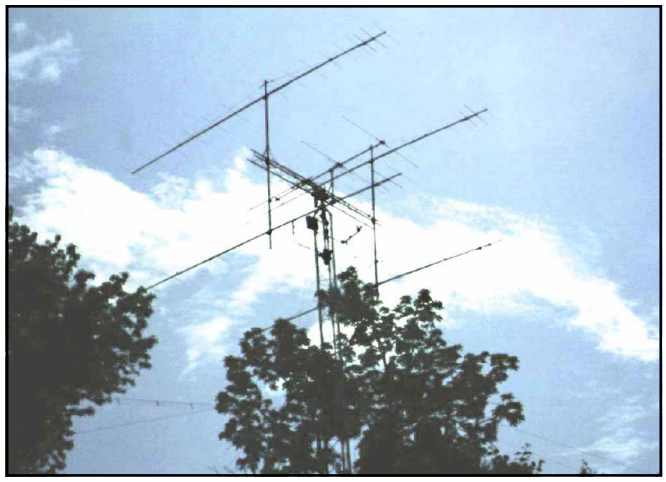


During the annual Perseids meteor shower, although stations were spread out, enough were active that QRM became a problem at times. (Everyone was crystal-controlled and there was no way to use a calling frequency in those days). Using various keying methods and multi-speed reel-to-reel tape recorders, some ops managed to work at speeds of up to 100 WPM (slowing the tape for copying).

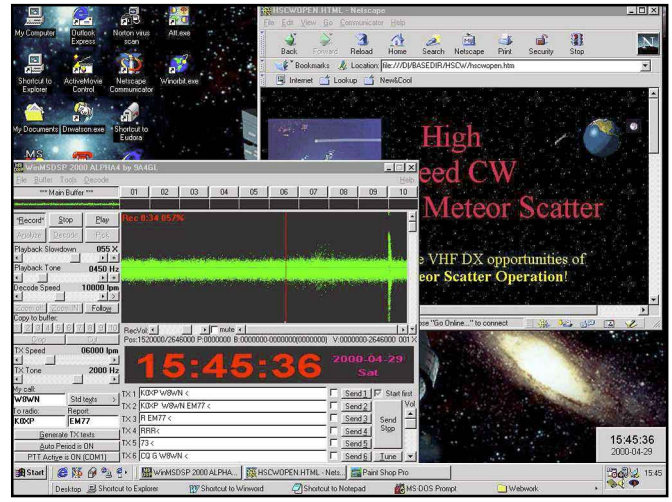
Most of the time the "pings" were few and short. As SSB operation became more common on VHF in the 1970s, North American hams were able to exchange more information in the same amount of time, but SSB operation still required pings of one second or longer to be really useful. On 144 MHz, these seldom occurred except during major meteor showers. (On 50 MHz, where pings are longer, SSB MS contacts are routine for well-equipped stations.) Nearly all North American 144-MHz meteor scatter operation occurred only during the "big three" meteor showers each year (the August Perseids, December Geminids and January Quadrantids).

Meanwhile, the Europeans developed a different approach. SSB meteor-scatter operation was still much too slow to utilize the barrage of tiny meteors that constantly strike the earth's protective atmosphere. These pings, while numerous, are usually weak and very short. The Europeans sent CW at very high speeds using electronic keyers, and recorded incoming pings on modified audio cassette recorders that could be played back at a readable speed.

This was a brilliant solution. Using this



Antennas at W8WN—quad array of KLM 16 LBXs for 144 MHz, 4-element Yagi for 50 MHz, 10-element X-Yagi for 432 MHz—all on the same az-el mount.



A full-screen shot showing *WinMSDSP* and Netscape *Navigator* running at the same time.

method, speeds of 400 WPM or more were quickly achieved. European operators were soon making routine contacts every morning of the year and logging dozens during meteor showers.

Although modifying the cassette recorders is relatively simple, this style of meteor-scatter operation, now called high-speed CW (HSCW) or high-speed meteor-scatter (HSMS), didn't catch on across the Atlantic. North American hams felt that SSB was superior. Several operators attempted to spur interest in HSCW, but few, if any, contacts were made.

Across the Atlantic at Last

North American HSCW started almost by accident when, in May of 1997, Steve, KO0U (now K0XP), and I learned that we each had a mutual interest in CW MS. Coincidentally, DL3JIN's *SBMS* ("Sound Blaster Meteor Scatter") receiving program, which used a computer to emulate a variable-speed tape recorder, had just become available. We ran several schedules at speeds up to 80 WPM using programmable keyers or OH5IY's *MS-Soft* program. W8WN was using *SBMS* to assist with receiving, while KO0U copied by ear at speed.

In August of that year, Tihomir Heidelburg, 9A4GL, a college student in Croatia, released the first beta version of his HSCW receiving program, *MSDSP* (Meteor Scatter using DSP). It wasn't as developed as DL3JIN's program, but it had several additional features that showed promise. E-mail messages began to fly back and forth across the Atlantic as Tihomir sent us version after version of *MSDSP* to test, eventually adding nearly every feature we requested.

Before the Perseids peak that year, a test version with transmit capability became available and speeds jumped to 2000 LPM or 400 WPM (LPM, letters per minute; LPM = WPM × 5). Things suddenly became interesting! Other operators learned of our HSCW experiments and began to join the fun. Speeds soon reached 4000 LPM (800 WPM), with one contact between Valerie, WD8KVD (visiting in EM77), and KO0U (FN42), topping the charts at a blazing 8600 LPM (1720 WPM), the highest speed then possible.[6] Next year (1998), again visiting in Kentucky for Christmas, WD8KVD and KO0U made a contact on Christmas Day at the unheard-of speed of 16,000 LPM (3320 WPM)![7]

Some operators had trouble using the *DOS* version of *MSDSP*, as many were familiar only with *Windows*. In 1999, Tihomir released his first *Windows* version, *WinMSDSP 2000*. With more features and capabilities, it was quickly downloaded and adopted by VHF operators around the world

During 1997 and 1998, another group had also been testing various techniques for HSCW MS operation. It soon became apparent that the procedures used for slow CW and SSB meteor-scatter QSOs were inadequate for HSCW. The Europeans, with their 20 years of HSCW experience, had developed many additional techniques. However, some of their procedures were quite different from ours, however, and it was challenging to suddenly change 40 years of North American operating experience.

Many of the schedules between W8WN and KO0U were devoted to testing various procedures, speeds, techniques and equipment settings. This is one reason why the percentage of completed contacts didn't increase as rapidly as we expected, considering the increase in speeds.[8]

Characteristics of HSCW MS Operation

HSCW meteor scatter operation in North America is now established, with speeds of 4000 to 10,000 LPM (800-2000 WPM) in common use. (All information here pertains to 144-MHz operation unless otherwise specified, as this is the most-used band for all types of MS operation.) Most operation is by schedule, with few routine CQs except during the annual North American HSMS Contest, which coincides with the Southern Hemisphere Eta Aquarids meteor shower during the first week of May. The number of North American stations capable of HSCW operation is still too small to provide many random contacts. (The HSCW calling frequency is 144.100 MHz in North America.[9]) Most schedules on this side of the Atlantic are arranged using the "MS Rocks Live!" real-time Web page[10]—often referred to as "Hot Rocks"—or via the HSCW Reflector.[11] A station equipped for weak-signal operation on 144 MHz (150 W or more, a 16-element Yagi and a decent location) has a good chance of completing a contact nearly any morning of the year using the underdense pings of sporadic meteors—*if* someone at a suitable distance is available for a schedule.

The equipment needed for HSCW MS operation can be found in a typical VHF shack: a multimode transceiver, an amplifier; a horizontally polarized beam antenna and computer running *Windows 9x*. (There are several other methods of operating HSCW MS besides using *MSDSP* or a modified cassette recorder. For more information about the alternatives, point your Web browser to any of the HSCW Web sites and follow the links.)[12]

If your station works reasonably well for aurora, tropo and other weak-signal modes, you should be successful with HSCW MS. For distances greater than about 1250 miles (2000 km), a good location and high antennas are needed. For medium distances of 600-1200 miles, however, low antennas

(in the clear) are quite usable. A quiet location is always an asset.

Don't worry about hacking up your SSB rig—no mods are needed. Keying is accomplished via audio tones (similar to most digital modes), and standard SSB filters work fine up to about 10,000 LPM (2000 WPM). The emission designator—J2A—produces keying that is indistinguishable from keying the main carrier. It's the same method used by many rigs to produce CW.[13]

Using standard SSB filters, the bandwidth of an HSCW signal is about the same as that of a voice transmission. For more technical information, see the numerous papers on the HSCW Web sites and the resources listed in the article by Jim McMasters, KD5BUR (now KM5PO).[14]

HSCW MS operation is decidedly different from conventional CW or SSB meteor-scatter operation. Both require overdense bursts or good (strong and long) underdense pings to complete a contact. SSB and slow CW operators hope for specular reflections from heavily ionized trails instead of "the abominable ping," as one writer put it. Unfortunately, overdense bursts are usually observed only during major meteor showers.

HSCW relies on the numerous subsecond bursts and the weak pings scattered from underdense particle trains. Pings of this type are often produced by the "sporadic" particles that constantly bombard the earth. Most of the debris that the earth "sweeps" into as it orbits the sun are not fragments from the asteroid belt but are particles from the dust trails left by ancient comets. The particles are widely distributed and no longer dense enough to produce recognizable showers. Their number may vary significantly from day to day—and even minute to minute. Most of these particles are no larger than grains of sand or specks of dust, but because of their extreme speed, the ionization they produce as they burn in the atmosphere is often enough to scatter or even refract radio waves.[15]

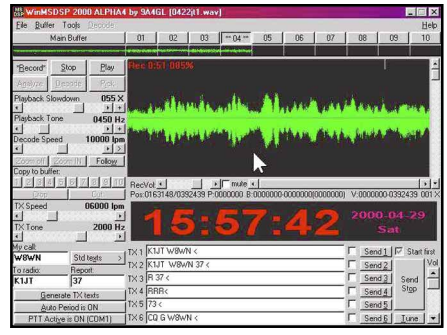
The duration of these pings is usually very short, but the number of tiny pings available on many mornings may surprise you. It's been estimated that if you have a 5% chance of completing a contact on SSB, your odds improve to 95% on HSCW. Of the approximately 215 completed HSCW contacts between W8WN and KO0U/K0XP, no more than 10 contacts could have been accomplished on SSB. Nearly all of those would have taken place during showers, when SSB MS comes into its own.

Meteor scatter (using any mode) is difficult at distances of less than 500 miles (800 km) or greater than 1400 miles (2250 km) because of the height of the meteor trails, antenna characteristics, the scattering mechanism, etc.[16] For close-in communication, back- or side-scatter techniques (or antennas that can be aimed in elevation *and* azimuth) are usually needed. At distances beyond 1400 miles, a good location and plenty of power are necessary. Although difficult, unusually long and short QSO paths are possible during showers.

Because HSCW relies entirely on signals scattered from underdense meteor trains, the typical sporadic ping will be weak and very short. So, when it comes to output power—the more the merrier. Does this mean that a 150-W station can't take advantage of sporadic underdense pings? To see what could be done, I talked my daughter, WD8KVD, into letting me operate portable from her home near Duluth, Minnesota, when I visited in July of 1999.

An 11-element Yagi on telescoping paint pole for portable operation at our son Steve's home near Clio, Michigan.

The "basement-portable" operating position at Clio, Michigan. The hardware includes an IC-706 MKII transceiver, 150-W amp, MFJ switching power supply, Bird wattmeter, GW2K laptop computer running *WinMSDSP*, audio filter and coffee cup! Notice the very fancy recycled cardboard box operating table they gave me!



***WinMSDSP*. Here we have the main *MSDSP* screen, and the flutter-type QSB on an overdense burst (burst length, 8.9 sec).**

My IC-706 transceiver drove a 150-W amplifier and an 11-element Yagi that was mounted on a telescoping paint pole about 20 feet (6 meters) above the ground. The location was merely fair for VHF. I used an old laptop computer to run the *Windows* or *DOS* version of *MSDSP*.[17] Compared with the kilowatt and the large array at home in Kentucky, contacts were more difficult, of course, but a number of ops were able to add a new grid to their logs.

An indoor portable operation was repeated at Christmas 1999 from my son's home near Clio, Michigan (EN83). Using the same equipment but with very flat terrain, contacts between 500 and 1000 miles were easily made. (Details and photos from both operations are available on the W8WN Web site.[18])

Since then, K9KNW/MM has completed a number HSCW contacts from his boat, running either a halo or a small beam. During May of 2000, K9KNW completed 28 HSCW contacts while sailing in seven water grids (EL93, FL03, 13, 14, 15, 23 and 24). His 12-element Yagi was only about three meters above the water, limiting his maximum QSO distance to about 1250 miles (2000 km). Stations less than 1100 miles (1775 km) distant found the contacts to be quite easy, usually taking less than 20 minutes. Those at greater distances were more difficult. Joe has plans for more trips, including a possible grid-hopping trip with much more time devoted to Amateur Radio.

How Fast is Fast?

Obviously, higher-speed transmissions can pack more information into each ping. MS speeds were originally 25-35 WPM (still the standard for slow CW operation). Several pioneer operators could operate at 50 WPM, copying in their heads. When the Europeans developed HSCW, routine speeds increased to 2000 LPM (400 WPM) or more. The current version of *WinMSDSP* is capable of speeds up to 20,000 LPM (4000 WPM). But are these extreme speeds practicable? And what is the maximum *usable* speed?

Although contacts have been made at higher speeds, the practical MS speed limit is about 12,000 LPM (2400 WPM) (using unmodified SSB transceivers with standard SSB filters and audio tone keying). At higher speeds, the signal-to-noise ratio degrades and the keying begins to sound "soft" and indistinct. Remember that, using a 2000-Hz injection tone and receiving with a 1500-Hz tone, a single dit may not even occupy a full audio cycle! By using wider filters and higher tone frequencies, faster data rates *may* be possible, but none of the *MSDSP* test

HSMS *Bounty*...K9KNW/MM Provides Rare Caribbean Grids to VHF Meteor Enthusiasts

Joe Goggin, K9KNW, is an avid deep sea fisherman. His love for that sport is second only to his love for VHF meteor-scatter operation. From May 19 through June 16, 2000, Joe managed to combine a fishing expedition with a 2-meter HSCW MS operation and provided some exciting QSOs and very rare Caribbean grid squares to North American HSMS operators.

The robust nature of HSMS techniques allowed K9KNW/MM to operate from seven rare grid squares and complete 29 QSOs. Some contacts were completed in 20 minutes or less, while others took up to an hour to complete the required exchange of information (call signs, signal reports and acknowledgements).

Morning operations were the rule, as sporadic meteors—the cosmic debris that provides HSMS operators with day-to-day airborne signal reflectors even in the absence of meteor showers—are most plentiful during the hours around local sunrise. Simple geometry—the height of the meteor trails—determined which US stations were within range of Joe's reflected signals.

The current North American HSMS distance record (anchored on one end by K9KNW from his home station) is a little more than 1400 miles. VHF operators located along the Eastern seaboard and much of the lower Midwest could have—had they been active on HSMS—picked up a handful of very rare grid squares.

K9KNW/MM activated grid squares FL03, FL13, FL14, FL15, FL23, FL24 and EL93. Joe worked WB5APD (in EM84) and W5SNX (in EM73) from every one of those grid squares. "Those two guys both had good signals, but, Bob Dodson, WB5APD, pounded me with pings in every grid."

Dodson and Dick Ray, W5SNX, operate sophisticated 2-meter stations and use high transmitter power and large antennas. Both were positioned within ideal MS range of Goggin's floating station. "But, I also worked Joe Taylor, K1JT, in FN20 from FL23, a distance of about 1164 miles," says Goggin, "and he runs a modest station (160 W to a single 11-element Yagi), which proves that you don't need high power and big antennas to enjoy HSMS."

The long-distance QSO champ for this voyage was W9FX, located in EM57. K9KNW/MM was in FL23, and the calculated distance for that QSO, based on K9KNW's GPS coordinates, was 1256.1 statute miles. Other successful HSMS operators were W8WN, K2TXB and W4WSR.

Goggin said he was "a little disappointed in the light turnout of stations who expressed an interest in working me. But since there wasn't any advance publicity for this trip and it was my first time out, I guess that's to be expected. For future trips, some of which may be tailored strictly as HSMS DXpeditions, I'll try to get the word out in advance so that more stations will have the opportunity to join in the fun."

HSMS operations are, for the most part, arranged in advance by sked. Dean Nickless, W4WHN, served as the primary land-based contact ('pilot' station in DXpedition terms) for the hungry grid hunters. W9FX filled in when Dean wasn't available. Sked arrangements made on the internet by HSMS operators were passed to Joe via 2-meter SSB or 20-meter PSK31. "Not having an internet hookup on the boat slowed things down. I'm going to have to see about equipping her with satellite-based internet access," Goggin stated.

K9KNW/MM operated from a custom-built 65-foot sport fisherman, the *Island Gyspy*. The wood hulled, twin diesel beauty with her 20-foot beam provided a relatively stable platform for Joe's 2-meter Yagi. Despite the fact that that all of his HSMS operations were conducted while at anchor, the Caribbean wind and waves did pose a unique antenna pointing problem. Joe says, "The boat was constantly changing position. I had to keep one eye on the computer screen and the other on the compass and rotator."

"This trip didn't demand much planning. We simply loaded supplies on board and took off," said Goggin. "That's why I didn't post an itinerary or publicize the anticipated HSMS operations in advance. There was a lot of thought—and work—involved in figuring out how to mount an effective antenna on the boat without detracting from the operation of the fishing gear or marine electronics."

How was the fishing? "Great, " said Joe. "But," he added, "I had more fun on 2 meters!"— *Brad Pioveson, W9FX, 301 Kirsch St, Benton, IL 62812-1706;* **w9fx@arrl.net**

stations had this capability, and no one has had the ambition to purchase new filters or to modify their rigs. Still, North American HSCW speeds are quite peppy!

Other Bands

HSCW MS operation in North America is mostly limited to 2 meters. Most MS activity takes place there already, and MS work on other bands is too difficult or rather easy, eliminating the need for HSCW altogether.

50 MHz (calling frequency 50.300 MHz): Compared to 2 meters, 6-meter meteor pings tend to be weaker, last longer and somewhat more frequent. The lower-gain antennas and reduced transmitter outputs typically used on 6 meters apparently account for the drop in signal strength. On 6, pings average about one second in length, with occasional pings of five or more seconds. This is why SSB MS is possible many mornings on 6 meters between well-equipped operators. Also, with E_s, F_2, tropo and other propagation modes, grids can eventually be worked even without cooperative meteor fragments.

Surprisingly, HSCW MS isn't all that easy on 50 MHz because of the weak signals. Most operators find 144 MHz to be more workable, making HSCW a relative rarity on the magic band.

222 MHz (no random operating; schedules only): As frequency increases, so does the difficulty. On 222 MHz, bursts can be strong but are fewer in number than on 2 meters. One-hour schedules are typical between well-equipped stations. Little HSCW operation has been done on this band, but more is expected this year. In fact, the first known HSCW MS contact was made on May 2 between N7STU and N0KQY—as this article was being prepared. The next day a second 222-MHz contact was completed between N7STU and K0GU. N7STU was running 450 W to a 7-wavelength Yagi, while K0GU had only 25 W to a 22-element Yagi!

432 MHz (no random operating; schedules only): MS QSOs on this band are difficult, but possible. Most 432-MHz MS activity has taken place in Europe. An MS QSO between SM3AKW and UA9FAD (some 2141 km) is believed to be the world record. The North American record (at 2036 km), held by N6RMJ and W7XU, isn't far behind.

Working meteor scatter here takes power and patience. Pings are infrequent and usually short and weak. Schedules are typically one or two hours *during showers*. The most successful ops elevate their antennas to null out as much ground noise as possible. Also, the notes about antenna aiming and using the "hot spot" should be carefully considered because of the extremely narrow beamwidth of 70-cm long Yagis.

Higher frequencies: These bands are generally considered to be unlikely candidates for MS operation, although 902 MHz QSOs should be possible between well-equipped operators during major showers.

Using *WinMSDSP*

Although modified cassette recorders and other means are used for HSCW operation, *WinMSDSP* has become the standard. A limited run-time version (shareware) can be downloaded from the 9A4GL web site and other locations. The software requires a computer running *Windows 9x* and supporting DirectX (additional operating system "helper" files may also need to be downloaded).

WinMSDSP should run with most full-duplex sound cards that support DirectX. The program is easy to use and requires only a few minutes to learn. It's loaded with features, however, so refer to the brief *Manual* and the *Problems* paper (actually, an FAQ) as you do the intial set up.

Many of the HSCW web sites have a few sample pings that can be downloaded to see what the different speeds and strengths are like. After a few minutes spent playing with the program and learning the main functions, further "practice" is of little value. Now it's time to join the HSCW Reflector and request a sked. (The meteor-scatter reflector is often used in Europe.)

What can you expect? This depends upon your location, equipment, distance to the other station, the other op's equipment, the time of year, the time of day—and maybe what your dog had for breakfast! For two small- or medium-size stations at an appropriate distance, ping rates may vary from only a few during any half-hour period to as many as 20 pings per minute. Conditions can vary greatly.

Does it work? The Europeans knock our socks off when it comes to routine MS QSOs. Also, Europe has *many* more active HSCW stations The biggest disadvantage to HSCW in the Western Hemisphere is the lack of stations—there just aren't enough stations using this mode.

Tips and Tricks

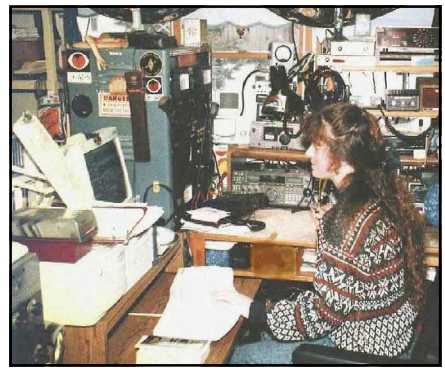
Once you start running HSCW schedules, you may immediately notice how radically the number of pings varies from month to month, day to day and even minute to minute. The best time of year for sporadic meteors is July to January, with February to May being the poorest. HSCW will allow you to complete contacts on almost any day of the year, although certain periods will likely be easier than others.

The number of sporadic meteors reaches a maximum at about 6 AM local time because the morning side of the earth is facing toward the direction of its orbital travel, sweeping up even slow-moving meteors. Around 6 PM local time, your location is on the trailing side, so only those meteors fast enough to overtake the earth will be captured (this is why MS is *much* easier in the morning). Meteor showers may be an exception—as long as the radiant is above your horizon. For information on daylight meteor showers, see the listings on listings the HSCW/MS "Hot News" Web page.[19]

On 144 MHz, one-second pings are excep-tional. Most pings are shorter than this, and many are *much* shorter. Because HSCW requires pings of at least a tenth of a second at 10,000 WPM (2000 WPM), only a fraction of the total pings are likely to contain usable information.

Other interesting things to watch for are Doppler shift, doubles, ionospheric scatter and—who knows? Doppler shift isn't often observed on underdense pings, but if you observe Doppler effects on one ping you're more likely to see them on other pings.

Another phenomenon you may notice (especially during certain showers) is that pings seem to sometimes come in pairs. At first glance, this would appear to mean that some meteors are traveling together, separated by a second or so. Scientists have long contended that this is only a statistical fluke, but hams have noticed the phenomenon for many years, and visual observers have recently been reporting it. (It will be interesting to see what ideas the predictions of Asher and McNaught eventually bring to this idea.[20])



Val, WD8KVD, operating W8WN's rig in Kentucky in December 1997. This was her highest-speed-ever contact with KO0U.

Finally, traces of ionospheric scatter are sometimes observed when two EME-class stations are running HSCW schedules. So when you're doing this type of operating, remember to be alert for unusual occurrences!

HSCW MS is much easier than other types of MS operation and has the advantage of visually displaying the pings, which makes it easier to carry out other observations. *MSDSP* also gives you the ability to save particularly interesting pings for later study. (If it all becomes too easy and you want a real challenge, see Maj. O. R. Disaster's collection of the works of that great wireless pioneer, Owa Taboo Byam.[21])

Conclusion

If you're serious about VHF DX, you almost certainly have a multimode rig with an amplifier, a decent antenna and a computer. Don't let the "CW" in the HSCW scare you away. You can slow the received signal down to *any* reasonable speed. At least *try* HSCW MS. If you're an active VHF DXer already, you may be pleasantly surprised!

Acknowledgements

Thanks to everyone who helped me with this article and to those who helped get HSCW MS started here in the states. Special thanks go to my wife Lora, WD8LPN; to Val, WD8KVD; to Steve and Alisca for the use of their homes when operating portable in Minnesota and Michigan; to Steve Harrison, K0XP, for three years of schedules while we tested all of the things listed above; to Maarten, W1FIG, and Joe, K1JT; to the MSDSP Alpha-test group for all of its work with the many versions of 9A4GL's program; to Ilkka, OH5IY, whose multi-part *MS-Soft* program is used by nearly every MS operator around the world; to Peter, DL3JIN, and Tihomir, 9A4GL, whose programming abilities and hard work started the modern age of HSCW operation; and to those HSCW operators in North America and Europe who have helped with testing, ideas and operating suggestions.

Notes

[1]Rick Lindquist, N1RL, "VHF-UHF Pioneer Paul M. Wilson, W4HHK, SK," Happenings, *QST*, Feb 2000, p 75.

[2]Emil Pocock, W3EP, ed., *Beyond Line of Sight*, pp 95-96. (A book of classic propagation reprints for the VHF DXer, available from the ARRL.)

[3]Emil Pocock, ed., *Beyond Line of Sight,* pp 104-105.

[4]Walter F. Bain, W4LTU, "V. H. F. Meteor Scatter Propagation," *QST*, April 1957, pp 20-24, 140, 142, 144.

[5]Walter F. Bain, W4LTU, "VHF Propagation by Meteor-Trail Ionization," *QST*, May 1974, pp 41-47, 176. Reprinted in *Beyond Line of Sight*, pp 108-115.

[6]See the sidebar, "HSCW Meteor Scatter Records are Made to be Broken," on page 38 of Apr 1998 *QST*.

[7]**http://www.qsl.net/w8wn/wd8kvd/wd8kvd2.html**.

[8]**http://www.qsl.net/w8wn/hscw/papers/archive.html#w8wn/k0xp**.

[9]See the North American "Procedures" paper, available on most of the HSCW Web sites, for more. (The Region I procedures can be found at **http://www.scit.wlv.uk/vhfc/iaru.r1.vhfm.4e/5B.html**.)

[10]**http://www.dxworld.com/hsms.html**.

[11]To join, send a message to "**Majordomo@qth.net**" with "subscribe hsms" as the text.

[12]Start with the W6/PA0ZN Main NA HSCW Web Site at **http://www.nitehawk.com/rasmit/ws1_15.html**, or the HSCW section of W8WN's Web site at **http://www.qsl.net/w8wn/**. Both have many links to other sites.

[13]For a discussion of keying methods, see *The FCC Rule Book*, available from the ARRL. See the publications ad in this issue.

[14]Jim McMasters, KD5BUR "High-Speed CW and Meteor Scatter - An Exciting VHF DX Medium!," *QST*, April 1998, pp 34-39.

[15]Kenneth Davies, *Ionospheric Radio Propagation*, U.S. Dept. of Commerce, 1965, pp 351-376.

[16]See the text files bundled with OH5MS's "MS-Soft" meteor program, available at **http://www.sci.fi/~oh5iy/**.

[17]*WinMSDSP* is available at **http://ham2.irb.hr/9a4gl/index.php3** or VE5EF's mirror site, **http:// www3.sk.sympatico.ca/freed/projects/9A4GL**. It and other HSCW material are also available at the W8WN Web site.

[18]See **http://www.qsl.net/w8wn/**.

[19]**http://www.qsl.net/w8wn/hscw/papers/hot_news.html**. Much more also on the "Archived News" page.

[20]See several articles in *Sky and Telescope*, June 2000, pp 30-40. A brief summary of their predictions is also available at **http://www.qsl.net/w8wn/hscw/prop/leodust.html**.

[21]**http://www.qsl.net/w8wn/hscw/papers/lose-qso.html**.

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By Henryk Kotowski, SM0JHF

No Power? No Problem! A Vacation Expedition to The Gambia

The best DXpeditions aren't necessarily frenzied, frantic or dangerous. Sometimes, a meandering, casual approach is best!

It was a strange coincidence that I was assigned bungalow C5 when I arrived at the Kotu Strand Hotel in The Gambia, West Africa. The fact that my bungalow ID matched the country's ITU prefix had to be an auspicious sign. It was natural, therefore, that I would follow up and go to Gamtel in Banjul, the capital city, the next morning to apply for a ham radio visitor's permit. Gamtel is the Gambian telecommunications company that's also responsible for Amateur Radio licensing.

Things couldn't have been easier. I asked for call sign C56JHF, and got it in a matter of minutes. Tourism is an important part of Gambia's economy, and accommodating visiting Amateur Radio operators is viewed as another service for tourists. I wish more countries shared this attitude!

When I came to The Gambia in January 2000 for a short holiday, I packed an ICOM IC-746 transceiver, a power supply, an automatic antenna tuner and a reel of antenna wire. Winters in Scandinavia are too long, too dark and too cold; I simply have to go south now and then.

When I got back from Banjul—the C5 licence burning a hole in my pocket—I was exhausted. It was quite hot, and the sudden climate change (from Scandinavia to Africa) made me weak. Still, I immediately connected the transceiver to the power supply and the power supply to the mains. I was lucky. The electricity was on and bungalow C5 was on the air!

I asked a local "palm climber" to attach one end of my 150-foot end-fed wire to a tree growing on the edge of the beach. I connected the antenna tuner, stuck a straightened-out wire clothes hanger into the dry soil outside the bungalow and checked conditions on 10 meters. The match wasn't good, so I inverted a bottle of water and placed it over my makeshift ground rod. As the water trickled into the soil I could see that more HF power was going into the end-fed wire. Thankfully, the antenna worked well on all bands from 160 to 10 meters.

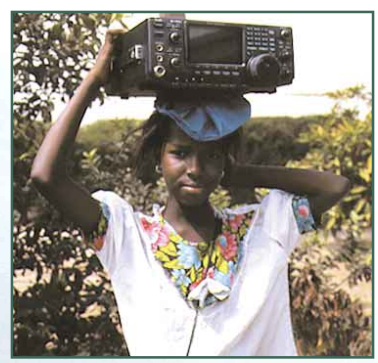
Watering my ground connection was a daily event for the next two weeks. Hotel staffers and guests often asked me to explain the upside-down bottle and accepted my explanations without raising an eyebrow. Everyone is relaxed here (unless you're in the marketplace, that is).

The Gambia is one of the smallest countries in Africa, with arbitrarily drawn borders inside Senegal. The population of about one million citizens is scattered among various tribes and groups. English is still the official language, although The Gambia ceased to be a British colony in mid-'60s. The country is more peaceful and secure than many of its neighbors.

Propagation is typical for equatorial regions and completely different from that of Scandinavia. I was frequently amazed when hams in Rotuma, Tonga or Hawaii came back to my CQ while I was using just 100 W and a piece of wire. I made nearly 5000 QSOs with hams in 100 countries in a very relaxed style. I was often surprised by the beautiful openings to the West Coast of the US.

But even the best radio conditions can't compete with frequent power outages, which happened morning, noon and night. Saturdays and Sundays were the worst. The hotels have backup diesel generators, but many don't bother to run them during the daytime. Mine didn't.

When the ac mains were down I walked along the beach to the nearest store, bought some gin and tonic or strolled to the market to buy fruit. Drinking plenty of fluids is highly recommended, but I found that the mineral waters available in The Gambia weren't too tasty. Gin and tonic, on the other hand, was better than anything else and was quite refreshing in the warm, dry climate (without promoting intoxication). Otherwise, no power might equal no fun! QST



You can contact the author at Sibeliusg 28 XI, SE-16477 Kista, Sweden; **sm0jhf@arrl.net**. *All photos were taken by the author.*

Not far from my hotel, was a radio station somewhat more powerful than my own—Radio Syd.

By L. B. Cebik, W4RNL

A Beginner's Guide to Modeling with *NEC*

Part 1: Getting settled and getting started

Antenna modeling has become a popular engineering and amateur activity. You can see the results in almost any issue of *QST*. Among the modeling products you might encounter are azimuth patterns, such as Figure 1, or elevation patterns, such as Figure 2, or even an SWR graph, such shown in Figure 3. Almost every ham knows that antenna-modeling software is available at reasonable prices. So only two important questions remain:

1. Can I model antennas, too? Can I master the software and produce the same kinds of results that I see in *QST*?

2. Is antenna modeling worth the effort? Does antenna modeling really offer me any information that I cannot easily get elsewhere?

The answer to both questions is a definite "yes." With a little coaching and a little practice, virtually any ham can effectively model many kinds of antennas. The result will be a better understanding of one's own antennas and of antennas in general. The purpose of this 4-part series is to provide the "little coaching" part of the effort. The practice is up to you.

In this first episode, we'll try to understand what antenna modeling is and become oriented to the many parts of a good antenna model. In future episodes, we'll take a closer (but still incomplete) look at crucial details that will make the task smoother and the output more understandable.

In all of our work, we'll focus our attention on the antenna-modeling core known as *NEC*-2. This public domain software is the heart of numerous commercial implementations that provide ways for the user to input data and also that supply tabular and graphical outputs. There is another modeling core called *MININEC*. Rockway and Logan developed it when PCs could not handle the *Fortran* of *NEC*. There are two versions available, a public domain version and a totally revised proprietary version.[1] The nature and limitations of *MININEC* have been covered in past ARRL publications, and so they need not be repeated here.[2]

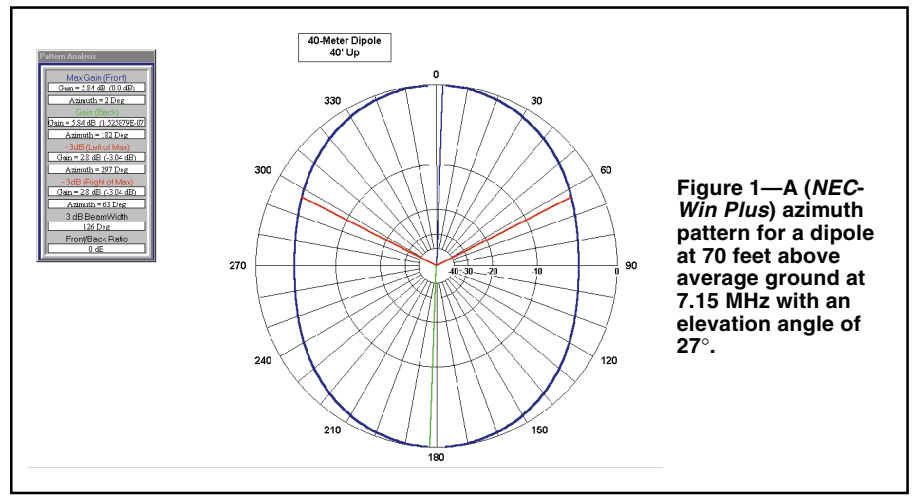


Figure 1—A (*NEC-Win Plus*) azimuth pattern for a dipole at 70 feet above average ground at 7.15 MHz with an elevation angle of 27°.

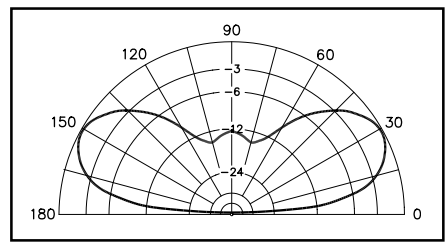


Figure 2—An (*EZNEC*) elevation pattern for a dipole at 70 feet above average ground at 7.15 MHz with an azimuth angle of 0 degrees.

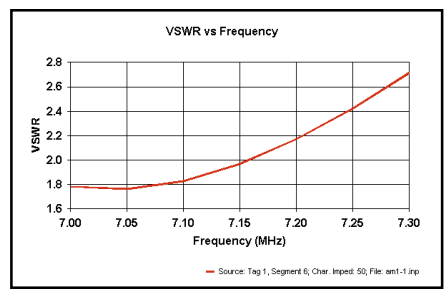


Figure 3—A (*NEC-Win Plus*) SWR graph for a 40-meter dipole at 70 feet above average ground.

Our focal software, *NEC*-2 is neither the newest nor the oldest modeling software.[3] It is the latest public domain core available and appears in several commercial implementations, as well as in "raw" form that one can download from more than one ftp site. For the beginner, one of the commercial versions is recommended, since the raw form requires that the user develop appropriate input and output systems.[4] I happen to have two different commercial versions of *NEC*-2—*EZNEC* 3.0 and *NEC-Win Plus*. Therefore, without prejudice toward or against any version, I shall be illustrating these guidelines by alternating among the programs I have. Figure captions will identify the program used for each graphic.

What is Antenna Modeling?

One common misconception of antenna modeling is that it is similar to making model boats and cars. The result sort of looks like—

[1]Notes appear on page 38.

and may even behave a little like—the real thing. Still, the model is a pretty but pale shadow of reality. Nothing could be further from the truth. So let's start all over again.

If you have ever referred to a formula to cut a dipole, you have done some rudimentary antenna modeling.

$$L_{ft} = \frac{468}{f_{MHz}} \qquad \text{Eq 1}$$

If we choose 7.15 MHz for our design frequency, then we need an antenna wire that is 65.45 feet long. Of course, the basic dipole formula always carries with it the advice to leave some extra wire and trim the length for the best SWR.

The formula does not include the diameter of the wire or the material out of which it is made. Nor does the formula account for the height of the antenna above ground or the properties of the soil that makes up the ground. Suppose we had a formula that would account for all of these factors?

We do. The oversimplified cutting formula for dipoles is just one small extract from a large body of mathematical analysis of antennas. If we place all of the most accurate equations into a single calculating piece of software, we would achieve much higher accuracy with our wire cutting. Not only could we analyze or predict the correct wire length for a resonant dipole, we could also calculate the field strength at any elevation above ground and in any direction from the antenna. This is exactly what *NEC* does. For many antenna types, *NEC*-2 is as accurate as engineering mathematics can make antenna analysis.

The basic antenna analysis used by *NEC*-2 relies on the "method of moments," a mathematical technique that subdivides an antenna element into segments, calculates the correct properties, and then combines the results to provide a set of results for the entire element (or an array of elements).[5] The results can be adjusted using standard engineering equations for material resistance, element loading, and ground effects. For the beginning modeler, two points are important to remember: (1) The method, when used within the limits of the software, is very accurate and (2) we have to think in terms of segments of our antenna elements. Instead of dwelling on the math behind the core, let's learn how to think in modeling terms.

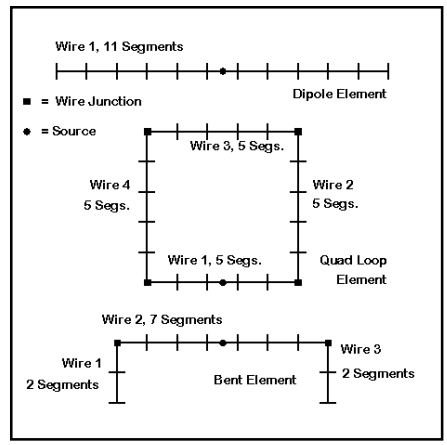


Figure 4—Several types of antenna elements with their segmented wire components.

The Language of Modeling

Clearly, we'll have to add some new terms to our antenna language in order to get a good grip on antenna modeling. We have already encountered one of them: the *segment*. In fact, we may find it useful to think of three different terms to sort out pieces of an antenna and pieces of an antenna model.

Figure 4 shows several different types of antenna *elements*, a dipole, a quad loop, and a bent element such as might be used in a half square or a Moxon rectangle. *NEC* can only work with individual straight *wires*, although we can form complex geometric shapes by joining straight wires at their ends. In fact, if we needed to form a circle, we would have to approximate it with a collection of straight wires, perhaps an octagon. Whatever the shape, each wire composing each antenna element has the dimensions of that part of the real antenna element. Of course, the single wire dipole element brings together the "wire" and the "element," but we should always keep the ideas of an element and a modeling wire separate.

Next, each wire in an element should be segmented. For beginning modelers, the following two guidelines are useful to stay on the safe side of *NEC* limits for segmentation:

1. A wire should have at least 9 segments per half wavelength. If a wire is only a quarter wavelength long, then perhaps 5 segments is a good minimum number. We'll shortly see why we're using so many odd numbers.

2. The segment length should be at least 4 times larger than the wire diameter. There is a complex equation for figuring the absolute minimum segment length that is reliable, but in the beginning, the 4:1 ratio of segment length to wire diameter is a safe guideline.

Let's add one more guideline:

3. To the degree possible, make all segment lengths equal within a model. If we have a dipole consisting of one wire and specify 11 segments, then the program will automatically make them all the same length. However, for elements consisting of more than one wire, we'll have to look at the number of segments we assign in order to equalize their lengths. Dividing the wire length by the number of segments gives the segment length. If we know the segment length we want, then dividing the wire length by the segment length gives the number of segments.

The next step is to set up a model element. Let's remain with our simple 1-dipole wire. In order to model the element, we must know the orientation of the dipole. For this first model, we shall make it horizontal. In fact, let's play with a 40-meter dipole cut for 7.15 MHz. To determine the wire's length, we'll initially use our traditional formula and arrive at a length of 65.46 feet for our antenna.

In order to place the antenna into the model, we must master the world of 3 dimensions, also called *Cartesian coordinates*. This system is just a way of specifying directions, as shown in Figure 5. Relative to the earth, we can think of the X-axis and the Y-axis as two lines at 90° angles, both of which are parallel to the Earth's surface. Then, the Z-axis becomes another word for height above ground. Since we are going to start with a dipole above the Earth, the Z-value can never be below zero, although—as we shall see—it

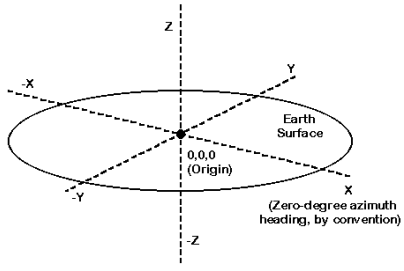


Figure 5—The Cartesian coordinate system with an "earth surface" shown.

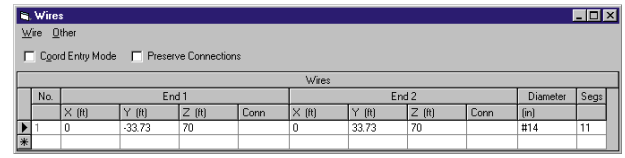


Figure 6—The *EZNEC* wire spreadsheet with 40-meter dipole components.

might be very close to zero.

As we begin to model, we need to begin to think systematically about antenna geometry. One of the most convenient (but not the only workable) systems for setting up a horizontal antenna is to place the ends equal distances along the Y axis. For most horizontal designs based on $^1/_2$-wavelength dipoles, this orientation will result in a pattern of radiation that is strongest along the X-axis, and the pattern value of zero degrees lies along this axis. So let's center the antenna on the X-axis and make the End-1 Y value –33.73 feet with the End-2 Y value +33.73 feet. Since we have only one wire, the X-value at both ends can be zero.

However, we must not neglect Z, the antenna height. Since a fairly common backyard value for the height of a 40-meter dipole is about 70 feet, let's use this value for Z—at both ends of the wire. Figure 6 shows the *EZNEC* wire window with exactly these values plugged in. Note that we have defined the wire by its end coordinates. If we had other wires as part of the same element, we would have added them by using either the End-1 or End-2 coordinates as the coordinates of one end of the extra wire. We shall explore more complex geometries in a future episode. For now, let's focus on mastering the language of the coordinate system of wire entry.

We can check our work for errors by looking at a diagram of the antenna that we have just entered. Most *NEC* programs have a "view antenna" option. Figure 7 shows the *EZNEC* view, with the antenna positioned above ground on the Z-axis and extending along the Y-axis on either side of the "origin," that is, the 0, 0, 0 point of the coordinate system.

Although the elements in all of our figures show feed points as small dots, we haven't yet added them to our model. In modeling language, a feed point is the source. We will have to specify both the position and the electrical conditions of the source. In *NEC*, the source is always the position within a segment, and for simplicity, we take its position to be centered.[6] If we wish to have a feed point or source positioned exactly at the center of an element wire, then we must have an odd number of segments on the wire. *NEC* was designed for voltage sources, so we shall specify a value of 1.0 for the magnitude and 0.0° for the phase for most common antennas having only a single feed point. For these kinds of antennas, changing the values we insert for the source will make no difference to the antenna pattern, gain or source impedance. We might as well keep it simple.

Different commercial implementations of *NEC* handle source setting in slightly different ways. The *NEC-Win Plus* system appears in Figure 8. We "drag and drop" the source symbol onto a picture of the wire that shows all of the segments. For an 11-segment dipole, we drop the symbol on segment 6. We then select the source type and values in a box that automatically appears. (The *EZNEC* system specifies the source position as a percentage of the wire length. For a center feed antenna, we specify 50%.)

The Other Parts of the Model

The work we have just done corresponds to cutting a piece of wire and stringing it up between supports. With a wire in place and having the correct dimensions, we can turn to the other parts of the program that we must set up before running the model. For example, the wire has a diameter that we can express in either the same dimensional units as the wire length (feet, in this case) or as an AWG wire gauge. Figure 9 shows the *NEC-Win Plus* wire diameter window that allows us simply to select a common wire gauge or provide a custom entry.

Not only does the wire have a diameter, it is also composed of a conductive material. We need to specify this material so that the program can account for any resistive losses in it. In Figure 9, we also see the separate *NEC-Win Plus* selection box for common materials. There is a place for entering the conductivity of materials not listed, a topic we shall look at down the line. For now, checking "copper" will get us started. Incidentally, the corresponding materials window in *EZNEC* will allow custom entries in terms of resistivity, which is simply the inverse of conductivity.

Next, let's look at the ground over which our antenna hangs. *NEC* has two "real" ground systems, but for our modern fast PCs, there is no reason not to select the better of the two. It goes under different names in different implementations of *NEC*. You can find it as the "high accuracy" ground, the Sommerfeld-Norton ground, or simply as *SOMNEC*, the name of the calculating module within *NEC*. Whatever the program-matic name, it is the most accurate available system for calculating the behavior of an antenna above ground. While other systems tend to become inaccurate for antennas below 0.1 to 0.2 wavelengths above ground, the Sommerfeld-Norton system is accurate down to a tiny fraction of a wavelength above ground.

Once we have selected the ground type, we need some values for ground conductivity (in Siemens per meter) and for the relative dielectric constant (also called permittivity). We usually derive these values from maps of our local area (available in *The ARRL Antenna Book*). However, the ground quality values do not make a big difference in horizontal dipole performance, so we can initially use the program default numbers. Most programs default to what is called "average" ground, which has a conductivity of 0.005 S/m and a dielectric constant of 13.

We have neglected the test frequency. *EZNEC* is set up for single frequency runs, so we would just click on the frequency button and enter 7.15 MHz in the box that appears. *NEC-Win Plus* is always setup for frequency sweeps, that is, multiple runs defined by start and stop frequencies, plus a frequency interval between runs. For a

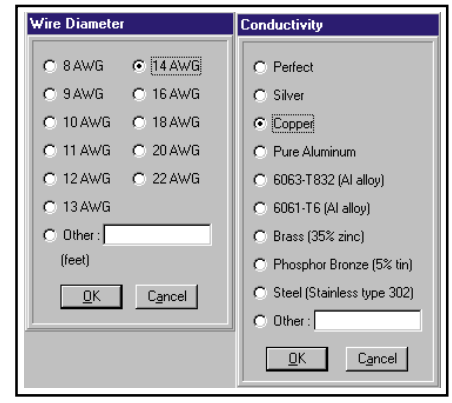


Figure 9—The *NEC-Win Plus* wire-diameter window and wire-material window.

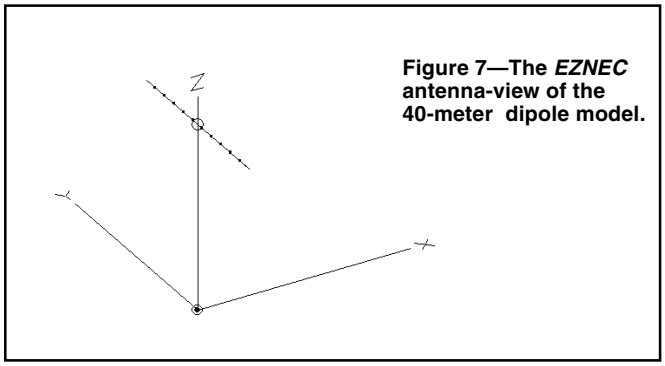


Figure 7—The *EZNEC* antenna-view of the 40-meter dipole model.

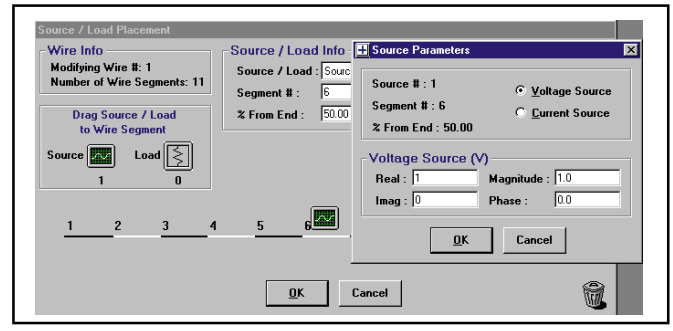


Figure 8—The *NEC-Win Plus* source-placement window.

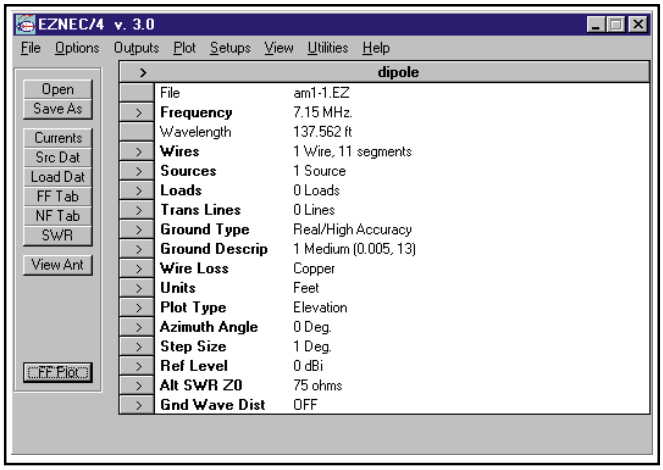


Figure 10—The *EZNEC* elevation pattern data on the main screen.

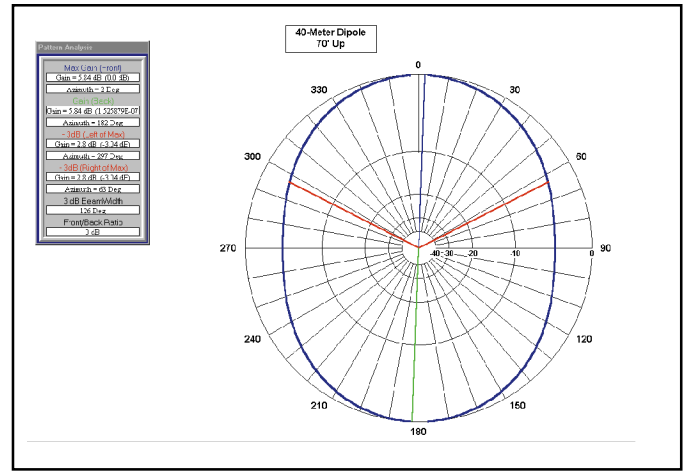


Figure 13—A (*NEC-Win Plus*) azimuth pattern for a dipole at 40 feet above average ground at 7.15 MHz with an elevation angle of 49°.

single run, we just enter the same frequency on both the start and stop lines. The interval or "step" will not matter.

We have now completely specified our model. We created the wire element and gave it an environment. Part of the environment was geometric as we set the coordinates to position the wire. A second part of the environment was electrical as we positioned the source. A further part of the environment was physical as we specified the wire material and the ground beneath the antenna. Essentially, we would go through all of these thinking processes when erecting a real antenna.

We should notice two things about the model that may differ somewhat from reality. First, there is nothing in the model's backyard except the antenna. All of the power lines, trees, and other objects that can affect antenna performance are missing. Much of this "ground clutter" can be modeled, but it takes special techniques that go beyond the scope of the basics of modeling. Second, the ground is continuous to the horizon and homogenous to any depth beneath the antenna. In advanced modeling, we can add a second set of ground properties at a distance from the antenna, but we cannot capture the stratified nature of the subsurface ground that occurs in many places. For most purposes, neither of these limitations of the modeling program will invalidate the results of the modeling calculations.

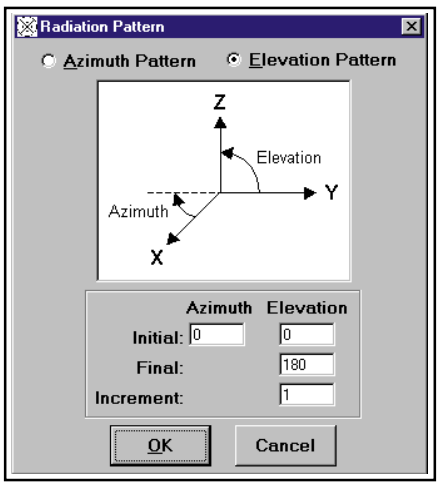


Figure 11—The *NEC-Win Plus* elevation pattern specification box.

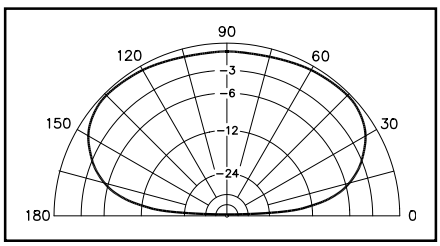


Figure 12—An (*EZNEC*) elevation pattern for a dipole at 40 feet above average ground at 7.15 MHz with an azimuth angle of 0 degrees.

What Output Pattern Do We Want?

If we have completely constructed our model and its environment, we have only one more step to go before we can hit the **RUN** button. We need to tell the program what kind of output pattern we want to see. The program will always calculate the source impedance, but most of us want to see a vivid graphic that tells us something about the gain and pattern shape of our antenna.

The entry is called the specification of a far field radiation pattern for our dipole. However, we may be initially at sea about what pattern to call and what specifications to enter for it. We know that the dipole radiates broadside to the wire and that this direction is an azimuth angle of zero (and 180) degrees. Let's begin, then, with an elevation pattern along the zero-180-degree line, usually specified as an azimuth angle of zero degrees. Most programs have a set of default values that you can use as starters. Figure 10 shows the *EZNEC* elevation data on the main screen, while Figure 11 shows the *NEC-Win Plus* elevation data selection box.

Now we are finally ready to run the model. We hit the right button and let the program do its calculations—very rapidly for this small model. After the run, *EZNEC* will bring up the pattern generated by the complex calculations, while in *NEC-Win Plus*, the design philosophy is to let the user call up any of the tables, graphs, or patterns desired. Figure 12 shows the *EZNEC* elevation pattern for our dipole.

Notice that the pattern provides us with several important pieces of information. First, we can see that low height (just above 1/4 wavelength) sends much of the radiation at very high angles, too high for most skip paths. Looking at the available data gives us a gain of 5.87 dBi maximum at an angle of 49 degrees above the horizon. *NEC* calculates all gain figures as dBi values, that is as gain in decibels greater than a theoretical isotropic radiator that would send radiation equally in all possible directions. Since *NEC* does not have any built-in range test data or similar baselines, everything must be calculated against the isotropic radiator. If we are interested in using some other standard, we can always model the standard antenna and compare gain figures. We add and subtract gain in decibels, using the same reference standard. Notice also that the gain is given to two decimal places. For most operational purposes, a value of 5.9 dBi would be sufficient for any comparisons between antennas. Even so, the difference among 5.5, 5.8, and 6.0 dBi would not be detectable in amateur operation.

Figure 13 provides a *NEC-Win Plus* azimuth pattern taken at the elevation angle of maximum radiation. Note that there is a 1° difference in the elevation angles of maximum radiation—sometimes called the

"take-off" angle—reported by the two programs. This difference is largely due to the complexity of the calculations involved as well as where and how a given program does its rounding from the long string of digits that computers use in their calculations. Also note that there is a 0.03-dB difference in reported gain, which is also insignificant. Of far greater importance is the pattern shape—a broad oval. Signals off the ends of the antenna will be weaker than those broadside to the antenna, but they may still be strong enough for contacts. The classic figure-**8** pattern is nowhere to be seen. The reason is the relative closeness of the antenna to the ground.

Before we leave the model, let's look at the source impedance data available as a table in most programs. The impedance listed is not the classic 72 Ω resistive that we associate with a resonant dipole. Instead, it is about 91 + *j* 20 Ω. The original cutting formula that we used to create our dipole model turns out to yield an antenna that is too long, as indicated by the inductive reactance at the feed point/source. As well, the resistive part of the impedance is considerably above the number used as the dipole standard. The numbers generated by *NEC* may be surprising. Nonetheless, they are accurate within the limits of the program, with its homogenous ground and clutterless field for the radiation.

Even though our main purpose in this episode was to get oriented to and started with antenna modeling, that does not mean that we can't discover some things about antennas—even using the simplest antenna possible. Even the most familiar antennas have new things to teach us about their behavior, and antenna modeling is a good way to learn them.

There remains much to be said about creating models out of wires and segments. The more complex the antenna structure, the more careful we must be. As well, we should look more closely at the information that the azimuth and elevation patterns can present to us, including some pitfalls to avoid. Next month we'll look more closely at the "ins" and "outs" of *NEC*.[7]

Notes

[1]Public domain *MININEC* is available in the following programs (with Web URLs listed):

NEC4WIN (*Windows*) from Orion: **http://www.cam.org/~mboukri**.

ELNEC (*DOS*) from W7EL: **http://www.eznec.com**.

Another version still used by numerous modelers is *AO* from K6STI. *AO* is a *DOS* program. For information e-mail **k6sti@n2.net**.

Expert *MININEC* is a proprietary program available at various levels from E.M. Scientific: **http://www.emsci.com/**.

[2]See the following references to using *MININEC* in ARRL publications:

John S. Belrose, "Modeling HF Antennas with *MININEC*—Guidelines and Tips from a Code User's Notebook," *The ARRL Antenna Compendium*, Vol. 3, pp 156-164.

L. B. Cebik, "A Beginner's Guide to Using Computer Antenna Modeling Programs," *The ARRL Antenna Compendium*, Vol. 3, pp 148-155.

Roy Lewallen, "*MININEC*: The Other Edge of the Sword," *QST* (February, 1991), 18-22.

The latter two items are republished in *Vertical Antenna Classics*.

[3]For a succinct history of method of moments programs for antenna analysis, see R. P. Haviland, "Programs for Antenna Analysis by the Method of Moments," *The ARRL Antenna Compendium*, Vol. 4, pp 69-73.

[4]There are at least three commercial implementations of *NEC*-2 readily available to amateurs at reasonable prices:

EZNEC 3.0 (*Windows*) from W7EL: **http://www.eznec.com** (reviewed in the September 2000 *QST* "Short Takes").

NEC-Win Plus (*Windows*) from Nittany Scientific: **http://www.nittany-scientific.com**.

Antenna Solver (*Windows*) from Grating Solver Development Co: **http://www.gsolver.com/**

[5]The actual equations used in developing antenna characteristics are available in the *NEC*-2 manuals. Although most users encounter only the final "Users" volume, the foundational volumes are available on-line at **http://www.qsl.net/wb6tpu/swindex.html** and at **http://members.home.net/NEC2**.

[6]In *MININEC*, the fundamental point of concern is not within the segment, but at segment junctions, called *pulses*. Hence, to center a source on a wire element, we would use an even number of segments and specify the centered junction as the source location.

[7]Those interested in pursuing each facet of basic *NEC* modeling more thoroughly may wish to consult *Basic Antenna Modeling: A Hands-On Tutorial*, available from Nittany Scientific (**http://www.nittany-scientific.com**). Although written to accompany *NEC-Win Plus*, with about 300 exercise files in *.NEC* format, the volume can be used with other implementations. A disk holding all of the exercise files in .EZ format for use with *EZNEC* is available from AntenneX (**http://www.antennex.com**).

You can contact the author at 1434 High Mesa Dr, Knoxville, TN 37938-4443; **cebik@utk.edu**.

STRAYS

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Next Stray

FEEDBACK

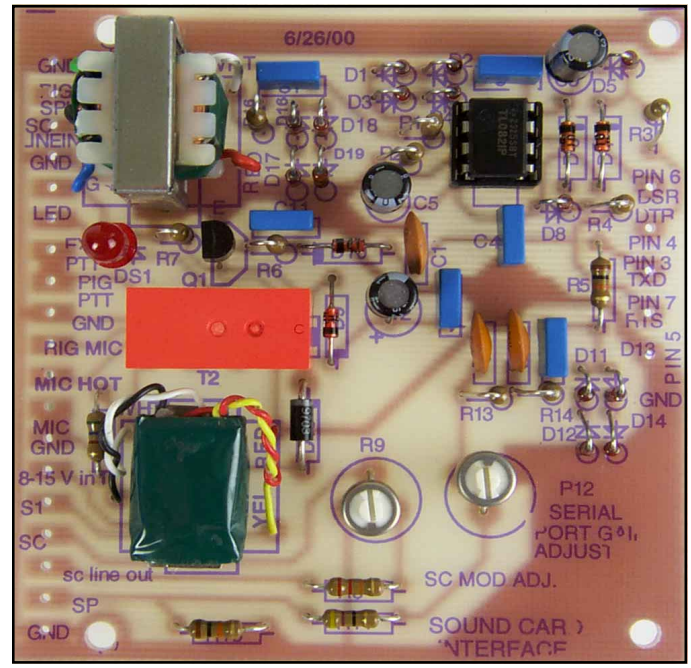
◊ Please refer to Rick Littlefield, K1BQT, "A Wide-Range RF-Survey Meter," *QST*, Aug 2000, p 44, Figure 1. The 0.1 µF capacitor near C5 should be labeled C6, not C1.—*tnx Rick Littlefield, K1BQT*

Next Feedback

By Jim Mitrenga, N9ART

A Flexible Digital-Mode Interface

One interface, all the software—here's how to do it simply and inexpensively.



JOE BOTTIGLIERI, AA1GW

Only a few short years ago, the fax, packet, RTTY and SSTV modes seemed to be reserved for those who possessed the means to purchase and operate sometimes large—and nearly always expensive—equipment. This began to change in the early '90s when software written for home computers began to replace the expensive hardware. Programs such as *HamComm*[1] allow operation of CW, RTTY and some 'TOR modes requiring only a few "junk-box" components to fabricate a simple comparator modem. *JV-FAX*[2] uses the same modem to give us SSTV with amazing results. These early DOS-based programs were followed by variations on the same theme, but eventually gave way to *Windows*-based software.

Programmers writing software for *Windows* didn't want to continue with the sometimes-inconsistent performance of the simple comparator interfaces, so they looked to using the sound cards with which most computers are equipped these days. A sound card can do most of the signal encoding and decoding required for these modes. Not only does the sound card do a fine job in the DSP department, it eliminates the need for some hardware. All that's necessary now is to deliver the transceiver audio to the sound card's input and send the sound card's output back to the rig's mic or accessory input. A means of keying the rig helps, too.[3]

Initially, I hesitated to try any of the newer SSTV programs because I didn't want to tear apart my reliable comparator-modem setup to reconfigure the audio I/Os to my computer's sound card. I wanted to continue to use the DOS-based programs, but also wanted to enjoy the new modes such as PSK31[4] and MT63[5] with software running under *Windows*. Soon I tired of manually connecting and disconnecting wires to the rig. I realized then that I needed an interface that would allow me to use the comparator modem for DOS applications and use the same I/Os for the sound card programs.

Circuit Description

The interface I designed is shown in Figure 1. The comparator section employs a dual op amp (U1) operating as a limiting amplifier with full free-run amplification. This creates the required rectangular waves at an RS-232-compatible level necessary to run the DOS-based SSTV and FAX programs. The four diodes (D1-D4) in the feedback loop of U1A soft-limit the waveform, delivering a relatively symmetrical rectangular wave with rounded tops and bottoms limiting at about ±2.8 V. U1B is another maximum-gain stage that ensures correct amplitude and rectangular waveform symmetry are presented to the serial port at J1. Open-loop gain in this stage eliminates the effects of the soft limiting at U1A. Op-amp operating voltage is supplied by the computer's serial port via the DTR and RTS lines. Diode matrix D5-D8 (a bridge circuit) ensures proper voltage polarity at the appropriate op-amp pins regardless of how the RTS and DTR lines are defined by the various programs.

To perform at their best, SSTV and FAX programs such as *EZ-SSTV*, *JV-FAX*, *MSCAN*[6] and *EasyFAX*[7] require only a basic HamComm-style modem. A HamComm modem can be as simple as a single op-amp stage, a decoupling capacitor driving the inverting input and a resistor to ground (see the inset of Figure 1). These programs can use such a modest interface because they determine the audio-input frequency by counting waveform zero crossings. A few other SSTV programs, such as *GSH-PC*,[8] rely heavily on the symmetry and accuracy of the rectangular wave presented to the serial-port handshake line (DSR) to produce their best picture quality. Waveform asymmetry and inaccuracy can be caused by a number of variables: A computer's DTR and RTS lines are rarely balanced (ie, having equal voltages of opposite polarity) and op amps may exhibit a large dc-offset error. This circuit, however, fulfills the requirements of all the DOS-based programs mentioned here by providing a very symmetrical waveform at proper RS-232 levels.

Q1 is driven by the serial port RTS line via D10 and R6. K1A is energized when Q1 turns on. A PTT switch action is pro-

[1]Notes appear on page 42.

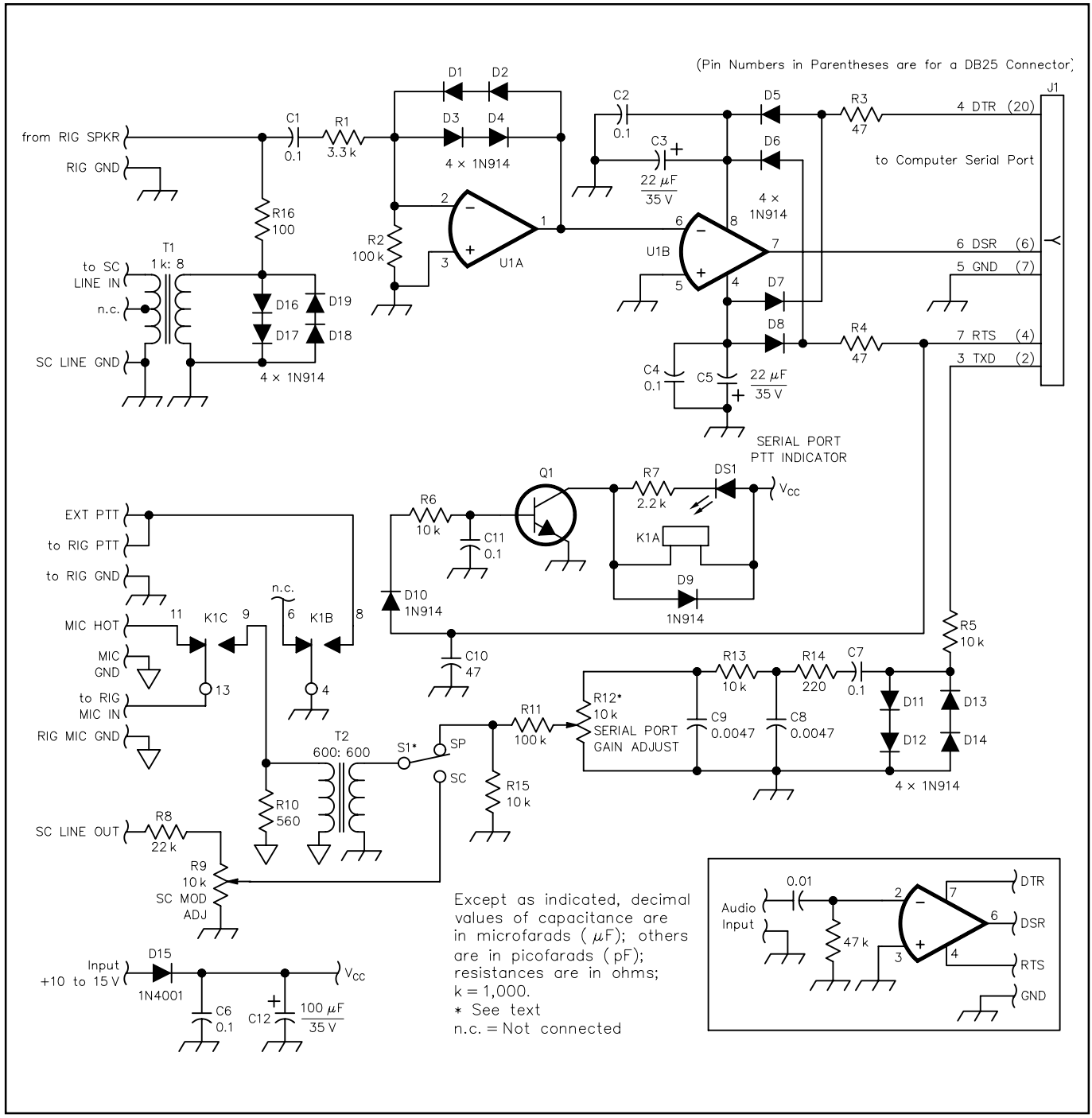


Figure 1—Schematic of the flexible digital-mode interface. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or metal-film units. RS part numbers in parentheses are RadioShack. (Note: All of the resistors used in this project can be found in assortment RS 271-312; specific part numbers are also given.) Equivalent parts can be substituted; n.c. indicates no connection. J1 pin numbers are for a DB9 connector; pin numbers in parentheses apply to a DB25 connector. The inset shows a basic interface referred to in the text. Note that a different ground symbol is used for the connections labeled MIC HOT, MIC GND, the bottom end of R10 and the primary of T2. These four connections are purposely isolated from the other grounds (see text) and should remain isolated from them and from the enclosure if a metal one is used. The other grounds are connected to a common bus and the FAR Circuits PC-board mounting pads and can be connected to the enclosure.

C1, C2, C4, C6, C7, C11—0.1 µF (RS 272-135)
C3, C5—22 µF, 35 V electrolytic (RS 272-1026)
C8, C9—0.0047 µF (RS 272-130)
C10—47 pF (RS 272-121)
C12—100 µF, 35 V (RS 272-1028)
D1-D14, D16-D19—1N914 (RS 276-1122, package of 10)
D15—1N4001 (RS 276-1101)
DS1—LED from assortment package (RS 276-1622)
K1—DPDT 12-V dc PC-mount relay (RS 275-249)
Q1—2N2222 (RS 276-1617)
R1—3.3 kΩ (RS 271-1328)
R2, R11—100 kΩ (RS 271-1347)
R3, R4—47 Ω (RS 271-312)
R5, R6, R13, R15—10 kΩ (RS 271-1335)
R7—2.2 kΩ (RS 271-1325)
R8—22 kΩ (RS 271-1339)
R9, R12—10-kΩ PC-mount pot (RS 271-282) or use optional 10-kΩ pot with SPDT switch (RS 271-215); see text.
R10—560 Ω (RS 271-312)
R14—220 Ω (RS 271-1313)
R16—100 Ω (RS 271-1311)
T1—Audio-output transformer (RS 273-1380)
T2—1:1 isolation transformer (RS 273-1374)
U1—TL082 dual op amp (RS 276-1715)

vided by K1B when the software signals *transmit* and toggles the RTS line positive. K1C selects the interface's modulating source: the mic, sound card or TxD line of the computer's serial port. When RTS is negative, the mic is selected. When RTS is positive, the PTT line is actuated and either the sound card or serial port is selected. A PTT indicator (optional) is provided by DS1 at the collector of Q1.

The modulating source of the interface is selected by S1. In the **SP** position, that source is the computer's serial port. The **SC** position selects the sound card **LINE** output. R8 and pot R9 (**SC MOD ADJ**) attenuate the sound card's **LINE** output. T2 isolates the interface and computer grounds from the rig's mic ground to minimize RFI problems.

DOS-based digital-mode software provides modulating tones in the form of square waves at the serial port's TxD line. A brute-force low-pass filter comprised of C7, R14, C8, R13 and C9 rolls off much of the square waves to present a waveform more like a sine wave to the rig's modulator; the rig's filtering does the rest of the job. R5 and D11-D14 form a limiter stage that maintains the output of the serial port's TxD line at around ±3 V. (This circuit is not required for the interface to function, however, and is discussed later.)

C6 and C12 filter the external dc source. D15 protects the circuit from an incorrectly polarized power-supply input. R16 and D16 through D19 act as a limiting stage to protect the sound card input from excessively high audio input.

Construction

Component values and types are such that a single trip to RadioShack should be all that's necessary if you can't find the parts you need in your junk-box or that of a friend. The FAR Circuits PC board[9] makes building this project easy. Duplicate holes are provided on the PC board for various connections. **EXT PTT** can be used if an additional PTT line output is needed.

Using a PC-mounted control at R12 to adjust the serial-port modulation level is adequate. Once this level is set, there is seldom any need for readjustment. On the other hand, the sound card line output might require more frequent adjustment if multiple *Windows*-based sound card programs are used; level requirements might vary from one program to another. Adjusting the sound card's mixer panel .WAV output is usually an acceptable means to ensure proper modulation level from the sound card's **LINE** output. This could be a minor inconvenience, but I found an excellent resolution to this dilemma in a normally stocked item at RadioShack: a panel-mounted 10-kΩ control with a SPDT switch (RS 271-215). Using this control for R12 instead of a PC-mount pot allows not only line-output adjustment, but doubles as the modulation-source selection switch (S1). Rotating the control fully counterclockwise to the **OFF** position selects the serial port (**SP**) as the modulating source. Rotating the control clockwise and turning the switch to its **ON** position selects the sound card's **LINE** output (**SC**) as the modulation source. If frequent sound card **LINE** output-level adjustment is not necessary, the PC-board-mounted control should be adequate for your application.

An external 10 to 15-V dc source applied via D15 is required to power the relay and the optional serial port PTT LED, DS1. If the optional PTT indicator circuit is not required, omit R7 and DS1.

Component-Value Considerations

A few component values might have to be changed to accommodate your equipment's level requirements. The TxD data-leveling circuitry (R5, D11-D14) in conjunction with the insertion losses of the low-pass filter (C7, C8, C9, R13, R14) and the attenuation provided by R11, R12 and R15 sufficiently reduce the amplitude of the TxD output to microphone level. This level reduction might be excessive for some applications. If you find that your rig can't be modulated adequately, remove D11 through D14 and replace R5 with a wire jumper. Adjust R12 to see if the level has increased sufficiently to properly modulate your rig. If the level is still not high enough, you can reduce the value of R11, but not below a value of 1 kΩ. Similarly, R8's value may need altering to ensure proper modulation when the computer's sound card is used as the modulation source. R8 is the *only* component in this part of the circuit whose value can be modified, as your computer's audio-mixer controls should be used to set these levels.

Alignment

With all components interconnected and a dummy load attached to your rig, rotate S1 to the **SP** position. Ensure R12 is fully counterclockwise (minimum resistance). Set your rig's microphone-level control as you normally would. Select a DOS-based SSTV program and load a picture. From within the program, select transmit. The rig should key, but should *not* be modulating. Slowly adjust R12 clockwise until the modulation peaks just enter the ALC region of your rig's meter. If the modulation level is high as you start to open R12, additional attenuation is required. Select a value for R11 that allows full modulation at about mid-rotation of R12. If R12 is full clockwise (minimum resistance) and your rig lacks full modulation, try one of the steps mentioned earlier to increase the level through the TxD low-pass filter to your rig's modulating point. Unkey the transmitter.

A similar procedure is used to adjust R9. Place S1 in the **SC** position to select the sound card as the modulating source. Use the sound card mixer panel to adjust the .WAV output level. Set R9 fully counterclockwise (minimum). Select a sound card program and set it up to transmit. If you choose an SSTV program for this adjustment, load a picture. From within the program, select transmit. The rig should key, but should not be modulated. Slowly rotate R9 clockwise and note how the rig begins to modulate. If the modulation level is high as you start to open R9, increase the value of R8 or decrease the sound card's .WAV output level. Select R8's value such that full modulation is realized somewhere around midposition of R9. On the other hand, if the incoming audio level is insufficient to properly modulate the rig with R9 at minimum resistance, decrease the value of R8. You should easily find a value for R8 that, in conjunction with adjustment of the .WAV output of your computer's sound card mixer panel, results in proper modulation.

No provisions have been made to adjust the rig's audio-output level at the interface. The input of the comparator (U1A and U1B) can handle speaker audio levels ranging from barely audible to full-room volume. If a fixed audio-level point (such as the output at an accessory connector) is connected to this point, that should do. Use the sound card mixer **LINE INPUT** control to control the audio level fed to the sound card. Some SSTV programs provide a control for this audio source also.

PC-Board Pin-Out IDs

Most of the connections to the PC board are obvious, but I thought it might be a good idea to identify them here as well. The labels near the PC-board interconnection pads identify lines *from* the off-board source.

- **RIG SPKR**—Connection your rig's **SPEAKER** or **LINE** output (high side) to this pad.
- **SC LINE IN**—Connects to the computer's sound card **LINE INPUT** jack (high side).
- **RIG GND**, **SC LINE GND** and **PTT GND**—Electrically, these are all the same point on the interface. These points connect from the interface to the rig or the sound card as indicated in the labeling.
- **EXT PTT**—This pad is connected in parallel with the relay PTT contacts. This is convenient if you have a secondary PTT actuator such as a foot switch or a grounding switch on the microphone.
- **MIC HOT**—If you're using the rig's mic input as the modulating point for the interface *and* the microphone, connect your mic to this pad and the mic ground to **MIC GND** on the interface.
- **RIG MIC IN**—From the rig's modulating input point; either the mic connector, or the

accessory jack **LINE** input. If you're using your rig's accessory connector as the modulation input to your transceiver, connecting a microphone to the interface's **MIC HOT** pad (as described earlier) isn't necessary as the mic is likely connected directly to the rig's mic connector.

- **SC LINE OUT**—Input from the sound card **LINE OUTPUT** jack (high side).
- **+10 to +15 V**—External power-supply connection.

Serial-port connection labels are on the component side of the PC board opposite the rig and sound card I/Os. Pin numbers indicated are those for a 9-pin (DB9) connector at J1. If you have a 25-pin serial port connection, use the pin numbers enclosed in parentheses in Figure 1.

Summary

Now you have no excuse for not trying AMTOR, FAX, Hellschreiber, MT63, PACTOR, PSK31, RTTY and SSTV. With this interface, you can operate most of the modes by simply running the appropriate software (much of which is *free*) and selecting the proper interface. You're sure to have fun!

Notes

[1]K7SZL's *Unofficial HamComm* home page (**http://home.att.net/~k7szl**) contains information on nearly every aspect of the popular *HamComm* program.

[2]The *JV-FAX*/*JV-Comm32* site is **http://www.jvcomm.de**.

[3]Most sound card SSTV and other digital-mode software can be found at **http://www.muenster.de/~welp/sb.htm**.

[4]For PSK31 information and software, visit the "Official" PSK31 Homepage at **http://aintel.bi.ehu.es/psk31.html**.

[5]Information on the MT63 experimental mode and software can be found at **http://members.xoom.com/ZL1BPU/MT63/MT63.html**.

[6]All of these DOS SSTV programs (*EZ-SSTV*, *GSH-PC*, *JV-FAX*, and *MSCAN*) in addition to most sound card SSTV software can be obtained from **http://www.ultranet.com/~sstv/index.html**. The *EZ-SSTV* site is **http://www.ultranet.com/~sstv/ezsstv.html**. *MSCAN* is available from **http://www.mscan.com**.

[7]You can download *EasyFAX* V1.10 from **ftp://ftp.funet.fi/pub/ham/fax_sstv/ef110.exe**.

[8]GSH-PC is available at **http://ourworld.compuserve.com/homepages/dl4saw** and **http://www.pervisell.com/ham/gs1.htm**.

[9]PC boards are available from Far Circuits, 18N640 Field Ct, Dundee, IL 60118-9269; tel 847-836-9148 (voice and fax); **http://www.cl.ais.net/farcir/**. PC Board only, $5 plus $1.50 shipping for up to four boards. Visa and MasterCard accepted with a $3 service charge.

Jim Mitrenga, N9ART, received his Technician class license in March of 1979; he upgraded to Amateur Extra class in 1981. Jim's wife, Sandy, is KB9MXF. Jim and Sandy are active on VHF and UHF FM for family communication. HF CW is Jim's favorite mode, but he's active on AM, FM, SSB, SSTV, PSK31, RTTY and packet, and enjoys Amateur Radio electronics design. Jim's other interests include fishing, hiking, bicycling, gardening, computers, audio recording and broadcast engineering. Jim is employed as a program manager at Motorola, Inc, in Schaumburg, Illinois, where he started as an RF design engineer in 1979. Currently he concentrates on digital communications audio quality. You can contact Jim at 1013 Chippewa Dr, Elgin, IL 60120; **sstv@hotmail.com** *and* **n9art@arrl.net**.

NEW BOOKS

THE ELECTRONICS OF RADIO

By David B. Rutledge, KN6EK

Published by Cambridge University Press, 40 West 20th Street, New York NY 10011-4211; tel 212-924-3900; fax 212-691-3239; ***http://www.cup.org****. First edition, 1999, 431 pages including the index, paperback 10 × 6⅞ inches, B&W illustrations, 3½-inch disk included. ISBN 0521646456. $44.95.*

Reviewed by TA Paul Danzer, N1II
ARRL Technical Advisor

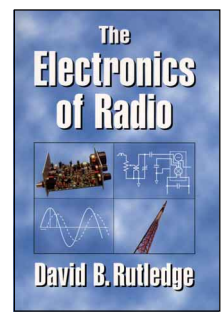
◊ *The Electronics of Radio* is a college-level textbook, and the author is a professor of electrical engineering at the California Institute of Technology. There is a good deal of mathematics in many of the chapters, and knowledge of basic first-year calculus would be helpful to understand some of the material.

This being the case, why would this book be of interest to many hams? Because there are some real goodies between the soft covers of an attractive, well-written text using the NorCal 40A QRP rig as its example.

The first chapter is a summary of radio —from the *Titanic* through basic electrical laws, receiver and transmitter components and stages, up to the NorCal rig. From this point onward the following chapters are more conventional—components, transmission lines, filters, amplifiers and so on. But included in here are any number of interesting sidelights and approaches. As an example of acoustics, in Chapter 7 there is a problem (or exercise for the student) using a resonate tube to change the response of a loud speaker. Anyone remember some of the old "Hints And Kinks?"

The oscillator chapter of *The Electronics of Radio* contains a very nice explanation of RIT, the NorCal circuit that generated this function, and a drawing of the components on the board to show how it is actually built. For those who like to see actual hardware along with theory, KN6EK often obliges.

Chapter 12 is devoted to mixers, and there is a bit of math used. However, for anyone who is tired of long and inconclusive discussions of mixers, spurious products and receiver problems, the material in this chapter is very much worth reading. Included is a very precise explanation of key clicks using a power spectrum expression —but with it is a filter and an explanation of the way the filter works.



The noise chapter a mathematically based explanation of what goes on in a receiver. Like it or not, this is an area where the math is needed to explain the operation. Although some calculus is used, unless you are an engineering student, you probably won't miss much by just passing over the calculus equations.

Chapter 15, Antennas And Propagation, contains a very nice section concerning the Friis Formula. Many technical people will recognize most of it as the radar range equation, used to predict how far a radar system can see a target. Along with it is an explanation of how to calculate line-of-sight for VHF, UHF and microwave is an explanation of why the Earth's radius is multiplied by 4/3 for calculating line-of-sight.

There are several appendices included. Appendix B goes through Fourier Series. But unlike the treatment in most math handbooks, this one is directed and limited to radio and electronics applications. The examples worked out in detail are for a square wave, rectified cosine (or sine) wave and narrow pulses.

Another appendix explains the use of *Puff 2.1* and the disk accompanying the book. *Puff 2.1* is a circuit simulator for linear circuits that also makes microstrip and stripline layouts. I did not attempt to use the software.

The final appendix is a very nice feature I appreciated both as a reader and teacher —a set of data sheets for the critical components used in *The Electronics of Radio*, as well as the Web addresses of many of the suppliers. Often you see a transistor or integrated circuit used in a technical discussion and you have no clue as to its characteristics. The appendix thankfully cures this problem.

In summary, *The Electronics of Radio* uses the novel approach of making a real ham rig as the subject of most of its examples. As a textbook, it is not general light reading for everyone, but it has a number of goodies in it, and if you want to see a slightly different approach to electronics, take a look at *The Electronics of Radio*.

Next New Book

By Dick Green, WC1M

Discover the Wonderful World of Contesting

Sharpen your operating skills and have a blast at the same time!

Contesting is a major operating activity enjoyed by thousands of amateurs. In fact, it is one of the fastest-growing areas of our hobby.

One thing that makes contesting special is that it often combines several aspects of Amateur Radio at once. For example, the more you know about antennas, propagation and pileup techniques, the better your scores will be in a DX contest. In many ways, contesting is the ultimate test of knowledge and skill in Amateur Radio. Best of all, contesting offers competitive options to suit just about anyone: you can compete against other individual operators, you can compete as part of a team in a multi-operator or club competition, or you can compete against yourself to improve your personal best.

What is a Radio Contest?

Simply put, most contests are based on the idea of contacting as many stations as possible in a fixed amount of time, usually one or two days. Each contact is brief: often the stations just exchange call signs, signal reports and locations. A typical exchange in a phone contest might go like this:

WC1M: "CQ CONTEST, THIS IS WHISKEY CHARLIE ONE MIKE. CONTEST!"

Steve, WB4OMM, prepares to do battle in the 1999 ARRL November phone Sweepstakes.

KA1LBW: "KILO ALFA ONE LIMA BRAVO WHISKEY"

WC1M: "KA1LBW, FIVE NINE, NEW HAMPSHIRE"

KA1LBW: "FIVE NINE, VERMONT"

WC1M: "THANKS. WHISKEY CHARLIE ONE MIKE, CONTEST!"

The exchange might look like this in a CW contest:

WC1M:	CQ TEST WC1M WC1M
KA1LBW:	KA1LBW
WC1M:	KA1LBW 599 NH
KA1LBW:	599 VT
WC1M:	TU QRZ WC1M

Sound familiar? If you've participated in Field Day, you've made contacts just like these.

Scoring

All contests have rules about how the score is computed. Usually, you get one or more points per QSO. In some contests, you earn more points for working stations outside your country or continent, or more points for working stations on the low bands. It makes sense to study the rules carefully. For example, you might be allowed to work the same station once on each band, or perhaps only once *regardless of band*.

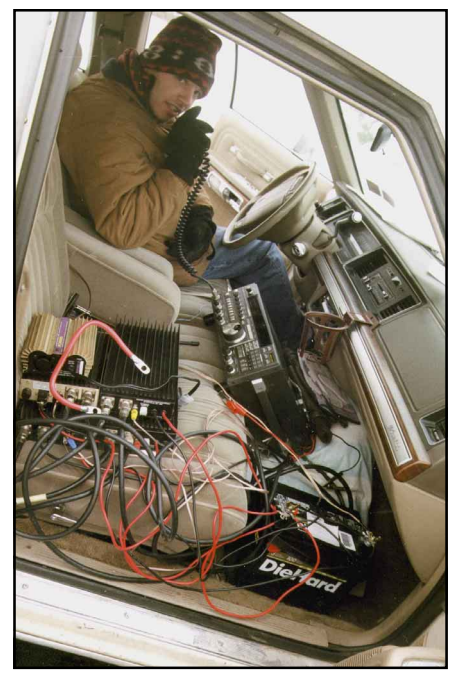
The number of QSO points is then multiplied by the number of different *multipliers* you worked. A multiplier is usually a distinct location, such as a state, ARRL sec-tion, grid square, ITU or CQ zone or DXCC entity. In one contest, each unique call sign prefix (e.g., W1, KH6, DL2) is a multiplier. Some contests let you work each multiplier once per band, while other contests count only the first contact with a multiplier. Some contests include more than one type of multiplier, such as zone and DXCC entity.

Here's a simple scoring example: let's say you get one point per QSO and each ARRL section counts as a multiplier. If you contact 500 stations in 50 ARRL sections, your score would be 25,000 points.

QSO points and multipliers add a strategic dimension to contesting. They force you to think about the best way to optimize your score, given the propagation conditions, the time of day, your location, your antennas and your operating preferences. Should you try for as many contacts as possible? Should you spend more time looking for multipliers? When should you switch to 80 meters? Even the most experienced contesters debate these questions endlessly. Finding your own answer is part of the fun.

Logging and Computers

Computerized logging programs have had a major impact on contesting, making it easier and more fun than ever. These programs allow us to enter just the call sign and exchange, and then they automatically



Leon, N1XKT, bundles up for a frigid rover operation during the 2000 ARRL January VHF Sweepstakes.

fill in other required information such as date, time, band, prefix, country, etc. The logging program takes care of "dupe checking," too, warning us when we've already worked a station on that band. The logging program computes your score and QSO rate throughout the contest, so you always know how you are doing. At the end of the contest, you can output your log to a file and e-mail it to the contest sponsor. The result is that you get to spend more time operating in the contest and less time doing paperwork chores.

The most popular logging programs are *CT*, *NA*, *TR-Log* and *WriteLog*. *CT*, *NA* and *TR-Log* run under *MS-DOS*, while *WriteLog* runs under *Microsoft Windows*. The *MS-DOS* based programs can be run on very inexpensive IBM-compatible personal computers with a 286 or greater processor and minimal configuration. For more information, get on the Web and go to **http://www.contesting.com** where you'll find links to the home pages for the popular logging programs.

Entry Categories

Virtually every contest has multiple entry categories, providing you with many options for participating. In the standard Single Operator category, one person does all of the operating chores, including sending, receiving and logging, and is allowed to transmit from only one radio at a time. Within the Single Operator category there are usually several power classifications, including Low Power, High Power and QRP. The exact power limits vary depending on the type of contest. In the Multi-Single category, two or more operators share the operating chores, but usually transmit from only one radio at a time. This is a good choice if you can't allocate enough time to work the entire contest (or can't stay awake that long!). The Multi-Two category in the ARRL DX contest allows two operators to transmit from up to two radios at a time, on different bands. The Multi-Multi category allows any number of operators to use any number of radios, as long as there is no more than one transmitted signal on each band.

One of the hot new trends in contesting is Single Operator Two Radio, or SO2R. This is a station in which one operator uses two radios, but only one transmitted signal is on the air at any time. This allows the station to compete in the Single Operator category, but with the advantage of being able to call CQ on one radio while at the same time tuning a different band on the other radio. Operating two radios at the same time is a little like juggling cats, so I recommend that you get a lot of experience contesting with one radio before you try SO2R.

Contest Resources

When you're ready to get started, the first thing to do is to get a calendar of upcoming contests, read the rules, and decide which contests appeal to you. There's a contest calendar in every issue of *QST*, in the "Contest Corral" department, and the ARRL Web site at **http://www.arrl.org/contests/** has a calendar and rules for all upcoming ARRL contests. You can also find contest calendars and rules on various contest websites, including **http://contesting.com**, **http://www.sk3bg.se/contest/**, **http://www.cq-contest.com/**, and **http://www.hornucopia.com/contestcal/**. A great magazine resource for contest news and information is the *National Contest Journal*. You can subscribe by calling toll free at 1-888-277-5289 between 8 AM and 8 PM Eastern Time, Monday through Friday.

Try "The ARRL Big Three"

Within the next few months you'll find three popular contests that are perfect for beginners:

• ARRL November Sweepstakes

ARRL November Sweepstakes is one of my favorite contests, and I try to participate every year. Since the contest is limited to the United States and Canada (W/VE), excellent scores are possible even from modest stations. It's also a great way to accumulate states for the WAS and 5BWAS awards. The object is to work as many W and/or VE stations as you can in no more than 24 of the 30 hours of the contest (from 2100 UTC Saturday to 0300 UTC Monday). There are separate contest weekends for CW (November 4-6) and Phone (November 18-20). Sweepstakes entry categories are Single Operator Low Power (150 W or less), Single Operator High Power (over 150 W), Single Operator QRP (5 W or less) and Single Operator Unlimited/Assisted (use of packet spots is allowed), Multi-Single, and Club. There's no Multi-Multi category. Complete rules for ARRL November Sweepstakes may be found elsewhere in this issue, or on-line at **http://www.arrl.org/contests/announcements/rules-novss.html**.

• ARRL 10-Meter Contest

Trying for 10-meter WAS, DXCC or 5BDXCC? Then the ARRL 10-Meter Contest is for you! It's a great DX contest, even for small stations. The object of the contest is to work as many stations as possible on the 10-meter band in no more than 36 of the 48 hours of the contest (from 0000 UTC Saturday to 2400 UTC Sunday). The contest takes place on a single weekend, December 9-10, so the CW and Phone portions are combined. The ARRL 10-Meter Contest has Single Operator (Low Power, High Power, QRP). In the Single Operator categories you can work CW only, Phone only, or Mixed (both CW and Phone). The only other category is Multi-Single, which is mixed mode only.

You'll find complete rules for ARRL 10-Meter Contest elsewhere in this issue, or at **http://www.arrl.org/contests/announcements/rules-10M.html**.

• ARRL January VHF Sweepstakes

You don't have an HF rig or antenna? The ARRL January VHF Sweepstakes may be just the ticket for you. It's the big Winter contest for VHF and UHF enthusiasts, and you can do very well with modest equipment and antennas. You can even operate with your mobile FM rig or an H-T.

The object of this contest is to work as many stations as possible in as many "grid squares" as possible using authorized frequencies above 50 MHz. The contest lasts 33 hours and takes place the weekend before the NFL Super Bowl (1900 UTC Saturday January 20 to 0400 UTC Monday January 22).

The January VHF Sweepstakes designates grid squares as multipliers. For more information on grid squares, see the April 1994 issue of *QST*, page 86. Even better, surf to **http://www.arrl.org/locate/gridinfo.html**. There you will find a link to the *QST* article, along with links to a Web page and a program for your PC that will compute the grid square for any set of coordinates. You can work each grid square once per band for multiplier credit.

A Roving Rover

Rover is a special category unique to contests above 50 MHz. It's designed for operators of mobile stations that move among two or more grid squares during the contest. In addition to the grid squares of stations they work, Rovers can count each grid square from which they make a contact as a multiplier. The rules allow either one or two operators for a Rover station, so you can hop in the car with a buddy and have some real fun driving from one grid square to another making contacts. Complete rules for ARRL January VHF Sweepstakes may be found in the December issue of *QST* or at **http://www.arrl.org/contests/announcements/01vhfss.html**.

You can contact the author at 190 Lyme Rd, Hanover, NH 03755-6602; **dick.green@valley.net**.

By Dave Pruett, K8CC

Coping with Cabrillo

Few developments have affected Amateur Radio contest operating as much as the development of logging software for personal computers. Such programs quickly replaced paper logs, dupe and multiplier sheets on the operating desk. These same programs make it a simple task to submit your log electronically to the contest sponsor.

Standardization Needed

In early 1999, computer professional Trey Garlough, N5KO, worked with many of the major developers of Amateur Radio logging software to develop a standardized electronic contest entry specification for the ARRL. The result was the *Cabrillo File Format Specification*, which in late 1999 was adopted by the ARRL as its standard format for electronic contest entries. Beginning with contests in November 2000, all logs for ARRL contests that are electronically generated must be in the Cabrillo file format. **The ARRL will continue to accept paper logs written by hand.** However, contest entries generated using a computer must submit the electronic Cabrillo file.

A Look at Cabrillo

Information about the Cabrillo File Format Specification is available on-line at: **http://www.kkn.net/~trey/cabrillo**. An example of a Cabrillo file is shown below.

Each line in a Cabrillo file begins with a keyword ending with a colon. This keyword identifies the data contained in that line. The file begins with the "START-OF-LOG:" keyword. Other keywords identify summary information defining the contest entry. Non-QSO data lines can appear anywhere in the file; however, QSO data lines must appear in chronological order.

The format of each QSO data field is defined in the Cabrillo specification, and there is at least one blank space between adjacent data fields. These fields must be positioned in a specific order. The line starts with the "QSO:" keyword, followed by the frequency (in whole kilohertz for HF contests, or a letter designating the band for VHF/UHF) and mode of the contact. Next is the date (in YYYY-DD-MM format) and four-digit UTC time. The entrant's call sign and sent information comes next, followed by the call sign of the station worked and the received information.

The log file ends with the "END-OF-LOG:" keyword, which is very important. On occasion, the ARRL has received electronic log files that have been cut off or truncated. This sometimes happens during the e-mail process, usually beyond the control of either the entrant or the ARRL. With a Cabrillo log file, if the "END-OF-LOG:" keyword is missing, it is obvious that the file has been truncated and the entrant can be contacted to send another copy. With the non-Cabrillo ASCII files generated by the popular logging programs today, this truncation can be difficult, if not impossible to detect.

Generating Cabrillo Files

Recent versions of most popular contest logging programs can generate Cabrillo files. Specific instructions for these programs and the Cabrillo-compatible version number follows. If you have a pre-Cabrillo version, you should contact your software provider about obtaining a current version.

- *CT* by K1EA—As of version 9.49, *CT* supports Cabrillo files for the CQWW, ARRL DX (either domestic or DX), Sweepstakes and ARRL 10-Meter contests. A Cabrillo file can be created from within the program by typing the command WRITELOG in the call sign field of the logging screen. The Cabrillo file will be created along with the other log output files. It will be named *yourcall*.TXT, where *yourcall* is the call sign used during the contest.
- *NA* by K8CC—NA has supported Cabrillo since version 10.43. A Cabrillo file can be created when exiting the program. On exit, a screen prompt appears saying "END PROGRAM: <W>rite Log to Disk, <P>rint, <E>xit". Press "W" to write the log to disk. The Cabrillo file will be created along with the other log output files in the *NA* output directory. It will be named *yourlog*.LOG, where *yourlog* is the base filename of the *NA* log being processed.
- *TRLog* by N6TR—The first Cabrillo-compliant version of *TR* is 6.50. A Cabrillo file is created using POST, the separate post-contest program provided with *TR* to generate entry files. Run the POST program, select "C" from the menu of commands and follow the prompts on the screen. The Cabrillo file will be created in the same directory as the log file being processed. It will be named *yourlog*.CBR, where *yourlog* is the base filename of the *TR* log being processed.
- *SD* by EI5DI—A Cabrillo file can be

```
START-OF-LOG: 2.0
CONTEST: ARRL-SS-CW
CALLSIGN: K8CC
ARRL-SECTION: MI
OPERATORS: K8CC, WB8T
CATEGORY: MULTI-SINGLE
CLAIMED-SCORE: 172536
CLUB: Mad River Radio Club
SOAPBOX: Big pileup on KP2N to get last section for sweep!
NAME: Dave Pruett
ADDRESS: 2727 Harris Road
ADDRESS: Ypsilanti, MI 48198   USA
QSO: 28002 CW 1999-11-06 2200 K8CC          1 M 69 MI  KH7R          1 A 67 PAC
QSO: 28002 CW 1999-11-06 2200 K8CC          2 M 69 MI  KE9I          1 B 75 IN
QSO: 28007 CW 1999-11-06 2201 K8CC          3 M 69 MI  N7VM          2 A 76 UT
QSO: 28010 CW 1999-11-06 2203 K8CC          4 M 69 MI  N0AH          4 B 95 WY
QSO: 28023 CW 1999-11-06 2204 K8CC          5 M 69 MI  W5VX          8 A 59 STX
```

An example of the Cabrillo file format.

created using SDCHECK, the separate post-contest program provided with SD to generate entry files. The first version of SDCHECK supporting Cabrillo is 9.68. Start up SDCHECK then select Option 4 - Entry File. The Cabrillo file will be created in the same directory as SDCHECK. It will be named *yourlog*.LOG, where *yourlog* is the base filename of the *SD* log being processed.

• *WriteLog* by W5XD—To create a Cabrillo file with *WriteLog*, pull down the Contest menu and click on Cabrillo File. In the screen that appears, make sure your sent information (ARRL section, category, power, etc.) is all entered correctly, then click OK. The Save As window appears showing the directory where the Cabrillo file (named *yourcall*.LOG) will be created.

Helping The Contest Branch Serve You

By Dan Henderson, N1ND, ARRL Contest Branch Manager

Our goal in the Contest Branch is simple: provide accurate contest results to our participants. Several changes have been implemented that have allowed us to make great strides toward that goal. E-mail addresses for each contest have helped get logs to the correct queues for processing. A back-up server allows us to archive all e-mailed contest entries, so that original e-mails can be consulted if a problem arises. A listing of logs received at **http://www.arrl.org/contests** allows participants to verify basic information that affects their entry. And you, as a participant, can help us avoid problems by following a few easy guidelines.

While more contesters are using electronic logging, we still receive approximately one-third of all logs in handwritten paper form. *Handwritten paper logs will continue to be accepted for ARRL contests.* There are generally three major problems we encounter with handwritten logs—all easily handled at the participant's end.

First, please make certain that you are using the most current forms and rules for the contest. Contest rules change occasionally and all participants need to make certain their information is up-to-date. The latest forms and rules may be obtained three ways: (1) Send an SASE to the ARRL Contest Branch, 225 Main St, Newington, CT 06111 and request the forms; (2) download them from the ARRL Contest homepage at **http://www.arrl.org/contest/forms**; (3) request forms by e-mail to the ARRL Info Server (server guidelines are found in each contest rules announcement).

Another problem we encounter with paper logs is that a participant may include entries for several contests in the same envelope. For example, in January 1999, we received one envelope from a participant, postmarked in late-January, that contained the following contest logs: ARRL Sweepstakes CW and Phone, ARRL 160 Meter Contest, ARRL 10-Meter Contest and the ARRL RTTY Round Up. By combining the entries into a single mailing, four of the five logs were received after contest submission deadlines. Help us serve you by submitting only one contest entry per envelope (and clearly marking the contest name on the outside of the envelope).

The final concern with paper logs is illegible handwriting. A recent handwritten entry included a tough-to-read call sign, which ended up wrong in the write-up. The entry, written in a sprawling script, had what appeared to be the letter W, but was in fact the letter U with an extremely long finishing tail. A simple matter to correct, but one that could have been avoided.

Electronic logging, while taking contesting to new levels, nonetheless presents its own pitfalls. E-logs share a common problem with paper logs when they are either submitted late or sent to the wrong contest address. But what can the participant do to help eliminate problems with e-logs?

One of the most common problems we encounter is participant submitting the log and summary for the wrong contest. In fact, in every major contest we receive at least one such log! Recently a phone call was received from an individual upset that his 160-Meter Contest log had been "lost." A check of the backup revealed that he had submitted a *CQ* World Wide summary sheet and an ARRL November Sweepstakes log!

Many contesters will name their log files with some variation of the contest name and year. Imagine the confusion caused at the ARRL Contest Branch when lots of people submit files *SSCW99.log*. That is why the rules tell you to use your call sign for the file name, with an extension such as .log (ie N1ND.log). The partici-pant saves us time—and helps eliminate potential headaches—by using the required file naming protocols.

The ARRL uses a different e-mail address for each event. E-mail sent to the wrong address has the potential to be overlooked. You should only submit the required files. When you send more than the required log files, you create the potential for saving the wrong file. You should only submit the file that contains the new Cabrillo log file! Please do not send other files, such as *CTLog* .bin files, *NALog* .qdf files, breakdown sheets, rate sheets, *Excel* spread sheets, or *Word* document files.

Rules for contests do change. All of the major contest-logging software programs incorporate rules changes in their latest versions. If a new ARRL section is added, or if there is a new entry category, older copies of software may not be correct. You may miss or lose multipliers, be entered in a wrong category, or your software may not recognize the exchange that you try to log. The result is that your entry will have a problem, and your score may not be accurately reported.

You should *always* verify that your summary information and log file are accurate before you submit your entry. Don't assume that your software prepares correct summary information. You should open the log file and verify what it contains before you submit the entry. If your file doesn't have all of the required information, your entry may be entered into a default category.

E-mail is the easiest method of submitting your log. Before you send that e-mail, take a moment to make certain your file is complete. Recently, a contest-winning performance ended up with a major submission problem, one that was not caught until after the results had been printed. The log file appeared to have been truncated and, therefore, it was incomplete. In this case, over 500 QSOs of the log were lost in the transmission. This sometimes happens when sending files over the Internet (I'll leave it to the net gurus to explain how this happens). A good way to catch this is to e-mail yourself a copy of the file as a cc: to your submission to the League. The new Cabrillo file format (with its End of Log statement) gives us a way to verify complete logs are received.

The old **contest@arrl.org** e-mail address is no longer valid. When you send your log to the correct address, you receive an automated response indicating that your e-mail has been received. Hold on to that receipt until the list of "logs received" is posted on the Contest Web page (or until the results are in print). If there is a problem with your entry or if it is missing, the response serves as proof of your submission before the deadline. If you have contest questions, send them to **n1nd@arrl.org** instead of the entry submission address.

To summarize, here is a "Top Ten" list of ways you can assist us in "getting it right."

(1) **Read** and familiarize yourself with the contest rules before the event.

(2) Use **current** copies of your logging program or paper summary sheets.

(3) Verify that your summary information is **complete** and **accurate**.

(4) If using paper summaries and logs, make certain all information is **legible**.

(5) If using e-logging, submit the **required** Cabrillo file.

(6) Send your entry **before** the 30-day deadline for submission.

(7) Use the **correct** e-mail or postal mail address for submitting the entry.

(8) Check to be certain your current mail and e-mail **addresses** are on your entry.

(9) Electronically logged contests **must** submit their Cabrillo readable log files.

(10) If you have questions, e-mail **n1nd@arrl.org** or call 860-594-0232.

Change the destination directory if desired, and then click OK.

Preparing the Entry

Cabrillo files can be easily viewed or edited using the *DOS Editor* program (EDIT.EXE) or *Windows NotePad*. A word processor program is not recommended since such programs often insert hidden formatting characters into the file without the user's knowledge.

Opening the Cabrillo file allows the entry information to be quickly reviewed. One very important item for the ARRL Contest Department is the "ARRL-SECTION:" field, which is used to compile the score listings in *QST*, which are by ARRL section. Be sure to check this field to ensure that your score will appear under the correct section in the *QST* listings. Remember that some states have multiple sections, so include the correct section if you live in one of those areas.

A common problem with electronic logs is incorrect information. For example, many popular logging programs allow a default location (such as your state) to be set. However, many contests use different entities for the geographic locator, in which case the default may be incorrect. Program bugs can also cause the QSO information to be incorrect. A few minutes reviewing the QSO information in your entry file can catch these types of errors quickly.

Prior to submitting your electronic entry, it may be necessary to rename the Cabrillo file. The ARRL requires your entry file to be named *yourcall*.LOG, where *yourcall* is the call sign used by the entry during the contest. Some programs name the Cabrillo file in this way, while some do not (to avoid the possibility of inadvertently overwriting a prior copy of *yourcall*.LOG from another contest.) If necessary, rename the Cabrillo file to *yourcall*.LOG using either the RENAME command in DOS, or using *Windows Explorer*.

One issue with using the call sign as a file name is that the forward slash character (/) used in portable call signs is not a valid file name character. Use the underscore (_) character as a substitute, or omit the character entirely.

Submitting the Entry

Your electronic entry may be submitted one of two ways. One method is to copy the Cabrillo file to a floppy and send it to the ARRL via regular mail. However, most entries are sent as e-mail attachments. E-mail programs typically support attachments as a way to send an electronic file as a separate, detachable part of the e-mail.

To submit your entry, prepare an e-mail addressed to the ARRL for the specific contest to be entered. The address is always found in the rules for each contest or online at **http://www.arrl.org.contests**. The subject line should contain your call sign, the name of the contest and your entry class. Nothing needs to be included in the body of the e-mail because the Cabrillo file is a complete entry in itself.

Attach the Cabrillo log file, send the e-mail and you're done! Don't send the files as the text of the e-mail, as this causes problems in detaching and saving the file information.

Submitting an electronic log is easy once you've done it a few times. Electronic logs allow the ARRL logcheckers to do their job more quickly and accurately, and Cabrillo allows them to spend less time doing data translation and more time checking. The entrant also benefits from Cabrillo through improved integrity of their entry file. Electronic log submittal is here to stay, and it sure beats killing a tree to print your entry!

QST

By Jean Wolfgang, WB3IOS

ARRL 2000 Technical Awards

Call for Nominations

Do you count yourself among those who know that technical advancement is not a lost ideal in the amateur community? If so, now is the time to nominate yourself or your colleagues for one or all of the awards described below.

ARRL members are encouraged to send nominations to ARRL Headquarters. Please include basic contact information for both you and the nominee. Submit support information along with a nomination letter, including endorsements of ARRL affiliated clubs and League officials. Nominations should thoroughly document the nominee's record of technical service and accomplishments.

ARRL Technical Service Award is given annually to the licensed radio amateur whose service to the amateur community and/or society at large is of the most exemplary nature within the framework of Amateur Radio technical activities. These include, but are not limited to:

- Leadership or participation in technically oriented organizational affairs at the local or national level.
- Service as an official ARRL technical volunteer: Technical Advisor, Technical Coordinator, Technical Specialist.
- Service as a technical advisor to clubs sponsoring classes to obtain or upgrade amateur licenses.

The Technical Service Award winner will receive an engraved plaque and travel expenses to attend an ARRL convention for the formal award presentation.

ARRL Technical Innovation Award is granted annually to the licensed radio amateur whose accomplishments and contributions are of the most exemplary nature within the framework of technical research, development and application of new ideas and future systems. These include, but are not limited to:

- Promotion and development of higher-speed modems and improved packet radio protocols.
- Promotion of personal computers in Amateur Radio applications.
- Activities to increase efficient use of the amateur spectrum.
- Digital voice experimentation.

The Technical Innovation Award winner will receive a cash award of $500, an engraved plaque and travel expenses to attend an ARRL convention for the formal presentation.

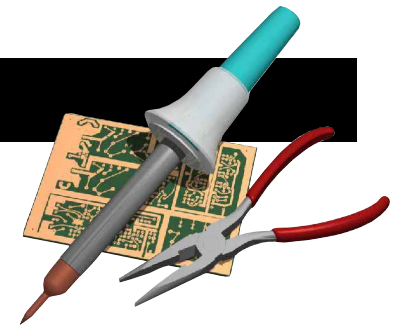
ARRL Microwave Development Award is given each year to the amateur (individual or group) whose accomplishments and contributions are the framework of microwave development, ie, research and application of new and refined uses and activity in the amateur microwave bands. This includes adaptation of new modes both in terrestrial formats and satellite techniques.

The Microwave Development Award winner will receive an engraved plaque and travel expenses to attend an ARRL convention for the formal presentation.

Nominate Now!

Send nominations to: ARRL Technical Awards, 225 Main St, Newington, CT 06111. Nominations must be received at Headquarters by March 31, 2001. Send any questions to Headquarters, or e-mail **jwolfgang@arrl.org**.

QST



The Doctor is IN

Q Dave, WD8DK, asks, "I am using a G5RV on 80-6 meters. How efficient is this antenna on 6 meters? I have been told that it is very inefficient on this band. In fact, I have been told that a ½ wavelength dipole is more efficient than the G5RV on 6 meters. Any comments?"

A On 20 meters, where the G5RV was designed to operate, it boasts a little gain over a conventional half-wave dipole. Given a reasonably efficient feed line (450-Ω line) and a good antenna tuner, there's no reason why the G5RV can't be at least as "efficient" as, say, a coax-fed dipole in the HF bands.

However, on 6 meters the G5RV acts as a long-wire antenna, with an azimuthal pattern with multiple, very narrow lobes. The narrow lobes are what give it gain, but also what make its performance compared with a regular garden-variety dipole inferior in direc-tions other than the ones it favors. The *EZNEC* plot shown in Figure 1 assumes that the antenna is mounted as a flat top at 50 feet above average ground. The G5RV has significantly more gain than the simple dipole, but it achieves this mainly in four, narrow-beamwidth directions. For the rest of the azimuths, its pattern has nulls that the dipole covers well.

Any multiband antenna is a compromise, but most of us can't have five or more dipoles hanging in our backyards. On 6 meters I would recommend a separate antenna designed for that band. There are a couple of inexpensive 6-meter wire antenna designs on the ARRL TIS Web site at **http://www.arrl.org/tis/**. Go there and click on "Antenna Projects," and then "Other VHF Antennas."

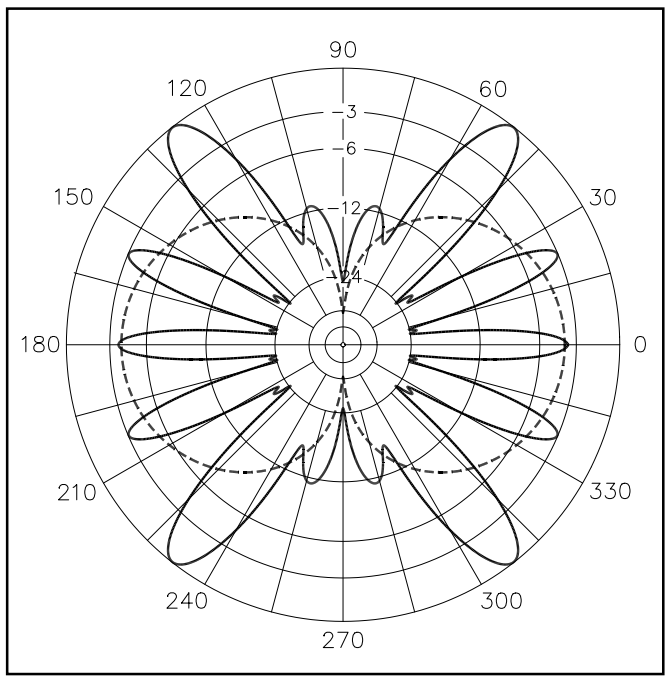


Figure 1—This is an EZNEC plot of a G5RV antenna on 6 meters compared to a dipole cut for 6 meters. The solid line represents the G5RV pattern while the dashed line represents the dipole. Notice that the G5RV is creating numerous narrow lobes of radiation.

Q I have a 10-year-old Realistic 13-inch color TV that I use with my ATV station. Recently the TV went completely dead. It won't turn on when I press the ON button on the front panel, or when I try to turn it on from the remote. I checked the power supply fuse and it is okay. The power supply appears to be working as well. Any ideas?

A Many TVs operate in what you might call a "sleep" mode. That is, there are circuits within the TV that are active continuously—even when the rest of the TV is off. Usually the primary microprocessor is always active, waiting for the command to switch on the rest of the set. If the microprocessor isn't responding to manual or remote "on" commands, the microprocessor could be defective. If you have a volt-ohm meter and a schematic diagram, measure the voltage at the V_{cc} pin of the microprocessor. Is it receiving power from the power supply (probably 5 V)? If so, find the microprocessor pin that produces the output signal to turn on the rest of the TV. Do you get a reading at this pin when you press the TV's "ON" button? If not (and I suspect you won't), the microprocessor is probably dead. On the other hand, if you do get a reading, it's time to troubleshoot the rest of the circuit that is responsible for switching on the set. This is likely to include a couple of switching transistors and possibly an optoisolator.

Q Last night I heard a strange CW signal on 6 meters. It was hissing and buzzing, but I was still able to copy. To my astonishment, I learned that the station was 500 miles away from me. Was this sporadic E propagation?

A My guess is that you heard auroral propagation. The clue is your description of the signal as having a hissing or buzzing characteristic.

Those of us who reside at the higher latitudes are occasionally treated to the visual spectacle of the aurora borealis, better known as the "northern lights." (Yes, there are "southern lights" as well, visible occasionally in South America and Africa.) The aurora is caused when the Earth intercepts a stream of charged particles

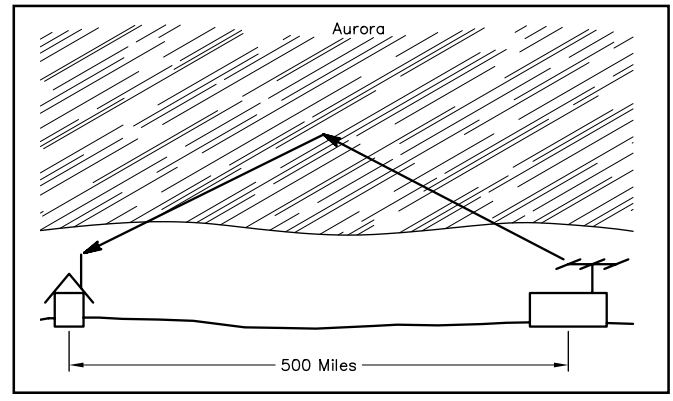


Figure 2—The auroral "curtain" can function like a giant mirror in the sky, reflecting radio signals over substantial distances.

ejected from the Sun, resulting in a "geomagnetic storm." These fast-moving particles funnel into the polar regions of the Earth thanks to our magnetic field. As the particles interact with the upper atmosphere, the air glows, which we see as an aurora. The shimmering, ghostly curtain of light is not only a treat for the eyes, it can reflect radio signals like a giant mirror (see Figure 2).

Like sporadic E, you'll encounter auroral propagation more often on 6 meters than on 2 meters. Nevertheless, 2-meter aurora is far more common than 2-meter sporadic E. You can also work distant stations using auroral propagation on 222 and 432 MHz.

As you've discovered, auroral DX signals are very distorted. That's why CW is the most commonly used mode, although you'll hear SSB from time to time. Auroral CW signals have the raspy, buzzing quality you heard. (It sounds like the other guy is operating an ancient spark-gap transmitter!) Just listen carefully and you'll be able to decode the signals.

You do not need directional antennas and high power to work aurora on 6 meters. The Doctor has done it with dipoles and 100 W. Many hams have even enjoyed success with 6-meter aurora from mobile stations!

Q I live on the top floor of an apartment building. We have a small balcony, but I can't hang wire antennas for HF because they'll droop onto the balconies below. I also need an antenna that I can remove quickly. Can you help?

A You actually have more options available than you think. You could try a compact tuned loop antenna such as those sold by MFJ. Other extremely compact antennas such as the Bilal Isotrons (**http://www.rayfield.net/isotron**) may help. You might also try using a lightweight mobile antenna such as a Hamstick. You could mount the Hamstick on the balcony railing, for example, and attach a counterpoise wire to the ground side of the antenna mount. (The counterpoise wire should be 1/4 wavelength for the desired band.) Just route the counterpoise wire along the floor of the balcony. Be sure to stay away from the ends of these counterpoise radials, where high RF voltages can exist even at modest transmitter power levels.

All of these antenna options are, of course, compromises. They sacrifice efficiency to save space. Don't expect any of them to outperform even a full-sized dipole mounted high in the clear, but they *will* get you on the air and provide many enjoyable contacts.

Q I'm confused about the concept of "SWR bandwidth." Can you explain?

A "SWR bandwidth" is a term you'll often encounter when you're reading about antenna designs, or checking the specifications of commercial antennas. Basically, the SWR bandwidth is the frequency range after the antenna has been tuned at one frequency, over which the SWR is 2:1 or less. This is easier to explain visually, so take a glance at Figure 3. Let's say that we have a 40-meter dipole antenna that is tuned to resonance at 7100 kHz. If our dipole has an SWR bandwidth of 200 kHz, we'd expect the SWR to rise to 2:1 at 7000 kHz and 7200 kHz.

Some types of antennas such as compact tuned loops have extremely narrow SWR bandwidths when tuned to resonance. Trap dipole and vertical antennas will have varying SWR bandwidths for each band, usually becoming narrower on the lower bands. Be wary of an antenna that claims a 2:1 SWR bandwidth covering all of a wide band, such as 80 meters. This band covers 3.5 to 4.0 MHz, a percentage bandwidth of more than 13%. While a wide SWR bandwidth may seem ideal, it's often the hallmark of an inefficient design with high losses. After all, dummy loads have the "best" SWR bandwidths of all! Read all about broadband antennas in Chapter 9 of *The ARRL Antenna Book*.

Q Don, WB5UIA, asks, "Can I still find RTTY on the HF bands? What about VHF? What do I need to get started with this mode?"

A RTTY as a digital mode is still very much alive, although it is primarily used for DXing and contesting these days

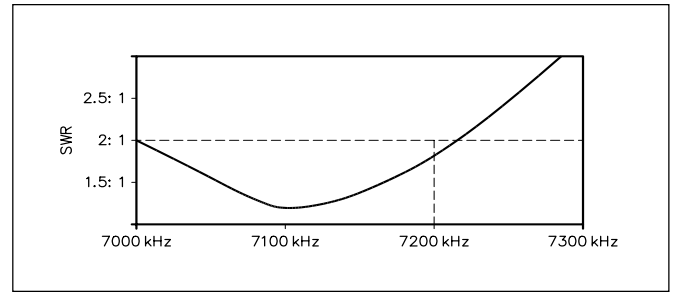


Figure 3—An SWR vs. frequency plot of a 40-meter dipole with a 2:1 SWR bandwidth of 200 kHz (see text).

(PSK31 has taken over the lion's share of the "conversational" HF digital activity). You'll find RTTY on just about every HF band, but it is mostly heard on 20 meters between approximately 14.080 and 14.095 MHz. As far as VHF is concerned, RTTY was once heard on 2 meters—there were even "RTTY repeaters"—but VHF RTTY activity today has all but disappeared in the US.

To operate RTTY you have two options: purchase an external multimode interface for your computer, or purchase software that will send and receive RTTY signals using your computer's sound card. The external interfaces are still popular, but the software approach is gaining ground. (See our review of *RITTY 4.10* by Brian Beezley, K6STI, elsewhere in this issue.) Beyond that, all you need is an SSB transceiver and you're good to go.

To learn more I'd strongly recommend that you pick up a copy of the *ARRL HF Digital Handbook*. You can purchase this book at your favorite dealer, or order directly from the ARRL. See the ARRL Publications page in this issue.

Q I know that VOX is voice-operated switching, but what is "MOX"? I see this popping up in transceiver feature lists from time to time.

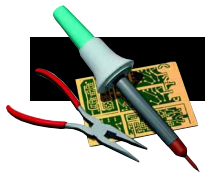
A MOX is manually operated switching. It is a front panel button that places the rig in the transmit mode. MOX is handy when you need to transmit, for antenna tuning purposes, for example, but don't have a mic or key connected to the transceiver.

Q I use a station clock that has large, red LEDs. I've noticed that if I am chewing on something (a mid-contest snack!) and happen to glance at the clock, the numbers seem to be jumping or flickering. Assuming that this isn't the symptom of some dreaded disease, what really causes the flickering?

A If you're chewing on something hard (crunchy potato chips, candy, etc) you set up vibrations in your jaw that propagate to your eyes, shifting their positions ever so slightly. The LED segments are "refreshing" themselves at a high rate of speed and, because of the movement of your eyes, the bright "moving" segments are in different places from where the visual centers of your brain expect them to be. You may see the same effect while watching your computer monitor.

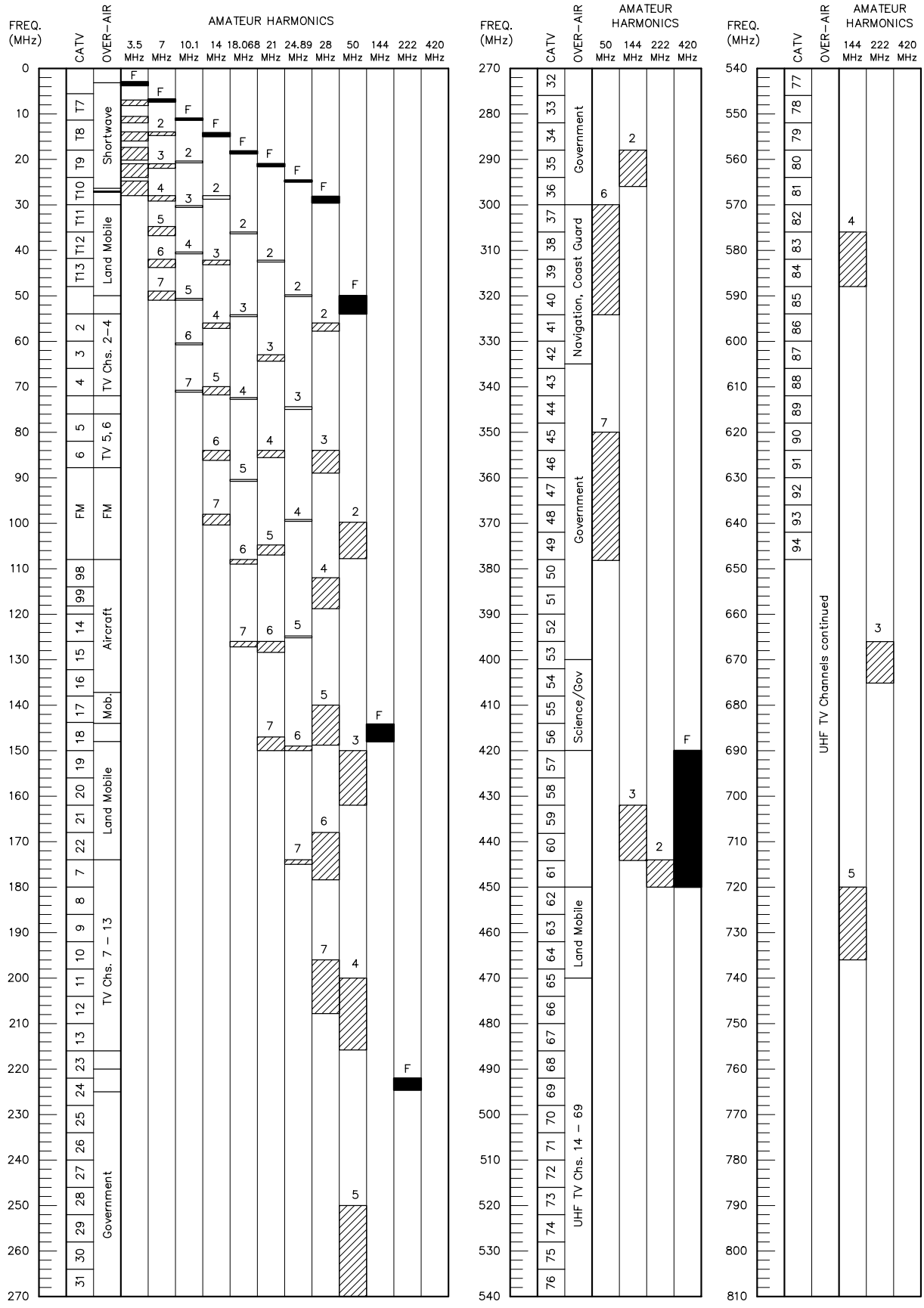
This phenomenon involves something called the *critical fusion frequency*, which is the point where we begin to perceive things that are flickering as if they are solid. Different factors influence that frequency, including the size of the object, its brightness, and which part of the retina it is seen by. The brighter the background, for example, the greater the flicker. The action of chewing jars the visual axis and changes your line of sight relative to the particular point you are focused on, moving it far enough off the central retina to change your ability to perceive a flickering image as a stable one.

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; http://www.arrl.org/tis/.



THE HELP DESK

The relationships between fundamental (F) amateur signals, and their harmonics, and CATV, over-the-air TV and other services.



DXTelnet 4.7

DX Clusters have become the nerve centers of the HF and VHF DXing world. The first of these information-sharing networks was born in the heyday of amateur packet radio. Known as PacketClusters, the networks consisted of various interconnected packet switching nodes scattered throughout a state or region. These nodes functioned as hubs for packet radio connections established by dozens or even hundreds of DX hunters.

With the advent of the Internet, a few Web-based clusters have emerged, but radio-based PacketClusters are still very active. In fact, many PacketClusters have incorporated connections to the Internet. These are not Web connections in the sense that you might normally think of them. To access these clusters you need to use the TCP/IP *telnet* function. Back in the "old days" of the Internet (before the Web), this was a straightforward procedure if you knew the proper TCP/IP commands. Hams today are more accustomed to navigating the Internet through Web browsers and many Web browsers lack a telnet plug-in. This makes the process of establishing a telnet connection a baffling experience.

Enter *DXTelnet*

DXTelnet is a *Windows* based software package developed by Fabrizio Sartoni, IK4VYX. *DXTelnet* streamlines the process of connecting to DX clusters via telnet. Now you can connect easily, and enjoy a number of convenient features to boot!

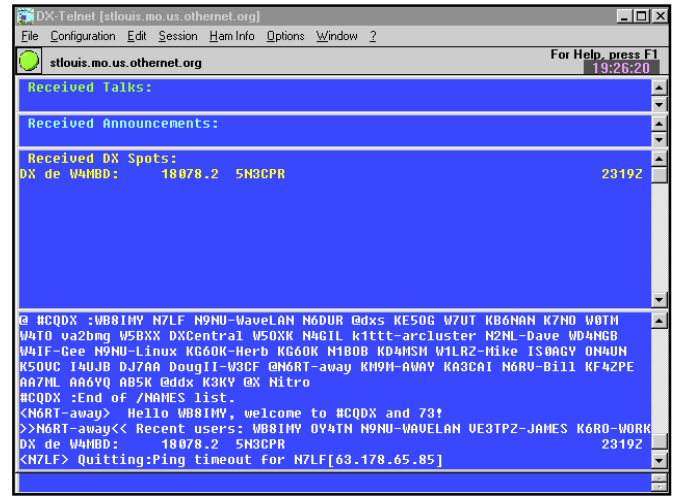
DXTelnet is really three *Windows* applications: *DXTelnet*, *DXPlorer* and *DXTNC*. *DXTelnet* is the telnet software, *DXPlorer* is a kind of specialized Web browser for Web-based clusters and *DXTNC* is designed for use with TNCs in radio-based PacketClusters. So, with one software package, you can choose any method you wish for connecting to your favorite DX spotting networks.

DXTelnet is much more than a simple terminal program or telnet client. *DXTelnet* is overflowing with bells and whistles that add even greater pleasure to the DXing game, especially for busy hams. For instance, you can filter DX spots so that duplicate spots (announcements about the same station posted more than once) are eliminated. You can set sound alerts that will chime when a spot for specific station call sign, or a particular entity, appears. You can even filter the alerts according to band. *DXTelnet* can export spot data into almost any log, or even to another cluster.

You can visually monitor the *DXTelnet* windows, or have *DXTelnet* audibly "announce" each incoming spot for you. If your PC is equipped with a sound card, *DXTelnet* will speak in a crisp voice with a slight Italian accent. Best of all—and this is a real hoot—*DXTelnet* can be configured to key a transmitter, such as a Family Radio Service (FRS) unit, and transmit the voice announcements to remote locations (it even includes an ID function). I tried this using two tiny Ranger FRS H-Ts and a jury-rigged keying line for the "base" unit. I set up *DXTelnet* to key the transmitter using an interface attached to my PC's printer port. Whenever a new DX spot showed up on the cluster, *DXTelnet* keyed the FRS rig and broadcast the call signs and frequencies to me while I was working in the yard. If you want to hear what this sounded like, listen to the audio sample at my personal Web site at: **http://home.att.net/~wb8imy/dxtelnet/dxtelnet.htm**.

On the Cluster

For this review I used *DXTelnet* primarily to connect to various Internet DX clusters and DX chat areas. You don't have to know the IP addresses to make a connection. *DXTelnet* has its own list of more than 50 active addresses. You begin by establishing your connection to the Internet. Once you are on line, bring up *DXTelnet* and click on the cluster you wish to try.



The main *DXTelnet* window (shown while connected to N6RT's popular CQDX-IRC node).

As you connect, *DXTelnet* logs you in automatically. If the site is active, you'll begin to see DX spots and other information within seconds. If you click on any received call sign and go to the HamInfo menu, you can activate a variety of online services to gather more information about the call sign. For example, you can do an address search, QSL manager search and so on.

By double clicking any displayed call you will get a pop-up window with information including the actual name of the DXCC country, distance, antenna heading, sunset and sunrise times, and much more.

I tried *DXTNC* briefly with a Kantronics KPC-3 TNC and it also worked very well. The split windows made reading easy and, once again, the voice announcements were particularly convenient. (This is especially so if you are puttering around the shack while trying to keep one ear on the radio.)

Downloading

DXTelnet is shareware and you can give it a try by downloading a copy at any of the following sites:

http://www.qsl.net/wd4ngb/telnet.htm
http://www.powernetonline.com/~dbald/dxtelnet.html
http://www.qsl.net/ad5xa/dxt.html

The unregistered version will operate for 30 minutes in the Web or telnet mode before shutting down. The TNC module will function for 60 minutes before quitting. If you enjoy *DXTelnet*, register the software and you'll not only get rid of the annoying premature shutdowns, you'll receive free "lifetime" upgrades as they become available.

Manufacturer: Fabrizio Sartoni, IK4VYX. $35, payable with VISA or MasterCard at the on-line ordering site on the Web at: **http://www.golist.net/**, *or visit* **http://www.geocities.com/dxtelnet/other.htm** *for information on other methods of payment. Minimum computer requirements: 486-66 or faster PC running* Windows 95, 98 *or* 2000.

Next Short Take

Steve Ford, WB8IMY ♦ QST Managing Editor

Ham University

As someone who teaches Amateur Radio classes in both theory and CW, I am constantly seeking new ways to help newcomers learn what they need to know. Hardly a week goes by without someone asking for the best way to learn theory, Morse code, or both. Often they mention specific tools, such as a particular book or some software they heard about from a friend. Only if I've actually worked with that item will I be able to give an answer based on anything except hearsay or rumor.

When I was offered an opportunity to try another tool, I couldn't refuse. Especially since I've heard so much about *Ham University* and its designer, Michael F. C. Crick. Over the years, many programs have been developed in the name of teaching about Amateur Radio. A few have withstood the test of time. This is one.

Installation and Use

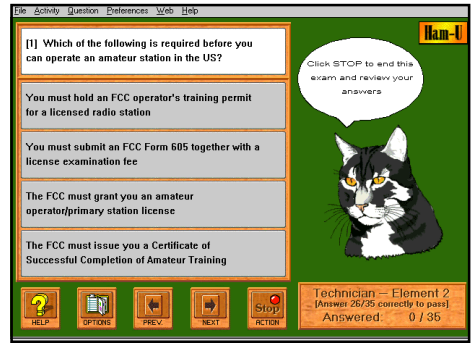
My home computer is a modest 486 PC running *Windows 95*. Since I found no mention in the installation and operation manual of specific computer requirements, I was a little concerned that my "ancient" machine might be too slow for the task. I was relieved to discover that program installed perfectly the first time. The book does say, however, that if you plan on using *Ham University* for learning Morse, a properly functioning sound card is necessary. I knew mine was working well (I've used it with the G3PLX PSK31 software), so I proceeded.

Using the instruction booklet, I quickly realized how easy this program is to use. At the title screen, you can pick from a variety of tools available under the "Activity" menu at the top of the page.

The first two items under the Activity Menu are FCC Question items. "Quiz" allows you to pick and choose which questions and/or topics you wish to be tested. The entire question pool is available to browse through, or you can focus on a particular topic. Each quiz is automatically given a default name (.QIZ extension) unless you assign a specific name. All option settings are saved when you leave. When you return, you can pick up right where you left off.

Clicking on FCC Question "Exam" brings a screen allowing you to either continue an existing exam or begin a new exam. All questions and answers are drawn word-for-word from the new FCC question pools, in use since April 15, 2000. At the end, the score shows exactly how many questions were passed and how many were missed. You can review those with incorrect answers. Exams are saved with .XAM extension, and can be saved before you start, during the exam, or after you've completed it.

Ham University takes a creative, entertaining approach to teaching Morse code.



"Morse" the cat grills you on Element 2 of the Technician exam.

Morse Training and Testing

Actual Morse code lessons are accessed by clicking on "Lessons." You must first put a Lesson Plan together. This is easily accomplished following the directions guided by Morris the Cat—an animated cat who assists by describing each function the mouse pointer indicates.

My favorite method is the "Exercise" approach done by copying with the keyboard. What you type is shown in the lower panel. At the end of the exercise, you can compare what you typed with the sent message displayed in the upper panel. Variables that you can manually adjust include speed in words per minute, character speed, message length and word length.

In addition to all this, *Ham University* offers a Morse game called PENTODE. The object is to build a large number of points in a short period of time. These points are received by connecting two or more tiles (the more the better), each containing the same character, as a diode (side by side), triode, tetrode or pentode. Personally, I found the game far less exciting than the speed exercise to copy Morse on the keyboard in the shortest possible time.

Conclusion

Ham University is an excellent tool for anyone wishing to use a computer to study for an Amateur Radio license, regardless of which level they wish to pursue. Of course, my recommendation is to use such a program in conjunction with a class. The interaction of others provides the additional element of experience, expertise, and a warm body to answer all of your questions.

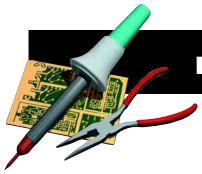
In the absence of such a class, *Ham University* provides everything you need to go from ground zero all the way to Amateur Extra…in the comfort of your own living room.

I'd be remiss in this review if I neglected to mention something else. Displayed at the top of each page of the instruction booklet is a flag of a foreign country. Next to the flag is the appropriate country name, accompanied by its latitude and longitude, CQ Zone number and call sign prefix. This is a very nice touch, adding to the educational and instructional factor of the *Ham University* program.

Manufacturer: Michael F.C. Crick, MICA, 2845-140th Ave NE, Bellevue, WA 98005; **mica@crick.com**; **http://crick.com/hamu/**; *tel 425-883-2876 (9 AM to 9 PM PST). $40 with on-disk documentation; $45 with a printed manual (shipping via US Postal Service included).* QST

Next Short Take

Dan Miller, K3UFG ♦ ARRL Certification Specialist



By John Hansen, W2FS

An Inexpensive KISS-Mode TNC

Four ICs on a slice of PC board aren't edible, but the combination makes a deliciously simple TNC!

For some time, I've thought it possible to use an inexpensive PIC microcontroller with an equally cheap modem chip to construct a packet-radio TNC that would be small, cheap and consume little power. In this project, that idea became real.

Background

This isn't a full-featured TNC, but one that is designed to operate primarily in KISS mode. KISS mode was developed by Mike Chepponis, K3MC, and Phil Karn, KA9Q, and is one of the modes now included in almost all commercial TNCs. If you think of the computer and TNC as the non-RF parts of a data-communication system, originally almost all of the system's intelligence was built into the TNC, not the computer. As a result, it was possible for completely dumb terminals to be used with TNCs to provide packet communications. This was done because the personal computers available when TNCs were first developed weren't very powerful. With time, computers became substantially more powerful. Taking the opposite approach, the Baycom and Poor Man's Packet modems move all of the intelligence out of the TNC and into the computer. KISS mode plows a middle ground, moving a portion of the intelligence from the TNC to the computer, but leaving some intelligence in the TNC as well.

A KISS-mode TNC can't be used in conjunction with just any terminal program. That's because certain TNC functions must be carried out in the computer, not the TNC. However, a significant amount of software has been created that supports KISS mode, including APRS, TCP/IP, my own *HamWeb* software and a range of other programs. (See the sidebar "KISS Mode Packet-Radio Software.")

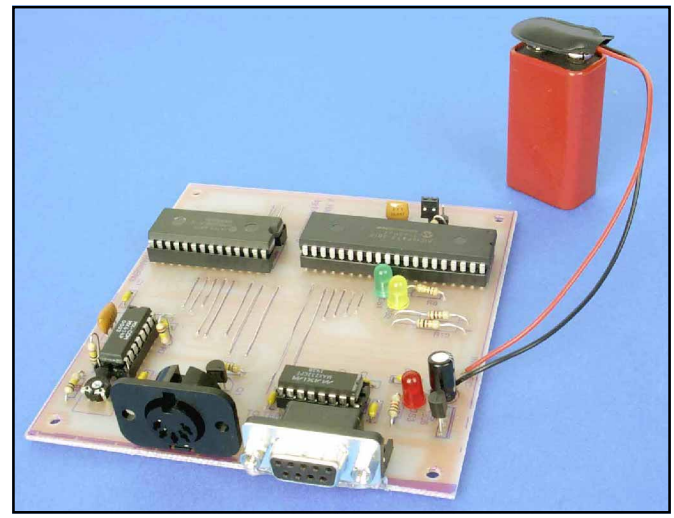
In addition to being a KISS-mode TNC, this TNC has a second mode. It can be interfaced with a GPS receiver and used to send APRS position reports (in Mic-E compressed format) and monitor incoming unconnected (UI) packet frames.[1] Here, I'll refer to this as "APRS Tracker mode." In this mode, the data can be displayed using any terminal program available on any computer; it does not require KISS-compatible software.

Circuit Description

The hardware for this project (see Figure 1) is relatively simple since most of the heavy lifting is done by the firmware in the PIC. U1 is a *programmed* PIC16F877 microcontroller.[2] This chip sends and receives data from the computer or terminal, formats incoming and outgoing packets, receives and interprets data from the GPS stream (if one is used) and drives the modem chip.

Even if the radio channel is busy and transmission is delayed, data continues to flow from the computer to the TNC. Because KISS mode does not support hardware or software flow control, a substantial amount of static memory is required. To avoid losing data, it's necessary to have a sizeable transmit-data buffer. The PIC itself doesn't contain enough memory to provide this function. Fortunately, static RAM chips of sufficient capacity are now extremely inexpensive. U2, a 62256 32-kB static RAM chip, is one of these devices. Of the 32 kB of memory contained in the 62256 static RAM, 28 kB are devoted to the transmit buffer. In addition, there is a 4-kB receive buffer. This buffer is required because the unit must accumulate an entire receive frame before it can check to ensure the CRC calculation matches the data in the receive frame and decide whether to discard it (if there is an error) or send it on to the computer (if it is not in error).

U3 is a MAX232 level-conversion chip. The PIC microcontroller communicates at TTL levels (0 to +5 V), while almost all computer serial ports communicate at RS-232 levels (±12 V). U3 handles the conversion in both directions. U4 is an MX-Com MX-614 modem IC. It takes the signals coming from the PIC and



PHOTOS BY JOE BOTTIGLIERI, AA1GW

KISS-Mode Packet-Radio Software

Here's a listing of just a few of the packet-radio programs that support KISS. Please note that I have not tested all of these programs; I list them here solely because they claim to work well with KISS-mode TNCs.

JNOS (TCP/IP Package):
http://www.tapr.org/tapr/html/softf.html

Pr4Win (general Windows-based Packet program):
http://www.geocities.com/SiliconValley/Vista/9244/

WinTNC (another packet terminal program):
http://www.tapr.org/tapr/html/softf.html

WinAPRS (Windows-based full-featured APRS program):
http://www.tapr.org/tapr/html/sigf.html

CLX (DX Cluster software): **http://www.clx.muc.de/**

G8BPQ (Packet switch software):
http://www.tapr.org/tapr/html/softf.html

—John Hansen, W2FS

[1]Notes appear on page 56.

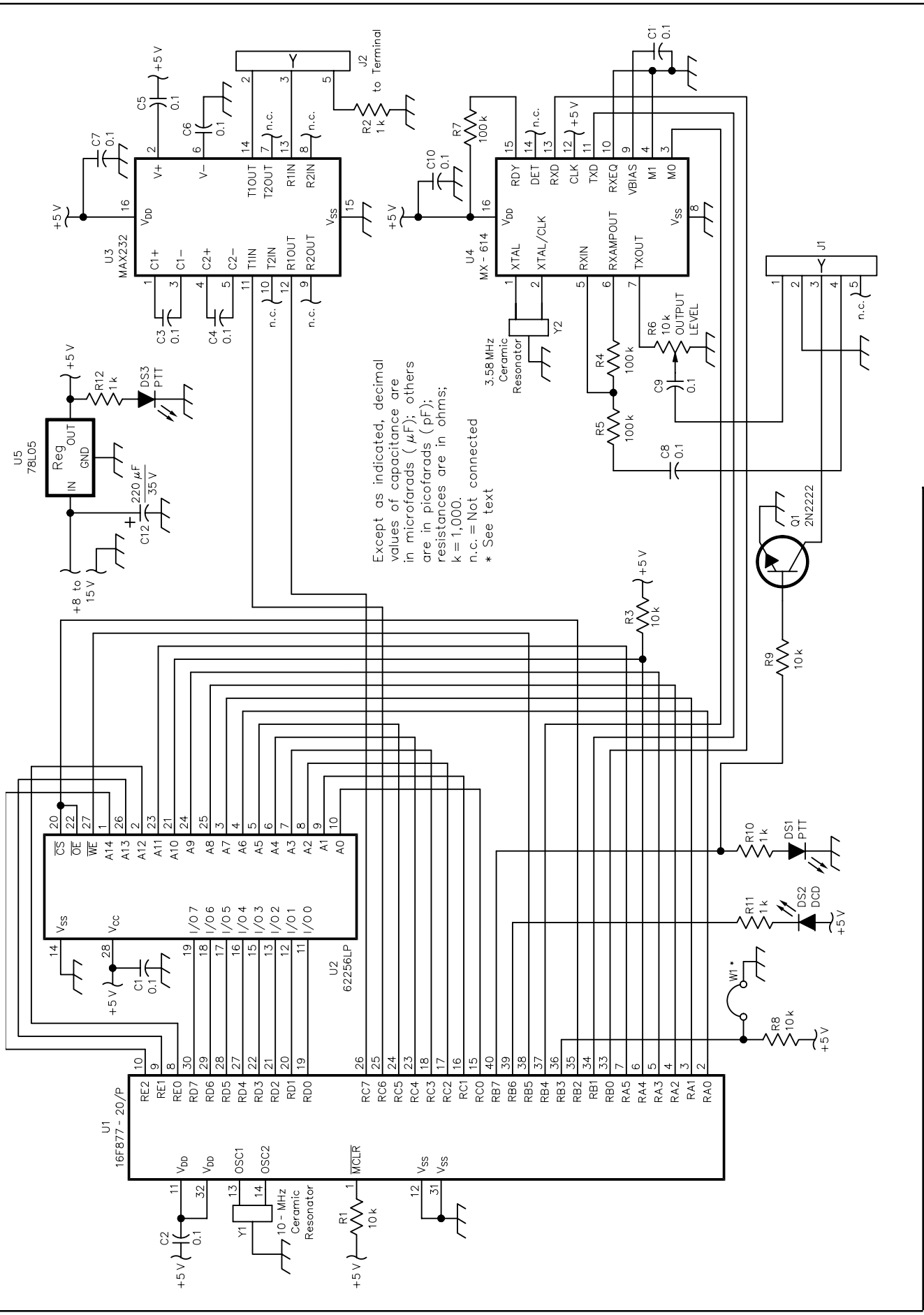
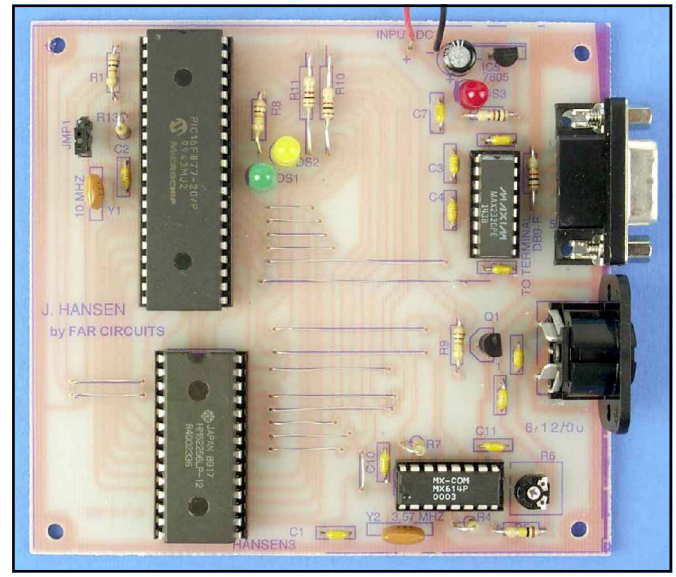

U1
16F877 - 20/P
U2
62256LP
U3
MAX232
U4
MX - 614
U5
78L05
Q1
2N2222
DS1
PTT
DS2
DCD
DS3
PTT
J1
J2
to Terminal
Y1
10 - MHz
Ceramic
Resonator
Y2
3.58 MHz
Ceramic
Resonator
W1 *
OUTPUT
LEVEL
+8 to
15 V
+5 V
Except as indicated, decimal values of capacitance are in microfarads (μF); others are in picofarads (pF); resistances are in ohms; k = 1,000.
n.c. = Not connected
* See text

Figure 1

Figure 1—Schematic of the KISS TNC circuit. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or metal-film units. Equivalent parts can be substituted; n.c. indicates no connection. JDR = JDR Microdevices, 1850 S 10th St, San Jose, CA 95112-4108; tel 800-538-5000, 408-494-1400, fax 800-538-5005, 408-494-1420; http://www.jdr.com, Mouser = Mouser Electronics, 958 N Main St, Mansfield, TX 76063-4827; tel 800-346-6873, 817-483-4422, fax 817-483-0931; sales@mouser.com; http://www.mouser.com.

C1-C11—0.1 µF monolithic (JDR 0.1UF-MONO)
C12—220-µF, 35-V electrolytic (JDR 220R35)
DS1-DS3—LED
J1—PC mount 5-pin DIN socket (Mouser 161-0503)
J2—PC mount DB9F (Mouser 152-5609)
Q1—2N2222
R6—10-kΩ PC-mount trimmer pot
U1—*Programmed* 16F877-20P microcontroller; see Note 2.
U2—62256LP 32 kB static RAM (JDR HM62256LP-10)
U3—MAX232CPE RS-232 transceiver (JDR MAX232CPE)
U4—MX-614 modem (available from http://www.tapr.org)
U5—78L05 5-V, 100-mA positive voltage regulator
Y1—10-MHz ceramic resonator, with capacitors (Mouser 520-ZTT400MG)
Y2—3.58-MHz ceramic resonator, with capacitors (Mouser 520-ZTT358MG)
Misc: Enclosure, PC board (see Note 2), hardware, IC sockets



A top view of the KISS TNC.

converts them into standard 1200-baud Bell 202 modem tones that can be fed directly to the radio. It also converts the received tones into TTL-level signals for interpretation by the PIC.

Operating Instructions

The first time you use the KISS TNC, configure it using a computer that can run a terminal program. Attach the DB9 connector to any serial port on your computer using a standard serial cable. Set the computer's software to communicate at 1200 baud, 8 bits, no parity. In the terminal program, turn off hardware and software flow control. Install jumper W1 on the TNC's board (this places the TNC in terminal mode). Apply power to the unit. You should see a menu that looks like this:

Configuration Menu
1 Operating Mode
2 Set TX Delay
3 Set Terminal Baud Rate
4 Set APRS Parameters
E Erase All Parameters
Selection:

The first time you run the KISS TNC, it's a good idea to choose **E** to erase all parameters. Selecting item **1** allows you to determine whether the device will be operating in KISS mode or APRS Tracker mode. Menu item **2** allows you to set the TX Delay. Item **3** allows you to set the terminal data rate. This is the rate at which the TNC communicates with the attached computer both in terminal mode and when operating in KISS mode. Remember, KISS mode does not support any type of flow control. If you set the terminal rate to a level that's faster than the data can be sent over the air and then use the device to transmit large files, the TNC's memory buffer will eventually be exhausted and data lost. Thus, it's probably a good idea to leave this set at the default (1200 baud).

If you are going to use the TNC in APRS mode, you will also need to select item **4** from the menu to set the appropriate parameters for APRS. The following menu allows you to set these parameters:

Current APRS Parameters
1 Station Call sign: W2FS
2 First Path Call sign: RELAY
3 Second Path Call sign: WIDE
4 Third Path Call sign: WIDE

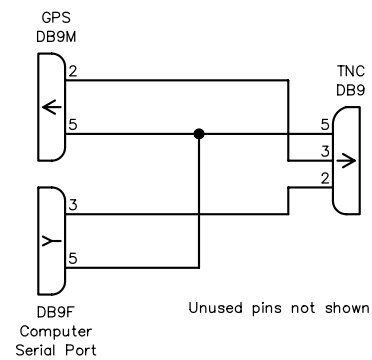


Figure 2—Using a Y adapter with the KISS TNC allows you to connect a GPS receiver and monitor incoming packets. A cheap and easy Y adapter is shown in Figure 3.

5 Icon Number: 3E
6 Alt. Icon Table? (Y/N): N
7 Delay Between Xmit (×10 seconds): 00
8 Quiet Time (in seconds): 00
9 Message Number: 1
A Set Beacon Rate: 02
B Beacon Text: This is a test of my PIC-based KISS TNC
Select Parameter to Change:

Item **1** allows you to set your call sign. It also allows you to specify the SSID to be used. The SSID should be entered as a single digit in hexadecimal format. That is, if you want the call sign W2FS-10, you should enter that as W2FS with an SSID value of A. In items **2** through **4** you can set a path that is up to three call signs long. The next two items (**5** and **6**) allow you to select the icon that is displayed when your station appears on APRS maps. Item **7** allows you to specify the length of the period between position beacons. If you set this value to zero, the unit will never beacon; it will simply monitor the frequency and display received packets. If you don't have a GPS receiver connected, set this value to zero. When the TNC is preparing to transmit a position report, it waits until it receives data from the GPS receiver. If no GPS receiver is connected, make sure that the TNC never tries to beacon, because it would wait forever to receive data from a nonexistent GPS receiver.

Table 1
KISS TNC DB9 Connector Pin-Out

Pin Number	*Function*
1	Transmit Audio
4	Receive Audio
2	Ground
5	Not Connected
3	PTT

The unit will not transmit an APRS position until the radio channel is clear. If you decide to delay transmission for a greater period after the channel is clear, you can set the quiet-time parameter to some value other than zero. Quiet time specifies the number of additional seconds that the unit delays transmitting.

Item **9** on the parameter menu specifies the message number (or "position comment" in Kenwood D700 terminology). You may select any one of the following:

0 Off Duty
1 Enroute
2 In Service
3 Returning
4 Committed
5 Special
6 Priority
7 Emergency

Menu item **A** specifies how frequently the unit should transmit the beacon text. Specifying 02, for example, indicates that the beacon text should be sent every second transmission. When values are specified as two digits in the menu, *two digits must be entered*. Thus, enter 02, not 2. Item **B** specifies what the beacon text will be.

When you are satisfied that you have specified all of the parameters correctly, remove jumper W1 and cycle the power off and on to force the unit to reboot in the proper mode.

If you want to use the unit in KISS mode, simply connect a standard serial data cable to the unit's DB9 connector (J2) and a radio connector to the DIN socket, J1. The DIN socket pin-outs are identical to those used on PacComm and MFJ TNCs, so that any existing cable of this type will work with this TNC as well. The pin-outs (in the order they appear on the connector) are shown in Table 1.

Usually the KISS program asks you to specify which TNC type you are using. This is the case with *WinAPRS*, for example. This information is required because the software needs to know which command to send to the TNC to place it in KISS mode. When using the KISS TNC, this setting is irrelevant because the unit is always in KISS mode. As a result, it doesn't matter which type of TNC you specify. There have been reports of some types of TNCs accidentally falling out of KISS mode. This should never be a problem with this TNC because KISS is its primary operating mode.

If you want to use the device to monitor UI frames, but don't intend to connect a GPS receiver, you can use the same hardware configuration that you used for KISS mode. Just remember to set the mode to APRS and to set the delay between transmissions to zero. If you want to connect your GPS unit to the KISS TNC, but don't care to connect a terminal to monitor incoming packets, you will need to connect the GPS unit to the TNC's serial port through a null-modem adapter. If you want to connect the GPS unit and also monitor incoming packets, you'll need to construct a simple **Y** adapter as shown in Figures 2 and 3. The adapter routes the GPS transmit-data line to the TNC's receive-data line and the TNC's transmit-data line to the computer's serial port receive-data line.

Construction Tips

I've built several of these units on pieces of RadioShack perfboard using point-to-point wiring, but this construction approach is rather difficult because there are quite a few wires interconnecting the PIC with the static RAM chip. Consequently, a substantial potential for wiring errors exists. A PC board is available for this project, as is a kit of parts (see Note 2). The PC board requires the installation of several wire jumpers. To ensure that the board works properly, install all of the parts, including the IC sockets, but *do not* install any ICs. Then, carefully observing proper polarity, apply power and ensure that approximately 5 V is present between the following pin pairs:

U1 socket pins 11 and 12 (pin 12 is ground)
U1 socket pins 31 and 32 (pin 31 is ground)
U2 socket pins 14 and 28 (pin 14 is ground)
U3 socket pins 15 and 16 (pin 15 is ground)
U4 socket pins 8 and 16 (pin 8 is ground)

When you're sure there are no cold solder joints or solder bridges, install the four ICs and apply power. Total TNC current consumption is less than 20 mA; most of that is consumed by the LEDs. You can reduce the current consumption by increasing the value of the current-limiting resistors (R10-R12), or you can omit the LEDs altogether. In this case, it should be possible to run the unit for several days on a 9-V battery.

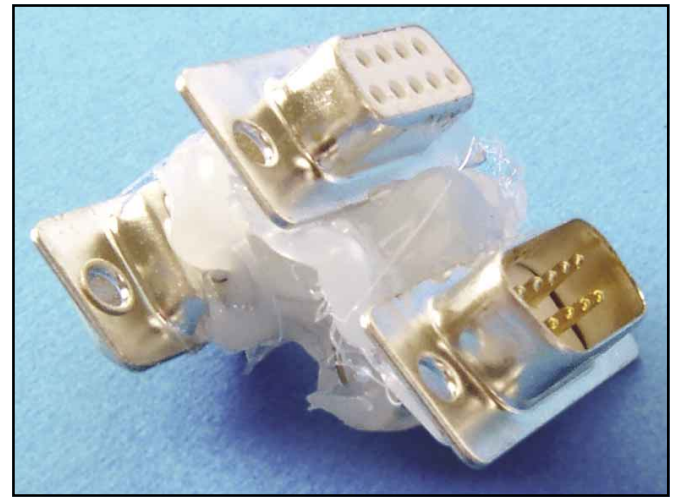


Figure 3—This simple Y adapter consists of one female DB9 socket interconnected with two DB9 male jacks, all held together with noncorrosive sealing compound.

Summary

PIC microcontrollers have rapidly become a staple of Amateur Radio construction projects. This project demonstrates one of the reasons that this has occurred. PICs are extremely flexible devices that can perform the functions of ICs that are considerably more expensive and consume much more power. We are just beginning to explore the range of amateur applications for these inexpensive, powerful devices.

Notes

[1]The APRS Mic-Encoder format compresses the APRS position report and message bits into the destination address and information fields of a standard AX.25 UI frame. For more information, see **http://www.tapr.org/tapr/html/mic-e.html**.

[2]A complete kit of parts including the PC Board, a *programmed* PIC16F877 and all other parts (except an enclosure) are available for $65 from John Hansen, W2FS, 49 Maple Ave, Fredonia, NY 14063. A *programmed* PIC16F877 only is available for $35. A wired and tested board is also available for $90. PC boards for this project are available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118-9269; tel 847-836-9148 (voice and fax). Price: $8 plus $1.50 shipping for up to four boards. Visa and MasterCard accepted with a $3 service charge. You can download th es ource code (KISSTNC.ZIP) for this project at **http://www.arrl.org/files/qst-binaries/**.

49 Maple Avenue
Fredonia, NY 14063
john@hansen.net

LogWindows 3.07.30

Although *LogWindows* is primarily a logging program, it combines this function with transceiver and rotator control, PacketCluster monitoring, award tracking and QSL management into an integrated system. Additionally, the program is frequently updated to accommodate new hardware and add new features.

The first step in getting acquainted with *LogWindows* is to crack open the very thorough 170-page manual. It reminds me of an adage in public speaking: In order to get your point across, you have to tell your audience what you will be telling them, then tell it to them and finally tell them what it was you just told them. In other words, repetition is one of the best ways to commit something to memory.

Easy Navigation

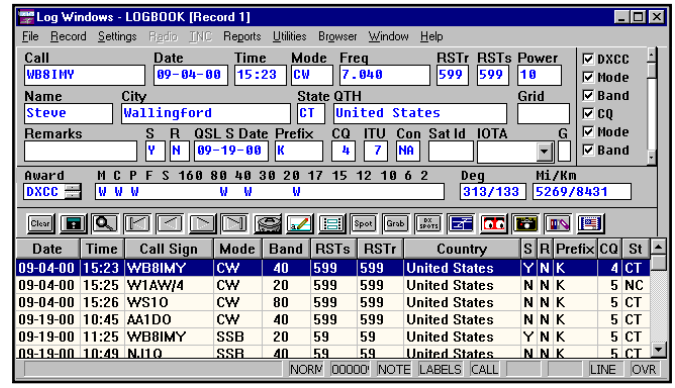
The program's main window is well organized. Data to be entered appears in the top portion, the bottom portion can be either a "terminal" (PacketCluster display) or a "browser" for contacts logged, and in between there is a row of boxes and a bar of buttons. The buttons perform special functions and the row of boxes indicates the direction and distance to the displayed contact as well as showing your progress toward earning particular awards. When the "terminal" is selected, there is also a row of buttons at the bottom of the terminal portion that are user-defined (typically used for PacketCluster command shortcuts). At the very bottom of the main window is a Status Bar showing some current program settings and messages to the user.

As expected, the data entry section includes fields for Call, Date, Time, Mode, Freq., RST Sent and Received, plus Power. Optional fields are available to enter Name, City, State, QTH, Grid and Remarks, plus QSL status and awards. The Remarks box is for brief comments; for more detailed comments there is a 255-character Operator Notes window that is opened and closed as needed (the notes are tied to the call sign, so the same notes appear for a particular call).

Buttons, More Buttons

The button bar is a row of icon type buttons that are used for the most common operations. The default buttons are: Clear, Save, Find, Go to First Record, Go to Previous Record, Go to Next Record, Go to Last Record, Delete Record, Open Notes Window, Print Label, Spot DX, Grab DX Spot, List Spots, Rotor Control, Pop-Up Database Browser, Capture TNC Data, Query Callbook and Query QSL Manager. Some of these items require appropriate hardware and/or software. For example, if you don't have a TNC, the DX Spot and Capture TNC Data functions will not be active. For those who prefer keyboard operations, there are also "hot-key" equivalents for each button.

Naturally, the Clear button empties all the entry fields so you can log a new contact. (The Date and Time fields are filled in for you and the Mode and Freq fields remain at their last settings. The RST and Power fields also receive default values.)The Save button preserves the data shown and the contact is not logged until the record is saved (so you can make as many changes as you need to before saving). To use Find, you clear the entry fields, type in a callsign or a partial call (with an "*" wildcard character) and click the magnifying glass. The data entry fields will display the first matching record and the browser (if selected) will show all matches. Other fields you can search by are Date, Prefix, State, QTH, Grid, CQ Zone and Continent. Band and Mode are ignored so you can't



search for all your CW contacts on 40-meters, but there is another way to do that (more on this in a minute). You can sort search results by Band, Call, Zone, Date, Mode, Prefix and State.

The record navigation buttons are very straightforward and they use arrow symbols similar to those on a VCR. The Delete button (a trashcan icon) removes the current record from the saved log. However, if you saved a record with a mistake in it, you don't have to delete it and reenter from scratch; instead you use Find to locate the record, fix the mistake and use Save to update the entry. The Open Notes window button (notepad with a pencil symbol) pops open a small window showing the operator notes. The print labels button (the icon is old style pin-feed address labels) prints labels for all the contacts you have marked for QSLing.

LogWindow's Spot, Grab and DX Spots (list) buttons gives folks with a TNC and access to PacketCluster node easy ways to log and "spot" DX stations. The Capture TNC Data (a camera icon) button allows you to save data from the TNC to a file. Lacking a rotator controller interface, I wasn't able to test the direction control (represented by a Yagi icon button).

Database Browser

The Database Browser window (a pair of eyes is the button for this) opens another window similar to the main window browse area, but with some additional search capabilities. In this window, you define a "query" (database lingo for search parameters). A query can be any combination of Date, Prefix, Zone, State, Band, Mode, and QSL status, with an additional box that lets you exclude up to 100 prefixes from the results.

The *Callbook* lookup button lets you query a callsign CD-ROM (all the ones I know of are supported) for address information and the Query QSL Manager button (a QSL card) will search an external QSL manager database for QSL route info. If you don't have a separate QSL manager, you can use the LWQSLMgr that is included with *LogWindows*.

Although the number of features included may seem overwhelming, the organization and screen presentation makes using this program a snap. *LogWindows* brings order to your station chaos, and it is a breeze to use!

Manufacturer: SCO, Inc (Les Scofield, W4SCO) with sales, support and development by Creative Services Software, 503 West State St, Suite 4, Muscle Shoals, AL 35661; tel 256-381-6100; fax 256-381-6121; **sales@logwindows.com**; **http://www.logwindows.com/**. *$69.95.*

Next Short Take

Michael Tracy, KC1SX ♦ ARRL Laboratory Engineer

RITTY 4.0

Several years ago, Brian Beezley, K6STI, developed one of the first high-performance RTTY programs for sound-card equipped PCs. Brian's *RITTY* software became extremely popular in the amateur digital community overnight. Actually, it was a little *too* popular. Before long, software pirates had copied *RITTY* and posted it on various Internet sites. That was the end of further *RITTY* developments—or so we thought.

We're happy to report that *RITTY* is back, and with improvements that make it well worth the wait.

What is *RITTY?*

For the uninitiated, *RITTY* is software that allows you to send and receive amateur radioteletype (RTTY) with a 486 DX or faster PC equipped with a 16-bit SoundBlaster-compatible sound card. *RITTY* is *DOS* software, but it can run in a "*DOS* window" in *Windows* on most Pentium-class PCs.

Instead of relying on an external interface to convert receive audio to data, and transmit data to audio, *RITTY* uses the sound card to perform the same tasks. This means you can send and receive RTTY with nothing more than your computer (even a laptop) and an SSB transceiver. Hardware connections for receiving involve an audio cable between your radio's line-level audio output (or external speaker) and the **MIC** or **LINE** inputs of your sound card. To transmit you need another audio cable between your sound card **LINE** or **SPEAKER** outputs and the auxiliary or microphone input of your radio. In addition, you'll need a keying interface (either a simple single-transistor homebrew circuit, or something more sophisticated such as a RIGBlaster interface) connected to your computer's COM port. Alternatively, you can allow the transceiver's VOX to do the keying. (*RITTY* also supports FSK keying if you can homebrew a dual-transistor interface for the COM port.)

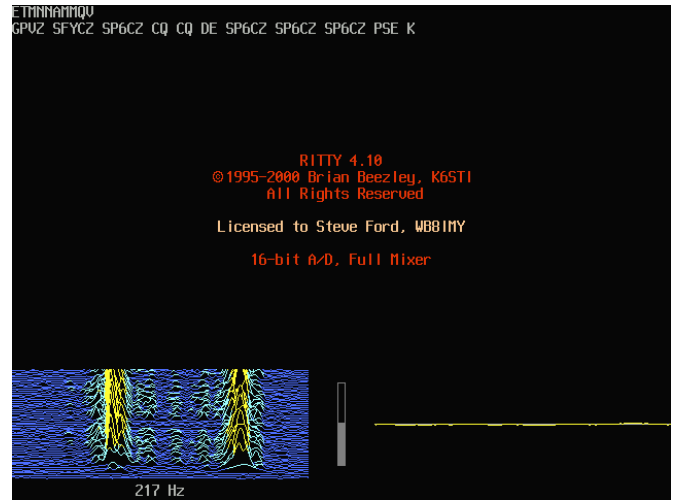
Turbo DSP

At the heart of *RITTY* are its high-performance digital signal processing algorithms. It's obvious that Brian has spent a great deal of time devising solutions for the peculiar problems of HF digital communication. Copying 1s and 0s while dealing with polar flutter, multipath, interference and noise isn't easy. Although *RITTY* doesn't claim to have conquered all of these gremlins completely, Brian has incorporated a number of effective DSP tools designed for troublesome conditions.

Take polar flutter, for example. Polar flutter amplitude-modulates a signal, generating incidental sidebands beyond the standard- or narrow-detector passbands. Depending on the severity, this can make decoding almost impossible. *RITTY* provides a special detector for polar flutter that uses wider channel filters to recover spread power. Like *RITTY*'s matched filters, its polar filters inherently have zero intersymbol interference. This property allows recovery of bits that flutter right down to the noise floor.

RITTY On the Air

Despite its technical sophistication, *RITTY* is simple to use on the air. The left-hand graph shows one of two spectral tuning indicators. If you opt for the line display, you see a horizontal line



***RITTY 4.0* on the air using the 3-D waterfall tuning display**

that seems to quiver slightly with the incoming noise. As you tune across a RTTY signal, the mark and space tones appear as twin spikes. The higher the spikes, the stronger the signals. *RITTY* locks onto the signals immediately and text begins marching across the black screen. Option two is a three-dimensional "waterfall" display in which RTTY signals look like ocean waves or mountain peaks moving from the bottom to the top.

The right hand graph displays one of three waveforms. The character waveform shows the demodulated mark-minus-space signal for one character length. The red tic marks locate samples for the start pulse, the five data bits, and the stop pulse.

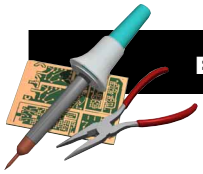
When you begin typing, your text appears in the transmit buffer window, but will not be transmitted until you actually press the **PAUSE** button on your keyboard. As the characters are transmitted, they change from white to blue. You also have up to 12 macro keys that can be programmed with "canned" messages.

My performance tests were purely subjective, but the results were impressive just the same. I used *RITTY* during the SARTG RTTY Contest last August. In terms of coping with QRM on 20 meters, *RITTY* was the clear winner when I put it up against an external multimode data processor. *RITTY* also outperformed two other sound-card based RTTY programs that I had available at the time.

I had an opportunity to try *RITTY's* polar flutter decoder when I attempted to copy BY1DX on 15 meters in the late evening. His signals were extremely weak and unreadable with either the external multimode unit or my various sound-card programs. When I switched to *RITTY* and activated the polar flutter detector, the difference was astonishing. I could copy about 75% of BY1DX's transmissions, more than enough to make a contest exchange. Unfortunately, BY1DX couldn't hear me, but that has nothing to do with *RITTY!*

Manufacturer: Brian Beezley, K6STI, 3532 Linda Vista Dr, San Marcos, CA 92069; **k6sti@n2.net**. *$100 with delivery via e-mail, $5 additional for postal delivery. Check or money order only.* QST

Steve Ford, WB8IMY ♦ QST Managing Editor



By Rod Peterson, K4QG

Another Look At Tower Work

Say what? You don't have half-a-lifetime to accumulate tower-climbing experience? Fear not, future climber—K4QG is letting you in on all of his hard-won tips and tricks!

I've been climbing towers for more than 20 years—my own installations and more than 70 other projects. During all of those trips up and down the tower, I picked up a few tips to help you with your upcoming projects. Some are common sense. Some are related to personal safety. Some are handy timesavers. And some are things you probably wouldn't think of on your own!

Without further ado, let's get started.

Fall-Arresting Gear

I've seen people climbing towers without a belt or harness. My only comment on that subject is *don't*. Life is too short and safety equipment is too affordable to engage in a task with *zero* margin for error. And don't settle for grandpa's old lineman's belt that's been slowly rotting in the barn for the past 40 years. If you're spending hundreds of dollars on a tower, hundreds more on antennas and perhaps thousands on equipment, skimping on safety gear is penny wise and pound foolish.

And when using a belt or body harness, don't make the mistake of simply wrapping a lanyard around the tower and declaring yourself safe. If you slip, you'll still slide down the tower fast enough to cause injury or death. Instead, *hook the lanyard line onto the tower*, climb, re-hook, and climb again. This is a much slower climbing process, but hooking the line securely to the tower is your best insurance for safety.

Teamwork

If you're lucky, someone in your area will have tower-climbing experience. Get to know that person and ask a lot of questions. Perhaps you can volunteer for ground crew duty. That experience will stand you in good stead later on. If you can get permission, perhaps you can climb a tower or two as an assistant, gaining valuable on-the-job training.

New Technology

Several years ago I read about climbing towers while using carabiners and slings—standard rock-climbing hardware. Carabiners are rugged, oval-shaped alloy rings with spring-loaded gates. Slings are pieces of webbing sewn in loops of varying lengths. Tapping my slush fund, I made a couple of trips to a mountaineering supply store and stocked up on eight carabiners and ten slings. You can't have too many of these versatile items. They're incredibly handy for attaching tool pails to towers, hauling antennas, temporary ties, bracing, carriers, etc. In addition, they can be used as safety attachments, which is their original purpose. The 'biners are made of lightweight alloy, so half-a-dozen will barely add two pounds to the weight of your belt.

Tool Tip No. 1

You should learn early on to organize your tools and equipment *before* climbing the tower. Climbing down (and back up again) to fetch a forgotten tool gets old in a hurry. Of course, your ground crew can help with that. Most tools and many antenna system parts can be quickly sent up the tower by merely untwisting a section of rope, sticking the object between the strands, and releasing. The tension in the strands will grip a tool or part firmly for the trip up the tower. Larger items may require a trip in the bucket.

Tool Tip No. 2

To avoid the pitfalls of trial and error, I've assembled a standard kit of tools that is always in the tool pouch of my climbing belt. It consists of:

- A $^{3}/_{8}$-inch ratchet
- $^{7}/_{16}$, $^{1}/_{2}$ and $^{9}/_{16}$-inch deep sockets
- $^{7}/_{16}$, $^{1}/_{2}$ and $^{9}/_{16}$-inch combination wrenches
- A $^{5}/_{16}$-inch nut driver (fits hose clamps. Sears has some nice stubby ones.)
- An alignment tool (it looks like a tapered drift punch)
- A small hammer
- A folding knife
- An adjustable wrench
- A $^{3}/_{16}$-inch flat screwdriver
- A roll of plastic tape (Scotch 88 is a good choice)
- An all-purpose Leatherman tool

These tools handle 98% of my tower work. A friend uses a ratcheting box wrench instead of a combination wrench, but I use the latter for the odd times that I need the open end wrench.

Compatibility

In today's international marketplace, your shiny new ham antenna may have metric bolts and hardware. Be sure to select your tools accordingly. When building BX-type or 45G towers (anything besides Rohn 20/25), use the appropriate tools as necessary. It's a good practice to note wrench sizes for antennas,

The ONV full-body climbing harness. Available from ONV Safety Belt, PO Box 404, Ramsey, NJ 07446; tel 800-345-5634.

thrust bearings, weatherproof boxes, side-mount hardware, torque arm assemblies, etc. Document all necessary hardware so you'll remember to take the appropriate tools up with you the next time you work on that particular antenna system. You'll be amazed at what you'll forget over the years...

Specialty Tools

I bought a chain-grip—a chain plier/Vise-Grip combo—to work on a 40-meter beam that tended to rotate about the boom when I didn't want it to. I tried locking the boom with a strap wrench, which proved unsuitable for a variety of reasons. With the chain-grip in place, however, things stayed put and I could easily rotate the antenna in either direction.

Chain grips are also useful when it's time to orient an antenna array. Simply loosen the rotator clamp, turn the mast with the chain-grip and re-clamp. These strange-looking tools are worth their weight in gold when muscling big, heavy antennas.

Safety Talk

To paraphrase Norm Abram of *The New Yankee Workshop*, let's take a moment to talk more about personal tower safety. I've been wearing a hard hat on the tower for years. I rarely see others doing so, and people often joke about "tools not falling up." But my life has been saved twice because I was wearing a hard hat.

An ONV safety belt with seat harness.

They're cheap and comfortable, and if you take your climbing seriously enough to invest in a belt, harness and the proper tools, get a hard hat—no exceptions!

Hot flash: When doing tower work in hot, humid weather, stop working every now and then and take your hat off to allow heat to escape from around your head.

Don't cramp your style: If your fingers or forearms start to cramp as you're working, your body is producing lactic acid and you are at a critical energy juncture. Translation: *You've done enough!* Tidy up and climb down ASAP—and that doesn't mean finishing whatever you were doing. Simply secure things that could fall or break and start down. And make sure you're attached to the tower at all times on the way down. If you're already cramping you can no longer depend on your grip. Once you're safely on the ground, have an electrolyte-rich sports drink or a banana or two to replace lost potassium.

Liquid refreshments: In addition to providing refreshments for your ground team—an accepted part of the "cost" of such a team—take a bottle of water up the tower with you. There's nothing worse than "tower-top cotton mouth." You generally won't have to worry about "disposing" of the water, either. While working hard on a hot summer day you'll have little inclination to visit the powder room. Of course, it goes without saying that "adult beverages" are strictly off limits.

Razors on the Tower

To avoid nasty gashes and keep your hands free from crud, always wear leather gloves while climbing towers (up and down). Did you ever take a close look at a galvanized tower section? When the manufacturer dips the section in molten zinc, some of the zinc flows off, cooling before it's completely detached. Some of these "zinc drips" are extremely sharp and can deliver some nasty cuts if you slide your hand along the edge. Also, your unprotected hands will get pretty grimy from the zinc residue, making them slippery. Tower work with slippery hands is a recipe for disaster!

Footwear is the Foundation of your Sole

Rugged work boots with steel shanks are worth their weight in gold. Your feet and back will thank you. A trip up a tower in flimsy shoes (or running shoes) will make that clear in a hurry!

Who's Running this Operation?

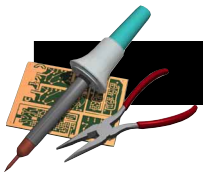
The person who generally has the best overall view of things—and the one who is taking the greatest risk—is the person who is on top of the tower. He (or she) is the boss. If he says, "stop," don't question or argue, just stop. If he says, "look out," don't look up—move! That doesn't close the door to suggestions from members of the ground crew, but there's only one *boss* on a tower project, and if you're not on the tower, you're not it.

Last Word

Tower work isn't for everyone. It can be hard, dangerous and unforgiving. It requires concentration and attention to detail (such as attaching safety straps *before* leaning back). If you aren't at least a little uneasy when you're up on a tower, you aren't normal. If your uneasiness gets in the way of working upstairs, however, the job may not be for you. If you respect the danger and unease you can work alongside it. If you fear the danger and unease, get someone else to do your aerial work. There's certainly no shame in that. Chances are good that there are several hams in your area who can handle the high stuff on your behalf.

Stay safe!

2781 Taft Street
#109
Hollywood FL 33020



By H. Ward Silver, N0AX

Test Your Knowledge!

Are you an Amateur Radio bookworm?

The ARRL Handbook is one of the hobby's great success stories, and one of the longest running technical publications in history. But how much do we know about this book and other Amateur Radio "bibles"?

1. When was *The ARRL Handbook* first published?
a. 1915
b. 1926
c. 1935
d. 1946

2. The *Handbook* begins with what?
a. FCC Rules
b. A quote from Hiram Percy Maxim
c. The Amateur's Code
d. A photo of the Wouff Hong

3. *Antennas*, a leading text on antenna theory and design, was written by…
a. Kraus
b. Yagi
c. Lawson
d. McCoy

4. Don Lancaster is the author of a popular series of design guides with what word in their title?
a. About
b. Cookbook
c. Handbook
d. Applications

5. What is the call sign of Bill Orr, author of a series of antenna design manuals?
a. K2GL
b. W0DX
c. W6SAI
d. W1BB

6. Bob Locher, W9KNI, is the author of *The Complete…*
a. *Contester*
b. *Ragchewer*
c. *QRPer*
d. *DXer*

7. What type of DXing is covered in ON4UN's latest book?
a. VHF
b. 10 meter
c. Low band
d. Long path

8. Who was the original creator of *The Second Op* DX reference aid?
a. W9IOP
b. W6AM
c. W4BPD
d. W4KFC

9. Who is the author of *The Op-Amp Cookbook?*
a. Carl Stallings
b. Stephen King
c. Doug DeMaw
d. Walter Jung

10. An early competitor to *The ARRL Handbook* was…
a. *The Radio Handbook*
b. *CQ World*
c. *IEE Compendium*
d. *Radio Experimenter*

Total Your Score!

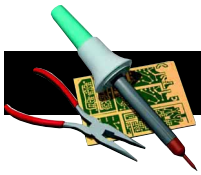
Count one point for each correct answer.

8-10	A literary genius!
4-7	A little dusty between the covers, but okay.
1-3	A visit to the library is in order.

22916 107th Ave SW
Vashon, WA 98070

Answers

1. b
2. c
3. a—Dr. John Kraus, W8JK, is also the inventor of the wire antenna of the same name.
4. b—Don's *TTL Cookbook* was one of the most popular design books ever published.
5. c
6. d
7. c—John's first book was *80-Meter DXing* and he sits atop the 80-meter DXCC totals today.
8. a—The distinctive wheel of Larry LeKashman's invention was an instant hit.
9. d—Walter's book has launched a million analog designs.
10. a—The *Radio Handbook* was edited by W6SAI in its later editions.



HINTS & KINKS

STRENGTHEN YOUR CUSHCRAFT D40 ROTATABLE DIPOLE

◊ My Cushcraft D40 has been a very effective antenna in terms of performance, but I prefer that it be mechanically stronger than it came from the factory. I was concerned about the physical strength of the antenna from the time I first purchased it. After I assembled the antenna, I measured its sag. The ends of the antenna hung 2 1/2 feet below the center! I recommend purchasing a D40, but I would reinforce it as described here before installing it.

In truth, the D40 served well for nine years before I finally decided to do something about it. A windstorm bent one side of the antenna where the aluminum tubing connects to the center mounting plate (see Figure 1). Even more ominous was the extreme distortion where the tubing attaches to the mounting plate (see Figure 2). Over nine years, the sag had now reached an incredible four feet from the center to the ends! Here's the fix.

The Elements

The tubing used in this antenna has a 1/16-inch-thick wall, and it is sold in 1/8-inch OD increments. This very common tubing should be easy to find. (Tubing with 0.058-inch walls is also available. It makes for an easier telescopic fit.—*Ed.*)

The center element sections must withstand the greatest bending moment, so I strengthen them by doubling the thickness of the first two sections (from the center out). I used an antioxidant paste[1] to lubricate the tubing and had no problem sliding smaller tubes into the larger ones. To do this, you will need two pieces of 1 1/8-inch-OD tubing 68 inches long and two pieces of 1-inch-OD tubing 48 inches long.

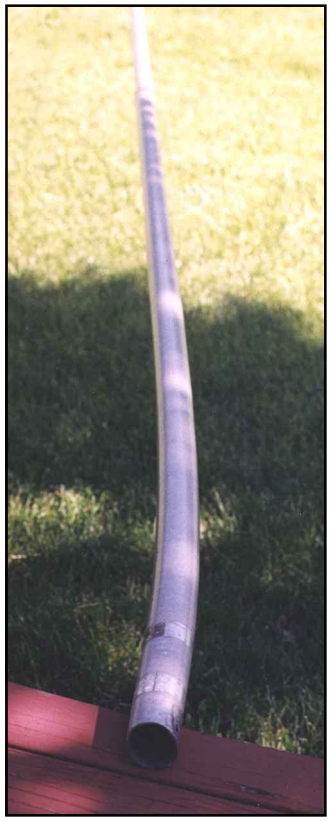


Figure 1—This bent tubing at the center mounting plate resulted from a windstorm.

The first center section is a 1 1/4-inch-OD tube 72 inches long. The second section overlaps the first by four inches, which leaves 68 inches open inside the first section. I inserted a 1 1/8 × 68-inch length of aluminum tubing inside the 1 1/4-inch section.

The second section is 1 1/8×48 inches. Since the third (1-inch diameter) section overlaps the second by four inches, I used 1×48-inch reinforcing tube that extends four inches toward the center from the splice made by the two 1 1/8 OD pieces. This ties everything together and makes a strong joint. When the stainless-steel hose clamps that hold the sections together are tightened, the inserts do not move from their assembled locations.

[1]Ox-Gard by GB Electrical. This is available at electrical supply houses. Any similar product would work as well.

Shortly after I erected my first antenna, the screws that hold the aluminum rods forming the X-shaped loading elements worked loose and fell off. To save yourself a lot of grief, use jam nuts and seal the nuts with glue to prevent them from working loose.

The Center Mounting Plate

The original center mounting plate is 1/4×4×10-inch aluminum. It has four plastic "clamps" to attach the elements to the plate, two on each side. These plastic clamps had become severely distorted. I replaced the original mounting plate with a larger one measuring 1/4×4×24 inches and purchased four more clamps, for a total of four on *each side*.

I discovered that the plastic clamps are manufactured by Stauff Company and are used for pipe clamps in industrial applications. My local distributor sells them for much less than Cushcraft does. They will sell them by mail order and send them out by UPS.[2] The part number for the plastic clamps is 5320-PA. That is the part number for polyamide plastic, profiled inside, with tension

[2]Carrier-Oehler Company,16965 Vincennes, PO Box 40, South Holland, IL 60473-0040; tel 708-339-8200.

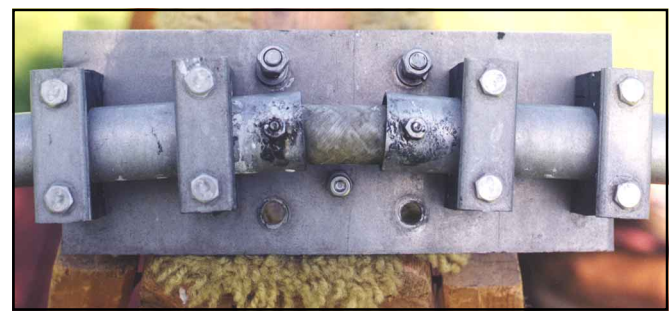


Figure 2—This extreme distortion where the tubing attaches to the mounting plate is ominous.

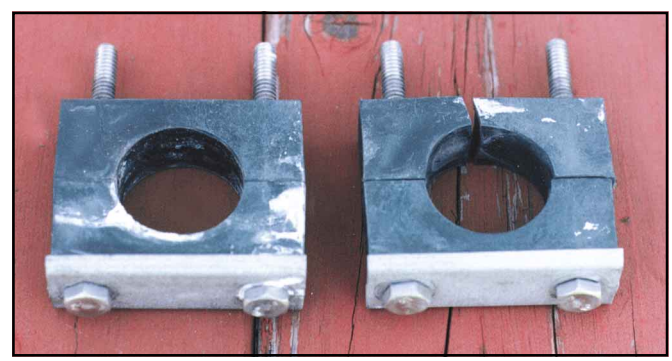


Figure 3—Broken plastic parts were evident when I took my antenna apart.

Bob Schetgen, KU7G ♦ Senior Assistant Technical Editor

Figure 4—The strengthened antenna mounted on my improved mounting assembly.

clearance, for 1 1/4-inch OD tubing. The part number for the stainless steel cover plates is DP-5/SS. For four clamps, order eight 5320-PA and four DP-5/SS. Order them *without* weld plates and bolts, because the clamps will be bolted to the mounting plate with nuts on the back side of the plate. This application is different from the typical fastening method used with this product. You will need to purchase stainless steel bolts and nuts separately. They should be available in most hardware stores.

When I took my antenna apart, I discovered that some of the plastic pieces were actually broken (see Figure 3). The new clamps were of a slightly different height than the originals, but I compensated for the difference with stainless-steel washers between the clamps and the mounting plate.

The new mounting plate can be seen in Figure 4. The four larger clamps are the new ones. Notice that I also added a 1/4×20 screw at the center of the plate, which extends into a matching hole, drilled in the wall of the mast. This prevents the antenna from turning in the wind. The plate is threaded to accept the screw. After tightening, the screw is held in place with a jam nut.

After my antenna had been up for a number of years, I had a problem with the coax connections loosening at the antenna. The problem was caused by birds sitting on the coax. My cure is to use jam nuts on the antenna terminal and tape a brace from the mast to the coax that supports the birds. The birds love to sit on my antennas! Before you put your antenna up, make sure that the terminal screws you got from Cushcraft are long enough for jam nuts. Mine were not and had to be replaced.

The Finished Product

When the modifications were complete, the sag at the antenna ends was slightly under one foot! This appears to be a very worthwhile and cost-effective way to improve the strength of a very good antenna. I am very pleased with the results that I've gotten with my D40 in the last nine years and I would buy another one, but I would strengthen it before erecting it.—*George Zurbuchen, K9CC, 10515 Hillcrest Dr, Palos Park, IL 60464;* **George.Zurbuchen@cognis-us.com**

FEEDBACK

DOX CONTROL FOR A YAESU FT-847

◊ I just got my first e-mail from an observant DOX constructor (*QST*, Sep 2000, p 68). He points out that R1 is incorrectly labeled R21 in the hint. Another and more grievous error is that the tip and sleeve connections on J3 are reversed on the schematic. Pin 1 should be the tip and pin 2 the sleeve of J3. (*My fault—KU7G.*) In my circuit, I did not use jacks at all, but cut the RadioShack cable in half, stripped the cut ends and soldered them directly to the circuit. (I hate using connectors if they are not necessary, especially for low-level audio.)

In addition, I want to point out that this interface is also useful on rigs that require a separate PTT line. In that case, connect the right-hand (+) terminal of C1 to the mic input, omit R3, and connect the drain of Q1 to the PTT line.—*David Smoler, AD6KI, 19982 Charters Ct, Saratoga, CA 95070-4458;* **ad6ki@earthlink.net**

Starting Screws in Tight Places

◊ My aging eyes introduced a typographic error in Hugh Inness-Brown's call sign (*QST*, Sep 2000, p 69). It should read W2IB.—*Bob Schetgen, KU7G*

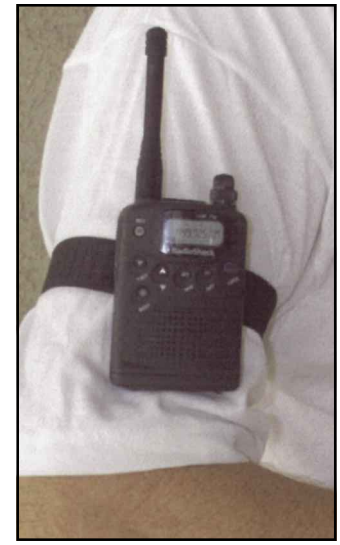


Figure 5—W7VEW's "arm holster" for small H-Ts.

AN "ARM HOLSTER" FOR YOUR H-T

◊ What a treat to see all the tiny H-Ts on the market. The problem with these little gems is where to carry them. While they easily fit in a shirt pocket, the display is not visible there and the antenna is often against your body. Because they're so light, it's possible to carry them right on your arm in my "arm holster."

What's an arm holster? It's the best thing to hold your lightweight H-T: a simple elastic strap that snugly fits your biceps. (See Figure 5.) A friction buckle lets one strap adjust to fit many arm sizes. With the strap in place, slide the radio belt clip over it. The radio is held safely with the display near eye level and the antenna at shoulder height. With the antenna so high and clear, reception is much better than with the radio on your belt or in a pocket. It is so nice to see the display, and be able to change frequencies without removing the radio from my belt.

Some radios—such as the Alinco D series—have no belt clip. To accommodate them, sew a two-inch strip of hook-and-loop fastener (hook side) onto the strap and install a similar loop-side self-stick strip on the radio.

For larger radios, increase the width of the elastic strap. A two-inch wide strap works great for the larger units.—*Steve Kimber, W7VEW, 180 N 1100 E #12, Washington, UT 84780;* **ckimber@infowest.com**

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

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters (see page 10), or via e-mail to **rschetgen@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

NEW PRODUCTS

PHILLIPS ECG LAUNCHES NEW LINE OF CHEMICALS

◊ Philips ECG, in an alliance with ITW/Chemtronics, has expanded their selection of electronic specialty chemicals.

In addition to the chemicals, swabs, wipes, solders and desoldering wicks previously offered, the recently added products include new lines of dusters, cleaner/degreasers, contact cleaners, flux removers, freeze sprays and conformal coatings.

For more information on these new offerings or to locate an ECG distributor in your area, call 800-526-9354 or visit their Web site at **http://www.ecgproducts.com/**. Phillips ECG, 1001 Snapps Ferry Rd, Greenville, TN 37744; tel 423-636-5688, fax 423-636-5809. QST

Next New Product

Yaesu MARK-V FT-1000MP HF Transceiver

Reviewed by Rick Lindquist, N1RL
Senior News Editor

When we first spotted the MARK-V FT-1000MP at the Yaesu booth at Dayton Hamvention 2000, we immediately began puzzling over the model nomenclature. We initially wondered what had happened to the MARK-I, II, III and IV. Had there been protypes of these models that never made it into production?

The mystery was soon solved. Glossy advertising brochures on the MARK-V touted five major refinements in the new version: higher RF power output (200 W), a 75 W Class-A mode, interlocked digital/analog bandwidth tracking, a receive preselector and enhanced ergonomics.

It has been five years since the original 'MP appeared on the market (see "Product Review," *QST* Apr 1996). In the intervening years, the (MARK-0?) FT-1000MP has become the reputed gold standard among many serious DXers and contesters. A proven "competition-grade" performer, the FT-1000MP is a veteran of the last two World Radiosport Team Championship events and countless contests.

When it comes to new gear, expectations always are high and frequently vastly overblown. The amateur community's elite corps naturally wants to know what Yaesu has brought to the table this time around. It's a lot like software. Is the MARK-V a major upgrade or an incremental one?

Or, perhaps more to the point: Did Yaesu incorporate all the things I longed for (but didn't find) in my original 'MP (or the earlier FT-1000)? And—the burning question of questions in hamdom—how much is my 'MP (or my FT-1000) worth now if I decide to trade up?

Without reiterating what some readers already will know, the original FT-1000MP is a full-featured competition-grade transceiver. It incorporates a main receiver and an in-band-only sub-receiver, digital signal processing, a vast arsenal of QRM-fighting features including crystal and mechanical filters, and lots and lots of flexibility.

The MARK-V is not fundamentally different in terms of its overall design architecture. If the original 'MP were a three-scoop ice cream sundae, the MARK-V is all that plus whipped cream with a cherry on top. In a real china dish, not a plastic cup.

Since we're looking at an upgrade of an existing product model here, this review will concentrate on how the MARK-V differs from—or stacks up against—the original 'MP. We would encourage readers to consult the original FT-1000MP product review for our insights and perspectives on the 'MP platform.

Technology Marches On

Five years is an eternity in the current technological environment. It would not be unreasonable to have expected the MARK-V to be a complete retooling of the FT-1000MP. A lot of very neat transceivers with myriad you-just-gotta-have-this features have come down the pike in the intervening years. We've seen significant improvements in the area of transceiver displays, digital signal processing technology, physical and ergonomic design, and flexibility through various user-settable adjustments.

When it was the new kid on the block in 1995, the original 'MP was among similar peers—the IC-775DSP and the TS-870—and DSP was still golly-gee-whiz stuff. At this point, it will be interesting to see how this unit stacks up in a marketplace awash with products bearing innovations that have appeared since the 'MP was a youngster.

So, where does the MARK-V fit into the lengthy technology parade? The MARK-V is a joy to behold with its slightly bolder styling and plethora of front-panel knobs and buttons—92 in all. This impressive new model has retained and, in some instances, significantly enhanced the performance of its predecessor while also retaining a few of its shortcomings.

Bottom Line

With a number of subtle enhancements, refined ergonomics and an all-new 200 W (Class A-B)/75 W (Class-A) MOSFET final amplifier, the MARK-V version of the FT-1000MP breathes new life into this proven competition-grade transceiver.

"I do think the Yaesu engineers tried to provide every feature needed for a competitive radio," one reviewer asserted.

While a few features failed to make the transition intact from the original 'MP to the MARK-V, the new radio incorporates some terrific technological advances. Like the original FT-1000, the MARK-V also puts 200 W of output power at your fingertips (that genetic trait must have skipped a generation). As one user said, "Having 200 W actually made it seem okay to just run barefoot."

All of this is built upon the solid (classic?) FT-1000MP foundation that serious operators have come to know and appreciate. The experiences of newcomers to this entry in the 'MP line likely will parallel those of the original FT-1000MP review team. This MARK-V 'MP is a transceiver with a steep learning curve and you still must learn to love it. By and large, our reviewers warmed to the MARK-V once they began to get a handle on it. It's quite a bit of radio.

Technological Innovation vs Window Dressing

Okay, so does the MARK-V represent *real* improvement or just so much window dressing aimed at getting additional mileage out of a proven platform? Inquiring minds want to know. Actually, it's a little of both.

We're sure Yaesu will want users to love the MARK-V for its mind, but let's focus on its looks and its ergonomics for a bit. This new 'MP at once looks a lot like the original—especially in the front panel—and yet different. The Euro look of its predecessor is still there. The more subtle differences become obvious upon closer inspection—and comparison with the original 'MP.

Perhaps the most striking physical feature is the obvious addition of the louvered heat sink cooling fins that occupy the top left-hand rear quadrant of the cabinet.

Joe Bottiglieri, AA1GW ♦ Assistant Technical Editor

Table 1

Yaesu MARK-V FT-1000MP, serial number 0F020049

Manufacturer's Claimed Specifications	***Measured in the ARRL Lab***
Frequency coverage: Receive, 0.1-30 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35,18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 MHz.	Receive, as specified; transmit, 1.5-2, 3.5-4, 7-7.5, 10-10.5, 14-14.5, 18-18.5, 21-21.5, 24.5-25, 28-30 MHz.
Power requirement: Receive, 2.3 A, 13.8 V dc; transmit, 14.5 A, 30 V dc and 2.2 A, 13.8 V dc (200 W output).	As specified.
Modes of operation: SSB, CW, AM, FM, AFSK.	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, 2 kHz bandwidth, 10 dB S/N: 0.5-1.8 MHz, <2.0 μV; 1.8-30 MHz, <0.16 μV.	Noise floor (MDS), 500 Hz filter: *Preamp off* / *Preamp on* 1.0 MHz: –115 dBm / –122 dBm 3.5 MHz: –127 dBm / –136 dBm 14 MHz: –127 dBm / –135 dBm
AM sensitivity, 10 dB S/N: 0.5-1.8 MHz, <13 μV; 1.8-30 MHz, <2.0 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation: *Preamp off* / *Preamp on* 1.0 MHz: 8.7 μV / 4.3 μV 3.8 MHz: 2.8 μV / 1.1 μV
FM sensitivity, 12 dB SINAD: 1.8-30 MHz, <0.5 μV.	For 12 dB SINAD: *Preamp off* / *Preamp on* 29 MHz: 0.72 μV / 0.3 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: *Preamp off* / *Preamp on* 3.5 MHz: 129 dB / 128 dB 14 MHz: 129 dB / 126 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 500 Hz filter: *Preamp off* / *Preamp on* 3.5 MHz: 98 dB / 94 dB 14 MHz: 101 dB / 98 dB
Third-order intercept: Not specified.	*Preamp off* / *Preamp on* 3.5 MHz: +24.3 dBm / +9.8 dBm 14 MHz: +25.7 dBm / +17.3 dBm
Second-order intercept: Not specified.	Preamp off, +68.3 dBm; preamp on, +68.5 dBm; with VRF on, preamp off, +110 dBm; preamp on, +112 dBm.[1]
FM adjacent channel rejection: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 85 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing, preamp on: 29 MHz, 79 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 99 μV; preamp on, 30 μV;
Squelch sensitivity: Not specified.	At threshold, preamp on: SSB, 14 MHz, 2.0 μV; FM, 29 MHz, 0.15 μV.
Receiver audio output: 2.0 W at 10% THD into 4 Ω.	2.9 W at 10% THD into 4 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth): CW-N (500 Hz filter): 439-925 Hz (486 Hz); CW-W: 440-1904 Hz (1464 Hz); USB-W: 376-2533 Hz (2157 Hz); LSB-W: 357-2247 Hz (1890 Hz); AM: 322-3550 Hz (3228 Hz).
IF and image rejection: main receiver, 80 dB; sub receiver, IF rejection, 60 dB; image rejection, 50 dB.	First IF rejection, main receiver, 106 dB; sub receiver, 104 dB; image rejection, main receiver, 98 dB; sub receiver, 90 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FM, 200 W (high); AM, 50 W (high).	CW, SSB, FM, typically 215 W high, < 1 W low; AM, typically 50 W high, < 1 W low.
Harmonic suppression: 60 dB. Spurious: Not specified.	49 dB.[3] Meets FCC requirements for spectral purity.
SSB carrier suppression: 40 dB.	73 dB.
Undesired sideband suppression: 55 dB.	84 dB.
Third-order intermodulation distortion (IMD) products: 31 dB at 200 W PEP; 50 dB at 75 W PEP (Class A).	See Figures 1 and 2.
CW keyer speed range: Not specified.	9 to 39 WPM.
CW keying characteristics: Not specified.	See Figure 4.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 22 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 12 ms; FM, 9 ms. Unit is suitable for use on AMTOR.
Composite transmitted noise: Not specified.	See Figure 3.
Size (hwd): 5.3×16×13.7 inches; weight, 31 pounds.[1]	

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

Third-order intercept points were determined using S5 reference.

[1]Noise floor with VRF on was –121 dBm with preamp off and –129 dBm with the preamp on for 20 meters.

[2]Does not include power supply.

[3]Spurious suppression. Harmonic suppression: 66 dB.

An expanded test result report for this transceiver is available on the ARRL Members Only Web site. Printed copies are also available for those without Web access.

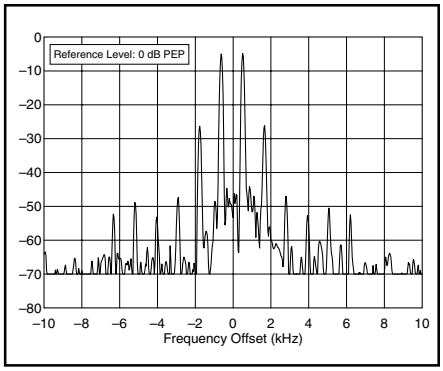


Figure 1—Worst-case spectral display of the MARK-V FT-1000MP transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 27 dB below PEP output, and the worst-case fifth-order product is approximately 48 dB down. The transmitter was being operated at 200 W output at 21.250 MHz.

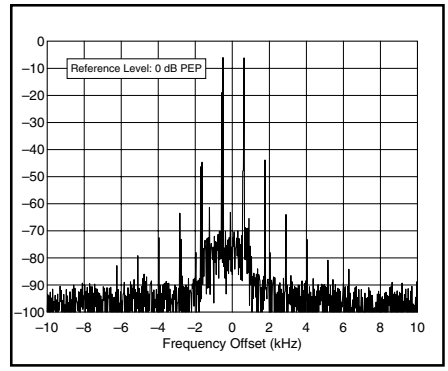


Figure 2—Worst-case spectral display of the MARK-V FT-1000MP transmitter during two-tone intermodulation distortion (IMD) testing in the Class A mode. The worst-case third-order product is approximately 45 dB below PEP output, and the worst-case fifth-order product is approximately 64 dB down (see text). The transmitter was being operated at 75 W output at 1.850 MHz. Note that the spectrum analyzer was set to a narrower scan bandwidth and a greater dynamic range (100 dB vs the 80 dB range that is normally used).

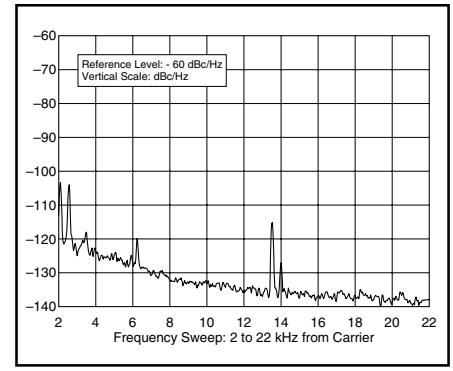


Figure 3—Worst-case spectral display of the MARK-V FT-1000MP transmitter during composite-noise testing at 3.520 MHz. Power output is 200 W. The carrier, off the left edge of the plot, is not shown. The plot shows composite transmitted noise 2 to 22 MHz from the carrier. Composite-noise testing in the Class-A mode provided similar results.

These, in combination with thermostatically controlled internal cooling fans, help dissipate the heat generated by the Philips BLF147 power MOSFETs that crank out the 200 W of RF. Less obvious is that the MARK-V is slightly smaller than the original 'MP, but not by much. We're talking fractions of inches here. And it's lighter by about two pounds—not counting the external power supply. More on that in a bit.

It just might be a subjective observation, but the MARK-V seems more hale and hearty than its predecessor.

MARK-V users liked the newly styled, slightly larger "rubberized" tuning knobs and the updated, larger, easier to grip anodized **SHUTTLE JOG** ring on the **MAIN VFO-A TUNING KNOB**. They also gave Yaesu high marks for replacing some of the smaller front-panel controls on the original 'MP with larger, rubber-grip units with calibrated knob aprons on the MARK-V. These small changes make a huge difference in the "look" of the front panel. The updates to the **MAIN VFO-A TUNING KNOB** and **SHUTTLE JOG** ring make it more pleasant to make large frequency excursions and to troll the band. The idea is you grasp the **JOG** ring on either side and twist it clockwise (to move up in frequency) or counterclockwise (to move down in frequency). Using the **SHUTTLE JOG** ring still takes a bit of practice to keep it under control.

A prime reason for the huskier **SHUTTLE JOG** ring on the MARK-V is that it now is home to two new control buttons. One button enables the new *Variable RF Front-End Filter (preselector)*; the other the new *Interlocking Digital Bandwidth Tracking* system—both of which we'll discuss in greater detail. "I didn't like the **VRF** and **IDBT** buttons on the **SHUTTLE JOG** ring," one ergonomics-conscious user said. "I kept thinking I was going to bump the dial if I tried to use them." They take some acclimation.

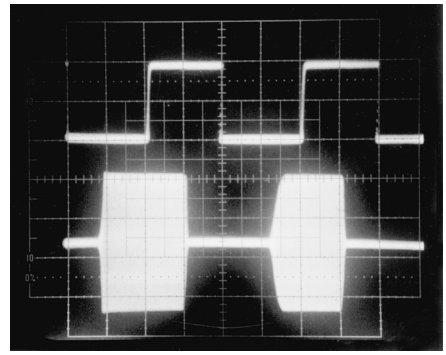


Figure 4—CW keying waveform for the MARK-V FT-1000MP showing the first two dits in full-break-in (QSK) mode. The equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output at 14.2 MHz.

On the subject of tuning: the direct digital synthesizers in the local oscillator are all driven from a single temperature-compensated master crystal oscillator. The resulting high stability, along with 13 user-selectable tuning steps that can be as fine as 0.625 Hz, should make the MARK-V popular with digital mode operators.

The display has undergone some minor but needed improvement. In the original 'MP, we'd noted that the inactive segments of the fluorescent discharge units "glowed faintly, especially at the high-intensity setting, making readability troublesome at most viewing angles." It appears that Yaesu has toned down the brightness of the fluorescent discharge display modules and used a darker lens to better hide the background. As we'd mentioned in the original 'MP review, the display is extremely busy—if you're not careful, it's easy to overlook that one function or another is enabled—or not.

Another change worth mentioning: In the 'MP, the AF gain controls for the main receiver and the sub receiver were concentric front-panel controls. In the MARK-V, Yaesu put the **RF GAIN** and **AF GAIN** controls for the main receiver on concentric knobs. The **SUB AF** gain control (which can also be set via a menu selection to serve as a main/sub balance control) has been relocated to the front-panel apron, where the **RF GAIN** control resides on the 'MP. Once they get the hang of where it is, most ops should find the new location more convenient (not all hams appreciate concentric controls), since the **SUB AF** knob is a control you'll use a lot in order to take maximum advantage of this transceiver.

We'd grumbled in the 'MP review that the proliferation of front-panel controls made some smaller controls hard to reach next to larger ones. The restyled knobs and some front-panel redesign has eliminated this issue. Reviewers also had complained that while using the concentric DSP and noise-reduction controls on the original 'MP, the RIT and sub-receiver knobs got in the way. This problem has gone away with the MARK-V, which has reconfigured the way you access the DSP functions to eliminate the rotary-style control. We'll discuss this further when we talk about how Yaesu has updated—and somewhat automated—the way DSP works in this newer 'MP.

Now For Something That's *Really* Different

In its advertising, Yaesu has been touting several brand-new aspects of the MARK-V not the least of which is the higher output power. As one user put it, "It's amazing what the feeling of an extra 3 dB

will do to your attitude." Another biggie is the Interlocked Digital Bandwidth Tracking System—or IDBT for short—which is aimed at simplifying and automating receiver DSP filtering. Then there are Yaesu's Variable RF—or VRF—front-end filter and the Class-A feature, both new with this model. Let's take a look at what Yaesu has added to the 'MP mix with this generation.

Interlocked Digital Bandwidth Tracking System

There's really not a whole lot you can say about the IDBT system because it pretty much does its thing without operator intervention. All you have to do is press the **IDBT** button on the **SHUTTLE JOG** ring. It's worth noting—because the *Operating Manual* does not—that IDBT only works in SSB.

The idea is that IDBT automatically matches up the bandwidth of the MARK-V's DSP passband with that of the IF filter passband. In practical terms, this means the DSP tracks the settings of the already very effective **SHIFT** and **WIDTH** knobs on the MARK-V. Yaesu says the idea is to eliminate having to make separate analog and DSP filter adjustments. In fact, Yaesu dropped the "bandpass" DSP filter selection on the MARK-V because IDBT makes it unnecessary.

The net effect is that with IDBT enabled, the MARK-V harnesses both digital and analog IF filtering for optimal impact on QRM. As one operator confronted with fools to the left and jokers to the right on a very busy 40-meter band described it: "I was able to work around loud signals about 1.8 kHz on either side just by using the **SHIFT** and **WIDTH** controls without IDBT, but switching in the IDBT cleaned up the annoying remnants."

Yaesu says the IDBT only works in SSB because that's where the greatest likelihood of a collision between wider and narrower bandwidths exists. On CW, Yaesu's philosophy is that the IF filters will do the job of rejecting QRM—assuming you've made the right selection and/or have the most effective filters installed—and you can resort to the narrow DSP CW Peaking Filter to bring very weak signals up out of the noise.

Enhanced Digital Signal Processing Enhancements

The number of EDSP "contours" in the MARK-V has been reduced from four to three, the "bandpass" setting largely obviated by the IDBT. Yaesu says the three available contours are "preset for different audio emphasis, using mathematical algorithms developed after thousands of hours of on-the-air testing." Pushing the contour buttons yields a visual cue: green for low-cut, orange for mid-cut and red for high-cut.

"The contour function was a good idea," one user proclaimed. "It's cool to listen to a pileup of stations and punch through the various contour options. You really hear stations come and go depending on where they are in the passband."

The EDSP **APF** (audio peaking filter) is great for weak-signal CW or data work. In CW, you can select from among 240, 120 or 60 Hz bandwidths. Somewhat like the **CONTOUR** settings for bandwidth, the **NR** (noise reduction) system permits the operator to pick one of four NR settings. One of these typically was more effective than the others in cutting back noise—even atmospherics. Some users still may wish for the sort of continuous adjustment available on other radios or on outboard DSP boxes, but these presets make for more snappy operating.

The EDSP functions, such as auto-notching, remain outside the AGC loop in the MARK-V. But in the case of notching, there's more than immediately meets the eye.

In addition to its DSP auto-notching capability, the MARK-V also lets you select a manual IF notch filter through the menu, and the DSP and IF notch filters can be cascaded. The manual IF notch is very effective and allows additional flexibility by letting you perform some filter shaping "on the fly." It can take a strong carrier out of the AGC loop, and the cascaded DSP auto-notch will eliminate any residual carrier audio bleeding through. The combination is quite formidable.

The EDSP still employs the 16-bit digital signal processing of the earlier 'MP, which runs at a 33-MHz clock speed.

EDSP is available in transmit as well, and the effects on your audio can be significant and even startling. It's possible to fashion everything from "contest" audio to "broadcast quality" by using the various EDSP menu settings in conjunction with tweaking the carrier frequency—also a menu option—to parameters that best suit your particular voice characteristics.

"The DSP feature was a plus," raved one reviewer. "I also had several unsolicited comments about the quality of the audio."

Variable RF Front-End Filter

This is a neat innovation that is another Yaesu exclusive, introduced with this model. Basically, VRF inserts a "preselector"—a tunable bandpass filter stage between the antenna and the fixed bandpass filters with their switching diodes—that's designed to offer additional protection from nearby strong signals in the bands from 160 through 20 meters. Yaesu says VRF is "ideal for multioperator contest environments." Although we did not have the opportunity to try it in one, we did find the VRF could be very effective—on the order of a few S units—in reducing "noise" from a very strong signal—even one in the same band. To get the maximum effect you might need to detune the VRF a bit away from peak sensitivity for the desired frequency. This will attenuate the signal, but the enhanced readability is worth the tradeoff. In the same regard, the VRF could be effective in cutting back "splatter" from a loud in-band signal too, although in most cases the other QRM weapons on board the MARK-V should do the trick as well or better.

Class-A SSB Operation

We've been particularly fussy over the years about how well transmitters are able to contain their higher-order intermodulation products on SSB. This aspect of performance can spell the difference between a transmitter that splatters and one that is kind to its neighbors. Yaesu's new Class-A function, available at the touch of a button, puts the RF output amplifier stage into IMD-friendly Class A mode. The idea here is that if you're driving a linear using a signal that exhibits superior IMD characteristics, you won't be making things unnecessarily worse when you crank up the amp. Class A mode on the MARK-V limits the output power to 75 W PEP.

The original 'MP did pretty well in the IMD department, with worst-case third order products down about 27 dB and fifth order products down about 43 dB (this was on 24.95 MHz). The MARK-V in Class A mode was considerably better, dropping the worst-case fifth-order products (observed this time on the 160-meter band) to –64 dB at 75 W PEP. On the other bands, fifth-order IMD was 74 dB down on 40 meters and a very impressive 85 dB down on 17 meters!

Either way, with 200 W in Class A-B or 75 W in Class A, you'll have plenty of power to drive an amplifier. "The 200 W is great!" one user enthused. "But the 75 W Class-A mode actually worked perfectly for me since my Alpha really only needs 80 W to get to full output."

Powering Up

To deliver the 30 V dc needed for the RF MOSFETs in Class A, Yaesu has paired the MARK-V up with a compact, external switching power supply. The lightweight model FP-29 dual-voltage unit comes with its own power switch and cooling fan.

Given the supply's trim profile, it begs the question why Yaesu didn't just incorporate the unit into the MARK-V and save the nuisance of having to route yet another cable in the shack. After all, the FT-1000 has a built-in supply, and one was an option on the original 'MP.

While one may reasonably assume that the engineers at Yaesu were concerned about heat dissipation and/or switching noise, the *Operating Manual* mentions a third consideration, stating that the power supply was kept separate "for safe trans-

portation" of the MARK-V during shipping or on a DXpedition. "The reduced weight inside the transceiver case provides a greater safety margin during the shipment of your MARK-V."

MARK-V Menuing

The strength of the MARK-V menu system is that the 80+ options allow tremendous flexibility in configuring the radio "your way." Its weakness is that in the years since the original 'MP (and a lot of other otherwise excellent transceivers) was designed, the menu system the MARK-V employs has not changed a whole lot from the original model. It's certainly utilitarian, but compared to what's out there in the market today, it's neither very elegant nor intuitive, and it no longer can be considered state-of-the-art. It's a bit like going back to *DOS* after years of working with *Windows*. By the same token, a lot of contesters continue to use *DOS*-based logging software, so maybe they won't really care.

As one reviewer remarked, "There are a lot of configurable options. It's too bad the user interface isn't more friendly." He suggested that Yaesu market a *Windows* software package that would allow the user to set all the necessary parameters via a PC. "Now that would be cool!" he concluded.

In the years since the original 'MP hit the market, some manufacturers have come out with user interfaces that feature plain English menu descriptions on an LCD graphical display. With the MARK-V, there's still no single "menu" button—you press **FAST** plus **ENT** to get into the menus—and you'd better keep the *Operating Manual*—or at least the thoughtful *Quick Code Sheet*—handy to "master the menu possibilities," to borrow a phrase.

As a result, fully customizing the MARK-V can take some time, and may try your patience. There is a veritable surfeit (that means "beaucoup") of user-settable items, from CW weighting to defining memory groups and setting the AGC for the sub-receiver. (Yes, the MARK-V offers 99 memory channels and scanning capabilities too.)

One reviewer began to acclimate to the MARK-V after a day or so of trying to bend the radio to his will. "I liked the radio better and began to see the potential," he conceded.

Filter Flexibility

The MARK-V boasts a whole new way to select filters. It was not a hit with everyone. As mentioned, the 'MP filter matrix has been supplanted by the EDSP **APF, NR**, and **CONTOUR** button panel. Filter selection has been reduced to three **BANDWIDTH** buttons to the right of the display: **NOR**, **NAR1** and **NAR2**. These three buttons determine filter selections for the 8.215 MHz second IF and the 455 kHz third IF.

Discerning readers likely already have done the math and figured out that you don't get quite as much flexibility in filter selection with three buttons and up to five optional filters on board. The original 'MP's filter matrix let you pick one from column A and one from column B—mix-n-match style. It was a feature many users appreciated. With the MARK-V, you predefine the filters you want assigned to each button via menus, which can be a bit baffling. Be careful: if you don't get it right, you might hear nothing at all when you press one of those **BANDWIDTH** buttons.

In the MARK-V filter selection scheme, you would, for instance, be able to define 2.4 and 6 kHz filters for the **NOR** selection, a pair of 2.4 kHz filters or a 2.4 and an optional 2.0 kHz filter for the **NAR1** position, and a pair of optional 2.0 kHz filters for the **NAR2** position on SSB. In CW, you might have a combination of 2.4 or 2.0 kHz and 500 or 250 Hz units in ascending degrees of selectivity. Some operators may find this limiting compared to the original 'MP, while others may find it more efficient.

Yaesu concedes that there *is* slightly less flexibility in filter selection in the MARK-V, in that you don't have on-the-fly ability to set a 250-Hz bandwidth by selecting, for example 500 and 250 Hz or 250 and 250 Hz filters in the 8.2 MHz and 455 kHz IFs.

"You need to predefine the selections you are most likely to want to make, and these then become the **NOR**, **NAR1** and **NAR2** selections," Yaesu told us. "The thinking was to free up that matrix slot on the left hand side of the main tuning knob and to make the radio easier to use at 4 in the morning at the same time."

The MARK-V offers stock 500 Hz crystal CW and 2.4 kHz SSB filters in the 8.215 MHz IF and a new 10-pole 2.4 kHz Collins mechanical SSB filter in the 455 kHz IF (the original 'MP used an 8-pole Collins SSB filter).

"With the filtering available, it was much easier to carve a hole in a very crowded 20-meter band," said one reviewer, relating his contesting experience with the radio. "I was also able to squeeze into a small opening on the upper end of 40 and actually have a decent run."

Held Over

Several really handy features survive in this 'MP incarnation. The MARK-V still offers the choice of two antennas via the **ANT A/B** front-panel button plus availability of a separate receive antenna. "It's nice to have two antenna inputs and a Beverage input," one well-known contester opined. "It worked just the way it should."

The MARK-V's flexible **CLAR**ifier (RIT) permits excursions of up to 9.9 kHz. There are separate **TX**, **RX** and **CLEAR** buttons, making the RIT available for quick split-frequency operation, such as working DX that's listening "up 2."

We've already received questions from members about whether Yaesu made any changes with respect to full-break-in (QSK) CW operation. The answer is no, nor did Yaesu include the capability to key the radio from an external source, such as a PC, while still providing access to the radio's internal memory keyer. The "bug" option has mysteriously disappeared from the keyer menu as well. A search is under way for the critter.

Speaking of the internal memory keyer, the MARK-V does not provide front-panel access to program this integrated accessory that offers six message memories and includes contest-style incremental numbering (even "cut numbers" if you want them). As with the earlier 'MP, accessing or programming the memory keyer functions requires the outboard accessory FH-1 Remote Control Keypad (or a homebrew keypad) that connects via a cable to the rear-panel **REMOTE** jack.

On a related note, the MARK-V also does not incorporate any sort of "tune" button (neither did the 'MP), but one is available via the FH-1 keypad. A digital voice recorder also remains an accessory. The optional DVS-2 Digital Voice Recorder has two 8-second or four 4-second messages. You also can record up to 16 seconds of incoming receiver audio for later playback.

The MARK-V's super off-the-air monitor works in all modes, including CW! The **MONI** button and level control are on the lower front-panel apron. The radio picks off the signal as it leaves the driver stage using the sub-receiver as a monitor. This is especially convenient to have when tailoring your audio using the MARK-V's manifold DSP capabilities.

The MARK-V's double-stacking register **BAND** keypad gives quick access to the last two frequencies (and mode and filter settings) you visited on a given band. It also permits direct keypad entry of a frequency. Pressing the **SUB** button then a **BAND** key lets you change bands or set frequencies and modes on the sub-receiver.

We'd complained in our earlier review about another front-panel characteristic that the original 'MP had carried over from the FT-1000—the row of smallish knobs and buttons along the lower apron. The MARK-V continues this tradition, but Yaesu swapped one control location and replaced another with the **CLASS-A** button.

Control legends for this lower tier of front-panel controls still tend to be a bit difficult to read, however, and the knobs still are the same shade as the front panel.

The "trap door" trimpot controls in the top of the radio still are there in the MARK-V. These still include the **TUN-M** control that you're not supposed to adjust (misadjustment could necessitate a factory

realignment). These require using a small Phillips' head screwdriver. Controls include such functions as audio levels to the headphone jacks; FM mike gain; VOX gain, delay and anti-vox; and the tuning meter adjustments for CW, packet and RTTY. One user wondered aloud why the CW VOX delay was set via the menu while the SSB VOX delay was set via a trimpot. "Why are they so hard to get to?," he asked. He said he'd rather see the two delay adjustments on the front-panel apron instead of the two squelch controls that he deemed much less likely to be needed.

The MARK-V still offers a menu-settable choice of flat or tuned preamps. There are three preamps in all—one a general-purpose "flat" amplifier and dual tuned units, one optimized for 1.8 to 7 MHz and the other for 24 to 30 MHz. (Yaesu says that on 14 MHz, the tuned and flat preamps have approximately the same gain, so there's not much difference between them.) To turn off the preamp, you turn on the IPO (intercept point optimization). While this may seem like backwards logic, Yaesu is not the only manufacturer use this kind of nomenclature.

Gone But Not Necessarily Forgotten

Some up-front items on the 'MP have been consigned all or in part to the menu. For example, the **USER** button has disappeared from the front panel and now lives in the menu. This function lets the operator set up a "custom environment" for a given user or type of operation. In the MARK-V, pressing and holding the **PKT** button accesses this menu to configure custom settings.

The **NB1** and **NB2** noise blanker buttons on the 'MP have been replaced by a single **NB** button on the MARK-V. You now go to the menu to select the type of noise blanker you prefer—depending upon the noise—and the desired blanking level. There's a menu shortcut to make changes on the fly—press and hold **FAST** and press **NB**.

The **SPLIT** button also is no more on the MARK-V. You go into split-frequency mode by pressing the appropriate red and green TX and RX LEDs near the main and sub-receiver tuning knobs. Not everyone was wild about the departure of the **SPLIT** button. Some operators thought it made operating the MARK-V more confusing and could lead to transmitting on the wrong VFO during the wee hours of a contest. The "**SPLt-SEt**" menu offers three split operating modes that vary largely in the degree of automation applied. The A=B mode, for example, applies a preset frequency offset to the sub VFO B when that VFO is enabled for transmit.

Performance Perspectives

How does the 'MP stack up where the rubber meets the road—on the air? Well, if there were any doubts that the new MARK-V offers some performance enhancements over the original 'MP, a look at the most critical lab testing numbers will quickly dispel them. Some quick comparison highlights:

- Two-tone, third-order IMD dynamic range in the MARK-V was about 4 dB better on the amateur bands, topping out at 101 dB on 14 MHz (preamp off). This is, like, totally *excellent* performance, dudes. Dynamic range defines the receiver's ability to distinguish and reflect the difference between weak and strong signals.
- The MARK-V's third-order intercept numbers were in the vicinity of +25 dBm (based on S5 reference), the highest we've seen for any receiver; the original 'MP's numbers were in the range of +14 dBm on the ham bands (preamp off in both cases).
- The second-order intercept numbers, around +68 dBm with the preamp on or off, although very respectable, were not as high as those we measured on the original 'MP. With the VRF feature activated however, the MARK-V managed to achieve another new high-water mark—+112 dBm with the preamp on and +110 dBm with the preamp off—the best we've seen by a wide margin.
- The typical transmitter high-order IMD numbers during Class-A operation are significantly better than any transceiver we've tested.
- The MARK-V's SSB/CW receiver sensitivity on the ham bands was within 1 dB of the original 'MP's.
- The MARK-V's blocking dynamic range (preamp off) was 11 dB worse, at 3.5 MHz and 13 dB worse at 14 MHz but at 129 dB, these are still excellent numbers.
- The MARK-V's AM sensitivity was slightly worse (by 1.7 µV) at 1.0 MHz (preamp off) and approximately the same everywhere else; FM sensitivity (preamp off) was slightly better (by 0.18 µV) at 29 MHz.
- FM adjacent channel rejection and two-tone, third-order IMD dynamic range numbers were 10 dB and 4 dB better on the MARK-V respectively (preamp on).
- The CW keyer range in the MARK-V tested out at from 9 to 39 WPM; the range of the original 'MP keyer was 6 to 120 WPM.

Puffs and Pans

Some user comments and observations, in no particular order:

- "Features seemed very similar to the original FT-1000MP, and it was not very hard to get used to them."
- "The notch filter is deep! But it has some menu-driven modes that require some practice."
- "The internal fan(s) in the MARK-V are pretty loud once the radio starts to break a sweat. The fan noise is audible even while wearing headphones."
- "Diversity reception is possible because of the flexibility offered via the menu for stereo headphone operation. You can listen to the main receiver in one ear, the sub-receiver in the other or to all of one or all of the other or even attenuated audio in the other ear from the other receiver."
- "The AF output jack on the back panel is a plus. Its constant level is great for grabbing audio for your sound card for digital modes or for just recording. You can plug in, set the levels, and then forget about it."
- "The dual receiver is well-done and very cool!"
- "The top-cover adjustments are not much better than the old FT-1000MP—ie, not very good."
- "The manual seemed to have more extensive explanations."
- "A true contester will learn to love this radio!"

Conclusion

With the introduction of the MARK-V FT-1000MP Yaesu has raised the bar, albeit incrementally in some cases, in the top-end transceiver marketplace. Have no doubt. This is a very fine radio that will hold its own in a competitive environment, and its enhanced DSP features are superb. A lot of current 'MP owners may be tempted to upgrade, and newcomers who are not intimidated by the challenge of a complex, feature-rich radio will give serious consideration to jumping aboard the FT-1000MP bandwagon with the MARK-V. Hams in the strong-signal areas of the world (Europe for example) should be particularly interested in this transceiver's strong-signal-handling capabilities.

While some may wonder why Yaesu didn't go further in some aspects of the redesign of the original 'MP into this MARK-V version, the new transceiver does offer several significant performance enhancements to a proven platform that has earned and continues to hold the respect of discerning contesters and DXers.

Thanks go to Randy Thompson, K5ZD; Dan Henderson, N1ND; Tom Frenaye, K1KI; and Dave Patton, NT1N, for using the radio and providing comments for this review.

Manufacturer: Yaesu USA, 17210 Edwards Rd, Cerritos, CA 90703; 562-404-2700; fax 562-404-1210; **http://www.yaesu.com**.

Manufacturer's suggested retail price, $4,200. Typical current street price: $3,300. List prices of selected optional accessories: DVS-2 Digital Voice Recorder, $238; FH-1 Remote Control Keypad, $88. The YF-114SN 2.0 kHz SSB filter, YF-114CN 250 Hz CW filter, YF-110SN 2.0 kHz SSB filter and YF-115C 500 Hz CW filter all list for $157.

The NorCal SMK-1 QRP Transceiver Kit

Reviewed by Joe Bottiglieri, AA1GW
Assistant Technical Editor

Since its inception in 1993, the Northern California QRP Club—better known as NorCal—has grown to be an extremely well known organization of low power Amateur Radio enthusiasts.

A few months ago NorCal announced something new: a full-featured 10-meter CW QRP transceiver kit that would use mostly surface mount components.

There has been enthusiastic response to that news, but several folks expressed a desire for a simpler project that would provide them an opportunity to gain some surface mount construction experience. The result was the SMK-1.

The SMK-1 was quickly developed by Dave Fifield, AD6A (of Red Hot Radio), and Doug Hendricks, KI6DS, not so much as a QRP transceiver kit but as an electronics construction project that would expose the builder to working with a variety of surface mount component packages. Most of the 84 parts that make up the kit are surface mount, but there's also a few through-hole components.

Noble Lineage

The SMK-1 40-meter CW transceiver consists of a transmitter section based on the late Doug DeMaw's (W1CER/W1FB) now legendary Tuna Tin 2 (see March 2000 *QST* for a complete retrospective on this QRP classic) integrated with a receiver modeled after Steve Bornstein's (K8IDN) MRX-40 direct-conversion receiver (featured in the September 1997 issue). Electronic transmit/receive switching, JFET receiver muting, VXO RIT and XIT circuitry, and a few additional modifications cooked up by Dave were incorporated, and surface-mount equivalents of virtually every component were substituted.

As was the case with W1FB's and K8IDN's projects, the resulting transceiver was never intended to be a high performance piece of radio equipment—a primary objective shared by all three is circuit simplicity.

It's a Small World, After All

Surface mount parts are available in a range of sizes. The components used in this kit are considered to be "the big ones." Designated 1206, the equivalents of conventional "two lead" parts—resistors, capacitors, inductors and diodes—measure about 0.12 × 0.06 inches.

There are also three surface mount 8-pin ICs, and a handful of surface mount transistors and electrolytic capacitors.

The tiny 2 1/2 × 2 1/4-inch circuit board is top quality. It's double-sided, solder masked and silk screened with the part

numbers and location outlines. All of the on-board components are provided in the kit. The builder will need to supply an enclosure and knobs, and connectors for external dc power, key or keyer, 'phones and antenna. A separate kit that includes predrilled enclosure panels, jacks, knobs and rubber feet—courtesy of the New Jersey QRP Club—is also available. (See NorCal's Web site for details.)

Let's Get It Together

As you can well imagine, the biggest challenge of surface mount construction is the handling and positioning of these tiny parts. Identifying a particular part can also be difficult—some don't carry any markings whatsoever.

The NorCal gang came up with a great solution to the identification problem. The parts are packaged in two clear plastic bags that are divided by a heat-sealer into a grid of 21 compartments, each containing specific components. "Grid maps" printed in the documentation act as a key.

I found surface mount part handling quickly became easier as assembly progressed. I used a large pair of surgical tweezers for handling and positioning the parts for soldering, and only really needed a magnifying lens for inspecting the finished solder connections. Your particular methods and needs, of course, may vary.

For some tips and techniques, visit NorCal's Web site, **http://www.fix.net/~jparker/norcal.html**. Also be sure to check out the ARRL Technical Information Service's information on this topic at **http://www.arrl.org/tis/info/surface.html**. (Copies of recent *QST* articles on this subject are posted here.)

The 8-page *Construction Manual* consists of four 8 1/2 × 11-inch stapled sheets. There's not a tremendous amount of handholding offered in the assembly descriptions—the instructions walk you through installing the contents of the first pocket of "Bag #1" and then instruct you to proceed likewise down through the bags.

The final few assembly steps involve winding and mounting a 6-turn bifilar toroid and installing the through-hole components. Alignment is easy—I used my main station transceiver to listen for the transmitted signal, to peak the receiver, and to "calibrate" the XIT and RIT controls.

I've got to admit, although surface mount construction does present a unique set of challenges, I found it to be considerably easier than I had anticipated. I'm now eager to attempt a more sophisticated surface mount project.

Let's Get it On

I've used the transceiver to make several contacts with stations up and down the east coast and into the midwest—not bad considering it puts out about 350 mW and my antenna is an attic dipole! I've received reasonably good signal reports and noted only a very small amount of drift.

Spot checks of the SMK-1 by the ARRL Lab show a transmitter tuning range of approximately 7.038 to 7.039 MHz and a receiver tuning range between 7.035 and 7.040 MHz. The noise floor—or minimum discernable signal—measures –110 dBm at 3 kHz bandwidth. While this may seem a bit low, this is due to the essentially "wide-open" front end of the receiver. There's more than enough CW sensitivity available for typical 40-meter QRP operation.

The current draw (at 13.8 V) is about 20 mA on receive and 110 mA on transmit. The blocking dynamic range came in at a noise-limited 74 dB. Spurious signal and harmonic suppression was better than 30 dB. Unlike the original Tuna Tin 2, this transmitter does not require additional filtering to meet current FCC spectral requirements for a transmitter of this power level.

Conclusion

Let's face it, sooner or later the electronics hobbyist will have to accept the fact that technology marches on. Surface mount components will continue to supplant conventional leaded components in both consumer electronics products and commercially produced Amateur Radio gear. With the SMK-1, NorCal is providing us a great opportunity to learn the basic techniques and further develop the home construction methods that we'll need to work with them.

Manufacturer: The Northern California QRP Club; **http://www.fix.net/~jparker/norcal.html**.

The SMK-1 sells for $30 plus $4 shipping and handling. To order one, send a check or money order for $34 (made out to Jim Cates) along with a note indicating that you are ordering an SMK-1 to Jim Cates, WA6GER, 3241 Eastwood Rd, Sacramento, CA 95821. If possible, also follow this with an e-mail with "SMK-1" in the subject line to Doug Hendricks, KI6DS (**ki6ds@dospalos.org**), so that he can maintain an adequate parts inventory. QST

Balloting Under Way in Three ARRL Divisions

Members in five ARRL divisions have nominated candidates for ARRL Director and Vice Director, and balloting is under way for contested positions in three divisions. The ARRL Election Committee has declared all candidates to be eligible. All unopposed candidates have been declared elected. All terms are for three years beginning at noon January 1, 2001.

Balloting for Director will occur in the Central and Northwestern divisions; balloting for Vice Director in the Northwestern and Hudson divisions.

There's a three-way race for the Director's seat in the Central Division. Running are incumbent Director Edmond A. Metzger, W9PRN, and challengers Richard David Klatzco Jr, N9TQA, and George R. "Dick" Isely, W9GIG. Vice Director Howard Huntington, K9KM, is unopposed for reelection.

In the Northwestern Division, incumbent Director Greg Milnes, W7OZ, will face Mary E. Lewis, W7QGP, a two-time former director. Incumbent Northwestern Division Vice Director Jim Fenstermaker, K9JF, is being challenged by Edward W. Bruette, N7NVP.

In the Hudson Division incumbent Vice Director J.P. Kleinhaus, W2XX, faces a challenge from former ARRL First Vice President and Hudson Division Director Steve Mendelsohn, W2ML. Director Frank Fallon, N2FF, is running unopposed.

Also without opposition are New England Division Director Tom Frenaye, K1KI, and Vice Director Mike Raisbeck, K1TWF, and Roanoke Division Director Dennis Bodson, W4PWF, and Vice Director Les Shattuck, K4NK.

ARRL full members of record in the Central, Hudson and Northwestern divisions as of September 10, 2000, were to be sent ballots by October 1. The deadline to receive completed ballots is noon Friday, November 17, when the votes will be counted. Any eligible member not receiving a ballot should contact ARRL Headquarters.

PHASE 3D SET FOR HALLOWEEN LAUNCH

The next-generation Phase 3D Amateur Radio satellite is set to go into space on Halloween! At press time, the launch agency Arianespace said that in addition to Phase 3D, an Ariane 5 rocket would attempt to orbit three commercial satellites on Tuesday, October 31. The launch will take place at the European Spaceport in Kourou, French Guiana, South America.

Arianespace says the October 31 mission will be the first to use the Ariane Structure for Auxiliary Payloads platform designed to carry mini or microsatellites as secondary payloads. The Ariane 507 flight also is to be the initial liftoff performed from the second Ariane 5 mobile launch table, which recently was qualified for service.

Launch preparations for the Phase 3D flight officially got under way September 18 and were proceeding "on target," according to AMSAT-Germany Executive Vice President Peter Gülzow, DB2OS. Gülzow has been heading the launch team at the European Spaceport in the absence of Phase 3D Project Leader Karl Meinzer, DJ4ZC, who was unable to make the trip. An advance P3D launch team arrived in Kourou September 9. By late September, the group had swelled to more than a dozen.

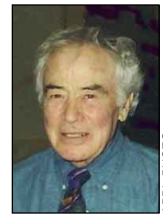
AMSAT-NA President Keith Baker, KB1SF, said Phase 3D was "doing just fine." As of press time, the satellite's batteries had been recharged, and RF testing of transmitter and receiver systems had been successfully completed. The team also carried out propulsion system pressure tests.

AMSAT officials were encouraged by success of a September 14 Ariane 5 launch that they'd been keeping an eye on as a bellwether for the next-in-line Phase 3D launch. That mission put two communication satellites into orbit.

More information about Phase 3D is on the AMSAT-NA Web site, **http://www.amsat.org/**.

QUIAT NAMED HONORARY VICE PRESIDENT; MORTON NAMED VICE DIRECTOR

The ARRL Board of Directors has elected Marshall Quiat, AG0X, of Denver, Colorado, as an Honorary Vice President. Quiat, 78, stepped down as Rocky Mountain Vice Director this summer for health reasons. The vote of the 15-member board was unanimous.



ARRL PHOTO

Marshall Quiat, AG0X

ARRL President Jim Haynie, W5JBP, called Quiat August 30 to inform him of his election. "There's no one more deserving of this honor than Marshall," Haynie said. "I'm happy for him."

An attorney and an ARRL Life Member, Quiat served as Vice Director from 1981 until 1987, as Director from 1987 until last year, and as Vice Director until August. In addition, he served as an ARRL Foundation Director from 1994 until 1999. As a director and vice director, Quiat logged a long record of service. Among other accomplishments, he chaired the Legal Strategy Committee appointed in 1986 and served as a member of the Part 97 Rewrite Committee in 1988. He also was instrumental in the success of the League's PRB-1 effort.

Haynie has named Warren G. "Rev" Morton, WS7W, of Casper, Wyoming, to complete Quiat's term of office as vice director, which runs through next year.

ARRL PHOTO

Warren G. Morton, WS7W

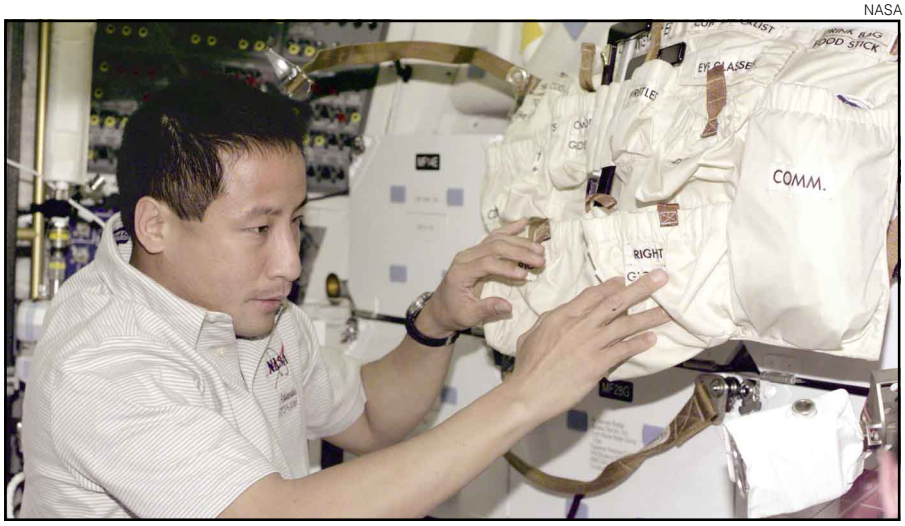
Morton served two terms as Wyoming Section Manager, from 1993 until 1997. While in that office, he spearheaded the successful effort to enact a PRB-1 bill in his state. (Morton's efforts are detailed in "Wyoming Hams Corral City and County Antenna Restrictions," *QST*, Jul 1998.)

HAM GEAR DELIVERED TO ISS

The Amateur Radio on the International Space Station initial station equipment was delivered to the ISS in September. Shuttle *Atlantis* mission STS-106 also dropped off supplies that the ISS Expedition 1 crew will need this fall. After opening the station, the STS-106 team of astronauts and cosmonauts, which included three hams, unloaded the cargo—including the ham

Rick Lindquist, N1RL ♦ Senior News Editor

NASA



Astronaut Ed Lu, KC5WKJ, checks supplies inside the shuttle prior to his spacewalk.

gear—from *Atlantis* and from a docked Russian *Progress* rocket and set the ISS up for its first crew.

The initial station gear now stowed aboard the ISS includes amateur VHF and UHF hand-held transceivers as well as a TNC for packet, a special headset and signal adapter module, and power adapters and interconnecting cables.

No Amateur Radio operation will take place from the ISS until the Expedition 1 crew of US astronaut Bill Shepherd, KD5GSL, and Russian Cosmonauts Sergei Krikalev, U5MIR, and Yuri Gaidzenko comes aboard in early November.

As part of the shuttle Atlantis mission, US astronaut Ed Lu, KC5WKJ, and Russian cosmonaut Yuri Malenchenko completed a more than six-hour space walk on September 11. Lu and Malenchenko attached nine power, data and communication cables to the Russian-built *Zvezda* service module *Zarya* control module.

Other amateurs aboard *Atlantis* included astronauts Dan Burbank, KC5ZSX, and Richard Mastracchio, KC5ZTE.

The ARISS initial station gear will be installed temporarily aboard *Zarya* and use an existing antenna that's being adapted to support FM voice and packet on 2 meters. The gear will be re-installed in the *Zvezda* Service Module next year, and it will have both 2-meter and 70-cm capabilities. The gear has been certified to operate from the Russian sector of the ISS, where a Russian call sign, RZ3DZR, will be used. German call sign DL0ISS has been issued, and US call signs for use aboard the ISS are pending.

For more information visit the ARISS Web site, **http://ariss.gsfc.nasa.gov/**.

TWO AMATEURS DIE IN WEST TIMOR VIOLENCE

Two of the three United Nations workers killed by a mob September 6 in West Timor, Indonesia, were Amateur Radio operators. Pero Simundza, 9A4SP, of Split, Croatia, had been in West Timor for nearly one year and had been active as 4W/9A4SP and as 4W6SP. He was 29. Carlos Luis Caceres, KD4SYB, a Technician licensee from Jacksonville, Florida, was 33. He was an ARRL member and a native of Puerto Rico.

Simundza, Caceres, and Samson Aregahegn of Ethiopia died when thousands of armed pro-Indonesian militiamen and their supporters stormed a UN office in Atambua, West Timor. Witnesses say the mob beat the three UN workers to death then burned their bodies in the street while Indonesian security forces stood by and did nothing to stop the violence.

The UN staffers, who all worked for the UN High Commissioner for Refugees, had been involved in helping refugees from the conflict with East Timor, which voted last year to break away from Indonesia.

Prior to his service in West Timor, Simundza had been working for the UNHCR in his native Croatia and in Bosnia-Herzegovina. Simundza managed communications for the Atambua UNHCR office.

In an eerie e-mail message said to have been sent by Caceres to UNHCR Headquarters the day he was killed, Caceres spoke of the UN workers' being barricaded at their stations waiting for "a wave of violence" to hit. "The militias are on the way," he wrote, "and I am sure they will do their best to demolish this office." Caceres told his colleague that the remaining UN staff members were "like bait, unarmed, waiting for the wave to hit."

Caceres' sister, Elba M. Caceres, was among those wanting to know why no one was there to protect the workers who stayed behind.

Caceres' father, Gregorio Caceres, KA4UXJ, said his son was fluent in several languages and held degrees in journalism and law.

Memorial Web sites for the two

In Brief

• **Question Pool Committee chair steps down:** Ray Adams, W4CPA, has resigned as the chairman of the National Conference of Volunteer Examiners' Question Pool Committee. "After pondering over the situation for an extended period of time, it is my firm conclusion that the best interests of Amateur Radio will be served by my resigning as a member of the Question Pool Committee," said Adams, 64, in an announcement to the nation's VECs and others. NCVEC Chairman Win Guin, W2GLJ, said Adams' decision came as a surprise. "Ray has done an outstanding job, and we will surely miss him in that important role." Guin asked that QPC vice chairman Scotty Neustadter, W4WW, of the Central America VEC assume the chairmanship. An ARRL Life Member, Adams had served as a member of the QPC since its inception in 1986 and had been chairman since 1989.

• **AO-27 is back on the air!** The AO-27 satellite has returned to analog Amateur Radio service. AO-27 ground controller Chuck Wyrick, KM4NZ, advises operators to wait until they hear the satellite in analog mode—ie, no data being sent—before transmitting on the 145.850 MHz uplink frequency. AO-27's downlink is 436.800 MHz. AO-27's computer crashed July 31, and it took more than one attempt to reload the software and get the satellite up and running again. "A lot of work has saved AO-27 for many more enjoyable amateur QSOs," Wyrick said in a posting to the AMSAT bulletin board.

• **New W6 Incoming QSL Bureau manager:** ARRL W6 Incoming QSL Bureau Manager Archie Willis, W6LPJ, has retired after almost 27 years on the job. Steve Frick, N6QEK, is the new manager. The new W6 Incoming QSL Bureau address will be: ARRL Sixth District Incoming QSL Bureau, PO Box 900069, San Diego, CA 92190-0069.

• **RAC seeks elimination of 12 WPM Morse requirement:** Radio Amateurs of Canada has asked Industry Canada—the Canadian equivalent of the FCC—to discontinue that country's 12 WPM Morse code requirement in favor of a 5 WPM test. The RAC Board says it's concluded that a majority of Canadian Amateurs support dropping the 12 WPM Morse test—although it acknowledges that many are against the change. "A decision by Canada to drop the 12 WPM test would be in harmony with what is happening in other parts of the world and would simplify the negotiation and implementation of reciprocal operating agreements," the RAC said. In a letter to Industry Canada, RAC President Kenneth Oelke, VE6AFO, recommended full HF operating privileges to amateurs passing a 5 WPM Morse test and written exams. At the same time, Oelke requested that the IC consider beefing up written tests.—*RAC*

FCC News

FCC TURNS DOWN CB DX PETITION

The FCC in August denied a petition that would have amended the FCC's Part 95 rules to permit DXing on the 11-meter Citizens Band. The petition sought to amend §95.413 of the rules that prohibits communications or attempts to communicate with CB stations more than 250 km away and to contact stations in other countries.

Designated RM-9807, the petition was filed by *Popular Communications* Contributing Editor Alan Dixon, N3HOE.

"Dixon's request is inconsistent with the purpose of the CB Radio Service and could fundamentally alter the nature of the service," the FCC said in turning town the petition.

The FCC said CB operators generally supported the proposal, asserting that the present rule was unenforceable. The ARRL commented in opposition to the petition. "The Amateur Radio Service is the proper forum for the desired long-distance communications sought by the Dixon petition," the League told the FCC.

The FCC agreed with the ARRL and said it did not intend to create a service paralleling the Amateur Service when it authorized the Citizens Radio Service.

The National Association of Broadcasters also opposed Dixon's petition. The NAB said consumers must be protected from illegal CB transmissions that interfere with radio, TV and other consumer electronics.

RF SAFETY RULES NOW IN FORCE FOR ALL AMATEURS

The time has come! September 1 was the date for all US amateurs to fully comply with the FCC's RF safety rules.

The regulations, which went into effect January 1, 1998, require US Amateur Radio operators to read and understand the rules and, where necessary, perform technical evaluations to determine that their stations are compliant with the new regulations. Before September 1, only hams filing an Amateur Radio application with the FCC had to certify compliance. Under the regulations, an amateur station must not exceed the maximum permissible exposure limits for transmitter operation. MPEs are both frequency and power-dependent.

ARRL Lab Supervisor Ed Hare, W1RFI, said the regulations do not impose a major burden on amateurs. "Most hams are already in compliance with the MPE requirements; some hams will need to conduct a simple station evaluation," he said.

A complete description of the rules and station evaluation resources are available on the ARRL Web site at **http://www.arrl .org /news/rfsafety/**.

The topic of RF exposure and safety also has been covered extensively in *QST* (see "FCC RF-Exposure Regulations—the Station Evaluation" by Ed Hare, W1RFI, *QST*, Jan 1998). Hare also wrote the standard Amateur Radio reference on the topic of RF exposure, *RF Exposure and You* ($15; order item #6621 from ARRL). The book includes step-by-step worksheets to help determine if a station complies with the rules—and, if not, how to correct the problem.

Address questions about RF safety to Ed Hare, W1RFI, **ehare@arrl.org**.

Amateur Enforcement News

• **FCC cancels license of "Captain Truth" suspect:** The FCC has canceled the license of the individual it strongly suspects was "Captain Truth." The Commission notified John M. Yount of Newton, North Carolina, on September 5 that it was canceling his Amateur Extra class ticket, K4QIJ, because he failed to appear for re-examination. The FCC zeroed in on Yount last spring as a prime suspect in its "Captain Truth" investigation into unidentified Amateur Radio transmissions and malicious interference. FCC Special Counsel for Amateur Radio Enforcement Riley Hollingsworth had written Yount on March 29, citing FCC and other close-in monitoring evidence that indicated Yount's station was the source of "malicious interference and jamming" on 20 and 75 meters. "Captain Truth" has not been heard on the air since the FCC's initial letter. The FCC says radio-direction finding bearings led to Yount's residence and antenna. Part of its monitoring evidence resulted from work done by the FCC's High-Frequency Direction Finding facility. Yount suggested in his only reply to the FCC that there were a lot of vehicles and other houses on his property and that someone else could have been responsible for the transmissions the FCC had monitored and tracked. Hollingsworth said he wrote Yount again on June 1 to seek clarification and additional information in the ongoing investigation. "I never heard from him again," Hollingsworth told the ARRL. After failing to get a reply, Hollingsworth wrote Yount on July 17 requesting that he retake his examinations by September 1. "And he never showed up," he said. Hollingsworth warned Yount that continued operation of radio transmitting equipment after September 5 could result in criminal prosecution.

• **FCC sets aside VE team leader's renewal:** The FCC wrote Amateur Extra licensee Julian Sanchez Colon, KP4RA, on August 14, setting aside the July 28 renewal of his license. The application has reverted to pending status. "This action was based on allegations of irregularities in an Amateur Radio examination that you, as VE team leader, administered on March 18, 2000, in Salinas, Puerto Rico," wrote FCC Special Counsel for Amateur Radio Enforcement Riley Hollingsworth. The session was held under the auspices of the W5YI-VEC. Hollingsworth said the FCC would be requesting that Sanchez Colon provide specific information and documentation needed to investigate the allegations and to make a decision on his renewal application. The W5YI-VEC last April decertified all of its volunteer examiners in Puerto Rico and put its program there under the administration of the Arecibo Observatory Amateur Radio Club.

amateurs killed were established at **http://www.qsl.net/kd4syb** and **http://www.qsl.net/9a4sp**.

UK-CANADA CROSSBAND LF QSO COMPLETED

Getting a leg up on the Transatlantic II LF tests planned for November, amateurs in the UK and in Canada completed a crossband LF-HF contact September 10. The contact involved well-known "LowFer" Dave Bowman, G0MRF, operating on 135.711 kHz and John Currie, VE1ZJ, on Cape Breton Island, Nova Scotia, Canada, operating on 20 meters.

"Dave had a surprisingly strong signal into FN95, Cape Breton Island," Currie said in an e-mail message to André Kesteloot, N4ICK, who's involved with the Amateur Radio Research and Development Corporation—AMRAD—LF experiment in the US.

Using *Spectrogram* software, Currie reported observing "weak dashes" from G0MRF just after 2205 UTC on September 9. Currie said he had "solid copy" on G0MRF by 2245 UTC, and the crossband QSO was completed on September 10 at 0008 UTC. "I could see every dot and dash," he reported.

Bowman says he was operating from a fifteenth-floor West London flat. The antenna was two sloping 250-foot long wires about 80 degrees apart. Grounding was via the building's plumbing. Loading involved fixed and variable inductors. Bowman estimated maximum power into the antenna at 700 W, but at one point, he dropped his power to about 320 W and VE1ZJ was still copying. "Even allowing for the large antenna, I believe this shows that many UK/EU stations will be able to make the transatlantic path this winter," Bowman said.

Canada has not yet authorized Amateur Radio operation at 136 kHz, but some stations have been given permission to experi-

ment there. Larry Kayser, VA3LK, and Mitch Powell, VE3OT, completed the first two-way LF contact in Canada on July 22 on 136 kHz, using very slow-speed CW (dubbed "QRSS") in preparation for TransAtlantic II.

TransAtlantic II will attempt to span the Atlantic in both directions on LF. The tests are set to occur November 10-27 from Newfoundland. Details are available at **http://www.rac.ca/vlftest.htm**.

AMRAD has been conducting LF beacon tests on 136.75 kHz from 12 Northern Virginia sites using the experimental call sign WA2XTF. Visit the AMRAD Web page for more information, **http://www.amrad .org/**.

The ARRL is awaiting an FCC decision on its petition to the FCC for two low-frequency amateur allocations.

ARRL AND REACT STEP TOGETHER

ARRL and REACT—Radio Emergency Associated Communications Teams—took some first steps together this summer. The ARRL Board of Directors in July approved a memorandum of understanding between the two radio organizations, and League officials were on hand for the REACT 2000 International Convention in Kissimmee, Florida, later that same month.

"REACT folks are dedicated to public service, responding dependably to cover emergencies, marathons and other charity events," said ARRL Southern Florida Section Manager Phyllisan West, KA4FZI, who set up and staffed an ARRL exhibit table for REACT's 25th annual convention. "They operate mainly on GMRS and FRS to avoid problems of unlicensed CB channels, and are excited about working more closely with hams."

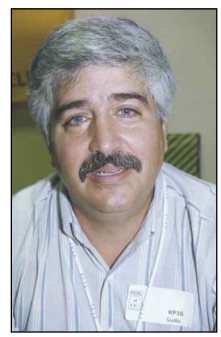
West said REACT conventioneers snapped up copies of *The ARRL Public Service Communications Manual* at the ARRL table. West said she encouraged those not already licensed to get their tickets "to enhance their ability to participate in emergency communications."

While REACT has been associated primarily with Citizens Band in the past, the organization has broadened its focus to embrace amateur and other services. Convention chairman Walt Young called REACT "just another radio group that is doing the same basic job as ham radio operators" that provides emergency communications when and where needed. "The trick is to get various groups to work together," he said.

REACT International has a Web site at **http://www.reactintl.org/**.

NOTABLE SILENT KEYS

GUILLERMO SCHWARZ, KP3S, SK



Former ARRL Puerto Rico Section Manager Guillermo M. Schwarz, KP3S, and his wife, Hildelisa, died July 29 after Schwarz's single-engine experimental aircraft crashed while attempting a final landing approach at Wayne County Airport near Wooster, Ohio. The Federal Aviation Administration is investigating. The couple had flown to the mainland on vacation.

Schwarz, 49, was Puerto Rico's Section Manager from October 1994 until September 1998 and had been serving as a Southeastern Division Assistant Director since 1996.

Former ARRL Field Services Manager Rick Palm, K1CE, remembered Schwarz as an enthusiastic volunteer who inspired others. Puerto Rico SM Victor Madera, KP4PQ, called Guillermo Schwarz "an excellent ham, a good friend." He said that Schwarz, who had piloted B-52s in the service, had only completed building the aircraft a few weeks earlier.

In addition to the couple's four children, survivors include Guillermo Schwarz' father, William Schwarz, KP4EEB.

ALFREDO LUCIANO, LU6DJX, SK

World-class DXer Alfredo Luciano, LU6DJX, died August 7. He was 91. *QST* DX Editor Bernie McClenny, W3UR, described Luciano as "the top DXer from South America and the leading DXer outside of the USA." First licensed in 1928, he was on the DXCC Honor Roll with 384 countries confirmed (mixed). During the 1999 Dayton DX dinner, Luciano was awarded a special plaque in honor of his accomplishments.—*Mario dos Santos, LW1EWY; Bernie McClenny, W3UR*

GEORGE D. "DEWEY" WILSON SR, W7HF, SK

The ARRL's most senior member has died. George "Dewey" Wilson, W7HF, of Aberdeen, Washington, died July 8. He was 102 and had been a member of the League and an active amateur for more than 70 years. "Besides being a tremendous Amateur Radio supporter and enthusiast, he was also the last of a local pioneer lumber family of Aberdeen," said Bob Maxfield, W7LEO, president of the Grays Harbor Amateur Radio Club to which Wilson belonged. Wilson also was an active QCWA member. Born in 1897, he was first licensed as 7GW in 1913—although he admitted to a little bootlegging before that time—making him among the nation's earliest licensed amateurs.—*Bob Maxfield, W7LEO*

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange, and Wyoming. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 12 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 December 8, 2000. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2001, to full members of record as of December 8, 2000, which is the closing date for nominations. Returns will be counted February 20, 2001. Section Managers elected as a result of the above procedure will take office April 1, 2001.

If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2001. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the April 2001 *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 Minnesota and North Dakota Section Manager elections by the deadline of June 9, 2000, nominating petitions are herewith resolicited. See the above details on how to nominate. QST

National Weather Service/ARRL Special Event

Mark your calendars! On December 2, 2000, the National Weather Service (NWS) and the ARRL will co-sponsor an on-the-air special event from 0000 UTC to 2400 (Friday night through Saturday).

There are four main objectives for the National Weather Service Special Event (NWSSE): Most importantly, the special event stations will commemorate the contributions that Amateur Radio operators make during times of threatening weather. Second, it would create an opportunity for NWS personnel to meet Amateur Radio operators, and it would also give Amateur Radio operators an opportunity to examine NWS operations. Third, it will encourage NWS personnel to actually get on the radio (under the supervision of a control operator) and, hopefully, encourage them to acquire an operating license. Fourth, it will be fun!

The NWSSE Web site has complete operating instructions, a list of participating NWS stations and QSL information. Log onto **http://www.nws.noaa.gov/event2000/** for complete details.

Operating Event Guidelines

The objective is for Amateur Radio operators at NWS sites to work as many other amateur stations as possible. If you would like to set up a special event at a National Weather Service office, it will be the responsibility of the local Amateur Radio club or group to provide equipment and configure your operating area with appropriate antennas. Please coordinate with your local NWS office, and register the station with Scott Mentzer, KB0WP, at **scott.mentzer@noaa.gov** by November 15.

The NWS Special Event will take place in the General and/or Technician part of the bands. VHF operations are encouraged and repeater contacts are allowed. Most contacts will occur on the bands between 80 and 10 meters. Entities that utilize specific frequencies on a routine basis (eg, National Hurricane Center) are encouraged to use those frequencies during the event. The actual frequency from which a NWSSE station operates is left to the local operator's discretion. (The ARRL 160-Meter Contest will run during the NWS Special Event. Therefore, special event stations will not operate on that band.) Although phone will be the primary operating mode, event stations will be encouraged to use the following digital modes: CW, PSK-31, APRS and RTTY. NWS Special Event operators will append "NWS" to the end of their call signs (eg, W0A/NWS) when using digital modes. The QSO exchange will include call sign, signal report, location, and a one or two-word description of the weather occurring at your site ("sunny," "partly cloudy," "windy," etc).

Certificate with Endorsements

The National Weather Service Special Event will award a certificate with endorsements. An endorsement is basically a sticker that is placed on the certificate if certain goals are reached. To obtain your certificate, create a handwritten log of NWS stations worked and indicate the endorsements you are applying for. You may also link to the certificate endorsement log at this address: **http://www.nws.noaa.gov/event2000/SpecialEvent2000.PDF**. Enclose a self-addressed stamped envelope, and mail both items to:

National Weather Service Special Event
920 Armory Rd
Goodland, KS 67735

Here's a list of the endorsements and qualifying criteria:

Blizzard: Work 5 NWS offices in the northern plains

Fire Weather: Work 5 NWS offices with fire weather support

Hurricane Hunter: Work 7 NWS offices along the Atlantic or Gulf coast

Hydrology: Work 7 NWS offices or River Forecast Centers

Lake Effect Snow: Work 5 NWS offices near the Great Lakes

Mighty Mississippi: Work 5 NWS offices with Mississippi River responsibility

Monsoon: Work 3 NWS offices in the Southwest

Noreaster: Work 5 NWS offices in the Northeast

NWS Support: Work 3 National Center or Headquarter Offices

Pacific Rim: Work 3 NWS offices along the West Coast, in the Pacific, and/or in Alaska

Rocky Mountain: Work 7 NWS offices with mountain weather responsibility

Tornado Alley: Work 7 NWS offices in tornado alley

Digital: Work any 5 NWS offices using a non-phone mode

What About QSL Cards?

In addition to the event certificate, a number of individual stations are offering QSL cards. A list of those offices accepting QSL cards can be found on the NWSSE Web site by clicking "QSL Card Info" on the menu.

NWS contact: Scott Mentzer, KB0WPY, **scott.mentzer@noaa.gov**. Telephone: 785-899-2360. ARRL contact: Steve Ewald, WV1X, **sewald@arrl.org**. Telephone: 860-594-0200.

COMMUNICATIONS FOR AN ENDURO

By Ken Wilhoit, W4OCW

Where did it all begin? The request for communications for a Union Point, Georgia, motorcycle Enduro race began with a visit by Sam Shaw to a Kennehoochee Amateur Radio Club (KARC) breakfast. Sam's request was special because his son had broken a leg in a previous Enduro, and had lain in the woods 45 minutes before emergency aid could get to him. Sam next solicited our services by attending our hamfest with his Enduro bike and full safety gear.

The Georgia Crackers Motorcycle Club sponsored the Enduro. Their members spent 1500 hours laying out (using GPS units on bike handlebars) and clearing the hilly, forested trails on land measuring 2 by 4 miles. The digital data was downloaded to a digital USGS map, producing a topographic map showing trail location and incremental mileage. The result was 49 miles of trails with a race goal of maintaining 24 mph throughout the course.

Rene Campbell, KF4ZYN, Ben Dasher, KE4YZX, Ian Gaffner, KG4GWR, Lee Gassett, KF4OLO, Charles Golsen, N4TZM, Dusty Rhodes, W8LJE, Marj Rhodes, N4REW, and Ken Wilhoit, W4OCW, drove for hours on a cold Sunday morning to the race site. They met with Sam to go over assignments and the trail layout.

The 285 riders ranged in age from 16 to over 70, and rode in 57 rows, five riders in each. They were released at one-minute intervals. KARC members leapfrogged along the course as the 25-mile long procession of racers progressed. The longest spacing between radio operators was 5 miles. As riders came to an operator they could report injured riders and at what mileage marker, so emergency medical technicians could go directly to the spot. One morning report resulted in rescuers arriving to aid a rider in 10 minutes. An afternoon report resulted in assistance within 5 minutes.

The combination of the map and the communications expertise of KARC made a highly successful operation, and the radio amateurs received good training in emergency communications. Lots of riders said "thank you," and that made for a pleasant experience. It was

Rosalie White, K1STO ♦ Field & Educational Services Manager

excellent exposure for Amateur Radio. Just another public service? You decide, and then volunteer for the next event!

THOUGHTS ON A SUCCESSFUL ARES STRIKE TEAM

By Rob Macedo, KD1CY, ARES SKYWARN Coordinator (NWS Taunton) and EC, New Bedford, Massachusetts

I think the key requirement for any successful ARES strike team is that they should have an agency to serve. SKYWARN is very active in Eastern Massachusetts because we've crossed what I like to call the "hidden barrier." Amateur Radio operators are viewed as "a necessity" instead of a "nice thing to have." That, to me, is the hardest thing to accomplish. Our local NWS office demands more of us because we deliver, and that's the key to getting a served agency to work closely with the hams. You must demonstrate that the benefit of ham involvement is superior to agency's cost (in time and money) to mount an equivalent response. Whether it's emergency management, Red Cross, Salvation Army or the National Weather Service, you must establish a need and get the agency to realize that your group is ideally suited to meet it.

The steps to success are fourfold: (1) Work in parallel with one or two served agencies. Work toward using the tools of technology (e-mail as well as regular mail), and generate interest among local clubs; (2) Meld a working relationship between the agencies you choose to serve and the hams that is based on a business/real job model; (3) Have an activation structure that will activate regardless of whether the main coordinators are available and (4) Work Public Service events as practice for ARES activations. If you do these things over a period of time, you can build a program that will be solid for years to come. QST

PATTI HALGUNSETH

The Yavapai County, Arizona, Amateur Radio Club, in cooperation with Yavapai County ARES/RACES, provided public safety communications for the Prescott Frontier Days Parade on July 1, 2000. Net control was conducted from their communications van, and the van itself was also an entry in the parade. District Emergency Coordinator and Radio Officer Lloyd Halgunseth, WA6ZZJ, is the driver.

Field Organization Reports

Public Service Honor Roll August 2000

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 8 categories (as reported to their Section Managers). Please note the maximum points for each category: 1) Checking into a public service net, using any mode, 1 point each; maximum 60. 2) Performing as Net Control Station (NCS) for a public service net, using any mode, 3 points each; maximum 24. 3) Performing assigned liaison between public service nets, 3 points each; maximum 24. 4) Delivering a formal message to a third party, 1 point each; no limit. 5) Originating a formal message from a third party, 1 point each; no limit. 6) Serving as an ARRL field appointee or Section Manager, 10 points each appointment; maximum 30. 7) Participating in a communications network for a public service event, 10 points each event; no limit. 8) Providing and maintaining an automated digital system that handles ARRL radiogram-formatted messages; 30 points. Stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from HQ on written notification of qualifying months to the Public Service Branch at HQ.

934
NM1K
549
K9JPS
448
N5JZ
391
K5NHJ
318
W9RCW
290
KK5GY
280
WA5OUV
271
KJ3E
266
KB5WEE
248
KF4NFP
246
KB2RTZ
231
KA2ZNZ
222
W7TVA
221
WD8V

212
KC5OZT
207
KK3F
WB5ZED
K7BDU
206
W6DOB
202
N2LTC
198
KA4FZI
197
W4ZJY
195
K7VVC
193
WA9VND
186
KB8ZYY
KA5KLU
183
NN7H
182
N2OPJ
178
K9FHI

176
KC4ZHF
AA4BN
172
K2UL
171
W4EAT
WA3HJC
N2RPI
170
W6IVV
169
KA2GJV
168
K6YR
164
W5ZX
WB2UVB
AD4DO
163
WB4GM
N2JBA
162
W8YS
161
K5IQZ
160
W3YVQ
KB2VRO

K1JPG
159
N8JGS
158
KC4TLG
KB2VVB
157
K0IBS
156
N5XGI
155
WA1JVV
154
K2DN
WN0Y
152
K4IWW
151
WA4QXT
N8FPN
N8IO
N2YJZ
150
W4CAC
N7YSS
149
NY2V
WA5I

148
WA1FNM
WB5NKC
147
W0OYH
146
WB2ZCM
K4SCL
145
W2RJL
144
K8GA
KJ4N/2
143
KB2KLH
142
W5GKH
KB5W
KC2AHS
141
N8BV
140
WA4DOX
W0LAW
W7NWP
KT4PM
139
W2MTA
W7GB
WO0A

N9BDL
NR2F
W7ZIW
AD4IH
K4RBR
138
N2KPR
N5OUJ
W2EAG
KT6A
N5IKN
KD4GR
137
KA1GWE
AF4GF
136
WB2GTG
135
W0WWR
AA3SB
W3VK
WD4JJ
KC2DAA
134
KC4PZA
W9YCV
KC5VLW
133
KE4JHJ
WX8Y
W3BBQ
N3WK
KB2ETO
N2AKZ
132
KC7SRL
131
AA3GV
W9CBE
130
WA2YBM
K9LGU
AF4PU
W7BO
129
N0SU
WA0TFC
WB2FGL
W7LG
128
AF4NS
K2GTS
NN2H
WA2UKX
WB2QIX

N5NAV
K5VV
NZ1D
WD8DHC
KB5TCH
127
K7GXZ
126
KK1A
N3ZKP
W1PEX
125
K8KV
W4NTI
W1ALE
WX4H
124
WD9FLJ
123
AA8SN
N2WDS
W5CDX
KF6OIF
N1LKJ
N7AIK
122
W3CB
AF4QZ
WA8SSI
W2JHO
KD1LE
121
W2FR
AA2SV
KE1AI
120
KC2EOT
KG2D
K5DPG
N9TVT
K4DMH
KA7AID
W2PII
119
W4UC
K0PIZ
KA4UIV
N9MN
118
KI4YV
NC4ML
W4CKS
K4MTX
AA4AT
N7DRP
N3WKE

KA2DBD
AD6LW
KJ9J
W9ZY
K9GBR
KA8WNO
K7MQF
116
KB0DTI
WB4TVY
W1JX
WB2IIV
AB4XK
115
WA8EYQ
114
K4YVX
K5MC
WD9HII
K2VX
W8SZU
113
K2PB
WA4EIC
112
AF2K
WD0GUF
N8DD
AG9G
WB5NKD
111
KC6NBI
W1QU
W2AKT
KB4DXN
K4FQU
110
AB4E
KO4OL
K4BG
109
W4WXA
K4WKT
108
KB2WII
W2MTO
107
K8VFZ
106
KF4KSN
105
W4DGH
104
N5JUU

103
N1JBD
102
WI2G
101
KT4TD
KE4VBA
100
WI8K
W2LC
99
AA4YW
KR4MU
KE6MIW
KC8CON
W5AYX
W5MEN
KJ7SI
W4AUN
98
W4XI
KA2CQX
97
KA2BCE
KG5GE
KF5A
KE4WBI
96
KB1DSB
W2JG
95
W1JTH
KC8HTP
WA2CUW
KC8GMT
KC3Y
94
WA2GUP
KE4GYR
W5XX
WB4PAM
KG4CHW
93
W4CC
N3WAV
92
KA4LRM
91
AA8PI
W8IVF
KE4DNO
90
WA4GLS
W7QM
WB2LEZ

KD4HGU
89
KA1VEC
AF4CD
88
AD4XV
N1CPX
87
K8ZJU
W4QHU
N9KNJ
KA2ZKM
86
WB4ZNB
KB3AMO
KE0K
85
WA8DHB
84
W4PIM
K1SEC
83
W7VSE
K8LEN
K9ZVT
KM5VA
82
WB9GIU
81
KC7SGM
80
WB4UHC
WA4EYU
78
KC7SGL
WA2YOW
76
K3CSX
W2CC
N5GG
75
WA1QAA
W2GUT
74
K3UWO
N4JAQ
73
KJ5YY
N1SGB
72
KE3FL
N1IST
70
AE4MR

The following stations qualified for PSHR in previous months, but their call signs and scores were not listed in this column: (July) K7VVC 252, N2KPR 148, W2FR 109, KE0K 100, KB2WII 85. (Jun) K7VVC 202. (May) K7VVC 234.

Section Traffic Manager Reports August 2000

The following ARRL Section Traffic Managers reported: AL, AR, AK, CO, CT, ENY, EPA, EWA, GA, IA, IL, IN, KS, KY, LA, MDC, MI, MN, NC, NFL, NH, NNJ, NTX, NV, OH, OK, OR, SBAR, SC, SD, SDG, SFL, SNJ, STX, TN, VA, VT, WCF, WI, WMA, WNY, WPA, WWA, WY.

Section Emergency Coordinator Reports August 2000

The following ARRL Section Emergency Coordinators reported: ENY, EWA, IN, KY, KS, LA, MDC, MI, MN, MO, NFL, NLI, OH, SD, SFL, STX, SV (North), TN, VA, WCF, WNY, WMA.

Brass Pounders League August 2000

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*
NM1K	775	1001	913	1	2710
KK3F	19	1200	1160	40	2419
WB5ZED	11	548	591	28	1178
WX4H	6	500	510	13	1029
K9JPS	0	465	43	452	960
W9IHW	0	444	38	397	879
W1PEX	0	138	712	12	862
W5SEG	33	388	418	0	839
K7VVC	19	376	422	8	825
N2LTC	0	362	413	24	799
N5JZ	298	66	308	12	684
W6DOB	0	298	300	68	666
N5IKN	0	329	329	0	658
KA2ZNZ	22	299	239	71	631
WA9VND	8	371	250	7	626
K7BDU	33	306	269	6	614
WA5OUV	0	272	56	276	604
K5NHJ	242	61	273	21	597
K6YR	0	283	302	0	585
KK5GY	0	216	40	216	575
W9YPY	0	259	293	0	552
KC5OZT	2	242	200	62	506
KA1VEC	10	237	245	8	500

BPL for 100 or more originations plus deliveries: K9GU 188, WZ7V 164, KJ3E 143, KB5WEE 125. QST

Pero Simundza, 9A4SP, March 18, 1971 – September 6, 2000

This month's column is dedicated to the Amateur Radio men and women of the United Nations and their agencies throughout the world, and to the memory of a fallen hero: Pero Simundza.—Bernie, W3UR

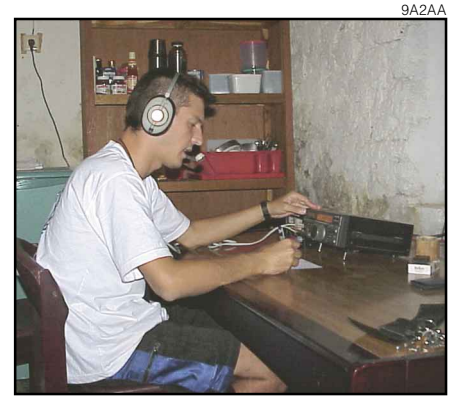
As we go to press I've received the sad news of the passing of Pero Simundza, 9A4SP/4W6SP, a 29-year-old Amateur Radio operator from Split, Croatia. Pero started working in East Timor in April 2000 for the United Nations High Commissioner for Refugees (UNHCR), very close to the East Timor/West Timor border. On September 6, 2000, Pero was working in the UNHCR building in Atambua, West Timor, Indonesia when an angry mob attacked the building, killing him and two other innocent workers. The Associated Press reported, "Thousands of pro Indonesian militiamen and their supporters stormed a UN office in West Timor Wednesday, killing an American and two other foreign UN staffers and burning their bodies."

Amazingly, approximately 30 other UNHCR people made it out alive and were later evacuated from West Timor. Pero was a radio operator and had been working for UNHCR since 1992. In 1996 he was working in Mostar, Bosnia Herzegovina, and was active as T98P. During late 1999 Pero was stationed in Tirana, Albania and operated as ZA/9A4SP.

Pero was not the only amateur killed in Atambua on that fateful day. An American, Carlos Caceres, KD4SYB, was also among the staff who died at the UNHCR building.

Perhaps we should all take this time to reflect on the difficult situations that some of the DX operators who bring us great joy are faced with every day. The next time you find yourself sitting in your shack trying to work one of those rare or semi-rare countries, think about the people on the other ends of the pileups. Having been in East Timor earlier this year, I can understand some of the difficulties the UN personnel have to live with. They face long hours, sometimes without family, and they don't get paid nearly enough. Amateur Radio and the world have surely lost a true humanitarian. Rest in peace, Pero Simundza. Our sincere condolences to the Simundza family.

9A2AA



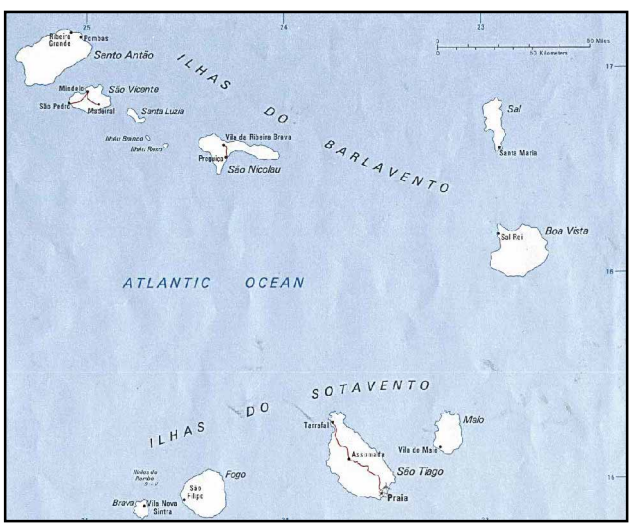
Pero Simundza, 9A4SP, operating as 4W6SP from East Timor, very close to the East/West border.

CAPE VERDE ISLANDS—D4

The Cape Verde Islands are a republic consisting of 12 volcanic islands in the Atlantic Ocean, most of which are inhabited. Praia is the capital city located on Sao Tiago Island, which is located at 14° 47′ North 23° 35′ West, just off the west coast of Africa. Ca'da Mosto, a Venetian navigator in service of Prince Henry of Portugal, discovered the islands in 1456. Settlement did not take place until 1462 by the Portuguese, who made it an official colony. Over the years both the French and English fought over the islands. In 1951, Cape Verde became a Portuguese overseas province and on July 5, 1975, became independent.

There are about 350,000 residents on the islands, of which only three are Amateur Radio operators. Carlos, D44CA, is located in Mindela on Sao Vicente Island (AF-086). Angelo, D44BS, and his wife Zizi, D44BW, live in the capital. Old timers will remember working Julio, D44BC, who became a Silent Key last year.

Spanish operators Manuel, EA8BYG and Jose, EA8EE/EA5CPU, have announced they will be active from the Cape Verde Islands in early November. The two will be operating from the home of Carlos, D44CA, on the Island of Sao Vicente from November 1 to 8. They plan to be active on all bands, including 6 meters. Look for them to be QRV on CW, SSB, RTTY, PSK31, HELL, MFSK16, MT63, SSTV and PACTOR. IC-706 MKIIG and TS-440 transceivers will be used along with an A4S beam and a vertical antenna. The logs will be updated daily on **http://www.qsl.net/dxgrancanaria/**. QSL cards will be handled by EA8URL.



The Cape Verde Islands are made up of 12 islands with some 350,000 inhabitants, of which only three are Amateur Radio operators.

TUNISIA—3V

It's hard to believe, with all the recent activity, that Tunisia remains on the 100 Most Wanted list. For those who still need this one you'll get another chance this month as a mostly German team will activate TS7N from Kerkennah Island (AS-NEW). This is good news for both IOTA and WPX chasers as this will be an all-time new one for both awards.

DL1BDF

Mustapha Landoulsi (right), DL1BDF, hands a 3V8CB QSL card to Mr. Lzahar (left), director of the center for the new Boy Scout station in Tunisia.

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

The team will be QRV from the island starting November 14 and ending on the 28. One of their goals for this operation is to concentrate on W6/W7, JA and VK. The operators include Andy, DJ7IK; Mustapha, DL1BDF; Andi, DL9USA; Tom, DL1GGT; Gunter, DJ9CB; Ruth, IT9ESZ; Britt, DL6BCF; Jun, JH4RHF; Ralf, DL3EA; Carsten, DL1EFD; Walter, DL6SAQ; Falk, DK7YY; Fernanda, I2RLX and Michael, DL2EBX.

This IOTA DXpedition plans to do something a little different. They will display the status of their operations live on the Internet. The Web page will show the station number, frequency they are transmitting on, mode, operator call, beam direction, pictures and other comments. Check out their home page at **http://qsy.to/ts7n/**.

While on the island they will participate in the CQ World Wide CW DX Contest as a multi-single. Before and after the contest they will be active on all bands from 6 to 160 meters on CW, SSB and the digital modes. QSL via DL6BCF either via the DARC Bureau, or direct to Britt Koester, Pützstr 9, 45144 Essen, Germany.

MACQUARIE ISLAND—VK0

Macquarie Island is an Australian sub-Antarctic island located 1,368 kilometers (850 miles) southeast of Tasmania in the Southern Pacific Ocean. For those trying to find it on the map, it can be found at 54° 30′ South 158° 57′ East. The island is administered by Tasmanian Parks and Wildlife Service and is 34 kilometers long by 5 kilometers wide. Captain Frederick Hasselborough was credited as the discoverer of this remote island while sailing the *Perseverance* on a sealing voyage. He was the first to record the sighting of Macquarie Island on July 11, 1810, and named the island after Governor Lachlan Macquarie of New South Wales, Australia.

The island was mostly used for sealing until 1919 when seal oil production ceased. Many scientific expeditions have taken place on the island throughout the years. In 1948 the Australian government established the first permanent scientific station. The Australian National Antarctic Research Expedition (ANARE) designated the island as a state reserve in 1972, then renamed it as the Macquarie Island Nature Reserve in 1978. This makes it impossible for any DXpedition to operate from the 11th most wanted country on the ARRL DXCC list.

The only operations from Macquarie Island must be those of ANARE employees. Over the past twenty or so years, minor operations have taken place from Robyn, VK0AE; Alan, VK0AN; Graeme, VK0GC; Graeme, VK0NE; Tom, VK0TS; and Warren, VK0WH. Typically the operators are usually the radio technicians on the island and stay for a 12-month stint.

The latest operator is Alan A. Cheshire, VK0MM, who is the island's Co-coordinating Communications Technical Officer. He arrived on Macquarie Island in November 1999 and took to the airwaves as VK0LD. To celebrate the new millennium he changed calls to VK0MM on January 1, 2000. Alan was active for 24 hours as AX0LD in late January. He is probably one of the more interesting operators we have seen on the air in recent years. All of his scheduled operations have been listed on his Web site at **http://www.geocities.com/vk0ld/.**

Alan expects to leave the island on November 12 when the ANARE 2000 team departs and the ANARE 2001 crew takes over. He has made more QSOs from Macquarie Island than all of the previous operators combined, although he would not say how many contacts he has made. QSL information will not be available until closer to the end of his assignment. If you still need this one, you'd better hurry. Alan says that there will not be an Amateur Radio operator among the 2001 crew. On top of that Alan says, "It is now ANARE policy to discourage amateur operations from the Australian Antarctic stations (Mawson, Davis, Casey & Macquarie Island)." In the weeks that remain, look for Alan to be only on 30 meters CW and 20 meters CW and SSB. For those who were fortunate to work Alan as AX0LD on January 25 or 26, you may QSL to the Sao Paulo CW Group (CWSP), PO Box 1807, Sao Paulo SP 01059–970, Brazil.

Alan A. Cheshire, VK0MM, has also operated as VK6CQ, VK8AC, A4XYF, VP8PT, G4EEL, VS5AC/V85AC and P29AC.

MAURITIUS ISLAND—3B8

Sigi, DL7DF, and Tom, DL7BO, just can't get enough of the DXpedition scene. In October they wrapped up their 5V7 and XT2OW operations. This month they will operate from the Indian Ocean island of Mauritius. No call was mentioned at press time, but more than likely they will sign 3B8/home calls. They plan to be active on 6 through 160 meters on CW, SSB and RTTY. Sigi and his operators are topnotch and they always put in a great effort on the low bands. Suggested frequencies are as follows: SSB—1847, 3777, 7077, 14177, 18137, 21277, 24937, 28477 and 50123; CW—1824, 3511, 7011, 10111, 14011, 18087, 21011, 24907 and 28011; RTTY—14087, 21087 and 28087. A Web site has been set up at **http://www.qsl.net/dl7df/**. QSL to DL7DF via the DARC QSL bureau, or direct to Sigi Presch, Wilhelmsmuehlenweg 123, D-12621 Berlin, Germany.

VIETNAM—3W

Hans Glista, WA1LWS, says he is planning another trip to Vietnam this month. If all goes well, he will be on the air as 3W2LSW from November 9 to November 26 and plans to participate in the CQ World Wide CW DX Contest. As before, Hans will operate exclusively CW and make as many QSOs as band conditions permit. He is applying for operating privileges on 10, 15, 20, 40 and 80 meters. However, authorization for 80 and 40 may not be granted. We will have to wait and see.

VATICAN—HV

ARRL Contest Manger Dan Henderson, N1ND, will be attending the Pescara DX Convention in Italy on November 25 and 26. Before the convention he plans to spend a few days operating from the Vatican. He'll be using HV0A, a special Jubilee 2000 call sign, around November 22 to 24. Look for him mostly on SSB with some CW on all the bands, but mostly 10, 15 and 20 meters. QSL via IK0FVC.

ALSO THIS MONTH...

November 4 and 5 Amateur Radio operators from South Korea will be attending the HL DX Convention in Cheonan (130 km south of Seoul). One of the topics will be a talk of a future operation with their DX brothers and sisters in Pyongyang. They anticipate some 150 DXers from HL. DXCC Field checking will be done also. For more information contact Lee, DS1BHE, by e-mail at **centaurs@hitel.net**. This year's SEANET Convention will be held on November 17 through 19 in Pattaya, Thailand. Those interested may contact Ray Gerrard, HS0/G3NOM by e-mail at **g3nom@ibm.net**, or by writing to PO Box 1300, Bangkok 10112, Thailand. The CQ World Wide CW DX Contest will be held on November 25 and 26. Keep an ear on the bands starting around November 19 for contest DXpeditions to start testing their equipment and antennas. This is one of the best contests for working DX, and so is the week prior! Watch your favorite DX bulletin for more contest DXpeditions.

W5 QSL BUREAU ON THE INTERNET

Remember hearing people on the air saying the Internet would be the end of Amateur Radio. Boy, were they wrong! In fact, it's actually enhanced the hobby. One of those enhancements is the W5 QSL Bureau on-line. Yep, the members of the Magnolia DX Association (MDXA) have thrown out the gauntlet at **http://www.mdxa.org/buro.html**. If you're a W5 and on the Internet, this is not new news to you, but those of us not in W5 land should see what these guys have done. Just like most of the other US QSL bureaus, the W5 QSL bureau has 26 sorters, one for each letter, and all with e-mail. 20 of the sorters have databases that are available on-line, listing the calls of the stations they are responsible for, the cards they are holding, the envelopes on file, the last mailing, and additional information. The site has all the information needed to claim cards, QSL bureau tips, monthly statistics and even a complaint department. Hats off to the guys and gals in the MDXA.

ARRL OUTGOING QSL SERVICE

Just a reminder that all QSL cards going to the ARRL Outgoing QSL Service must be sorted in alphabetical order by country prefix & the correct fee enclosed. Full details can be obtained at **http://www.arrl.org/qsl/qslout.html**, or in the September 2000 issue of *QST* page 67, or by writing the ARRL.

DXCC MILLENNIUM AWARD

This is just a reminder concerning the DXCC 2000 Millennium Award, which is available to anyone working 100 DXCC entities on the ARRL DXCC List this year. No cards are needed for this separate and distinct award. For complete details check out the December 1999 issue of *QST,* page 47. Applications can be obtained on-line at **http://www.arrl.org/awards/dxcc**, or by writing the ARRL.

WRAP UP

This month's column could not have been possible without the help of D44BS, DJ7UC, DL1BDF, DL7DF, EA8EE, G3NOM, N1ND, N5FG, T93Y, *The Daily DX*, VK0MM, WA1LWS and WC7N. Please keep sending those newsletters, pictures and DX information. Until next month, see you in the pileups!—*Bernie, W3UR*

VHF in China

China is an immense country halfway around the globe, with an area greater than the 48 United States and a population of more than 1.2 billion. Amateur Radio in China has a long history, stretching back more than sixty years, but during the past decade, activity has increased noticeably on all bands, including VHF.

Like many other areas of Chinese life, Amateur Radio was transformed during the reforms of the early 1990s. One significant change has been the licensing of private home stations for the first time in many years. By the end of 1999, there were 850 individual stations and as many licensed operators in China, along with 140 club stations (BY prefixes). With prior authorization, foreign Radio Amateurs may operate club stations only, and several Americans have done so in recent years. It is now common enough to hear Chinese calls on all the HF bands, and there is growing interest in VHF as well.

Chinese amateurs in each of three license classes (BA, BD and BG prefixes) have access to the 6- and 2-meter, 70- and 23-cm bands. (See Table 1 for details.) Six-meter operation is generally permitted only in the southernmost province, Guangdong (with its population of 60 million), largely due to the continued presence of television broadcasting near 49.750 MHz elsewhere in the country.

About 10 stations have been active on 6-meter SSB/CW from Guangdong in recent years, with a few others reported occasionally from other provinces. Guangdong call signs include the number "7" with suffixes beginning with the letters I through P, such as BA7JG, BD7IB and BG7LP. Any other 6-meter operations presumably have special permission. BI4X and similar calls with the BI prefix are reserved for special island expeditions, some of which have included 6-meter stations.

The most active 6-meter operator in all of China is probably Mars Liu, BG7OH, of Shenzhen. Liu operates primarily on SSB using a JRC JST-245 and a 4-element 6-meter Yagi perched on the roof of his seven-story apartment building. In little more than two years of operating, Liu has already accumulated 40 DXCC entities, including such rare catches as 9N6CT, A45ZN, EY8CQ and S21YJ. He can also be found on 28.330 MHz using a 3-element Yagi, but Liu's license does not allow him to operate on 28.885, the 6-meter liaison frequency.

VR2IL PHOTO

Mars Liu, BG7OH, welcomed W3EP, the first overseas foreign Radio Amateur ever to visit his station in Shenzhen, on July 1. Liu has been the most active of the dozen or so 6-meter operators in China. Several enthusiastic 6-meter operators from Hong Kong kindly accompanied me on this visit. From left to right are VR2IL, BG7OH, VR2XMT, W3EP, VR2XRW and VR2PM. For more photos, set your browser to http://www.qsl.net/vr2dxa/w3ep.htm.

Two-meter activity is just getting started in China. Apparently, there are no FM repeaters, although Chinese Radio Amateurs sometimes show up on the Hong Kong machines. BY4BJA has been reported on AO10, and further interest in satellites may provide an avenue to expand SSB/CW activities on the higher VHF bands. During spring 1998, the club station BY1QH (with the aid of SM0KAK) made quite a number of 2-meter moonbounce contacts, and this activity may have inspired some continuing interest in EME.

Hong Kong

Hong Kong and the New Territories, with a population of about seven million, have constituted a Special Administrative Region of China since 1997. Hong Kong has about 1500 licensed radio amateurs and a well-established tradition of VHF activity. The Hong Kong Amateur Radio DX Association (HARDXA) provides the primary focus for organized VHF activity. See the HARDXA Web site at **http://www.qsl.net/vr2dxa/**.

At least two dozen operators are active on 6-meter SSB and CW, including VR2IL, VR2PM, VR2LC, VR2EQ, VR2XMT, VR2XMQ, VR2XRW and VR2ZYJ. Typical stations run 150 W and 5-element Yagis, although VHF operating conditions are often hampered by crowded conditions, hilly local topography, many tall buildings and urban RFI problems. Six-meter operators follow the Japanese DX Packet Cluster spots, but they sometimes feel lost in the huge pileups of Japanese stations during openings to East Asia. Nevertheless, they are eager DXers, and most of them are still looking forward to their first contacts with Europe and North America. The VR2SIX beacon runs 10 W to a $^1/_2\lambda$ vertical on 50.075 MHz.

Local activity on 2 meters is even more popular, aided by four FM repeaters and two packet digipeaters. There is even some

This Month

November 17-18	Leonids meteor shower peaks
November 19	Very good EME conditions
November 18-19	ARRL EME Contest (second weekend)

Emil Pocock, W3EP ♦ Box 100, Lebanon, CT 06249 (Voice 860-642-4347, fax 860-594-0259) ♦ w3ep@arrl.org

2-meter FM DXing. Taiwanese 2-meter FM operators sometimes make the 700 km stretch to Hong Kong repeaters via tropospheric paths across the South China Sea. These contacts provide Hong Kong operators with some DX excitement and propagation news, especially concerning conditions to Japan.

Two-meter SSB and CW activity has been modest, primarily due to Hong Kong's relative isolation and challenging operating conditions. HARDXA members have set up a VHF Field Day-style station on the relative isolation of Tate's Cairn, just north of Kowloon. From there, they participate in the annual Two Meter SSB Whole Country Migration Communication and the Pan-Asian 2-Meter SSB Propagation Test. VHFers in Japan, Russia, Korea, China, Taiwan, Australia, the Philippines, as well as Hong Kong, participate in these events.

In the 26th running of the Whole Country Migration Communication this past July, for example, the HARDXA station VR2K heard nothing beyond Hong Kong on 2 meters, but Taiwanese stations made a flurry of 2-meter sporadic-E contacts into Japan. VR2K had to settle for 150 QSOs via 6-meter E-skip to Japan and Korea. For more information and photos of the activities from Hong Kong perspective, browse the HARDXA Web site.

Several operators, including Charlie Ho, VR2XMT, and Steve Beesley, VR2XMQ, have 2 meter and 70 cm SSB/CW equipment set up at home primarily for satellite work, but they are willing to use their stations for terrestrial contacts and even EME. One additional problem is that 2-meter weak-signal activity in both Hong Kong and China has been frustrated by interference from pagers in the low end of the band. Despite the difficulties, both Charlie and Steve are keen to expand their VHF horizons. What big gun will give them their first EME contacts?

Taiwan

There is also significant VHF activity from Taiwan, the island nation of 22 million population and 68,000 licensed radio amateurs 150 km from the Chinese mainland. Several Taiwanese stations, including BX2AB, BO2YA, BX4AG and BM6ADL have been active on 6 meters during the past several years. The Taiwanese maintain a number of 2-meter repeaters, and many operators have FM equipment. BV3CE and BV1AL have also been active on the satellites, especially AO10, but there is only a modest amount SSB/CW activity on the band.

Sporadic-E has provided the greatest DX opportunities for Taiwan 2-meter operators. In addition to successes during the 26th Whole Country Migration Communication, BW0VHF made 21 QSOs with Japan during an E-skip opening on June 3, according to Hatsuo Yoshida, JA1VOK. Hatsuo's 2-meter contact with BW0VHF during that opening was his first with Taiwan, completed over an respectable 2100-km path.

Table 1
VHF/UHF Allocations in China, Hong Kong and Taiwan

Band	China	Hong Kong	Taiwan
6 m	50.000—50.100*	50.050—51.500	50.000—50.012.5
	50.100—54.000	52.025—52.110	50.110—50.122.5
2 m	144.000—144.100*	144.000—146.000	144.000—146.000
	144.100—148.000		
70 cm	430.000—430.100*	430.000—431.000	430.000—432.000
	430.100—440.000	435.000—436.000	
	437.000—437.200		
23 cm	1260.000—1300.000	None	1260.000—1265.000

*CW only. China has exclusive subbands for satellite and television in the 2m, 70 cm, and 23 cm bands. Hong Kong also has allocations at 5 cm (5.725—5.850 GHz), 12 mm (22.00—24.25 GHz), 6 mm (47.0—47.2 GHz), 4 mm (75.5—76.0 and 76.0—81.0 GHz), and 2 mm (142.0—144.0 GHz). Taiwan also has an allocation at 13 cm (2.440—2.450 GHz).

Macau

There are relatively few active stations in Macau, a Special Administrative Region of China since 1999, located 60 km west of Hong Kong. Aside from local 2-meter FM activity, there have been few sustained VHF operations from this enclave of not quite half a million. XX9TSS, XX9TRR and XX9TVP have made 6-meter contacts recently, but Hong Kong VHFers are under the impression that much of the 6 meter activity over the past dozen years has been by foreign visitors.

Prospects

Long-term prospects for VHF and UHF in China are good, especially as the number of radio amateurs in China is bound to increase. Current band allocations through 23 cm are sufficient to support many different activities, including FM and FM repeaters, television, digital modes, satellite, EME and weak-signal DX. Stations capable of making worldwide SSB/CW contacts through Earth satellites hold special promise, as they can also be used to take advantage of favorable terrestrial propagation and even to complete EME contacts.

The highest incidence of sporadic-E propagation anywhere in the world occurs over Southeast Asia, ideally situated for stations in China and surrounding countries. There are good indications that tropospheric ducting is common across the South China Sea, perhaps supporting contacts into the 3000-km range from China as far as the Philippines, Malaysia, Singapore and even Indonesia. The possibilities of VHF ducting across the Pacific to Guam (over 3000 km) and even farther may be comparable to the California–Hawaii path.

Perhaps in the near future we will be reading about extraordinary VHF and UHF activity from China, with its huge population, vast area and a nearly ideal geographic location to take advantage of a variety of DX propagation modes. Many thanks to BG7OH, VR2XMT, VR2XMQ, VR2IL and JA1VOK for their generous help in answering questions and providing information for this article.

ON THE BANDS

August is normally a transitional month for VHF propagation modes, especially during solar-cycle peaks. Sporadic-E declines from its long summer season just as tropospheric ducting becomes more widespread. There is a greater chance for aurora, auroral-E and transequatorial propagation as the autumnal equinox approaches. The reliable Perseids meteor shower completes the August menu. This August, there was a good deal of each kind of propagation to keep VHFers busy. Indeed, on August 12, large areas of the country experienced aurora, auroral E, tropospheric ducting and meteor scatter simultaneously.

In addition to calls mentioned in the summaries, many thanks to WA2EZG, WB2AMU, WV2V, K3IB, KU4WW, N5TIF, W7GJ, W8RU, KB7WW and XE2EED for their valuable reports. Dates and times are all UTC.

Six Meter DX

A mixture of late-season sporadic-E to Europe and a number of surprisingly early-season north-south F-layer contacts provided DX thrills for August. At the same time, Europeans were already making great runs into Africa, the adjacent Indian Ocean and even to South America. Activity in the western Pacific also picked up as August progressed. All this occurred about a month earlier than in previous peak-sunspot years.

Stations as widely scattered as KQ1V (FN43), N8II (FM19) and W9/VE2CDP (EM48) made a few sporadic-E contacts with Spain and Portugal on August 4, between 2000 and 2120. This was undoubtedly the last opening of a most productive transatlantic E-skip season.

On August 29 around 2230, Mick McManus, W1JJM (FN31), WB8XX (EM79) and N8KOL (EN80) hooked up with ZD8KW on Ascension Island in the South Atlantic. The

propagation mode was not clear, but it was probably a sporadic-E link to a dense F-layer region off the West African coast. Europeans were also working ZD8KW and South Africa about the same time. On August 30 at 1640, N5KME posted a contact with 3C5I (Equatorial Guinea) on the DX Packetcluster.

Activity from the Pacific got an early start. On August 3 around 0140, VK3HK made a lone contact with W8JI/4 (EM73) and was heard by W3CMP (FN11). After 2345 on both August 3 and 4, VP6PAC (Pitcairn Island), worked K5XX (EM21), K5SW (EM25), N8KOL (EN80) and others in Ohio, Maryland and Virginia, at least. XE2EED, N6XQ and W6BYA worked ZL3TIC, ZL3FOX, ZL4WA and ZL3GS on August 20 between 2250 and 2310.

The biggest flurry of contacts came from South America, the usual source of early-season F-layer DX. Jose Carbini, LU6DRV, and other Argentines made widely scattered contacts across the US on the late afternoons of August 3 (New Mexico), 4 (Texas), 20 (Idaho, California and Arizona), 21 (Georgia) and 31 (New England).

Other South Americans made it into the US during the month. K5SW and K5IX (EL29) were among the lucky few to find CE3SAD on August 3 and 4. K5CM (EM25) reported HC8GR/b on August 28, but no live stations. YV4DDK heard KB4TEQ and other W4s on August 30, but no contacts resulted. PX2XB worked W3JO (FM29), W1RA (FN41), W3BO (FN20), N4MM (FM17) and several others on August 31 after 2300. This was all just a teaser for what undoubtedly has already been an exciting September and October.

Sporadic E

Six-meter operators enjoyed E-skip openings on August 4, 5, 15-18 and 22 somewhere across the US and Canada. The openings of the 4th and 5th were notable for double-hop conditions, especially between the W1 and W7 call areas. Several stations scattered through the Pacific Northwest reported C6, CO, XE and ZF stations on August 4 after 0200.

Two-meter operators also had opportunities to make E-skip contacts during rare openings on August 4 and 5. Shuler Ringley, KB4DFK (EM86), in southwestern Virginia, made three such contacts into southeastern Texas after 0100 on the fourth. Other reported paths that evening were Kansas to Florida, and Iowa and Nebraska to New York and New England states.

Two meters opened again for sporadic E the next evening for more than two hours beginning around 0030. In general, activity seemed to move northward over the eastern half of the country during this period. Ken Reecy, AC4TO (EM70), in the Florida panhandle, ran 13 QSOs into Texas, Oklahoma, Kansas, Arkansas and Missouri after 0035. By 0100, stations in South Dakota, Minnesota, Iowa and Nebraska were making a flurry of contacts into all of the New England states, New York and New Jersey, including W0ZQ (EN34), who made 14 contacts with the Northeast. Dave Johnston, KQ1V (FN43), gave Maine to three happy Iowa and Nebraska stations. WB0LUX (EN04, South Dakota) provided a new state to W3EP (FN31) with a 2200 km QSO, perhaps the longest of the opening.

Aurora and Auroral E

August 10 through 12 provided some of the most intense and widespread aurora and auroral-E activity since—well, since July 15-16. These events were spaced just about 27 days apart, or one solar rotation, suggesting that the same active region of the sun was responsible. It is too early to tell as this was being written whether there was a third great aurora around September 8-9, just before the September VHF Contest.

The August 10-11 aurora began late in the evening. The K index hit five at 2100 on August 10 and rose to seven by 0600 before falling throughout the morning. Russ Holshouser, K4QI (FM06), heard a few raspy 2-meter stations peaking due north after 2330, but activity was low. W3EP made 10 auroral QSOs on 2 meters between 0035 and 0245, but none farther south than New Jersey.

The main excitement that morning was the strong auroral-E opening on 6 meters, which became evident by 0200 and persisted through 0630. Soon after 0200, Arliss Thompson, W7XU/0 (EN13), copied the OX3VHF (HP15), VE8BY (FP53), VE4/KG0VL (EO26) and VE8WD (DP22) beacons, as did many stations from New England across the Midwest. Big things were expected, and stations across Alaska, Canada and the northern third of the US did not have long to wait.

Within the hour, VE9AA (FN65), VO1GO (FN95), VO1TJM (GN08) and other Maritime Canadians were running stations all the way to the West Coast. VO2/DL2KG (FO93), who had brought an FT-100 and a 2-element Yagi while on temporary assignment in Goose Bay, provided added excitement. His best DX of the morning was with VE7SL (CN88) at about 4235 km.

Simultaneously, KL7RG (CO35), KL7NO (BP54), KL7FH (BP51), NL7Z (BP51) and perhaps other Alaskans were working into the lower 48 states as far eastward as New England. Some long contacts included NL7Z to VE9AA (5335 km) and KL7NO to W3EP (5250 km).

Aurora returned with even greater intensity the next evening. The K index was five at 0000 August 12, seven at 0300, and then nine (the highest on the scale) at 0600. It remained at seven during the next three reporting intervals before declining to five at 1800. All this made for an intense geomagnetic storm, but unfortunately, auroral signals were not evident until 0430. Most operators had probably called it quits for the evening or were napping in anticipation of running meteor scatter in the early morning.

What a surprise greeted those hearty VHFers who got on the air after 0500! Two-meter aurora signals were strong as far south as a line from southern Utah, through Arkansas, to central Georgia. K4QI (FM06) was among those who got up intending to work meteor scatter, but ended up instead making 75 aurora contacts on 144 and 222 MHz. His longest 2-meter QSO was with N0KQY (DM98), 1980 km distant.

K7ICW (DM37) was delighted to work K0QMS (EN31) in Iowa at 0843, also over a 1900-km path. "I was astonished," Al wrote. "This was my first aurora QSO from my vacation get-away near Duck Creek Village, Utah . . . I can't ever remember hearing aurora out here in the West in August! Dick's signals were 55A and he gave me 53A." Ironically, the pair duplicated the contact via meteor scatter within an hour.

Others had equally good success on 2 meters. VE2PIJ (FN35), who was making contacts as early as 0435, worked west to EN40 and south to FM19. Herb Krumich, WA2FGK (FN21), made 50 QSOs west to EN10 and south to EM44. Dave Calvert, KB0BE (EM48), made 19 contacts from central Missouri, most of them to more northerly stations. Likewise, nearly all of N0LL's contacts from EM09 were stations at higher latitudes as far eastward as FN02, 1700 km away. N0KQY (DM98, in western Kansas) found numerous contacts from Washington to Virginia. VE3AX (FN02) had a string of notable 222 MHz contacts with N0LL, KM0T (EN13), K5UR (EM35), W5RCI (EM44) and K4QI.

The subsequent auroral-E propagation, which became evident for most 6-meter operators after 0745, was not nearly as strong or as extensive as the previous morning. Northeastern stations heard the OX3VHF and VE8WD beacons and made a few contacts into the Pacific Northwest, but Alaskans were limited to single-hop contacts to the West and upper Midwest.

Perseids Meteor Shower

Experienced meteor-scatter operators were not inspired by the 2000 Perseids. "Meteor scatter scheduling and random activity on SSB/CW seemed down from recent years," according to W0AH's comments on the Stanford VHF e-mail reflector. K7ICW wrote that "this shower was not one of the better Perseids that I have worked from Utah or Nevada." Others attached similar comments to their reports. "The shower turned out to be a real dud," according to N0LL. K0MQS concluded that "the Perseids was a disappointment again this year."

There may have been a reason for the noticeable decline in activity. As W8WN commented, everyone was working the strong aurora on the morning of the 12th and not paying attention to random meteor scatter. It was even possible that the aurora diminished the effects of meteor scatter, as meteors typically leave their ionized trails in the same region of the E-layer where aurora has its greatest effects on VHF radio propagation.

Even so, persistent operators did made contacts on 144 and 222 MHz. K0GU, for example, completed four of eight schedules on 222 MHz on the morning of the 12th and found conditions best between 0730 and 0930. Shelby Ennis, W8WN, identified several flurries of activity to the northeast on August 12 between 1415 and 1515, while Europeans reported good success during the predicted peak times around 0530 and 1000.

The most interesting results may have come from the growing crowd using high-speed CW (HSCW) techniques. Computer-assisted high-speed CW makes it easier to use shorter pings and perhaps weaker signals, thus often cutting down the time necessary to complete a contact. It may also be easier to complete contacts near the theoretical limit of about 2350 km for meteor-scatter paths. Indeed, NJ0M and K9KNW completed a notable 2-meter contact over a 2360 km path during this year's Perseids using HSCW techniques. This may be the longest such contact yet reported.

At least 22 stations also participated in the such contact yet reported. At least 22 stations also participated in the North American HSMS Contest, run just prior to predicted Perseids peak. N0KQY, N7STU and K0GU

completed the first-ever 222 HSCW meteor contacts during the contest, according to K0XP. Complete results of the North American HSMS Contest, sponsored by the Western States Weak Signal Society, can be found at **http://www.qsl.net/k0xp/**.

Tropospheric Ducting

Tropospheric conditions were quite good across the Mississippi Valley through much of August, as the central part of the country stagnated under a blocking high-pressure system and generally hot, dry conditions. Typical 144 through 1296 MHz contacts were in the 1000- to 1500-km range from South Dakota, Minnesota, Iowa, Nebraska and Kansas to western New York, Ohio, Kentucky, Tennessee and Alabama.

N0KQY made some of the longest reported contacts from his western Kansas location. For several hours after 0000 on August 19, Gary found many strong 144, 222, 432 and 1296 MHz signals eastward as far as Ohio. He made 144 and 222 contacts with K8TQK (EM89) at about 1580 km and with AA4H (EM86) at nearly 1700 km.

Favorable tropospheric ducting conditions continued right to the end of August, when K2AXX (FN12) worked 1600 km west to EN13 on 2 meters. Randy Ebers, WA0I (EM47), who just got on 2 meter SSB/CW earlier in the month, worked all the way to western New York and Canada. Randy has accumulated 82 grids on the band in just one month of operating.

NOTES FROM ALL OVER

New 10 GHz DX Record

Congratulations to DJ4AM and DJ3KM, who made a record-breaking 2079 km contact on 10 GHz this past June 15. According to the July/August issue of *Israel Ham News*, Dieter Doerfler, DJ4AM, set up his station on one of the upper floors of the Residence Hotel in Netanya, Israel (KM72kh). Adalbert Kaufmann, DJ3KM, operated from the Italian island of Lampedusa (JM65hm) off the North African coast. The pair was able to maintain their trans-Mediterranean QSO for about an hour.

The Mediterranean Sea, site of the July 1983 10 GHz record contact of 1666 km (which stood for 11 years), is well known for its strong, stable ducts. The pair chose their operating locations carefully and made lengthy calculations in order to orient their 60-cm dishes with the 1° tolerance required. Both used identical 5 W transverters built and designed by DL1RQ.

This contact broke the existing 1912 km record established in Australia during December 1994. It is likely a longer 10 GHz mark will be set before another six years passes, perhaps across the twice-proven Mediterranean once again, or from Hawaii to California.

VHF/UHF/MICROWAVE NEWS

Awards

The ARRL Board of Directors selected Al Ward, W5LUA, as the recipient of the ARRL Microwave Development Award at its July 21 meeting. Al has made notable contributions over the years in microwave circuit design, especially of receiver preamplifiers.

At its July meeting in Winnipeg, the Central States VHF Society presented Steve Kostro, N2CEI, with its annual Wilson Award and named Kent Britain, WA5VJB, as recipient of the annual John T. Chambers Award for technical achievement.

The Northeast VHF Conference honored Ron Whitsel, W3RJW (ex-WA3AXV) as recipient of its annual Tom Kirby Award at its annual August meeting in Enfield, Connecticut. Congratulations to all those honored for their dedication to the world above 50 MHz.

FEEDBACK

The most notable 6-meter transatlantic contact for the month of June was left out of Table 2 in the September column. On June 24 at 1631, VE9AA made a contact with 9J2BO over an 11,530 km path. Similarly odd contacts from eastern North America to Tanzania and Malawi have been reported in previous years. QST

NEW BOOKS

A PHONE OF OUR OWN: THE DEAF INSURRECTION AGAINST MA BELL

By Harry G. Lang

Published by Gallaudet University Press, 800 Florida Ave NE, Washington, DC 20002-3695; tel 800-621-2736; TTY 888-630-9347; **http://gupress.gallaudet.edu**. *Hardcover, 6 ×9 inches, 256 pages. ISBN 1-56368-090-4. $29.95.*

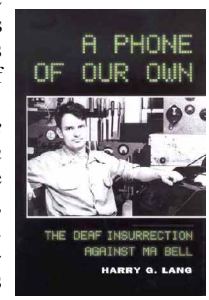
Reviewed by Steve Ford, WB8IMY
QST *Managing Editor*

◊ If you're compiling a list of technological achievements pioneered by Amateur Radio operators, don't forget to include teletype (TTY) terminals for the deaf—the forerunners of modern TDDs (Telecommunications Devices for the Deaf). As chronicled by Harry G. Lang in *A Phone of Our Own: The Deaf Insurrection Against Ma Bell*, the creation of versatile communication devices for the deaf was hardly a straightforward process. It's a story of innovation and frustration that spans two decades.

The late Robert Weitbrecht, W6NRM, was a major player in the early days of Amateur Radio radioteletype, or RTTY. He was instrumental in getting the FCC to expand ham RTTY privileges after World War II.

Weitbrecht was born deaf, so he was well aware of the difficulties deaf individuals faced when attempting to use non-visual communication devices, such as telephones. In addition to his fascination with sending teletype over radio, he experimented with sending teletype signals over ordinary telephone lines. By the early 1960s, Weitbrecht had developed a dual-tone audio modem and an acoustic coupler to translate signals between his telephone line and his teletype machinery.

Weitbrecht's accomplishment soon came to the attention of Dr James Marsters, a deaf orthodontist who had also been exploring the idea of developing a better telephone communication tool for the deaf community. At the time, AT&T offered crude devices that relied on flashing lights or vibrations to communicate just three pieces of information: "no," "yes" and "please repeat." (AT&T also provided their TWX data service, but the cost was well beyond the reach of the average deaf person.) When Marsters saw Weitbrecht's teletype setup, he was astonished—Weitbrecht had invented an affordable device that allowed printed text to be sent from one telephone to another. Recognizing the huge potential benefit to the deaf, Marsters and Weitbrecht formed a business partnership with wealthy deaf businessman Andrew Saks.



The tale that unfolds in A *Phone of Our Own: The Deaf Insurrection Against Ma Bell* has all of the elements of a Greek tragedy, complete with a doomed hero. Initially the trio worked at converting cast-off teletype terminals for use by the deaf, but these were difficult to acquire because AT&T made it a practice to destroy old TTYs as a method of "competition control." To make matters worse, AT&T claimed the right to terminate service to anyone who connected a non-AT&T device to their telephone line. It took a lawsuit brought by another company to finally remove this obstacle in the late '60s.

Weitbrecht, Marsters and Saks attempted to convince AT&T to adopt their telephone teletype design for deaf customers, but the corporation steadfastly refused. So, they continued their conversion business and, under the engineering guidance of Weitbrecht, developed more sophisticated (and much smaller) solid-state terminal units.

Their company, known as APCOM, enjoyed considerable success through the mid-70s, but it wasn't to last. Other deaf entrepreneurs invented even more compact devices. Larger companies were focusing their attentions on the market as well. By the end of the '70s, APCOM folded.

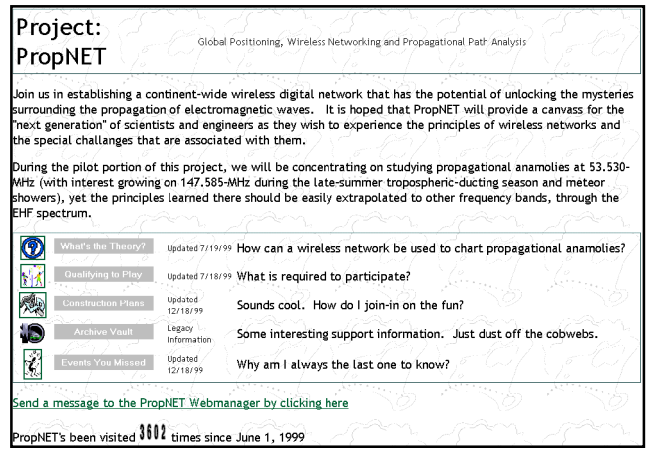
Harry Lang spins a story that is unflinching in its honesty. Although he praises Weitbrecht for his accomplishments, Lang stops short of elevating him to sainthood. Weitbrecht was as neurotic as he was brilliant, and his personality quirks often got in the way of business. Extremely awkward in social settings, Weitbrecht preferred to communicate with his partners and others through a constant barrage of written notes. These notes became increasingly bitter and paranoid as the years wore on. According to *A Phone of Our Own: The Deaf Insurrection Against Ma Bell*, Weitbrecht's behavior was largely responsible for the ultimate demise of APCOM and the dissolution of the partnership. Weitbrecht's prospects seemed to improve in the APCOM aftermath, but his life came to a violent end when he was struck and killed by a car in 1983.

This book is compelling technological history, with a heavy "ham emphasis" throughout. You don't have to be deaf to be intrigued by *A Phone of Our Own: The Deaf Insurrection Against Ma Bell*. On the contrary, you'll come away with a deeper appreciation of this little-known struggle for equal communication access. QST

The Leonids Meteor Shower Packet Experiment Q&A

According to the folks who predict such things, November 17-18 will be the peak of the biggest meteor-shower event of the year. As in past showers in past years, ham radio operators will try to bounce signals off the ionized trails that follow each shooting star.

SSB and high speed CW are usually the weapons of choice when gunning for meteor-shower contacts, but over the years, there has been a growing number of hams who use FM packet radio to ping the falling space debris. One of the most active groups of packet pingers is PropNET, a coordinated network of hams using their computers hand-in-hand with their TNCs and radios to track the signals propagated by meteors. PropNET will be active during Leonids and if you are interested in joining them in their quest for space communications, read the following Q&A dialog written by their faithful leader, Ev Tupis, W2EV.



The PropNET Web site (http://go.to/PropNET) has full instructions on how you can participate in this year's Leonids meteor shower packet experiment.

Conventional wisdom dictates that FM packet is not suitable for meteor scatter work. Why bother?

The state of the art continues to evolve. Conventional wisdom once dictated that flight in "heavier than air" craft was impossible. Past successes prove that FM-based packet radio may indeed be used for long-distance communication via meteor-trail refraction at Amateur Radio power levels.

Was the 1999 Leonids meteor-shower packet experiment a success?

Absolutely! Especially if you gauge success by learning lessons and using that learned knowledge to establish a vision for fine-tuning the process for future attempts. Dozens of participants announced the receipt of at least one DX packet attributable to meteor-trail refraction.

I participated, but didn't see any icons on my screen, yet my neighbor just 20 miles away received two DX stations. What gives?

Welcome to the world of meteor-scatter communications. The geometry of RF propagation by meteor-trail refraction is such that what you describe is actually quite typical, especially as operating frequency increases. That is to say, you will experience this phenomenon more on 2 meters (147.585 MHz) than on 6 meters (53.53 MHz).

Of everyone that I know who participated, no one had a screen full of icons like what I saw in QST. Who were the lucky people with those screens?

No one person had the "screen full of icons" that you saw in *QST*. As noted in the November 1999 *QST* article, those maps were composites of all reported successes, that is, a pictorial representation of all reported successes.

The frequency was clogged in my (urban) area. Why?

Urban areas typically have a higher density of hams to potentially participate in any activity. Couple that with a small, but very costly mistake that was made in the instructions for participating, and you have a very clogged frequency in high-population areas.

One TNC parameter was inadvertently omitted from the directions. TNCs operate in a Carrier Sense Multiple Access (CSMA) mode, that is, they wait to transmit until after they detect that the channel is clear of other signals. Invoking the TNC command "FULLDUP ON" would have disabled the CSMA function and doing so would have opened the frequency significantly.

What was the most common setup error that participants encountered?

Most folks that experienced operation problems did so because they failed to reset their TNC to the factory defaults prior to configuring it for meteor-scatter work.

What kind of power does it take to assure success?

With no reported exception, 2-meter participants required a *minimum* 500 W of effective radiated power (ERP); 6-meter stations required a minimum 100 W ERP. This is the classic example of "more is better." Transmit with as much RF power as you can muster. Small beam antennas seem better than omnidirectional antennas or large beams, as they bathe the sky with a broad pattern, while providing a fair amount of receive "gain" as well.

What frequencies will be used for the experiment this year?

Almost everyone will be on 53.53 MHz and 147.585 MHz just like last year.

How can I best stay in contact with other packet propagation enthusiasts?

Subscribe to an Internet e-mail list that caters to packet propagation enthusiasts. Visit the TAPR Web site (**http://www.tapr.org**) and subscribe to the PropNET special interest group (SIG). Activity peaks around meteor showers and during the summer tropospheric-ducting/inversion season. This is a low-volume e-mail list. Don't worry about your e-mail box filling daily. Just remember, PropNETers and BEACONeters are pioneering experimenters. Come and learn right along with them!

I cannot find my November 1999 QST. Where can I go to get instructions for participating in this year's round of packet meteor-scatter experiments?

Instructions are available at **http://go.to/PropNET** or **http://go.to/BEACONet**, while November 1999 *QST* is available on the ARRL Periodicals CD-ROM 1999 from ARRL headquarters (**http://www.arrl.org/shop/**). QST

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The Good and The Bad

In my May column, I asked readers to tell me about their "Radio Friendly/Unfriendly" vehicles. Response has been excellent, and I really appreciate everyone who took the time to send details (and pictures) of their mobile installations and experiences—good or bad.

This month, I'm going to share a few of those responses with you. As you read, keep in mind that no attempt is being made to endorse or condemn any particular vehicle, radio or antenna. Just because someone else is/isn't having RFI problems with a specific vehicle doesn't guarantee you'll experience the same results. As one reader aptly pointed out, not all installations are created equal.

Remember, too, that some vehicles, though villainous generators of RFI, can be squelched with simple suppression methods. Others cannot. Some auto manufacturers are willing to assist owners in dealing with RFI/EMI problems. Some are not. Many don't address the use of radio transmitting equipment, while some consider it unacceptable in any case. Bottom line? The best approach is to thoroughly research the RFI/EMI issue before you buy a vehicle. After all, it's *your* money!

Tom Hybiske, K3GM

I recently purchased a 2000 Chevrolet Impala, and 3 days following delivery, proceeded to "leave my mark" by punching a nice $^3/_4$-inch hole in the trunk and installing a Larson NMO mount dual-band antenna. I did some investigation before my vehicle purchase and found the Impala to be very antenna friendly. Open the trunk lid, and you will find oval cutouts in the ribs at both center and side locations. The trunk lid will easily hold three antennas. Also, the designers seemed to locate the rib cutout so that you can open the trunk without having the antenna tip smack the roof of the car; it just misses! I installed my ICOM IC-207H in the trunk and used the umbilical cable to connect to the front panel, which is located nicely in the Impala's front console. I connected the radio directly to the battery using 8 AWG wire. There is a grommet in the firewall directly behind the engine. It's quite low, but very accessible. I have had no engine computer or broadcast radio problems on 2 meters or 70 cm at any power level.

Michael Gollihue, KC8NRG

I operate mobile from a 1999 Pontiac Grand Am GT1 with ABS, power locks and windows, power seats, 8 speaker CD/cassette radio and an automatic transmission with a 3.4L V6. I use an ICOM IC-2800H with a Larsen dual-band mag-mount antenna placed on the roof. I generally stay on 2 meters while mobile, monitoring the local repeaters and 146.52 MHz. There are no noticeable RFI problems during transmit, but I do hear a slight bit of noise on receive. I believe that poorly shielded coax and its proximity to the vehicle wiring may cause this. (A problem I plan to address.) The radio is installed under the center console in a large space beneath the radio, out of the way of heating ducts, in front of the shifter. The "head" of the radio is mounted above the rear-view mirror.

I tried grounding a fan motor case and burned up the motor! It is obviously not meant to be grounded!

Jon Zaimes, AA1K

I started HF mobile operation with a Kenwood TS-180S in my 1991 Jeep Cherokee, equipped with 6-cylinder engine. I used a roof-mounted Pro-Am antenna for 20 meters, switching to a steel whip for 10 meters. The TS-180S was eventually replaced with an ICOM IC-706MK2. The Jeep was fairly quiet, but there was a definite increase in noise floor as soon as I would switch on the ignition (even before starting the engine). The noise was S2-3 on most bands, but on 15 meters it was the worst, perhaps S5-6. There was some ignition noise, but I was still able to work 100 countries, mostly on CW.

I recently purchased a new 2000 Volkswagen Jetta TDI with a 5-speed transmission, ABS, sunroof and air conditioning. Since it's a diesel, there are no spark plugs and no ignition noise! Now I have an extremely quiet noise floor; the S meter doesn't move. I do observe slight RFI when I switch on the headlights. This produces some slight interference every few kHz on 24 and 28 MHz. The car has daytime running lights, but the noise is only present when the light switch is on, which illuminates the panel and taillights. I haven't experienced any incidents with radio transmissions, HF or VHF, causing any problems with vehicle operation.

Dave, KD3PC

I drive a 1997 Mustang, V6 electronic fuel injection with all the options—ABS, airbags, power seats, upgraded CD player (Alpine), power windows, seats and cell phone. I run a Kenwood TM-261 at 50 W with only one problem: a slight buzz that is picked up in the rear amplified speakers at high volume with no audio (ie, between tracks). No other problems.

Bob, WD6L

I have a 1997 Ford F350 diesel truck plagued with an S-5 or greater noise level on the 160-10 meter bands. After some detective work, I determined the noise is from the control unit for the fuel injection pump. The noise it generates sounds like a 60-Hz buzz. I contacted Ford and spoke to a ham there who says that Ford is well aware of the problem (they had to modify their AM-FM radio to make it work in the vehicle).

Joe Shreve, WD5EGK

I have a '96 Ford Taurus SE with electric windows and door locks and the V6 engine. I run the Ten-Tec Scout with a Hamstick vertical and the matching coil and mount from the Lakeview Company. Normal operation is on 40 meters. I have lots of noise from the twin radiator cooling fans. I tried grounding a fan motor case and burned up the motor! It is obviously not meant to be grounded! A 0.22 µF capacitor across the fan motor leads knocked down some of the noise, but it is still extremely strong on 20 meters and above, making those bands nearly unusable. There is also a hash-type noise that I believe is from the ignition. I grounded the trunk lid and tailpipe to the body using coax braid and that seemed to reduce this particular noise source by several dB.

Perry Churgin, KB2MBE

My 1996 Ford Windstar states in the manual: "No transmitters allowed!"

QRZ

It isn't too late to send me your "Radio Friendly/Unfriendly Vehicle" info. As before, specify vehicle make and model, radios used, problems encountered and if/how they were solved.

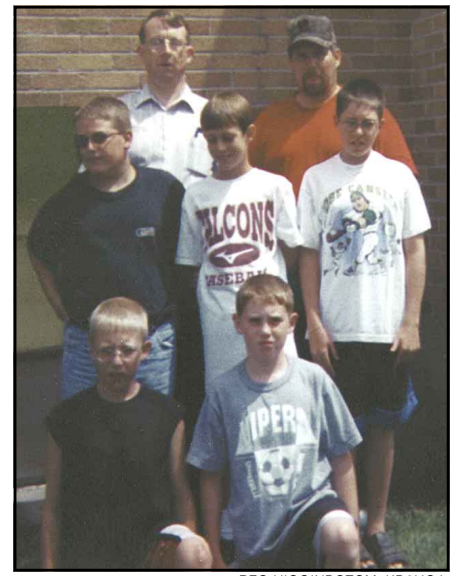
FAUX PAS...

In the July column, I incorrectly listed the URL for the home page of the Mobile Amateur Radio Awards Club. The correct link is: **http://marac.org/marac/**. Thanks to Dennis, KK7X, for pointing out the error. QST

Roger Burch, WF4N ♦ Box 100, Island, KY 42350 ♦ wf4n@arrl.org

Victor C. Clark Program Now Offering $1000 Minigrants!

We're happy to announce that the Victor C. Clark Youth Incentive Program (**http://www.arrl.org/arrlf/vicyip.html**) is now able to offer up to $1000 in matching funds to Amateur Radio youth groups. This successful program has, over the years, helped youth clubs acquire station equipment, fund community radio displays, purchase needed study materials or kits, and a wide range of creative Amateur Radio activities that have brought other youngsters into the hobby. The incentive part of the program is that which young people provide directly—hands-on, youth-led leadership. They learn, teach, and apply what they know to make hamming fun for themselves, while opening their minds to future possibilities. The seeds of productive, enjoyable careers are often sown in young carefree minds pursuing hobbies they love. Reginald Higginbotom, KB0UOJ, tells us about one such group: "Our program, the Centerville Area Amateur Radio Youth Program, was blessed with a $300 minigrant that was used for educational materials and equipment for our initial group (8 boys from the local Boy Scout Troop #32 and the Moulton Christian Church). We hope to eventually offer classes for both boys and girls and participate in Field Day and Bunny Hunting activities. The youth are very grateful for this grant."



(Right) Members of the Centerville Area Amateur Radio Youth Program include: Front row, l-r: Chaz Welch, Chris Welch. Middle row, l-r: Travis Knowler, Kyle Kauzlarich, Calvin Welch. Back row, l-r: Reg Higginbottom, KB0UOJ, and Randy Welch. Not shown: Michael Kauzlarich, Marshal Jay, and Chad Spurgeon.

REG HIGGINBOTOM, KB0UOJ.

JOSEPH GUTWEIN, WA9RIJ

The Six Meter Club of Chicago was happy to celebrate with this year's Six Meter Club scholarship winner, Alan Schwab, KB9REU. On hand for the festivities were: Ray Stair, W9CEJ, President of the Club; Ed Metzger, W9PRN, ARRL Foundation President; Larry Schwab, KB9REV, Alan's Dad; Alan; Jim Novak, WA9FIH, Vice President of Six Meter Club; and ARRL Vice Director Howard Huntington, K9KM.

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Program
Jackson County ARC (Mississippi), in fond memory of Hazel Orman, KC5RIB
Rich Greenwald, N7GHE, in fond memory of Len E. Graf, WA7JID
Patricia M. Maier, in loving memory of Tom Maier, W1EQG
Larry J. Shima, W0PAN*
Dottie Shima*, in fond memory of Riley Dunn, W0CEL
Charles J. Valek, Jr, KA6RRZ, in loving memory of Geneva A. Valek, KB6CRP
Robert L. Happel, N4LGX, in fond memory of William F. Norris, Jr, W4IPR
Charles A. Higgins, N3NQX in fond memory of Charles Cleveland, W2DII

The Jesse Bieberman Meritorious Membership Fund
Steel City ARC, Inc, in fond memory of Joseph E. Lawrence, N3VDL, and George M. Gaydos, Jr, KS3I.
Kenneth D. Hopper, KD7KH**
Barbara O. Hopper**
** in fond memory of Samuel N. Barbara, W2KFI, Carl A. Felt, Jr, N2XJ, Ernest D. Kolb, N2EFR, and Harry C. Snyder, W7HC
Claude Parker, KE6DXJ, in fond memory of Howard L. Schreck, N6MFL

PHD ARA Scholarship Fund
PHD ARA (Missouri), in fond memory of Lile Corval, N0BBJ

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Richard D. Cox & Company for Paul H. Davis
John L. Swartz

The Tom and Judith Comstock Scholarship Fund
Tom and Judith Comstock, N5TC and K5JRC

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West Jackson County ARC, Inc (Mississippi), in fond memory of Hazel W. Orman, KC5RIB
Harry A. Mills, Jr, in loving memory of Harry A. Mills, II, W4FD
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Theresa Elmendorf, KA2CQZ
Eugene Cummings, W9CMO
John D. Baer, W6SL
John V. Boehme, K4PRK
Santiam Canyon ARE (Oregon) in fond memory of Cal Culbertson, W7SAN
Frank Czaza, W9XZ, in fond memory of Roy Hawkins, WA9KEC
David R. Anderson, WA3WZX
Janice R. Scheuerman, KJ4N, in fond memory of Carl A. Felt, Jr, N2XJ
Eric Shuler, in fond memory of Frederick Crum, W2NIA
Mary R. Cantrell, in loving memory of Hazel B. Russell, WD5GLG
Ruth Smith, in loving memory of Frank O. Smith, III, N4UVA
Greg Harris, WB9MII, in fond memory of E.E. Slim Ellsworth, W9JMG
John G. Troster, W6ISQ
Friends of Al Duncan, W4BHF
Dade Radio Club of Miami, Inc (Florida) in fond memory of Daniel Carlin, KE4YNC

As received and acknowledged during the months of **May, June, July** and **August**.

QST

Mary E. Lau, N7IAL ♦ Secretary, ARRL Foundation, Inc

The Hallicrafters S-1

One of the best known and respected names in ham radio is Hallicrafters. Founded in 1932 by William J. Halligan, the company name was chosen as a composite of the two words: "Halligan" and "handcrafted." "Handcraft Makes Perfect" was the first logo of his enterprise.

In 1933 Halligan acquired the use of the bankrupt Silver-Marshall company's name, factory, and most important, the use of their RCA license. With the help of Kendall Clough, former engineer from Silver-Marshall, they designed the first of a new line of ham radio receivers. First announced in the April 1934 issue of *Radio News*, the "S-1 Skyrider" sold for $39.95, about the same price as popular kit radios. A few were built in small production runs of 50 or 100 sets. Each one was handcrafted and signed by the assembler.

To become a successful manufacturer in the Depression, cost had to be kept to a minimum. The 4-tube circuit was a tried and well-tested design. It had one stage of tuned RF (using a 6D6), a regenerative detector (another 6D6) and two stages of resistive-coupled audio (a 6C6 followed by a 42 in the output). The set was built in a small cabinet complete with a speaker and a built-in ac power supply using an 80 tube.

The S-1 introduced several innovations into ham radio receivers. Most receivers up until then had plug-in coils. Alternatively, the S-1 offered band switching. Four positions covered from 1.6 to 22 MHz.

Micro-vernier, anti-backlash tuning was introduced with a reduction ratio of 18:1. Tuning was accomplished by turning the lower left horizontal tuning knob with your left thumb, the rest of your hand wrapped around the left side of the cabinet. It is a comfortable tuning position for a right-handed person. This allowed the other hand to be used for adjusting the dual controls for RF sensitivity and audio gain.

The antenna input circuitry was designed for use with standard antennas, or to utilize the advantages of "doublet" antennas. An additional ground wire was provided for easy attachment.

Because so few S-1s were built, not many survive today. I'm happy to tell you that my Old Radio Museum will have the S-1 on display starting late this fall. For more information, you can read a radio magazine engineering report on the S-1, see additional photos and some early Hallicrafters S-1 advertising on my Web site: **http://www.eht.com/oldradio/arrl/index.html**.

The S-1 model was quickly followed by the S-2, which added a bandspread control and a send-receive switch to the front panel. The S-1 through S-6, made in small quantities, took Hallicrafters into 1935. By late 1935, they started producing communications receivers with the name "Hallicrafters" in their new factory. The 1935-36 SX-9 "Super Skyrider" was the first model to be produced in significant quantities. By 1938, Hallicrafters had produced 23 different models.

My thanks to Chuck Dachis, author of Radios by Hallicrafters, *for his personal help with the history of this radio and the Hallicrafters company.*—K2TQN

Old Radio Auction

Every so often, you hear about radio auctions. This is a short report on one.

I just returned from the annual Antique Wireless Association meet near Rochester, New York. It is held every year around Labor Day. You will always find a large 3-day flea market, interesting radio presentations, an old equipment contest, seminars and two auctions there.

The first auction is the Communication Equipment Auction for ham radios and boatanchors only. AWA Museum Curator "Col" Ed Gable, K2MP, is the Auctioneer.

Radios and their selling prices in the accompanying, are from left: an RCA ACR-136 went for $70; the National NC-57 with the slant base and meter went for $22 and the Howard 663 went for $47. That's Ed taking the bids in the accompanying photo.

The second auction is the main auction, held in three parts. First, there is a vacuum tube auction, then a paper collectables auction, and last, the general auction. Here you will find rare and expensive items, as well as early ham radio gear.

If you are interested in the results, check my Web page. QST

John Dilks, K2TQN ♦ 125 Warf Road, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

IARU Region 3 Conference Calls for Morse Testing Phaseout

The 11th International Amateur Radio Union Region 3 Conference in Darwin, Australia, ended September 1 by resolving to seek the ultimate removal of Morse code proficiency as an International Telecommunication Union licensing requirement for HF operation. As "an interim measure," the conference agreed to support the reduction of all Morse code testing speeds to 5 WPM.

"IARU Region 3 strongly supports Morse code as an effective and efficient mode of communication," the resolution said in its preamble. "However, it believes that the position of Morse as a qualifying criterion for an HF amateur license is not relevant to the healthy future of Amateur Radio."

The resolution urged IARU Region 3 member societies to seek an interim 5-WPM Morse code testing requirement while looking toward eventually eliminating the Morse requirement altogether. "We recommend that, setting aside any previous relevant decisions of earlier Conferences, a policy of the removal of Morse code testing as an ITU requirement for an amateur license to operate on frequencies below 30 MHz be adopted by IARU Region 3," the Conference resolution declared.

Voting in accordance with ARRL Board policy, International Affairs Vice President Rod Stafford, W6ROD, cast the lone dissenting vote on the League's behalf, although he voted in favor of an earlier motion to support 5 WPM as the top code speed for testing. The Hong Kong Amateur Radio Transmitting Society abstained. The Asian and Pacific region's 11 other member societies who were present at the Conference favored the resolution.

The Region 3 Conference recommended that the IARU Administrative Council adopt its position as IARU policy. Meeting September 3-4 in Darwin, the Administrative Council declined to act on the policy recommendation, however, until after the Region 2 conference next October in Guatemala.

Conference delegates addressed another concern related to ITU Radio Regulation S25, which requires that applicants demonstrate Morse proficiency to operate below 30 MHz. Some delegates worried over wording in a preliminary draft recommendation that includes reference to "radio telegraphy" among amateur license operating skills. Delegates were told that the ITU defines "radio telegraphy" to mean RTTY and facsimile as well as Morse. In a motion proposed by the Radio Society of Great Britain and seconded by the ARRL, the conference requested that the IARU Region 3 representatives to the IARU Administrative Council propose replacing the term "operating skills" with "methods of communication."

Left to right: David Sumner, K1ZZ, Rod Stafford, W6ROD, and Paul Rinaldo, W4RI, at the IARU Region 3 Conference.

The Conference also reaffirmed the IARU's determination to obtain an exclusive worldwide allocation of no less than 300 kHz in the vicinity of 7 MHz. The conference instructed the Region 3 IARU directors to "treat achievement of this objective as a matter of the highest priority," and Region 3 member societies were encouraged to do all they can to support the IARU goal at 40 meters.

In other business, the Conference elected Peter Naish, VK2BPN, and K.C. "Selva" Selvadurai, 9V1UV, as new IARU Region 3 directors and re-elected Fred Johnson, ZL2AMJ, who was appointed chairman, Yong S. Park, HL1IFM, and Yoshiji Sekido, JJ1OEY—all for three-year terms.

In addition to Stafford, those on hand from the US included IARU President Larry Price, W4RA, ARRL Executive Vice President and IARU Secretary David Sumner, K1ZZ, and ARRL Technical Relations Manager Paul Rinaldo, W4RI.

The next IARU Region 3 Conference will be held in Taipei, Taiwan, in September 2003.

IARU ADMINISTRATIVE COUNCIL ALSO MEETS IN DARWIN

The Administrative Council of the International Amateur Radio Union met on 3-4 September 2000 in Darwin following the IARU Region 3 conference. The principal business at the meeting was to begin preparations for WRC-2003, which has several items of importance to the amateur services on its agenda.

At its Darwin meeting the Administrative Council:

1.…thanked the IARU WRC-2000 delegation for its diligent work on behalf of Amateur Radio at WRC-2000 in Istanbul.

2.…identified and reviewed the WRC-2003 agenda items of relevance to the amateur and amateur-satellite services.

3.…appointed a five-member core delegation for WRC-2003 that was given responsibility for preparation for WRC-2003 agenda items relating to 7 MHz.

4.…identified the ITU meetings at which IARU representation will be required for the coming year; accepted the recommendations of the President and International Secretariat with regard to representatives to attend these meetings.

5.…noted the update on the progress towards its policy of transferring into an ITU-R Recommendation the operational and technical qualifications for an amateur license and acknowledged the input of Region 1 member-societies and the Region 3 Conference on the subject. This input will be taken into account in the formulation of further IARU input on the subject to ITU Working Party 8A.

6.…reviewed, updated, and approved the present and anticipated future requirements for radio spectrum allocations to the Amateur and Amateur-Satellite Services, with special emphasis on the frequencies in the upper part of the spectrum.

7.…reviewed and approved an updated *Action Plan* for the development of support for Amateur Radio in Africa. The *Plan* includes several courses in Amateur Radio Administration to be taught under the joint sponsorship of the ITU and the IARU.

8.…adopted a budget for 2001-2003, as submitted by the International Secretariat.

9.…asked the International Secretariat to prepare a document highlighting the need for radio amateurs to support the IARU through membership in their member society in order to protect the amateur spectrum and to maintain the vitality of the Amateur Services.

10.…received and noted the report of the Committee on IARU Structure and comment from the Region 3 Conference. The topic of possible constitutional changes to the IARU structure remains open for further consideration.

11.…expressed its thanks to the IARU Monitoring System International Coordinator, Bob Knowles, ZL1BAD, and his colleagues for their continued excellent service to the amateur community.

12.…selected "Providing Disaster Communications: Amateur Radio in the 21st Century" as the theme for World Amateur Radio Day, April 18, 2001. QST

The NorCal 40A—an Instant Classic

The current plethora of QRP kit radios owes their existence to one rig: the NorCal 40, a monoband, 40-meter transceiver, first presented as kit by the Northern California QRP Club in 1994. The success of this kit was a surprise to the NorCal folks and the rig's designer, Wayne Burdick, N6KR (designer of the Sierra, SST, K1 and K2 transceiver kits). It was such a success that Wayne and Bob "QRP Bob" Dyer, KD6VIO, formed Wilderness Radio to commercially market a redesigned (and greatly improved) version, the NC-40A.

What makes this kit so unique? First is the price versus performance factor. The kit still sells for $129.00 (plus shipping and handling), which is the price it sold for from the very beginning. This includes case, knobs, printed circuit board and *all* parts. You have a completely finished high performance, portable QRP transceiver for $129. Second, all the parts, controls, jacks and connectors are board mounted with no off-board wiring required. This greatly simplifies construction and reduces errors in building.

The NC-40A's Performance Set the Standard

Performance is outstanding, considering the simplicity of the design. June 1996 *QST* features an overview of the Wilderness NC-40A along with several other QRP kit transceivers.[1] The receiver sensitivity and the dynamic range are terrific for such a simple design using minimal parts. The QRP fraternity received the NC-40A with open arms. QRP Bob tells me that Wilderness Radio has sold over 1000 NC-40A kits to date. The rig has become a standard at Cal Tech's Electrical Engineering Department as a project for undergrad engineering students.[2] I obtained a copy of Dr. Rutledge's book, *The Electronics of Radio*, and found a fascinating (but somewhat math intensive) text that details the inner workings of the NC-40A. If you want to *really* understand how this rig works, spend the money and buy Dr. Rutledge's book.

Speaking of receiver performance, this is the one area that has been a big stumbling block in past efforts to produce a QRP transceiver kit for the masses. By providing enough amplification at the receiver front end, extremely good Minimum Discernible Signal (MDS) characteristics are achiev-able. However, it is what happens to the signal *after* the RF front end that dictates overall receiver performance. Unless your mixer and IF stages can reject unwanted signals while amplifying the desired signal with minimal distortion, you can have the most sensitive receiver front in the world, but it won't do you much good.

Two key parameters in assessing receiver performance, in addition to MDS, are Blocking Dynamic Range and Two-Tone Dynamic Range.[3] Looking at the ARRL lab results of the Wilderness NC-40A, the MDS is –137 dBm (which is very good) while the BDR is 108 dB and the T-TDR calculates out at 89 dB, also quite good. Obviously these specs are not as good as the better commercially manufactured receivers available today. But when is the last time you saw any of these radios available in kit form for under $130?

A True Battery Miser

Another area where the NC-40A really shines is power consumption. When Wayne Burdick initially designed this kit, one of his primary concerns was to make the rig battery friendly in order to provide a compact backpacking transceiver for those who wanted to take their ham radio hobby on the trail. Therefore, Wayne paid particular attention to insure the rig's overall current drain was small. My unmodified NC-40A (s/n 1000) has a receive idle current of only 18 mA at full volume with no signal input! Now *that* is battery friendly.

Of all the rigs reviewed in June 1996 *QST*, the Wilderness Radio NC-40A (a highly modified version, I might add) offers the best receiver idle current 28 mA (max volume, no signal at 13.8 Vdc). Transmit current for 3 W output was measured at 300 mA (key down, 50-Ω load, at 13.8 V dc. While a number of the other transceivers were capable of higher RF outputs (some up to 7 W!) their transmit current drain was also considerably higher. Again, Wayne's design philosophy was such that what could be accomplished at 5 W (the QRP "legal limit") could also be done at the 2-3 W level.

Varactor Tuning

Tuning in the NC-40A is accomplished via a varactor diode. The main tuning control is a 10-kΩ potentiometer that varies the reverse bias of the MVAM108 varactor diode in the oscillator circuit. While this is crude by some standards, resulting in a limited tuning range of about 45-60 kHz, it is simple and quite easy to use. Modifications exist to greatly expand this tuning, but dial accuracy then becomes critical. Some QRPers have substituted a precision 10-turn, 10-kΩ pot in place of the standard 10-kΩ pot with good results.

Born to be Modified

The NC-40A was made to be "played with" and modified. After all, what's the fun of building a homebrew rig if you can't experiment a bit? The inside of the rig offers a lot of room for add-ons. Anyone for digital readout? Wilderness Radio sells their KC-1 memory keyer/audio digital readout specifically for the NC-40A. Small Wonder Labs[4] also sells their FreqMite audio digital frequency readout on a small PC board that can be easily installed. In addition, Embedderd Research[5] and K1EL[6] offer PIC memory keyers on tiny PC boards that will easily fit inside the NC-40A case. Add a small two-port RF power bridge and miniature meter for measuring forward and reverse power[7] and you have a very respectable homebrew rig that will go anywhere.

Notes

[1]Rick Lindquist, KX4V (now N1RL), "Low Cost Transceiver Kits You Can Build," *QST*, June 1996, p. 45.

[2]Dr. David Rutledge, *The Electronics of Radio* ISBN: 0-521-64645-6. Available from Cambridge University Press, 110 Midland Ave, Port Chester, NY 10573-4930; tel 914-937-9600.

[3]ARRL Web site: **http://www.arrl.org/tis/info/rigbuy.htm** and **http://www.arrl.org/members-only/prodrev/testproc.pdf**.

[4]Small Wonder Labs, 80 East Robbins Ave, Newington, CT 06111; **http://smallwonderlabs.com**.

[5]Embedded Research, PO Box 92492, Rochester, NY 14692; **http://www.frontier.net/~embres/**.

[6]K1EL, Steve T. Elliot, 43 Meadowcrest Dr, Bedford, NH 03110; **http://members.aol.com/k1el/**.

[7]Zack Lau, W1VT, *2000 ARRL Handbook*, "A 30/40 Watt 20-M Transceiver." QST

Rich Arland, K7SZ ♦ 25 Amherst Ave, Wilkes Barre, PA 18702 ♦ k7sz@arrl.org

SILENT KEYS

It is with deep regret that we record the passing of these amateurs.

KA1CR, James H. Bonney, Stratford, CT
W1ISH, Michael J. Gallo, Blue Hill, ME
KA1LYG, Wendell M. McLaughlin, Whiting, ME
K1NPA, Frank W. Wells, Gardner, MA
WA1QDO, Dorothy A. Dunn, Port Orange, FL
W1QXX, John C. Wilson, Arlington, MA
K1UOV, Salvatore N. Feola, Trumbull, CT
W2BPU, John E. Triesner, Teaneck, NJ
WA2EAQ, Raymond G. Frowd, La Grangeville, NY
*N2EFR, Ernest D. Kolb, New Providence, NJ
N2EUA, Joseph S. Banach, Jamesburg, NJ
N2GMB, Giles T. Blossom, Glenford, NY
W2HIY, Paul F. Bragger, Watertown, NY
W2HSA, Charles M. Snyder, Oak Ridge, NJ
N2IMS, James L. Miller, Henrietta, NY
N2KEN, K.E. North, Chesapeake, VA
*WA2KLZ, Thomas G. Kelley, Williamstown, NJ
N2MQU, Arthur Gordon, Forest Hills, NY
W2MRB, Frank F. Pollino, Eggertsville, NY
W2NIA, Frederick C. Crum, Bogota, NJ
WA2RQO, Gordon A. Atwater, New Rochelle, NY
W2ZNR, John T. Rice, Ocean View, NJ
W3AAB, Russell L. Parker, Annapolis, MD
W3AHF, Paul F. Naftzinger, Reading, PA
W3CW, R. Hirsch, New Hope, PA
W3DYB, John W. Hartman, Edgewater, MD
K3FTE, Harry Schoene, Labelle, FL
N3GZE, Chester A. Gardner, Ellicott City, MD
WA3IVJ, Michael Puchir, Spring Lake, NJ
WB3JJL, John B. Twist, Baltimore, MD
WB3KSY, Wilmer F. Bennett, Evansville, IN
W3MIB, Roy W. Bryson, Cockeysville, MD
WA3NPB, Margaret Steininger, Bethlehem, PA
AA3O, Gregg A. Houck, Bellefonte, PA
N3QDA, Michael S. Lubline, Dresher, PA
KA3UIJ, John T. Miller, Harrisburg, PA
KF4AAO, William H. Jones, Woodbridge, VA
KD4CHE, Trenton R. McCall, Sumter, SC
WD4DXE, Charles D. Edwards, Cartersville, GA
WW4F, Wilbur C. Dempsey, Plant City, FL
N4IXY, Getson Roberts, Manchester, KY
KA4JAW, William A. Weems, Millport, AL
KC4LYP, Dempsey L. Poole, Gray Court, SC
WA4PSJ, Jerry C. Mills, Macon, GA
WD4PVH, Bobbie K. Webb, Walling, TN
WA4QKC, Edward W. Crawford, Albertville, AL
KF4SIW, Joseph P. Pocius, Safety Harbor, FL
WB4UDK, Clarence A. Hinds, Florence, SC
W4UIQ, Paul M. Jenkins, Melbourne, FL
KE4YNC, Daniel L. Carlin, Miami, FL
KB4ZNR, Cecil W. Bruton, Charlotte, NC
W4ZXK, Lois A. Spencer, Inverness, FL
W5DCK, Charles W. Caccamise, Jackson, MS
W5DHF, Ansley H. Colvin, Jonesboro, LA
N5GVU, Lowell E. Davis, Mcallen, TX
WV5K, Charles E. Hamm, Magnolia, TX
W5KWU, Edwin N. Lowe, Albuquerque, NM
KB5LAD, Covin L. Chaffin, Hamilton, MS
W5NCB, Walker J. Coffey, Oxford, MS
*WA5NYG, Richard W. Thimmesch, Belle Chasse, LA
K5OCN, Charles R. Rummel, Clifton, TX
*W5ODF, John M. Gavin, Little Rock, AR
KA5REC, Ray Kindred, Shreveport, LA
W5VRJ, John J. Kaiser, Chester, CA
KA5VYX, Bernard D. Getto, Seabrook, TX
KC5YZ, W. R. Estep, Fort Worth, TX
W6BVR, Russell C. Lunn, Westlake Village, CA
W6CTD, James L. Syrett, Placentia, CA
*N6EA, Robert C. Schmidt, Sonora, CA
*W6EFB, James S. Evans, Ridgecrest, CA
*WD6GEV, Charles A. Torbit, Jr., Fountain, CO
WB6JOT, Carl F. Alger, Redding, CA
W6JUU, Carl L. Perry, La Mirada, CA
W6KSI, Sidney A. Burnett, Imperial Beach, CA
*W6LOE, Charles B. Eder, Citrus Heights, CA
N6MCW, Donald F. Scott, Santa Maria, CA
KC6MKA, James F. Rogers, Fresno, CA
AE6T, William E. Ziegler, Reseda, CA
W6YBI, Hugh B. Davis, Orange, CA
WA6YTB, Harold W. Bingham, Camino, CA
*K6YZR, David B. Anderson, Atascadero, CA
K6ZTK, Roger Brackney, Long Beach, CA
N7CEY, Edgar A. Smith, Vancouver, WA
KL7CMQ, Charles T. Coleman, Anchorage, AK
W7DXI, Julian C. Whaley, Seattle, WA
KB7GBM, Fred A. Rupp, Capitola, CA
W7GTJ, Sig L. Elaeson, Electric City, WA
W7GZN, Ezra J. Adams, Yakima, WA
W7HC, Harry C. Snyder, Carefree, AZ
W7HF, George D. Wilson, Aberdeen, WA
WA7HGS, Francis J. Torney, Salt Lake City, UT
W7KIU, Walter Lochmiller, Talent, OR
W7PJO, Lester W. Redman, King City, OR
W7QLG, Merle D. Handy, Puyallup, WA
*K7RM, Donald R. Kelly, Scappoose, OR
NA7U, Jerry L. Chavers, Boise, ID
W7WRT, Paul J. Beringer, Spokane, WA
WB8BUF, Raymond H. Clark, Cincinnati, OH
N8CVK, William J. Butler, Findlay, OH
W8DRW, Francis J. Antinone, Steubenville, OH
W8ESQ, Robert D. Hough, Elkins, WV
K8ISM, Stephen C. Iacono, Columbus, OH
KG8KM, Hal R. Heisler, Clinton Township, MI
W8LRE, Richard R. Sando, Greenville, OH
W8MOB, John C. Sutherland, Livonia, MI
WD8MTP, James C. Gardner, Wheeling, WV
W8PQZ, Edgar O. Fisher, Dayton, OH
WA8THG, Lowell A. Behner, Grafton, OH
WB8UOR, Robert G. Fisher, Springfield, OH
W8VSL, Eileen M. Stuber, Munroe Falls, OH
NN8Y, Louis F. Heline, Rockford, MI
K8YYR, Paul L. Magnuson, Lancaster, OH
W9ASC, Philip P. Porter, Kokomo, IN
WA9BSK, Robert J. Scott, Indianapolis, IN
W9CRC, Russell B. Rennaker, Kokomo, IN
K9CRS, Edwin J. Ward, Carmel, IN
KC9KM, Leo D. Mueller, Sandwich, IL
KA9LYR, Richard Kaitchuck, Des Plaines, IL
N9MEK, August Blissmer, Lowell, IN
K9MMQ, John W. Holden, Warsaw, IN
NT9T, Ronald J. LaMothe, Michigan City, IN
N9VBB, Carol A. Aughey, Creve Coeur, MO
NQ9X, Edward L. Van Sickle, Whitehall, WI
N0BBJ, Corval Lile, Kansas City, MO
KC0GLT, Todd D. Humphrey, Fort Calhoun, NE
NX0K, John S. Lynch, Grand Forks, ND
W0OZO, Max A. Albee, Cedar Rapids, IA
W0PJ, Glenn D. Johnson, Knoxville, IA
K0PSZ, Val L. Wilson, Sunrise Beach, MO
N0PTA, Frank J. Stelter, Hastings, MN
W0UYS, Arthur D. Sinning, Edina, MN
F9YZ, Jacques Cartier, Merignac, France
G3LWY, Frances E. Woolley, Surrey, Great Britain
G4OO, Dennis Hoult, Lincolnshire, Great Britain
*VE3CRU, Hans D. Peters, Cobourg, ON, Canada

*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. 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

NEW PRODUCTS

SMA TO BNC ADAPTERS BY KC2BHO

◊ Stephen G. Gulyas, KC2BHO, has introduced a series of SMA-to-BNC Rubber Covered Antenna Adapters for handheld transceivers.

The new adapters allow the use of male BNC-terminated antennas and cables on handheld transceivers that employ SMA-type connectors. The manufacturer states that the adapters will "…prevent expensive, difficult-to-repair damage to radios that use an SMA-style antenna connection that can occur over time as the result of repeatedly changing antennas, such as when alternating between portable, mobile and base operation. The adapter takes all the wear and tear, instead of the radio's SMA connector."

The low profile adapters are said to fit all BNC antennas and connectors. The adapters feature gold-plated contacts and teflon insulators and are rubber covered for a factory antenna look. Once screwed on, the rubber cover makes contact with the top of the radio. No additional spacers are required for moisture and dirt protection, and the design provides additional mechanical support for the antenna or coax connector.

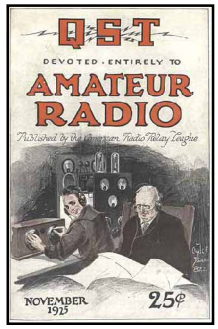
Different versions are available for use with most of the current SMA-equipped transceivers. These include Yaesu's VX-5, VX-1, VX-10 and FT-50R; ICOM's IC-Q7A, IC-T8A, IC-T81A and IC-R2; Kenwood's TH-D7A and TH-G71; Alinco's DJ-V5; Standard's C508A and C510A; and RadioShack's HTX-200, HTX-400 and HTX-245 handhelds.

The SMA-to-BNC adapters are $11.95 each plus $1.50 shipping and handling. (Check or money order only. Please specify your radio's brand and model number when ordering.) For more information contact Stephen G. Gulyas, KC2BHO, 706 Lalor St, Trenton, NJ 08610; tel 609-393-6476; **gulyas@netzero.net**.

Next New Product QST

75, 50 AND 25 YEARS AGO

November 1925

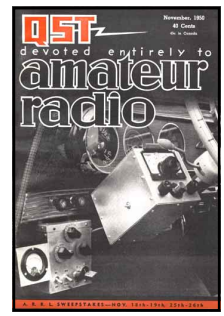


◊ The cover illustration by Clyde Darr, 8ZZ, shows a young ham demonstrating the magic of radio to an older man, who is listening to the receiver with earphones. Under the heading "Do You Tell the Truth," the editorial advises amateurs to give accurate signal reports, while "Make a Brass Pounder" urges hams to work toward bringing broadcast listeners into the ham radio fold.

John Clayton urges hams to use "Crystal Control for Amateur Transmitters," citing the proven success of NKF of the Naval Research Laboratory. "KFUH," by Ralph Heintz, describes the radio equipment used on the yacht *Kaimiloa*, which will be used for scientific research in the South Seas; P. J. Townsend tells about "KFUH's Receiver." "The One-Stage R. F. Amplifier," by P. L. Pendleton, discusses experimental work on receiver R. F. amplifier circuits. "Schnell Returns" reports the return of the US Battle Fleet from its Australian cruise, and the fine performance of ARRL Traffic Manager Schnell, who was in charge of short-wave communications from NRRL on the flagship USS *Seattle*.

"The Making of a Radio Receiver," by Virgil Graham, describes how receivers are produced at the Stromberg, Carlson Telephone Mfg. Co. plant. Assistant Traffic Manager A. L. Budlong in "Keeping a Log," stresses the importance of keeping accurate station records. "Navy Developments in Crystal-Controlled Transmitters" details the pioneering work of the Naval Research Laboratory in that field.

November 1950



◊ The cover photo shows the mobile installation of W1LOP, with a homebrew bandswitching converter (described in this issue) and a companion bandswitching transmitter. The editorial provides a look at the National Security Resources Board's new report, *United States Civil Defense*, pointing out that when a Civil Defense plan is developed and implemented sometime in the near future, hams are sure to be called on for emergency communications support.

F. E. Edmunds, W1JEO/9, describes "A Crystal-Filter S.S.B. Exciter" to help hams get started on this new mode of ham communication. Don Mix, W1TS, and Julius Galin, W1LOP, tell about "A Bandswitching Mobile Converter," which is shown in the cover photo. Two looks at transmitter speech processing are presented in "Premodulation Clipping and Filtering," by Stephen Stuntz, W1RXX, and "Cut-Off Frequencies and Audio Quality," by J. P. Neil, VE3PN. "Technical Topics" continues that area of discussion with "Frequency Response and Intelligibility." The column "Military Amateur Radio System" describes the newly installed MARS station at the Pentagon. That station will sign WAR and AIR on military frequencies, and K4USA and K4AIR on the ham bands. Continuing the ARRL series of articles on amateur operating, John Huntoon, W1LVQ, discusses "General Operating." G. Franklin Montgomery, W3FQB, tells about "'Corkey—A Tubeless Automatic Keyer" that uses only a battery, two diodes, one fixed resistor, three fixed capacitors, three variable resistors, and two relays! Rex Hess, W7NJ, reports on ARRL Emergency Corps participation in "The Seattle A-Bomb Test," a simulated attack on the city with two nuclear bombs. Because the military surplus T-23/ARC-5 v.h.f. transmitter is so popular with hams, O. W. H. Jonson, W2ZYX, describes his techniques for "TVI-Proofing the ARC-5 V.H.F. Transmitter."

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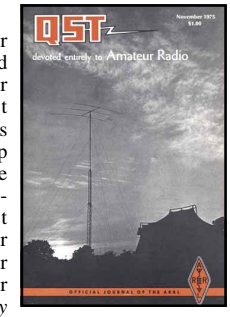


◊ The moody cover photo shows a tent and an HF beam and tower silhouetted against the setting sun, as W9UMU/9 rounds up Field Day contacts. The editorial beats the publicity drum again—it seems that hams never have (and possible never *will*) get the publicity for Amateur Radio that *only they* can provide.

Ed Tilton, W1HDQ, presents his "Ideas on 2-Meter FM Mobile & Portable Antennas." Jerry Sevick, W2FMI, describes "A Resistive Antenna Bridge…*Simplified*." Hardy Landskov, W7KAR, discusses "Pattern Factors for Elevated Horizontal Antennas over Real Earth." Jay Rusgrove, WA1LNQ, tells about "The Trombone Trimmer," describing how to build your own variable capacitors. "Linear Tuning—What Price?" by Donn Shankland, W8WVS, discusses making variable capacitors with an offset rotor shaft for nearly linear frequency-versus-rotation tuning. Interestingly, this concept was announced in *QST*'s pages almost exactly 50 years earlier, when a commercial manufacturer started making such capacitors. QST

Al Brogdon, W1AB ♦ Contributing Editor

W1AW Schedule

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM - 1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	TELEPRINTER BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	TELEPRINTER BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ **Morse code transmissions:**

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, $7^1/_2$, 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 1992 *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. 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. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

♦ **Teleprinter transmissions:**

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:**

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Miscellanea:**

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors from 10 AM until noon and from 1 PM until 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy.

In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day.

COMING CONVENTIONS

INDIANA STATE CONVENTION

November 18-19, Fort Wayne

The Indiana State Convention (28th Annual Fort Wayne Hamfest and Computer Expo), sponsored by the Allen County AR Technical Society, will be held at the Allen County War Memorial Coliseum and Expo Center, 4000 Parnell Ave; at the corner of Indiana 930 (Coliseum Blvd) and Parnell Ave. Doors are open for setup on Friday evening and Saturday morning; public Saturday 9 AM to 4 PM, Sunday 9 AM to 3 PM. Features include over 1100 commercial and flea market tables; new and used radio, computer, and general electronics items; vendors; international ham equipment manufacturers; forums and meetings; VE sessions (Saturday); parking ($2). Talk-in on 146.88. Admission is $5, under 12 free with adult (good both days). Tables: 8-ft $20 for flea market, $40 for premium, $27.50 for electricity (219-483-8163). Send SASE to AC-ARTS/Fort Wayne Hamfest, Box 10342, Fort Wayne, IN 46851; or contact James Boyer, KB9IH, 219-489-6700 or 219-484-1314, **jboyer@aol.com**; **http://www.acarts.com**.

WEST CENTRAL FLORIDA SECTION CONVENTION

December 2-3, Palmetto/Bradenton

The West Central Florida Section Convention (25th Annual Tampa Bay Hamfest), sponsored by the Florida Gulf Coast AR Council, will be held at the Manatee County Convention and Civic Center, 1 Haben Blvd, US 301/US 41 and Haben Blvd; 3 miles W of I-75 from Exit 43. Doors are open Saturday 9 AM to 5 PM, Sunday 9 AM to 3 PM. Features include commerical exhibitors (Bob Laus, K4RJL, 727-539-8627; **k4rjl@arrl.net**), swap tables (Dan Hawthorne, AI4ET, 727-586-0497; **ai4et@arrl.net**), tailgating ($10 per space; Sam Everts, KE4BXF, **ke4bxf@tampabay.rr.com**), forums and programs (ARRL, Skywarn, contesting, digital topics), VE sessions (9:30 AM both days, on a walk-in basis, no preregistration), special guests Riley Hollingsworth, K4ZDH (FCC Special Council for AR Enforcement) and Jim Haynie, W5JBP (ARRL President), limited number of on-site camping spaces (100% self-contained, no hookups or facilities; Frank Morton, AC4MK, **ac4mk@arrl.net**), free parking, refreshments. Talk-in on 146.73 (146.82 backup), info loop 147.555 MHz. Admission is $5 in advance, $7 at the door (good both days). Tables are $25 each for the entire weekend (electricity is available for $32). Make checks payable to FGCARC Tampa Bay Hamfest, Box 48725, St Petersburg, FL 33743. Contact Fred Hendershot, N3BUL, 813-671-9556, **n3bul@arrl.net**; **http://www.fgcarc.org**.

October 20-22
Pacific Division, Concord, CA*

October 27-29
AMSAT-NA Space Symposium and Annual Meeting*

*** See October *QST* for details.**

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Gail Iannone ♦ Convention Program Manager

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 **November 1** to be listed in the **January** 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 (Montgomery)—Nov 11. Phil Salley, K4OZN, 334-272-7980.

†**Colorado (Golden)—Nov 11,** 8 AM to 2 PM. *Spr:* Rocky Mountain Radio League. Jefferson County Fairgrounds, 15200 W 6th Ave; Indiana Exit from 6th Ave. ARRL forum, VE sessions, refreshments. *TI:* 145.22. *Adm:* $4. Tables: $10. Ron Rose, N0MQJ, 13481 W Alaska Pl, Lakewood, CO 80228, 303-985-8692, **n0mqj@arrl.net**; **http://rmrl.hamradios.com**.

Florida (Coral Gables)—Nov 18. Bill Moore, WA4TEJ, 305-264-4465.

Florida (Palmetto/Bradenton)—Dec 2-3, West Central Florida Section Convention. See "Coming Conventions."

†**Florida (Port St Lucie)—Nov 11,** 8 AM to 2 PM. *Spr:* Port St Lucie ARA. St Andrew Lutheran Church, 295 N Prima Vista Blvd; Exit 63C off I-95, then E 3.1 miles. Tailgating ($2), refreshments. *TI:* 146.955, 146.52. *Adm:* $2. Roy Cox, KT4PA, 412 NW Cornell Ave, Port St Lucie, FL 34983, 561-340-4319, **roycox@ecqual.net**; **http://www.qsl.net/pslara**.

†ARRL Hamfest

†**Georgia (Claxton)—Dec 2;** set up Friday 1-6 PM; public Saturday 8 AM to 4 PM. *Spr:* Claxton ARES. Veterans Community Center, W of downtown Claxton on Hwy 280 W; intersection of Hwys 301 and 280, travel W on Hwy 280 for 2 miles, building on S side. VE sessions, forums (ARES, MARS, ARRL). *TI:* 147.075. *Adm:* advance $4, door $5. Tables: $5 each (with electricity). Mr. Ellie Waters, W4CJB, Box 231, Pembroke, GA 31321, 912-653-4939; **w4cjb@g-net.net**.

Hawaii (Honolulu/Oahu)—Nov 11. Walt Niemczura, AH6OZ, 808-263-3872.

†**Indiana (Evansville)—Nov 25;** set up Friday 5-9 PM, Saturday 6-8 AM; public 8 AM to 2 PM. *Spr:* EARS. Vanderburgh County 4-H Center, Fairgrounds Auditorium, 202 W Boonville-New Harmony Rd; US Hwy 41 at Boonville-New Harmony Rd, 5 miles S of I-64, 2 miles N of Evansville Airport. Indoor flea market, new and used equipment, free tailgating (weather permitting), commercial dealers, vendors, free parking, refreshments. *TI:* 145.15, 146.925, 443.925, 145.11 (107.2 Hz on all frequencies listed). *Adm:* $5. Tables: advance $8 (flea market), $10 (wall space); after Nov 15 $10 (flea market), $12 (wall space). Neil Rapp, WB9VPG, 1506 S Parker Dr, Evansville, IN 47714, 812-479-5741, **ears@w9ear.org**; **http://w9ear.org/hamfest.htm**.

Indiana (Fort Wayne)—Nov 18-19, Indiana State Convention. See "Coming Conventions."

†**Louisiana (Monroe)—Nov 17-18;** set up Friday 2-5 PM; public Friday 5-7 PM (social cookout on site), Saturday 8 AM to 3 PM. *Spr:* Twin City Ham Club. Barak Shrine Temple, 6620 Frontage Rd; from I-20 take Exit 120 (Garrett Rd), go S on Garrett Rd, turn left at first traffic light (Frontage Rd), Shrine Temple is about 1 mile on the right. Vendors, limited number of RV hookups available ($16 per night), VE sessions (Saturday, 9 AM), card checking for DXCC and VUCC awards, forums (ARRL, AMSAT, PSK31), refreshments. *TI:* 146.85. *Adm:* $5. Tables: $10 (electricity $10 additional). Jim Ragsdale, W5LA, 111 Eagle Lake Dr, W Monroe, LA 71291, 318-396-9529, **hamfest@tchams.org**; **http://www.tchams.org/users/hamfest**.

†**Massachusetts (Newtonville)—Nov 18;** sellers 9:30 AM; public 11 AM to 4 PM. *Sprs:* Waltham ARA and 1200 RC. Newton Masonic Hall, 460 Newtonville Ave; at the corner of Walnut St and Newtonville Ave, near the Star Market which straddles the Mass Pike. Amateur Radio and Electronics Auction. *TI:* 146.64. *Adm:* $2. Eliot Mayer, W1MJ, 24 Hamilton Rd, Belmont, MA 02478, 617-484-1089, **w1mj@amsat.org**; **http://www.wara64.org/wara/auction.htm**.

†**Michigan (Mt Clemens)—Dec 3,** 8 AM to 2 PM. *Spr:* L'Anse Creuse ARC. L'Anse Creuse High School, 38495 L'Anse Creuse Rd, Harrison Twp; I-94 to Exit 236 (Metro Beach Pkwy), E to Crocker, N to Reimold, E to L'Anse Creuse Rd. Hamfest/Computer Show, tailgating (weather permitting), vendors, seminars, forums, VE sessions, free parking, refreshments. *TI:* 147.08. 146.52. *Adm:* advance $1, door $5. Tables: $10. Donna Luh, KA8QBD, 732 Brookwood Ln E, Rochester Hills, MI 48309, 248-651-7387, **jrluh@aol.com**; **http://www.ameritech.net/users/lc_arc/index.html**.

†**Mississippi (Ocean Springs)—Nov 17-18;** set up Friday 1 PM; public Friday 5-9 PM, Saturday 8 AM to 2 PM. *Spr:* West Jackson County ARC. St Martin Community Center; take Exit 50, S from

Gail Iannone ♦ Convention Program Manager

I-10, follow Hwy 609 S to second light, turn right onto Lemoyne Blvd, Center is 1½ miles on right. Hamfest/Swapfest, VE sessions (Saturday, 11 AM; bring photo ID, original and photo copy of license, $6.65 test fee), self-contained overnight RV parking (no hookups), free paved parking. *TI:* 145.11. *Adm:* $2. Tables: $5. Phil Hunsberger, W9NZ, 1207 Lancelot Ln, Ocean Springs, MS 39564, 228-872-1499, **w9nzl@juno.com**; or Ernie Orman, W5OXA, 228-392-2816, **w5oxa@datasync.com**.

New Hampshire (Londonderry)—Nov 4. Paul Gifford, K1LL, 603-883-3308.

New Jersey (Lawrenceville)—Nov 4. W2ZQ, 609-882-2240.

†**North Carolina (Benson)—Nov 19,** 6 AM to 4 PM. *Spr:* Johnston ARS. American Legion Complex, US Hwy 301 N, near the intersection of I-95 and I-40. Indoor flea market, vendors, dealers, tailgating, VE sessions. *TI:* 147.27. *Adm:* advance $4, door $5. Bill Lambert, AK4H, 8917 NC Hwy 50 N, Benson, NC 27504, 919-894-3352 or 919-894-3100 (7-10 PM), **blambert@interpath.com**; **http://www.jars.net**.

†**Ohio (Georgetown)—Nov 18,** 8 AM to 3 PM. *Spr:* Grant ARC. Adams and Brown Community Action Building, 200 S Green St; I-275 to Rte 125, E on Rte 125 to Georgetown; or Rte 68 to Rte 125, W on Rte 125 to Georgetown. Flea market, onstage auction for charity, refreshments. *TI:* 146.73. *Adm:* $2. Tables: $3 each (plus admission). Dorothy Silman, KB8TQU, 502 Waynoka Dr, Sardinia, OH 45171, 937-446-2234, **huggee@bright.net**; **http://www.qsl.net/~n1djs**.

Oklahoma (Enid)—Nov 4. Tom Worth, N5LWT, 580-233-8473.

Pennsylvania (Linglestown)—Nov 5. Harold Baer, KE3TM, 717-566-8895.

†**Texas (Azle)—Nov 11.** *Spr:* Tri-County ARC of NTX. Heritage RV Park, 501 Beaver Creek; FM 730, 5 miles S of Hwy 199 in Azle or 9 miles N of Weatherford. Flea market, vendors, APRS presentation, emergency communications displays, AMSAT, VE sessions. *TI:* 147.16 (110.9 Hz). *Adm:* $2. Tables: $10 (indoor), $5 (outdoor). Jerry Buxton, N0JY, 129 PR 3803, Springtown, TX 76082, 817-523-4426, **n0jy@arrl.net**; **http://www.qsl.net/tcarc-ntx/nctech.html**.

Texas (Houston)—Nov 25. Bill Krampe, KC5GYD, 281-579-7232.

†**Washington (Ferndale)—Nov 4,** 9 AM to 2 PM. *Spr:* Mount Baker ARC. Ferndale Band Boosters Bingo Hall, 5330 Labounty Dr; Exit 262 off I-5, westbound to second light, left at light onto Labounty Dr, hall about ½ mile. Dealers, country store, overnight RV parking, free parking. *TI:* 146.74. *Adm:* $3. Tables: advance $15, door $20. Al Norton, K7IEY, 1008 Liberty St, Lynden, WA 98264, 360-354-4622, **k7iey@netscape.net**.

Attention All Hamfest Committees!

Get official ARRL sanction for your event and receive special benefits such as free prizes, handouts, and other support.

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111. Or send e-mail to **giannone@arrl.org**. QST

SPECIAL EVENTS

James Bay, QC: Zone 2 Contest Group, VB2R, 0000Z **Oct 21** to 0000Z **Nov 4**, celebrating the 100th birthday of Canadian radio pioneer E.S. Rogers. 28.450 21.250 14.170 7.065. QSL. Carl Styan, VE3BY, RR#1, Glencairn, ON, L0M 1K0, Canada.

Rock Springs, WY: Sweetwater Amateur Radio Club, WY7U, 1500 to 2000Z **Nov 4**, celebrating UPRR steam engine 3985, one of two surviving. 14.240 21.325 28.350 7.250. Certificate. Dave Gregory, 1000 South Dakota, Green River, WY 82935.

Greenville, SC: Experimenters Group ARC, N4ISS, 1500Z **Nov 4** to 2000Z **Nov 5**, operating from the Super Flying Fortress CAF B-29 "FIFI." 7.290 14.290 28.429 AO-27. Certificate. Al Lark, 301 Shannon Dr, Greenville, SC 29615.

Huntington, WV: Tri-State Amateur Radio Association, WV8MRT, 1700Z **Nov 4** to 1700Z **Nov 5**, as the Museum of Radio & Technology honors 100 years of radio. 7.240 14.240 21.340 28.340. Certificate. Tri-State ARA, PO Box 4120, Huntington, WV 25729.

Georgetown, DE: Sussex Amateur Radio Assoc., N3N, 1200 to 2200Z **Nov 9**, for the Sussex County Returns Day celebration. 14.260 28.400 3.900. Certificate. Tom McDougall, N3JRB, 18572 Whaleys Corner Rd, Georgetown, DE 19947.

Arlington Heights, IL: Armored Force Amateur Radio Net, KA9NLX, 1500Z **Nov 10** to 2000Z **Nov 12**, as AFAR member stations remember all military veterans. 7.030 7.283 14.325 21.375. Certificate. John Paskevicz, 1423 North Ridge Ave, Arlington Heights, IL 60004-4606.

Whitefish Point, MI: Stu Rockafellow Amateur Radio Society, N8F, 1300Z **Nov 10** to 1700Z **Nov 12**, on the 25th anniversary of the *Edmund Fitzgerald* tragedy—operating from the Great Lakes Shipwreck Museum. 7.270 14.270 21.370 28.370. Certificate. Dave Langston, KB8RAP, Maritz, 1000 Town Center, Suite 1200, Southfield, MI 48075.

Reisterstown, MD: Baltimore Amateur Radio Club, W3FT, 1700-2359Z **Nov 11** and **Nov 12**, to celebrate the first anniversary of moving into our meeting and training facility. 7.230 14.260 52.150 146.67. Certificate. BARC, c/o Awards Manager, PO Box 120, Reisterstown, MD 21136.

Hackensack, NJ: 10-70 Repeater Assn & NJ Naval Museum/USS *Ling*, NX2ND, 1400 to 2130Z **Nov 11**, to commemorate the resurrection of the *Ling* Navy call: NX2ND. 7.260 7.039 14.260 14.039. Certificate. William Stagg, KC2BLN, 38 Rutgers Dr, Oakland, NJ 07436.

Nutley, NJ: Robert D. Grant United Labor Amateur Radio Association, N2UL, 1200 to 2400Z **Nov 11**, during "CQ Veterans Day," honoring the veterans of our great country. 18.120 21.375 28.420. Certificate. RDULARA, PO Box 716, Nutley, NJ 07110-0716.

Guthrie, OK: Edmond Amateur Radio Society, N5OK, 1400 to 2200Z **Nov 18**, recognizing Oklahoma Statehood Day. 7.289 14.289 21.289 28.389. QSL. EARS, PO Box 48, Edmond, OK 73083.

Plymouth, MA: Whitman Amateur Radio Club, Inc, WA1NPO, 1400Z **Nov 25** to 2100Z **Nov 26**, to commemorate our forefather's first successful settlement in America. 3.970 7.270 14.270 24.970. Certificate. Whitman ARC, PO Box 48, Whitman, MA 02382.

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 with two units of First Class postage 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 a SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111) and write "Special Requests Form" in the lower left-hand corner. You can also submit your special event information on-line at **http://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; ie, a special event listing for **Jan** *QST* would have to be received by **Nov 1**. Submissions may be mailed to George Fremin III, K5TR, at the address shown on this page; faxed to ARRL HQ at 860-594-0259; or e-mailed to **events@arrl.org**. QST

George Fremin III, K5TR ♦ 624 Lost Oak Trail, Johnson City, TX 78636 ♦ k5tr@arrl.org

STRAYS

LOOKING FOR QSL COLLECTORS

◊ I would like to hear from any hams interested in participating in an Internet trading club dedicated to collecting pre-1939 vintage QSL cards. Please e-mail Tony Ricicki, W2VRK, at **tpllrs@eclipse.net**.

WANTED: HF SKEDS

◊ The Starved Rock Radio Club is offering a Technician class at our local LaSalle Illinois Veterans' Home this fall. We would like to set up evening HF skeds with other Veteran facilities to help introduce our students to Amateur Radio. Please e-mail Joe Tokarz, KB9EZZ, at **kb9ezz@arrl.net**.

OPERATION CQ

◊ The Amateur Vanity Call Sign Headquarters Web site at **http://www.carroll-usa.com/vanity** has inaugurated a program known as "Operation CQ." This project will enable hams across the US to document their formerly held call signs and license information. The intent is to build a searchable, historical database and make it available, online, with no fees, in 2001. Operation CQ provides instructions and an 11-step online form which hams can use to supply details concerning their former call signs. Call sign registration will continue into next year.

LOOKING FOR *ACP-131*

◊ While I was a cryptologist in the US Navy (1980-86), I often used a publication that I very much wish to find again. This publication had a complete listing of all Q & Z abbreviations used in Morse code. It was titled *ACP-131*. If anyone has a copy, or knows where I can find one, please e-mail Mark Linafelter, NL7AS, at **mjlinafe@visi.com**. QST

Next Stray

CONTEST CORRAL

Feedback

In the **1999 ARRL Ten-Meter Contest**, **G0MRH** should be shown with 14,080 points, 80 QSOs and 44 multipliers in the Single-Op, CW-Only, Low-Power, Category. **N0FW** should be listed in the ND section, making him the section winner in the Mixed-Mode, High-Band category. A resolved file problem changes the score of **W6SD** to 127,410 points on 410 QSOs with 105 multipliers. The **San Fernando Valley ARC** should be shown in the Local Club Category with a score of 335,866. **K0DAT** should appear in the Missouri section instead of the Michigan section. The operators for the **K6HAI** entry in the San Diego section should be **KD7BC, WB6BDY, WA6EOO, AB6EZ, W6JXA, WB6LLO, KC6QHQ, KA6UCD, N6UN, KQ6XJ, KK6XY** and **W6ZBE**.

In the **2000 ARRL RTTY Round-Up**, **N8LRG** should be listed as the Seventh Place finisher in the W/VE Multioperator Low-Power category. The call sign of **KF8KW** is incorrectly shown as KF8MK in the KY section.

In the **1999 November Sweepstakes**, after reverifying the entry category, the Single-Operator, Low-Power Phone Canadian winner should be listed as **VE4GV.**

In the **2000 ARRL International DX CW Contest**, **W3CP** is a Single-Band 10-Meter entry in the MDC section.

W1AW Qualifying Runs are 9 AM EST, Thursday, November 2, and 7 PM EST Friday, November 17. The K6YR West Coast Qualifying Run will be at 9 PM PST on Wednesday, November 1. Check the W1AW schedule for details.

4-6

ARRL November Sweepstakes, CW. See October *QST,* page 102.

Seventh Annual North American Collegiate ARC Championship, CW, 2100Z Nov 4 to 0300Z Nov 6 (phone is 2100Z Nov 18 to 0300Z Nov 20). Both sections run concurrently with the ARRL November Sweepstakes contest. Participation limited to clubs at institutions of higher learning beyond the high school level. Colleges may enter Sweepstakes in any of the valid Sweepstakes entry categories and abide by all of the ARRL Sweepstakes rules. In an effort to encourage club station improvements all contacts must be made from the established club radio station located on a college campus, if one exists. (No "portable" operation from a nearby contest "super station.") A club may operate from a member's station provided that a club station does not exist on campus. Official results will be based on those published in *QST*, so all contestants must submit a valid log to the ARRL. The combined champion is based on a points system whereby each CW and phone score is divided by the highest scoring collegiate score for that mode and multiplied by 1000. The overall combined score is the sum of the CW and phone points. Separate champions will be determined for CW, phone and combined scores. Contestants must also submit a score summary (the contest summary sheet, not a complete log) to: Collegiate Championship, c/o Ken Harker, WM5R, 927 E 46th St, Apt 102, Austin, TX 78751; **wm5r@arrl.net**. Provisional scores and winners will be available on the Collegiate Championship home page at **http://www.collegiatechampionship.org/**.

IPA Contest, Phone and CW, sponsored by The International Police Association Radio Club, CW Nov 4, 0600Z-1000Z and 1400Z-1800Z; Phone Nov 5 0600Z-1000Z and 1400Z-1800Z; 80 40 20 15 10 meters. Single op, Multi-single, Multi-multi and SWL. Exchange RST and serial number. IPARC members give their membership number. Count 1 point per QSO; 5 points for every QSO with an IPARC member. Multipliers are DXCC entities and US states per band. Final score is QSO points × total multipliers per band. Add band totals together to get final score. Send logs by Dec 31 to: Uwe Greggersen, DL8KCG, Hurststr. 9, D-51645 Gummersbach, Germany; **dl8kcg@talknet.de**; **http://www.iparc.com/Contests/contests.html**.

10-12

Worked All Europe Contest, RTTY, from 0000Z Nov 10 to 2400Z Nov 11. 80 40 20 15 10 meters. Single-op all band, multiop, single transmitter and SWL. DX cluster assistance allowed for all classes. Single ops must take 12 hours of "off" time (consisting of periods lasting no more than three hours) during the contest. Exchange RST and QSO serial number. Work stations once per band. Count 1 point for each QSO and 1 point for each QTC. A QTC is a report of confirmed QSOs that took place earlier in the contest that is sent back to a station. 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 the same station, the same station can be worked several times to complete this quota. Count 1 point for each QTC reported to any station not on your own continent. Each station may both send and receive QTCs, but the sum of QTCs exchanged between two stations (sent plus received) must not exceed 10. A uniform list of QTCs sent must be kept. QTC 3/7 indicates that this is the 3rd series and 7 QTCs are now being sent. Record all received QTCs on a separate sheet with a clear indication of the sender. Multipliers are DXCC/WAE countries per band. Each multiplier counts as follows: 80 meters × 4; 40 meters × 3; 20 15 10 meters × 2. Score is total number of QSOs + QTCs × total number of multipliers. Awards. Send logs by December 15, to WAEDC Contest Committee, Durerring 7, PO Box 1126, D-74370, Sersheim, Germany; **waedc@darc.de**; **http://server.darc.de/referate/dx/xedcwr.htm**.

Japan International DX Contest, phone. sponsored by *Five-Nine Magazine*, from 2300Z Nov 10 until 2300Z Nov 12. Work JAs only. 80 40 20 15 10 meters. Operate no more than 30 hours (JAs operate full 48). Single operator multi/single band, high (>100 W) or low (<100 W) power, multi-single, or maritime mobile. Single ops allowed only one transmitted signal at a time; multiops are allowed an additional signal only to work new multipliers; otherwise, they must remain on a band for 10 minutes. Exchange RS(T) and CQ Zone; JA stations exchange prefecture number (1-50). Score 4 pts/QSO on 160; 2 pts/QSO on 80 and 10; and 1 pt/QSO on 40, 20 and 15. Multipliers are JA prefectures worked per band (max 50). Final score is QSO points × multipliers. Electronic entries accepted. Awards. Send logs postmarked by Dec 31 to JIDX Contest, c/o *Five-Nine Magazine*, PO Box 59, Kamata, Tokyo, 144 Japan; **jidx-log@ne.nal.go.jp**; **http://jzap.com/je1cka/jidx/.**

OK/OM DX Contest, 0000Z Nov 11 to 2400Z Nov 12, CW and SSB, 160 80 40 20 15 10 meters. Single ops, SSB, CW or mixed mode; Multiops, mixed mode, QRP. Exchange RST plus serial number. OK/OM stations will include their three-letter district code no. Count 1 pt/QSO with OK/OM. Final score equals total QSO points times the total number of OK/OM/OL prefixes worked per band and mode. Entries must be received by Dec 15. Mail to: OK1FUA, Martin Huml, Radioamater, Vlastina 23, 161 01 Praha 6, Czech Republic; **okmdx@radioamater.cz**; **http://crk.mlp.cz/ENG/DXCONTE.HTM**.

18-20

ARRL November Sweepstakes, phone. See October *QST,* page 102.

North American Collegiate ARC Championship, phone. See Nov 4-6 listing.

LZ DX Contest, CW only. sponsored by the Bulgarian Federation of Radio Amateurs, 1200Z Nov 18 to 2100Z Nov 19, 80 40 20 15 10 meters. Categories A—single op, multi band; B—single op, single band; C—multiop; D—SWL. All categories must stay on a band 10 mins. before changing to another band. Exchange RST and ITU zone. Count 6 points for QSO with an LZ station, 3 points for QSO outside your continent, 1 point for QSO inside your continent. Multiplier is ITU zones per band. Final score is QSO points × total ITU zones. Awards. Send log within 30 days to: BFRA, PO Box 830, 1000 Sofia, Bulgaria; **lz1bj@yahoo.com**; **http://www.qsl.net/lz1fw/contest/.**

25-26

CQ WW DX Contest, CW. See October, *QST*, Page 101.

George Fremin III, K5TR ♦ 624 Lost Oak Trail, Johnson City, TX 78636 ♦ k5tr@arrl.org

STRAYS

QST Congratulates...

◊…Dr James T. Kennedy, K2PHD, of Dover, New Jersey who was recently selected to sit on the Board of Directors of the National Association of Radio and Telecommunications Engineers. Dr Kennedy is an author, professor and consultant who has been involved with all forms of communication (RF, satellite, digital, telecommunications, etc.) for more than 35 years.

◊…and John Pinckney, WD4EBY, who was named "Difference Maker of the Day" for July 25, 2000 by MADD (Mothers Against Drunk Driving). Each day in the year 2000, for its 20th anniversary, MADD has been honoring two people whose work has made a significant contribution to preventing drunk driving, supporting its victims, or preventing underage drinking.

◊…ARRL education advisor Anthony R. Curtis, K3RXK, of Florence, Kentucky, who was selected by Apple Computer for a two-year appointment as an Apple Distinguished Educator (ADE). ADE is a global community of innovative higher-education professionals focused on educational excellence and leadership. It recognizes persons in many countries who have most innovatively integrated technology into curriculum.

Next Stray

FEEDBACK

◊ We neglected to identify the World Radiosport Team Championship competitors in the photos on the cover of October 2000 QST. In the top photo, Eric, K3NA, leads the US competitors in the opening ceremony. Just below the landscape are two shots taken during the contest. Markus, DL1MFL, is in the photo on the left. On the right are Mark, ON4WW (front) and Peter, ON6TT. In the bottom photo, shot during the pileup competition, are Doug, K1DG (left) and Dan, K1TO.

◊ In the VHF/UHF Century Club report in the October 2000 *QST*, page 99, W3EP was accidentally credited with having worked 850 grids on 6 meters. The total should have been 650.

General Rules for All ARRL Contests

1. Precedence of Rules:

1.1. Rules for individual contests or events, including Field Day, take precedence over all General Rules.

1.2. General Rules for HF and VHF contests take precedence over General Rules for all contests.

2. Conditions of Entry: Entrants agree to be bound by:

2.1. The provisions and intent of ARRL contest rules;

2.2. The regulations of the national licensing authority;

2.3. The decisions of the ARRL Awards Committee.

3. General Rules:

3.1. All operators must observe the limitations of their operator licenses and station licenses at all times.

3.2. All signs and exchange information must be sent, received, acknowledged and logged correctly by each station for a complete QSO.

3.3. One operator may not use more than one call sign from any given location during the contest period.

3.4. The same station may be worked only once per band for contest credit.

3.5. A transmitter used to contact one or more stations may not be subsequently used under any other call during the contest period, except for family stations where more than one call has been issued, and then only if the second call sign is used by a different operator. (The intent of this rule is to accommodate family members who must share a rig, and to prohibit manufactured or artificial contacts.)

3.6. For the purposes of ARRL contests, maritime mobile is defined as shipboard operation on the high seas, outside of the territorial waters of the country (defined for these purposes only as 12 miles).

3.7. All transmitters and receivers must be located within a 500-meter diameter circle, excluding antennas.

3.7.1. This prohibits the use of remote receiving installations.

3.7.2. Exceptions:

3.7.2.1. Stations remotely controlled by radio link may use necessary equipment at the control point. This does not include using the control point as another receiving location.

3.7.2.2. Multioperator and Single Operator Assisted stations may use spotting nets.

3.8. Cross-band contacts are not permitted.

3.9. Contacts made through repeaters, digipeaters, or gateways are not permitted.

3.9.1. This applies to all forms of active relays or repeaters.

3.9.2. Satellite contacts, where allowed, are not subject to this rule.

3.10. The use of non-Amateur Radio means of communication (for example, Internet or telephone) to solicit a contact (or contacts) during the contest period is not permitted.

3.11. Entrants who qualify for unsponsored plaques may purchase them from the ARRL Contest Branch.

3.12. General contest queries should be directed to the Contest Branch Manager via e-mail at **n1nd@arrl.org** or by telephone at 860-594-0232.

3.13. All logs (electronic or paper) submitted to the ARRL for any contest must be in chronological order, in a single log (file). Separate band-by-band files or logs are subject to being classified as checklogs and ineligible for competition.

3.14. In contests where packet or spotting nets are allowed, spotting your own station or requesting another station to spot you is not permitted.

4. ARRL Standard File Format for Electronic Submission of Entries.

4.1 The official ARRL File Format for electronic submissions is the Cabrillo format (effective November 1, 2000).

4.2. All electronic files must be standard ASCII text.

4.3. Cabrillo format specifications are available:

4.3.1. On the ARRL Contest homepage at: http://www.arrl.org/contests.

4.3.2. On the Internet at http://www.kkn.net/~trey/cabrillo/.

4.3.3. By sending an SASE with two units of postage and $1 to: Cabrillo File Specs, Contest Branch, ARRL, 225 Main St, Newington, CT 06111.

4.4. Electronic files may be submitted either via the Internet as e-mail or on diskette.

4.4.1. Files sent via e-mail must be sent as attachments, not as the text of the e-mail, and sent to the appropriate e-mail address from the following list:

4.4.1.1. 10GHZ@arrl.org
10Meter@arrl.org
160Meter@arrl.org
AugustUHF@arrl.org
DXCW@arrl.org
DXPhone@arrl.org
EMEContest@arrl.org
FieldDay@arrl.org
IARUHF@iaru.org
JanuaryVHF@arrl.org
JuneVHF@arrl.org
RTTYRU@arrl.org
SeptemberVHF@arrl.org
SSCW@arrl.org
SSPhone@arrl.org
StraightKey@arrl.org

4.4.2. E-mails must include the participant's call sign, contest name and year in the Subject line of the e-mail. Electronic files must be names with the operator's call sign and the file extension .log. Files that are sent using a filename other than the operator's call sign are subject to being classified checklogs.

4.5. Electronic logs are assumed to be signed when submitted.

4.6. Any log that is computer generated must submit the electronic file of the log in ARRL file format. Failure to submit the required electronic file can result in the entry being designated a checklog, and thereby ineligible for competition. A paper printout of the log file is not an acceptable substitute.

4.7. Only one entry may be included in each submission (e-mail or diskette). CW and Phone weekends of the November Sweepstakes and International DX Contest are considered separate contests and must be submitted separately.

4.8. All diskettes submitted become property of the ARRL and are not returnable.

4.9. Multioperator Two Transmitter category entries must indicate which transmitter makes each QSO in the log file.

4.10. In contests that require rest periods, the "ON" and "OFF" times must be listed in the Soapbox (comments) section of the Cabrillo Summary sheet. Do not list them in the main body of the Cabrillo log file itself.

4.11. Any electronic file that does not include complete entry information (category, power, etc) will have the missing data recorded at a default value.

4.12. Diskettes sent via postal service should be mailed to: ARRL, 225 Main St, Newington, CT 06111 with the contest name clearly marked on the envelope/mailer.

5. Paper Logs:

5.1. Entrants must use official Contest Forms or acceptable facsimile.

5.2. The most current forms should be used, as scoring rules, ARRL sections, etc, do change periodically.

5.3. Handwritten logs files, showing required QSO information, are accepted for all ARRL contests.

5.4. Handwritten logs that have been transcribed after the contest to a word processor, database, or contest-logging program are considered electronic logs and must meet Cabrillo file format and submission requirements.

5.5. Paper entries with more than 500 QSOs must include band by band dupe sheets.

5.6. Paper entries should be submitted to: ARRL, 225 Main St, Newington, CT 06111 with the contest name clearly marked on the envelope.

5.7. Only one contest entry may be included in each envelope mailed to ARRL.

6. Reporting:

6.1. Entries must be sent to the ARRL within 30 days after the end of the contest. For electronic submissions, this is determined by the date the e-mail is sent. For regular mail, this is determined from the postmark.

6.2. Logs not submitted by the contest deadline will be classified as checklogs: no extensions, no exceptions.

6.3. Entries received at the ARRL more than 30 days after the contest submission deadline may not be included in *QST* listings.

6.4. Only one entry per e-mail / envelope is allowed.

6.5. All entries must include complete summary information.

7. Disqualification and Penalties:

7.1. If the claimed score of a participant is reduced by 2% or more, the entry may be disqualified. Score reduction does not include correction of arithmetic errors.

7.2. Score reduction may be made for taking credit for unconfirmed QSOs or multipliers, duplicate contacts or other scoring discrepancies.

7.3. An entry with more than two-percent duplicate contacts left in the log or an entry in which more than 2% "rubber clocking" (altering the actual time to increase the operating time so that it is greater than the allowable limit) is detected will be automatically disqualified.

7.4. Participants that are disqualified will be barred from submitting an entry in the next annual running of that specific contest; for example, disqualification from the 2000 phone SS prohibits submission of an entry for the 2001 phone SS, but 2001 CW SS participation is allowable.

7.5. Call signs of all disqualified partici-pants will be listed in the *QST* contest report.

7.6. Any participant on the borderline of disqualification, but not actually disqualified may receive a warning letter.

7.7. In a paper log, for each duplicate contact that is claimed for credit, each miscopied call sign or each busted exchange that is removed from the log by HQ, three additional contacts will be deleted as a penalty. In electronic logs, for each duplicate contact that is claimed for credit, each miscopied call sign or each busted exchange that is removed from the log by HQ, one additional contact will be deleted as a penalty. The penalty will not be considered part of the 2% disqualification criteria.

7.8. In all cases, the decisions of the ARRL Awards Committee are final.

8. Club Competition:

8.1. Six ARRL-sponsored contests include an ARRL affiliated club competition:

8.1.1. January VHF Sweepstakes

8.1.2. (February and March) International DX Contest

8.1.3. September VHF QSO Party

8.1.4. November Sweepstakes

8.1.5. (December) 160-Meter Contest

8.1.6. (December) 10-Meter Contest

8.2. Only clubs actively affiliated with the ARRL may participate in the club competition. This means the club:

8.2.1. Is affiliated with the ARRL, and

8.2.2. Has filed an annual report with the Field Services Department of ARRL HQ within the last two years.

8.3. For a club to be listed, the following conditions must be met:

8.3.1. Entries from three different members of the club must be submitted.

8.3.2. The entry must clearly indicate the club name on the summary sheet.

8.3.3. The club secretary must send a list of all club members eligible to compete for the club (not a club roster) and which level (unlimited, medium, local) they wish to enter for each competition within 30 days after the contest.

8.3.4. A member's score must be shown in the contest results to be counted for a club. Only that score shown in the results (or in subsequent corrections) will count for the club competition.

8.4. There are three categories of club competition:

8.4.1. **Unlimited**

8.4.1.1. Club submits 51 or more entries.

8.4.1.2. One station can submit two entries—one on CW and one on phone in the November Sweepstakes and the DX Contest.

8.4.1.3. All stations and all operators must reside within 175 miles (282 km) of the club's center.

8.4.1.4. All members must attend at least 2 club meetings per year to be eligible to submit an entry. (However, if the person has not been a member for a year's time, they must have attended one meeting as a member prior to the contest.)

8.4.1.5. Those club members who are disabled to the extent that they are unable to travel are exempt from the two meetings per year rule. However, they must be regularly active in club affairs.

8.4.1.6. To be considered bona fide, a member must be active in club affairs.

8.4.1.7. Members living outside 175 miles and members that operate stations outside 175 miles may not compete in the club competition. (See rule 8.6.)

8.4.2. **Medium**

8.4.2.1. Club submits 50 or fewer entries and does not qualify under the local club criteria.

8.4.2.2. One station can submit two entries—one on CW and one on phone in the November Sweepstakes and the DX Contest.

8.4.2.3. The same mileage and attendance requirements apply as the unlimited class club.

8.4.2.4. Members living outside 175 miles and members that operate stations outside 175 miles may not compete in the club competition. (See rule 8.6.)

8.4.3. **Local**

8.4.3.1. Club submits 10 or fewer entries.

8.4.3.2. (One station can submit two entries—one on CW and one on phone in the November Sweepstakes and the DX Contest.)

8.4.3.3. All members must reside and operate within 35 miles of the club's center.

8.4.3.4. There is no attendance require-ment.

8.5. Single Operator and Multioperator station scores may be counted:

8.5.1. At a guest-operated single-operator station, both the guest operator and the station licensee must be members of the same club in order to count the score for that club.

8.5.2. At multioperator stations, at least 66% of the operators must be members of the same club for the score to count for that club.

8.5.3. A multioperator entry may (optional) utilize non-member operators licensed one year or less without including such operators in the above 66% calculation. (The intent here is to encourage clubs to recruit contesters from newer amateurs without adversely affecting the club aggregate score.)

8.6.For the ARRL International DX Contest, DXpedition (operating outside the United States and Canada) scores may be counted for either single operator or multioperator stations even though the operation is outside the club's area.

8.6.1. For single guest operators at a DX station, only the operator must be a club member and meet all other criteria.

8.6.2. For multioperator stations, the score counts for only one club and at least 66% of the operators must be members of that club and meet all other criteria.

8.7. In conjunction with the two meetings per year rule, the club must hold at least four in-person meetings per year.

8.8. A club's entry classification may be changed if, in the opinion of the ARRL Awards Committee, the club has manipulated its number of entries to allow the club to enter a lower classification. (For example, if a club with 100 members submits only the 10 highest scores, even if more than 10 of its members wish to compete.)

8.9. It is not within the intent of these rules that a club should vote out a member or that a member resign and then be voted back into the club later so the member-attendance rule can be met.

8.10. The highest scoring active affiliated club entry in each category (unlimited, medium, local) will be awarded a gavel.

General Rules for ARRL Contests on bands below 30 MHz (HF)

1. General Rules:

1.1. See General Rules for All ARRL Contests.

1.2. Cross-mode contacts are not permitted.

2. Entry Categories: The following categories are defined for ARRL contests on bands below 30 MHz. See the rules for each contest to determine which categories apply, and whether additional categories exist for that contest.

2.1. Single Operator: One person performs all transmitting, receiving, spotting, and logging functions as well as equipment and antenna adjustments.

2.1.1. Use of spotting assistance or nets (operating arrangements involving other individuals, DX-alerting nets, packet, Internet, etc) is not permitted.

2.1.2. Single-Operator stations are allowed only one transmitted signal at any given time.

2.1.3. Single Operators may be divided into subcategories based on power output:

2.1.3.1. QRP: 5-W PEP output or less.

2.1.3.2. Low Power: 150-W PEP output or less.

2.1.3.3. High Power: More than 150-W PEP output.

2.2. Single Operator Assisted: One person performs all transmitting, receiving, and logging functions as well as equipment and antenna adjustments.

2.2.1. Use of spotting assistance or nets (operating arrangements involving other individuals, DX-alerting nets, packet, etc) not physically located at the station is permitted.

2.2.2. Single Operator Assisted stations are allowed only one transmitted signal at any given time, not including transmissions on a spotting net.

2.3. Multioperator: More than one person performs transmitting, receiving and logging functions, etc. Multioperator stations are divided into subcategories:

2.3.1. **Multioperator, Single Transmitter:** Stations are allowed only one transmitted signal at any given time.

2.3.1.1. In those contests that do not have Single Operator Assisted class, this category includes those single operators that use any form of spotting assistance such as from nets or packet.

2.3.1.2. Includes those that receive assistance with logging or relief operators, etc.

2.3.1.3. Limited to 6 band changes (maximum) in any clock hour.

2.3.1.3.1. The clock hour is from zero through 59 minutes.

2.3.1.3.2. Band changes are defined so that, for example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes.

2.3.1.4. Violation of the 6 band changes rule or improper logging will result in an entry reclassification to the Multi-operator Multitransmitter class.

2.3.2. **Multioperator, Two Transmitter:**

2.3.2.1. A maximum of two trans-mitted signals at any given time, on different bands.

2.3.2.2. Each transmitter is limited to 6 band changes (maximum) in any clock hour.

2.3.2.2.1. The clock hour is from zero through 59 minutes.

2.3.2.2.2. Band changes are defined so that, for example, a change from 20 meters to 40 meters and then back to 20 meters constitutes two band changes.

2.3.2.2.3. Violation of the 6 band changes rule or improper logging will result in an entry reclassification to the Multi-operator Multitransmitter class.

2.3.2.3. Both transmitters may work any and all stations; the second transmitter is not limited to working new multipliers only. However, a station may only be worked once per band regardless of which transmitter is used.

2.3.2.4. Each of the two transmitters must keep a separate, chronological log for the entire contest period.

2.3.2.5. The Cabrillo log must indicate which transmitter made each QSO in this category.

2.3.3. Multioperator, Multitransmitter:

2.3.3.1. A maximum of one transmitted signal per band at any given time.

2.3.3.2. Multioperator, Multitransmitter stations must keep a separate, chrono-logical log for each band for the entire contest period.

General Rules for ARRL Contests on bands above 50 MHz

1. General Rules:

1.1. See General Rules for All ARRL Contests.

1.2. Individuals and stations are limited to one entry per contest.

1.3. A transmitter, receiver, or antenna used to contact one or more stations may not subsequently be used under any other call during the contest period, except as provided for in General Rules for All ARRL Contests number 3.5.

1.4. Stations may be worked for credit only once per band from any given grid square, regardless of mode. This does not prohibit working a station from more than one grid square with the same call sign (such as a Rover).

1.5. Crossband QSOs do not count.

1.6. Aeronautical mobile contacts do not count.

1.7. Retransmitting either or both stations, or use of repeater frequencies, is not permitted.

1.7.1. This prohibits use of all repeater frequencies.

1.7.2. Contest entrants may not transmit on repeaters or repeater frequencies for the purpose of soliciting contacts.

1.8. Use of the national simplex frequency, 146.52 MHz, or immediately adjacent guard frequencies, is prohibited.

1.8.1. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs.

1.8.2. The intent of this rule is to protect the national simplex frequency from contest monopolization.

1.8.3. There are no restrictions on the use of 223.50 MHz.

1.9. Only recognized FM simplex frequencies may be used, such as 144.90 to 145.00; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band.

1.9.1. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of the above rules, or the spirit and intent of the band plans as recommended in the ARRL Repeater Directory, may be used for contest purposes.

1.10. While no minimum distance is specified for contacts, equipment should be capable of communications at a range of at least 1 km.

1.11. A station located precisely on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given without moving the complete station (including antennas) at least 100 meters.

1.12. Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs using coherent radiation on transmission (for example, laser) and employing at least one stage of electronic detection on receive.

1.13. Marine Mobile (and Maritime) entries will be listed separately as "Marine Mobile" in the listings and compete separately for awards.

1.14. Participants are reminded that the segment 50.100-50.125 MHz should be used for intercontinental QSOs only, using 50.125 MHz as a calling frequency, then QSY after contact is established.

2. Entry Categories: The following categories are defined for ARRL contests on bands above 50 MHz. See the rules for each contest to determine which categories apply, and whether additional categories exist for that contest.

2.1. **Single Operator:** One person performs all transmitting, receiving, spotting, and logging functions as well as equipment and antenna adjustments.

2.1.1. Single Operator Low Power:

2.1.1.1 Power limits on any band may not exceed the following:

2.1.1.1.1. 50 MHz and 144 MHz—200 W PEP.

2.1.1.1.2. 222 MHz and 432 MHz—100 W PEP.

2.1.1.1.3. 902 MHz and above—10 W PEP.

2.1.2. Single Operator High Power: Power limits on any band exceeds the limits for the Single Operator Low power.

2.1.3. Use of spotting assistance or nets (operating arrangements involving other individuals, DX-alerting nets, packet, etc) is not permitted.

2.1.4. Single Operator stations are allowed only one transmitted signal at any given time.

2.1.5. Both categories of Single Operator stations compete for all-band and single-band awards.

2.1.6. Overall and single-band winners are recognized both in *QST* score listings and in awards offered.

2.2. Single Operator Portable: (formerly QRP Portable)

2.2. 10 W PEP output or less.

2.2.1. Portable power source.

2.2.2. Portable equipment and antennas.

2.2.3. Single Operator Portable stations must operate from a location other than a permanent station location.

2.2.4. Single Operator Portable stations may not change locations during the contest period outside of the original 500 meter diameter permitted circle.

2.3. **Rover:** One or two operators of a single station that moves among two or more grid squares during the course of a contest.

2.3.1. A rover vehicle may transport only one station using a single call sign.

2.3.2. A rover may not operate with more than one call sign.

2.3.3. Rover vehicles must transport all the equipment, power supplies, and antennas used at each operating site.

2.3.4. Rovers sign "rover" on phone and /R on CW after their call sign.

2.3.5. All Rovers are encouraged to adopt operating practices that allow as many stations as possible to contact them.

2.3.6. Rover operators may submit separate logs for single operator (fixed station) in addition to their rover entries. Rovers submitting a score for inclusion in a club competition must also include a secondary summary sheet indicating the portion of the score which counts for the club score if any of the QSOs submitted take place outside of their club's territory.

2.4. Multioperator: More than one person performs transmitting, receiving and logging functions, etc. Stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters (1,000 feet). Multioperator stations may be divided into subcategories:

2.4.1. **Multioperator (Unlimited):** Stations submit logs with more than four bands used.

2.4.2. **Limited Multioperator:** Stations submit logs with a maximum of four bands used. (Logs from additional bands used, if any, should be included as checklogs.)

2000 ARRL 10-Meter Contest Rules

1. Object: For Amateurs worldwide to exchange QSO information with as many stations as possible on the 10-meter band.

2. Date and Contest Period: Second full weekend of December. Starts 0000 UTC Saturday; ends 2400 UTC Sunday (**December 9–10, 2000**).

2.1. All stations operate no more than 36 hours out of the 48-hour period.

2.2. Listening time counts as operating time.

3. Entry Categories:

3.1. Single Operator: (9 categories)

3.1.1. QRP.

3.1.1.1. Mixed Mode (Phone and CW).

3.1.1.2. Phone only.

3.1.1.3. CW only.

3.1.2. Low Power.

3.1.2.1. Mixed Mode (Phone and CW).

3.1.2.2. Phone only.

3.1.2.3. CW only.

3.1.3. High Power.

3.1.3.1. Mixed Mode (Phone and CW).

3.1.3.2. Phone only.

3.1.3.3. CW only.

3.2. Multioperator, Single Transmitter, mixed mode (only).

3.2.1. Includes single operators using packet or spotting assistance.

4. Contest Exchange:

4.1. W/VE stations (including Hawaii and Alaska) send signal report and state or province (District of Columbia stations send signal report and DC).

4.1.1. KH6 and KL7 participate as W/VE, not DXCC entities in this contest.

4.2.1. Novice and Technician stations sign /N or /T on CW. If used, you must indicate /N or /T on your summary sheet.

4.2. DX stations (including KH2, KP4, etc, but not including KH6 or KL7) transmit signal report and sequential serial number starting with 001.

4.3. Maritime mobile stations send signal report and ITU Region (1, 2 or 3).

5. Scoring:

5.1. QSO points:

5.1.1. Count two points for each complete two-way phone QSO.

5.1.2. Count four points for each two-way CW QSO.

5.1.3. Count eight points for CW QSOs with US Novice or Technician stations signing /N or /T (28.1 to 28.3 MHz only).

5.2. Multipliers: (per mode, phone and CW).

5.2.1. The fifty US states (plus District of Columbia).

5.2.2. Canada NB (VE1, 9), NS (VE1), QC (VE2), ON (VE3), MB (VE4), SK (VE5), AB (VE6), BC (VE7), NT (VE8), NF (VO1), LB (VO2), YT (VY1), PE (VY2), and **NU (VY0)**.

5.2.3. DXCC entities (except the mainland US, Canada, Alaska and Hawaii).

5.2.4. ITU regions (maritime mobiles only).

5.3. Final Score: Multiply QSO points by total multipliers (the sum of states/VE provinces/DXCC entities/ITU regions per mode). Example: KA1RWY works 2245 stations including 1305 phone QSOs, 930 non-Novice CW QSOs, 10 Novice CW QSOs, for a total of 6410 QSO points. She works 49 states, 10 Canadian provinces, 23 DXCC entities and a maritime mobile station in Region 2 on phone and 30 states, 8 Canadian provinces, and 19 DXCC entities on CW for a total multiplier of 140. Final score = 6410 (QSO points) × 140 (multiplier) = 897,400 points.

6. Miscellaneous:

6.1. Single operator mixed-mode and multioperator stations may work stations once on CW and once on SSB.

6.2. If participating as DX, your call sign must indicate your DXCC entity (N6TR in Oregon does not send N6TR/7, but K6GSS in Puerto Rico must send K6GSS/KP4).

6.3. All entrants may transmit only one signal on the air at any given time.

6.4. All CW contacts must take place below 28.3 MHz.

7. Awards: Certificates will be awarded to:

7.1. The highest-scoring single-operator station (in each category) from each ARRL/RAC Section and DXCC country.

7.2. Top scoring Novice/Technician station (each category) in ARRL Sections.

7.3. Top multioperator entries in each ARRL Division, Canada and each continent.

7.4. Additional certificates will be awarded as participation warrants.

8. Miscellaneous:

8.1. All electronic logs (computer generated) must submit an ASCII text file of the log information in Cabrillo file format. Paper printouts of the electronic file are not acceptable substitutes.

8.2 Handwritten paper logs are acceptable submissions.

8.3. All entries must be e-mailed or postmarked by January 10, 2001.

8.4. E-mail entries only to: **10meter@arrl.org**. Submissions require Cabrillo log file with all required information (including exchange sent, category entered, power, and ARRL/RAC section—see General Rules for specific file format).

8.5. Electronic files not in Cabrillo file format may be designated as checklogs.

8.6. Paper entries should be mailed to 10 Meter Contest, ARRL, 225 Main St, Newington, CT 06111.

8.7. Paper entries must be submitted on current ARRL entry forms or an acceptable facsimile.

8.7.1. Forms are available for downloading at the Contest Branch Web page at **http://www.arrl.org/contests/forms/**.

8.7.2. Forms are available for an SASE sent to the Contest Branch.

8.7.3. Forms may be received by sending the following message to **info@arrl.org**.

HELP
SEND 10M.RLS
SEND 10M.FRM

8.8. See "General Rules for All ARRL Contests" and "General Rules for ARRL Contests on bands below 30 MHz (HF)" in this issue of *QST*.

8.9. General queries should be directed to the Contest Branch at **N1ND@arrl.org** or by calling 860-594-0232.

2000 ARRL 160-Meter Contest Rules

1. Object: For Amateurs worldwide to exchange information with W/VE amateurs on the 160-meter band CW only. DX-to-DX QSOs do not count for contest credit.

2. Date and Contest Period: First full weekend of December. Starts 2200 UTC Friday, ends 1600 UTC Sunday (**December 1-3, 2000**). This is a forty-two hour period with no time limitation.

3. Entry Categories:

3.1. Single Operator:

3.1.1. QRP.

3.1.2. Low Power.

3.1.3. High Power.

3.2. Multi-operator, Single Transmitter (only).

3.2.1. This includes single operators using packet or spotting assistance.

4. Contest Exchange:

4.1. W/VE: Signal report and ARRL/RAC Section.

4.2. DX: Signal report. Country name is obvious from the callsign. Send ITU Region if maritime mobile.

5. Scoring:

5.1. QSO Points:

5.1.1. Two points for QSOs with amateurs in an ARRL/RAC Section.

5.1.2. W/VE stations count five points for DX QSOs.

5.2. Multipliers: ARRL/RAC Sections (**maximum of 80**) and DXCC countries (W/VE participants only).

5.2.1. Northwest Territory multi-plier includes the Yukon (VY1) and Nunavut (VY0).

5.3. Final Score: Multiply QSO points by multiplier. Example: KA1TRF works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points [(344 × 2) + (13 × 5)] multiplied by 67 for 50,451 points.

6. Miscellaneous:

6.1. Participants are reminded that the segment 1.830 to 1.835 should be used for intercontinental QSOs only, in compliance with the ARRL band plan.

7. Awards: Certificates will be awarded to the top-scoring QRP, low-power and high-power single-operator stations in each ARRL/RAC Section and DXCC country, and to the top-scoring multioperator stations in each ARRL Division and continent.

8. Miscellaneous:

8.1 All logs that are generated using a computer must submit an ASCII text file of the log information in approved ARRL file format (Cabrillo). Paper logs in lieu of the electronic file are not acceptable substitutes. Handwritten paper logs are still acceptable.

8.2. All entries for this contest must be emailed or postmarked by January 3, 2001.

8.3. E-mail entries only to: **160meter@arrl.org**. Electronic submissions require a Cabrillo format summary file (combined summary and log). (See "General Rules" for specific file format.)

8.4. Electronic files not in Cabrillo format may be designated as checklogs not eligible for awards.

8.5. Handwritten paper entries should be mailed to 160 Meter Contest, ARRL, 225 Main St, Newington, CT 06111.

8.6. Paper entries must be submitted on current ARRL entry forms or on an acceptable facsimile.

8.6.1. Forms are available for downloading at the Contest Branch Web page at **http://www.arrl.org/contests/forms/**.

8.6.2. Forms are available for an SASE sent to the Contest Branch.

8.6.3. Forms may be received by sending the following message to **info@arrl.org**.

HELP
SEND 160M.RLS
SEND 160M.FRM
QUIT

8.7. See "General Rules for All ARRL Contests" and "General Rules for ARRL Contests on bands below 30 MHz (HF)" in this issue of *QST*.

8.8. General queries should be directed to the Contest Branch at **N1ND@arrl.org**, or by calling 860-594-0232. QST

NEW PRODUCTS

AUDIO ENHANCING PRODUCTS FROM K²RF

◊ K²RF offers two products intended to enhance the audio quality of repeaters, links and remote base radios.

The DSL-100 Dynamic Speech Limiter is designed to maintain the voice quality through a system by ensuring that the audio fed to the transmitter is at the proper level. Once calibrated, the DSL-100 will automatically apply up to 12 dB of gain or attenuation to the audio supplied to the transmitter, resulting in lower distortion and reducing the audio clipping that can result from over-deviation.

Ideal for HF, VHF and UHF link transmitter applications, the DSL-100 ensures that all the audio received from those who access the radio repeater system will be input into the system's transmitter at a consistent audio level. This is an important consideration for telemetry/mixed signal systems as well.

The DSL-100 meets Telephony B-302 specifications and operates from 10 to 18 V dc at 10 mA. The total harmonic distortion is specified at less than 1% and the 3 dB bandwidth is specified at 50 Hz to 15 kHz (with an input impedance of 10 kΩ and an output impedance of 600 Ω). The DSL-100 is constructed on a PC board and comes assembled and tested. It measures $1^3/_8 \times 2^3/_8 \times {}^1/_2$ inches.

The SAGE-300 is a 3-band speech audio gain equalizer that is designed to enhance and balance the tone quality of a communications system by enabling the user to cut or boost, by up to 10 dB, three audio ranges.

The low frequency cutoff is at 250 Hz, which prevents sub-audible CTCSS tones from being passed on for equalization. Measured at the –3 dB points, the audio passband is from 275 to 4,400 Hz. Three trim potentiometers enable the user to control the amplitude of the low (275-1,000 Hz), mid (1,000-2,600 Hz), and high (2,000-4,400 Hz) audio ranges. Total harmonic distortion is specified at under 0.01% at 1 kHz.

When used for telemetry purposes, the SAGE-300 allows the audio path to be bandwidth limited and can reduce DTMF twist problems associated with interconnected systems. The SAGE-300 also allows adjustment of Narrow Band FM radios to meet the new EIA de-emphasis specification (6 dB per octave de-emphasis curve).

The SAGE-300 operates from 10 to 18 V dc at 12 mA. The maximum input amplitude is specified at 8.0 V P-P (with an input impedance of 10 kΩ and an output impedance of 150 Ω). The SAGE-300 is constructed on a PC board and comes assembled and tested. It measures $1^1/_2 \times 2 \times {}^1/_2$ inches.

Price: DSL-100 Dynamic Speech Limiter, $95; SAGE-300 3-Band Speech Audio Gain Equalizer, $95. For additional information contact K²RF Communications Products, 11725 SW Timerline Ct, Beaverton, OR 97008; tel 800-268-1516; fax 503-642-5678; **KenS@k2rf.com**; **http://www.k2rf.com**. QST

STRAYS

QST Congratulates...

◊…Dan Ringer, K8WV, who was presented with the American Bar Association's "Sole Practitioner of the Year" award. Ringer is an attorney in Morgantown, West Virginia. The annual award recognizes the meritorious achievement or accomplishment of a sole legal practitioner who is widely accepted by peers as having consistently achieved distinction, and who epitomizes the ideals of the legal profession. Ringer is an ARRL Volunteer Counsel and an ARRL Volunteer Examiner. QST

2000 ARRL International DX Contest Phone Results

By Dan Henderson, N1ND
Contest Branch Manager

Tuning across the bands during any contest weekend could probably be compared to visiting a world-class art museum on any busy tourist weekend. Picture yourself hurrying through gallery after gallery (band after band), trying to take in (work) masterpiece after masterpiece (QSO after QSO). Throw in a wonderful piece of symphonic music, say Mussorgsky's "Pictures in an Exhibition" (to simulate the sound involved) and you might have the visual, aural and mental experience that comes with a world-class contest.

It would take one of the grand masters of the arts to fully capture the excitement that was the 2000 ARRL International DX Phone Contest, which was run March 4-5. A total of 2172 competitive entries were received. With the inclusion of 102 check logs, we received a record number of entries for the combined ARRL 2000 International DX Contest—a total of almost 4700 logs processed between the two contest weekends. As you might expect, record breaking participation brought about record breaking efforts from the US and Canada and near-record performances from the rest of the globe.

It has become apparent that operating from HC8 provides a tremendous advantage for a DX station. With George, K5TR, serving as the "guest artist," the DX Single Op High Power category was won from HC8N. George survived a stiff challenge from WP3R, with Jim, KB3AFT, serving as the operator. Top honors from Oceania go to Mike, KH6ND, operating from KH7R, while Pekka, EA8AH, took top honors among African entries. M6T with Andy, G4PIQ, wielding the "brush" took top honors in Europe while Igor, UA0ZBK, finished as "best in show" from Asia.

The DX Single Op Low Power winner was Bob, KQ3V, who "painted the airways" operating as VP5A, who handily defeated second place and South American continental winner Ed, OA4SS. Kazuo, JL1ARF, took top honors from Asia, while Janez, S57J, led the way in Europe. Jaro, SU9ZZ, took top honor for Africa while Craig, 3D2TC, won Oceania.

In the DX Single Op QRP category Peter, HA2A, emerged as the victor while Girts, YL2KL, operated YL8M to top honors in the DX Single Op Assisted category. DX Single Band winners were KV4FZ (160), YV3AZC (80), ZF2JB with KK9A as op (40), IQ3A with IV3TAN as op (20), TG0AA with IK2NCJ op (15) and ZF2AH (10). While great efforts were put forth, no overall DX scoring records were established during the contest weekend.

Zbyszek, 9K2/SQ5DAK, managed to make several ops happy with a great multiplier in his limited operating time.

Craig, 3D2TC, made quite an impact from Fiji, completing a WAS on 10 meters and only missing Wyoming on 15 meters.

W/VE Single Operator QRP

KR2Q	1,110,600
N0KE (at WB0GAZ)	641,556
WA8RCN	442,035
KB3TS	435,024
N7VY	430,992
W6QU (W8QZA, op)	378,144
WA0JYC	375,959
N0UR	313,992
W6CN	312,360
N0HJZ	277,656

W/VE Single Operator Assisted

KI1G	5,790,720
K3WW	5,080,320
W2RE	4,722,771
N2TX	4,667,646
KS1L	4,344,480
K2XA	3,922,425
K3MM	3,753,468
N3AD	3,665,382
K2BU	3,562,299
N2NT (W2GD,op)	3,382,950

DX Single Operator QRP

HA2A	320,991
F5BEG	226,044
JR4DAH	184,710
JH1HRJ	163,674
JA2JSF	163,350
JA1YNE (JP1OGL, op)	140,301
JA6GCE	124,830
LU1VK	88,200
UA0KCL	85,284
G3FNM	63,516

DX Single Operator Assisted

YL8M (YL2KL, op)	2,352,987
JH4UYB	1,095,219
OK1DG	668,682
JQ1BVI	642,546
IZ5AXA	581,976
7L4IOU	560,628
JR2DOL	495,900
RV3BR	474,306
JH4NMT	438,840
PA3EWP	366,366

The DX Multioperator categories saw both exciting competition and a run-away winner. Riding an outstanding 4K QSO total on a wide-open 10-meter band, the "artists known as VP5B" were able to compensate for being out-QSOed on three other bands to win the Multi-Single category over P40V. Also using a superior rate on 10 meters, the crew at KL7RA held off the RW2F ops to win the DX Multioperator Unlimited category.

W/VE Single Band Top 10

160 Meters

WW2Y	10,206
K1ZM	9,198
AA1BU	4,002
W2VO	912
W8WEJ (W8BAR, op)	855

80 Meters

KE1Y	58,140
K3SV	13,965
VA3POS	6,498
AG4W	4,998
AA9IV	576

40 Meters

K4XS	245,127
K7EM	210,105
K5MR	207,834
W4MR (AA4NC, op)	149,592
N5DO	77,964
W5FO	30,030
W4JKC	29,388
N2WK	26,226
W9GXR	24,840
KZ2I	23,664

20 Meters

WA2QNW	391,524
W5WMU	324,060
VA3MG	320,358
N9HCA	102,240
W2AY	100,440
WA1MKS	71,799
W0TM	55,440
N8LIQ	50,172
K7NAV	41,958
KB3AGZ	38,391

15 Meters

K8DX	1,239,540
W7WA	987,228
VA7RR	935,280
VE6JY	863,232
W7EJ	806,577
VE3KZ	749,439
K4VUD	592,455
W7EB	419,580
ND8DX	358,020
W7FP	275,880

10 Meters

W4ZV	981,837
K5RX	890,760
K0CL	882,279
K4WI	721,806
VA3UZ	699,696
NA5B (W5AO, op)	648,000
KG9X	645,840
NY1E	634,056
K5AM	623,025
N7DF	596,403

DX Single Band Top 10

160 Meters

KV4FZ	28,098
V26P (W5AJ, op)	21,480
S54E	1,680
EA1DVY	48

80 Meters

YV3AZC	127,716
CO8ZZ	85,800
OT0T (ON4UN, op)	58,926
I4AVG	34,194
S57O	18,135
EF1CFD	18,135
DL3LAB	15,480
4N1K (YU1XA, op)	15,066
OM7M (OM5ZW, op)	10,800
YT0T (YU1FJK, op)	7,488

40 Meters

ZF2JB (KK9A, op)	269,748
4M5E (YV5NWG, op)	133,209
SP7VC (at SP7GIQ)	118,674
S53M (S55OO, op)	109,725
PY5EG	107,358
LY3BS	74,850
JA8NFV	72,663
F5RZJ	49,446
YT7A	47,400
9A4X	36,270

20 Meters

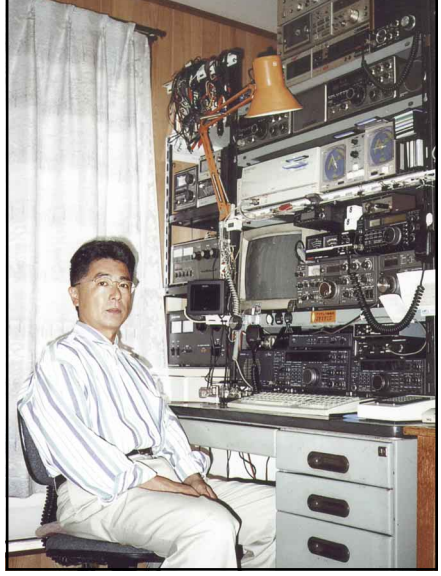
IQ3A (IV3TAN, op)	538,842
DJ7AA	513,132
3E1AA	437,721
SP2PIK (SP2WKB, op)	408,273
YU1JW	381,189
YT1BB	378,993
ZX5J (PP5JR, op)	308,700
YZ9A	303,378
LY2BM	252,900
RM4W (RW4WR, op)	245,700

15 Meters

TG0AA (IK2NCJ, op)	549,585
ZW5B (PY2KC, op)	392,055
S57AW	381,555
PY0FF	370,992
SP7GIQ	360,540
5N0W (OK1RK, op)	331,740
PQ5W	328,686
OE8SKQ	304,263
IR2W (I2EOW, op)	296,322
IK2DUU	279,540

10 Meters

ZF2AH	495,030
OK2RZ	483,669
DF9ZP	471,060
7J2YAF (JA1KSO,op)	465,687
CT1DVV	456,402
ON4UN (ON4MA, op)	448,899
LU4FM	447,987
9AY2K (9A9A, op)	438,480
GM7R (GM0NAI, op)	437,190
S50K	434,700



Yoshi, JF2FIU, is putting together a good station and has become a familiar JA QSO in many logs.

In the DX Multioperator Two-Transmitter class, the ops at 6D2X showed why they are a major force in contesting. Using their location advantage on the low bands and great conditions on the high bands, they outdistanced KL7Y, though they did fall short of setting a new category record.

In the W/VE "gallery," similar to the DX CW contest, record-breaking efforts were "on display" to be admired. Leading the way was Bob, KQ2M, in the W/VE Single Op High Power category. Bob used his radio "palette" to become the first to break the 6-million-point barrier, mirroring his record setting DX CW performance, also set this year. Also breaking the old mark was second place finisher John,VE3EJ.

In the W/VE Single Op QRP and Single Op Assisted categories, we also found two more artists pulling off a record-setting "doublet." Doug, KR2Q, added the Single Op QRP record to his growing contest vitae, as he easily outdistanced Philip, N0KE, operating from WB0GAZ's station. While four stations broke the existing Single Op Assisted mark, it was Rick, KI1G, edging out Chas, K3WW, as he did in the CW contest to set the new standard for the category. Congratulations also go to Ray, W2RE, and Mike, N2TX, who also bettered the old standard.

Bill, AC0W, led the way in the W/VE Single Op Low Power category, as he edged out 3 challengers—Henry, N4VHK (operating W4WS), Tom, WD5K, and Fred, W2TZ—by less than 83,000 points. Though no record was set in the category, it provided the best overall competitive finish.

W/VE Single Band scoring records were set by K4XS (40), K8DX (15), and W4ZV (10). Of special note is the performance of W2WA and VA7RR on 15 meters and K5RX and K0CL on 10 meters, who all managed to break old category records while finishing as runner-ups in the catego-

W/VE Single Op Low Power

	Score	160	80	40	20	15	10
AC0W	1,491,963	12/9	25/16	60/39	248/75	331/85	883/95
W4WS (N4VHK, op)	1,456,389	2/2	26/20	88/48	468/80	332/75	635/88
WD5K	1,434,510	0/0	31/20	58/26	369/89	312/87	715/100
W2TZ	1,409,676	4/3	29/24	109/52	214/71	342/77	789/89
K1SD	1,347,192	2/2	40/31	112/47	306/75	442/79	556/74
KS1J	1,296,759	5/5	21/19	45/42	250/69	393/85	667/93
K6RO	1,292,760	8/4	39/18	79/38	291/84	286/82	627/98
K1NU	1,175,070	0/0	14/14	45/37	197/71	313/84	741/93
WS1A	1,138,977	0/0	13/11	83/52	224/70	295/78	638/92
VE3XN	1,117,665	2/2	9/7	23/21	339/69	390/73	698/83

W/VE Single Op High Power

	Score	160	80	40	20	15	10
KQ2M	6,400,260	10/11	69/36	127/58	1178/119	1546/123	1658/118
VE3EJ	5,513,712	21/15	71/50	148/70	807/117	1359/124	1322/117
W9RE	4,949,697	18/14	53/35	131/60	1098/99	848/106	1771/107
K4ZW	4,621,194	8/8	84/39	142/61	1123/105	1168/106	1169/98
WB9Z	4,178,310	21/17	81/44	113/61	566/81	969/114	1489/113
K4AB	3,288,480	19/14	58/40	121/55	680/91	647/102	1195/101
N2LT	3,439,146	12/9	66/32	75/45	356/79	945/106	1547/111
K3ZO	2,926,458	5/6	33/24	93/48	585/82	928/104	1014/103
N4RV	2,828,601	23/17	59/41	102/54	499/92	412/102	1134/117
W7GG	2,709,720	19/14	60/21	315/50	484/81	565/93	1066/101

W/VE Multioperator Single Transmitter

	Score	160	80	40	20	15	10
K5ZD	6,730,380	26/21	172/58	253/83	1145/124	1180/127	1394/125
W3BGN	6,285,270	30/23	149/59	171/72	1287/116	1014/133	1302/127
KV1W	6,199,875	22/17	87/51	227/75	1067/114	1167/123	1555/121
K8AZ	5,961,684	19/17	57/51	114/72	1213/129	927/128	1448/129
W0GU (at N2IC)	4,924,920	15/11	53/35	284/65	681/106	930/114	1645/124

W/VE Multioperator Two Transmitters

	Score	160	80	40	20	15	10
K1AR (at K1EA)	11,435,802	18/16	159/57	417/86	1709/134	2167/145	2171/136
N3RS	9,557,757	22/18	89/50	398/81	1457/136	1545/137	2168/139
N2RM	5,958,596	13/13	94/46	135/63	1277/116	999/127	1534/126
KB1H	5,742,492	12/11	101/49	170/72	993/119	1145/127	1415/121
K9XD	5,499,711	5/4	31/23	171/65	847/109	1504/119	1599/121

W/VE Multioperator Unlimited Transmitters

	Score	160	80	40	20	15	10
KC1XX	19,610,580	45/29	406/85	632/103	2700/164	2777/159	2900/151
W3LPL	18,015,732	58/34	344/80	698/104	2542/161	2596/162	2516/145
K3LR	17,744,616	37/23	237/72	631/108	2746/165	2581/162	2492/148
K9NS	14,225,484	37/24	137/63	395/87	1568/155	2406/160	2901/148
W1GQ	12,589,776	18/18	163/60	637/104	2399/148	1893/140	1838/134

DX Single Op Low Power

	Score	160	80	40	20	15	10
VP5A (KQ3V, op)	4,257,162	120/30	231/46	482/52	664/56	903/57	2346/58
OA4SS	2,620,026	0/0	33/21	265/50	849/56	1121/57	1326/59
VP6BR	1,503,000	0/0	1/1	304/49	143/40	478/53	1579/57
V73CW (AC4G, op)	1,410,750	2/2	18/14	315/49	351/50	580/53	824/57
JL1ARF	1,214,022	0/0	34/12	161/41	222/52	366/52	1108/57
JA1CG	1,141,920	0/0	0/0	41/19	380/53	421/55	1238/56
ZX2B (PY2MNL, op)	1,093,176	0/0	0/0	0/0	386/54	644/56	1139/58
CO2II	995,565	0/0	0/0	0/0	497/52	708/52	936/51
JM1LPN	780,084	0/0	5/3	79/27	248/44	495/56	571/56
S57J	735,435	0/0	24/11	19/13	187/38	483/58	672/57

DX Single Op High Power

	Score	160	80	40	20	15	10
HC8N (K5TR, op)	7,645,056	189/49	337/56	548/59	889/60	1489/60	3956/60
WP3R (KB3AFT, op)	7,254,090	164/42	458/59	518/57	1686/59	1444/59	2948/59
KH7R (KH6ND, op)	6,676,188	167/47	359/53	551/56	1155/56	1240/60	3231/60
ZF2NT (N6NT, op)	6,435,558	220/49	464/56	327/51	1391/60	1566/58	2474/59
V31JP	5,815,071	30/18	344/55	718/56	1100/60	1464/60	2617/60
HU1A (YT1AD, op)	5,686,092	107/47	446/58	561/57	697/60	731/60	3000/60
ZF2DR (K5RQ, op)	5,238,477	98/35	229/48	204/49	1378/58	1328/60	2414/59
V47KP	5,090,715	115/32	337/54	513/52	1259/59	1439/59	1724/59
EA8AH	4,916,430	6/6	267/50	330/46	1712/59	1414/58	2166/59
P40B (P43P, op)	4,766,400	138/43	316/55	439/53	713/59	936/61	2258/60

DX Multioperator Single Transmitter

	Score	160	80	40	20	15	10
VP5B	8,498,052	171/47	377/57	651/57	1651/59	1452/59	4054/60
P40V	7,419,015	228/48	542/58	611/57	1268/57	1762/60	2884/59
8P9Z	6,627,060	145/38	599/57	611/54	1609/59	1097/61	2633/61
PJ4G	6,059,724	104/33	393/57	485/52	1197/59	1474/59	2679/59
TM1C	4,907,646	8/7	419/42	526/54	1106/59	1573/60	2169/69

DX Multioperator Two Transmitters

	Score	160	80	40	20	15	10
6D2X	11,223,927	324/53	703/58	1229/59	2205/60	2995/61	3203/60
KL7Y	7,062,198	46/15	248/38	970/56	1463/59	2780/59	2724/59
WP2Z	6,871,005	105/34	404/52	545/56	1451/59	1898/60	2732/60
IR4T	6,189,336	41/13	185/30	636/57	2010/61	1913/61	2531/60
RU1A	4,476,150	0/0	22/10	498/57	2032/59	1781/60	1757/59

DX Multioperator Unlimited Transmitters

	Score	160	80	40	20	15	10
KL7RA	5,989,440	15/7	244/31	621/56	1369/59	2179/59	2912/60
RW2F	5,148,729	3/3	176/26	739/60	1845/61	1772/61	1798/60
T48RAC	4,471,602	130/35	649/58	512/56	920/57	1743/60	748/51
9A7A	4,093,164	14/8	163/26	518/51	1562/61	1256/61	1578/61
JH7PKU	3,195,801	0/0	154/30	414/53	778/58	1150/60	1617/58

W/VE Region Leaders

Boxes list call sign, score, and power (A = QRP, B = Low Power, C = High Power).

Northeast Region (New England, Hudson and Atlantic Divisions; Maritime and Quebec Sections)			Southeast Region (Delta, Roanoke and Southeastern Divisions)			Central Region (Central and Great Lakes Divisions; Ontario 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/Yukon Sections)		
KR2Q	1,110,600	A	W3MGL	23,598	A	WA8RCN	442,035	A	N0KE (at WB0GAZ)	641,556	A	N7VY	430,992	A
KB3TS	435,024	A	AD4TJ	13,776	A	N8XA	223,200	A	WA0JYC	375,114	A	W6QU (W8QZA, op)	378,144	A
N1TM	97,512	A				AF9J	7,626	A	N0UR	313,992	A	W6CN	312,360	A
W2JEK	10,626	A							N0HJZ	277,656	A	NQ7X	80,154	A
W1XV	1,872	A							WA0VBW	179,772	A	N6WR	30,996	A
W2TZ	1,409,676	B	W4WS	1,456,389	B	VE3XN	1,117,665	B	AC0W	1,491,963	B	K6RO	1,292,760	B
K1SD	1,347,192	B	N4IG	946,950	B	N4TZ	1,041,768	B	WD5K	1,434,510	B	W7YAQ	950,880	B
KS1J	1,296,759	B	WA4IMC	892,440	B	VE3WIB	782,100	B	VE5SF	786,255	B	WN6K	681,750	B
K1NU	1,175,070	B	K4BEV	563,562	B	KI8CS	681,429	B	KW4T	494,730	B	AE6Y	537,732	B
WS1A	1,138,977	B	WA1EHL	561,792	B	KF8K	681,138	B	WA5IYX	478,470	B	WN7J	514,800	B
KQ2M	6,400,260	C	K4ZW	4,621,194	C	W9RE	4,949,697	C	NR0X	1,834,668	C	W7GG	2,709,720	C
N2LT	3,439,146	C	K4AB	3,288,480	C	WB9Z	4,178,310	C	N6ZZ	1,401,456	C	WC6H (NU6S, op)	2,511,495	C
K3ZO	2,926,458	C	N4RV	2,828,601	C	K9BGL	1,827,660	C	N5JR	1,279,608	C	N6ED	2,195,559	C
K2PLF	2,285,490	C	K4DLJ	1,668,009	C	KE8GG	1,371,249	C	K5OT	1,171,200	C	N7TT	1,620,402	C
K2WK	2,284,200	C	K2UOP	1,326,645	C	WQ7B	1,343,991	C	K5ZO	1,142,856	C	AK6R	1,084,455	C

Plaque Winners

Category	*Winner*	*Sponsor*
W/VE All Band Phone	KQ2M	Frankford Radio Club
W/VE 1.8 MHz Phone	WW2Y	Butch Greve, W9EWC Memorial
W/VE 14 MHz Phone	WA2QNW	William F. Beyer Jr., N2WB
W/VE Low Power Phone	AC0W	Dauberville DX Association
W/VE Single Operator Assisted	KI1G	Pete Carter, K3VW Memorial
W/VE Multi-Single	K5ZD	Steve Adams K4RF
W/VE Multi-Unlimited Phone	KC1XX	Western New York DX Association
World Single Operator Phone	HC8N (K5TR, op)	North Jersey DX Association
Asia Single Operator Phone	UA0ZBK	Tim Coad, NU6S
Europe Single Operator Phone	M6T (G4PIQ, op)	Jerry Griffin, K6MD
Oceania Single Operator Phone	KH7R (KH6ND, op)	W7EW in honor of W7IYW
World 1.8 MHz Phone	KV4FZ	In Memory of ZL2BT
World 3.5 Mhz Phone	YV3AZC	K1ZM Communications, Inc
World 14 MHz Phone	IQ3A (IV3TAN, op)	Central California DX Club
World 21 MHz Phone	TG0AA (IK2NCJ, op)	Long Island DX Association
World 28 MHz Phone	ZF2AH	North Shenandoah DX Association NS4DX

Category	*Winner*	*Sponsor*
World QRP Phone	HA2A	Southern Arizona DX Association
World Single Operator Assisted	YL8M (YL2KL, op)	Willamette Valley DX Club
World Multi-Single Phone	VP5B	Carl Cook, AI6V/P49V
Asia Multi-Operator Single	JA7YAA	Yankee Clipper Contest Club
North America Multi-Single Phone	8P9Z *	Nick Lash, K9KLR
World Multi-Two Phone	6D2X	W6NL and K6BL
World Multi-Multi Phone	KL7RA	Stanley Cohen, W8QDQ
Europe Multi-Multi Phone	RW2F	Operators at K1TTT
Oceania Multi-Multi Phone	AH0P	David Brandenburg, K5RQ
South America Multi-Two Phone	PY3MHZ	Operators at K1TTT
Great Lakes Div. Single Operator	KE8GG	Livonia (MI) Amateur Radio Club
Japan All Band Phone	JA1ELY	Communication Ham Club
Japan Low Power All Band Phone	JL1ARF	Western Washington DX Club
Seventh Call Area All Band Phone	W7GG	Willamette Valley DX Club

*Asterisk indicates plaque is awarded to runner-up when winner has been awarded an overall plaque.

ries. The remaining W/VE Single Band winners were WW2Y (160), KE1Y (80), and WA2QNW (20).

Perhaps this year's phone contest will be remembered as the "Year of the Multioperator Station." Every W/VE multioperator record was broken during the contest. The first five finishers in the Multioperator Single Transmitter category each broke the old record. Congratulations to the ops at K5ZD for leading the charge on the record book.

In the W/VE Multi-Two category the team of K1AR, operating at K1EA's station, broke the existing category record substantially (by almost two megs) and painted a victory over second place N3RS on their canvas. In the W/VE Multi-Unlimited category, the familiar calls of KC1XX, W3LPL, K3LR and K9NS are found leading the way. Using towers and antenna arrays worthy to be called sculptures, the quartet of stations all broke the existing category record. In the end, the crew at KC1XX emerged as the category winner.

The Affiliated Club Competition saw each category emerge with a definitive winner. At times, quantity definitely has an impact. But don't overlook the quality of the entries. The Unlimited competition saw the Yankee Clipper Contest Club emerge as champion over the Frankford Radio club. FRC's average log size was over 1.9 million points—compared to YCCC's 1.5 million. However, YCCC members submitted 90 more logs than FRC to tip the balance in their favor.

In the Medium Club competition, the Society of Midwest Contesters staged a heated battle with the Northern California Contest Club. The number of submissions was almost identical (42 to 43) but SMC's points per log average of 1.75 million was around 280 thousand points more per log than NCCC, and gave them a decisive victory. In the Local Club category, top honors go to the Hudson Valley Contesters and DXers, who used their East Coast advantage to outdistance runner-up River City Contesters.

Affiliated Club Competition

Unlimited Category	*Score*	*Entries*
Yankee Clipper Contest Club	394,997,526	253
Frankford Radio Club	322,686,531	164
Potomac Valley Radio Club	173,331,348	119
Medium Category		
Society of Midwest Contesters	73,709,229	42
Northern California Contest Club	63,166,662	43
North Coast Contesters	54,085,131	13
Mad River Radio Club	36,717,858	20
North Texas Contest Club	34,653,282	29
Southern California Contest Club	34,355,163	34
Central Texas DX and Contest Club	32, 023,164	8
Minnesota Wireless Assn	28,993,308	27
South East Contest Club	27,797,874	16
Tennessee Contest Group	26,286,204	33
Florida Contest Group	25,265,535	27
Mother Lode DX/Contest Club	14,571,768	15
Western Washington DX Club	13,982,358	27
Order of Boiled Owls of New York	11,782,317	10
Rochester (NY) DX Assn	10,343,655	20
Western New York DX Assn	5,942,889	16
Southwest Ohio DX Assn	5,920,266	3
Central Arizona DX Assn	5,565,087	12
Willamette Valley DX Club	4,736,517	7
Oklahoma DX Assn	4,537,266	5
Eastern Iowa DX Assn	3,985,536	4
Mile High DX Assn	3,975,699	3
Cajun Contest Club	3,861,324	3
Carolina DX Assn	3,547,737	10
Grand Mesa Contesters	2,910,171	9
Kansas City DX Club	2,851,200	9
Ozark Contest Club	2,761,779	5
Texas DX Society	2,517,357	8
Magnolia DX Assn	2,265,636	4
Southern California DX Club	1,939,329	5
Salt City DX Assn	1,898,760	9
Worldradio Staff ARC	1,695,351	10
Mississippi Valley DX/Contest Club	1,592,658	4
West Park Radiops	1,388,358	11
Twin City Ham Club	1,265,037	5
Bay Area Wireless Assn	1,198,836	3
Northern Arizona DX Assn	1,181,211	7
California Central Coast DX Club	1,177,752	3
Northrop Grumman Radio Club	1,130,175	7
Poughkeepsie ARC	901,473	3
Northern California DX Club	626,238	3
Wabasha Area RC	440,790	3
Ozaukee Radio Club	410,250	4
Green River Valley ARS	324,063	3
Kentucky Contest Group	315,933	3
Woodbridge Wireless	225,162	3
South Jersey Radio Assn	109,476	6
Local Category		
Hudson Valley Contesters and DXers	17,514,624	8
River City Contesters	5,233,869	3
Great Falls Area ARC	2,483,880	5
American Red Cross Emergency	1,729,245	7
Midwest Contest Club	1,481,067	3
Western Illinois ARC	1,036,485	3
Heartland DX Association	868,803	7
Metro DX Club	550,320	3
Northern New York Contest Club	369,603	4
Sturdy Memorial Hospital ARC	253,008	3
CT RI Contest Group	114,540	3

All artists look for ways to expand their talents. Some play in new mediums – canvas or sculpture or clay for example. Now is the time for contesters, to also try new skills and talents. Maybe adding a new band to your collection will help you create a new personal best score. Changing the "canvas" (a new radio or antenna perhaps) might help you increase your potential. Start thinking about new skills and strategies for this contest. Remember that Cabrillo will be the only official ARRL electronic file format by the time this contest rolls around in 2001. Whether the "picture" you paint to exhibit your talent next year is just for personal pleasure, or becomes an award winning "masterpiece," we are certain that the many "brushstrokes" across the bands will paint an overall picture worthy to be admired by all.

Soapbox

First time over a meg in ARRL DX and first time for DXCC on 2 bands. Conditions on 10 and 15 were unbelievable and 40 was open to everywhere in the hour before sunrise on Sunday. WOW! (AA1QD)…We are always full of fight! (AH0P)…First time for SO2R What a thrill to hear Ghana in one ear and the Ivory Coast in the other! (AK6R)…The contest was fun. A big thank you to N5KO for letting me play radio. (K5TR at HC8N)…Wow!! What great conditions. Wish there were more hours in a day (K1MV)…Heard stations up to 28.950 (K3NCO)…My first ARRL DX Contest in 40+ years. Great! (K5EJL)…DXCC on 10 and I only operated Sunday—hello sunspots! (K7BG)…My first 200 hour contest! (K8DX)…Worked all continents very soon after starting contest! (KC0FUD)…Most contacts ever including 20 new ones for me! (KC7WUE)…Being able to put out the DC multiplier was great fun, but the best moments were being called a "rare" one by T32B and finally working Suriname! (KE3VV)…Thanks to VY1JA for going to a lot of extra effort in giving us YT on all six bands. Jay, you're a real gentleman! (KH7R)…Conditions were almost too good. Low band activity suffered. USA operators were pointed at population centers, not at the South Pacific. The 10 meters runs were terrific, though, with 277 the first hour (T32B)…80 and 160 were terrible with static over the pain barrier! Ten was as good as it gets! Fantastic! The contest was great fun and it demonstrates for those of us at the ends of the earth what it must be like to be close to the big population centers of the US and Europe. (VK5GN)

Revised ARRL International DX CW Contest Scores

After the October issue of *QST* went to press, an error was discovered in the log checking software for the 2000 ARRL International DX CW Contest results. The error caused multiplier totals for all electronically submitted logs (DX and W/VE) to be undercounted. The problem has been corrected and the revised scores will be used to determine all awards and certificates. Since all electronic logs were affected by the same order, you should notice very little change in the final standings in the contest. The complete revised article will be posted on the ARRL Contest Branch Web Page at: **http://www.arrl.org/contests** in Adobe PDF format and may be downloaded from that site. For those without Internet access, a printout of the revised article is available upon request to: ARRL Contest Branch, 225 Main St, Newington, CT 06111. An SASE with 2 units of postage would be appreciated.

On behalf of the log checking volunteers and Contest Branch employees, I apologize for the error and any inconvenience it may cause.—*Dan Henderson, N1ND, ARRL Contest Branch Manager.*

Scores

Scores are listed by DXCC Entity and ARRL\RAC Sections. Within each Country or Section, scores are listed in descending order, Single Op by power categories, then Single Band entries. All Single Assisted and Multioperator entries then follow. Line scores list call sign, score, QSOs, multipliers, power (A = QRP, B = Low Power, C = High Power, D = Multioperator), and band.

W/VE

Single Operator

1

Connecticut

N1TM	97,512	239	136	A	
W1CTN	1,024,830	1158	295	B	
K1RO	534,264	788	226	B	
KA1JVR	204,282	351	194	B	
W1AZT	127,872	288	148	B	
KA1RWY	79,629	209	127	B	
KE1AU	15,405	79	65	B	
W1XF	8,694	69	42	B	
KQ2M	6,400,260	4588	465	C	
W1NG	2,130,096	1592	446	C	
K1VDF	1,140,795	1515	251	C	
KE1IH	967,308	1082	298	C	
NT1N	910,296	1128	269	C	
N4XR	601,398	602	333	C	
W1AW (N1ND, op)	344,112	536	214	C	
W1QK	271,029	473	191	C	
W1CRS (W1RPG, op)	136,710	310	147	C	
KA1DSQ	100,980	306	110	C	
K1IM	64,974	238	91	C	
W1TS	40,158	138	97	C	
KA1VMG	38,391	191	67	C	
K8CH	17,160	88	65	C	
W1AMF	221,805	795	93	B	10

Eastern Massachusetts

K1NU	1,175,070	1310	299	B	
K1HT	734,046	893	274	B	
KA1DZV	681,651	851	267	B	
W1VIV	420,552	649	216	B	
N3KCJ	387,855	585	221	B	
N1DS	264,438	498	177	B	
K1TEX	252,495	465	181	B	
K1WCC	198,897	397	167	B	
N1ZZN	187,110	378	165	B	
N1EDM	136,851	319	143	B	
WT1O	98,298	258	127	B	
K1VUT	82,800	240	115	B	
WG1Z	73,080	290	84	B	
K1IX	66,738	227	98	B	
W1EWN	37,728	131	96	B	
WA1WFH	36,864	128	96	B	
KC1WD	24,948	108	77	B	
N1CX	2,084,850	1695	410	C	
K5MA	1,719,360	1592	360	C	
NZ1Q	1,223,928	1146	356	C	
W1RY	773,424	984	262	C	
W1KRS	653,310	854	255	C	
KA1UQ	442,656	696	212	C	
K1TWF	351,876	497	236	C	
W1OHM	256,056	454	188	C	
W1AZ	229,890	395	194	C	
K1GU	205,320	472	145	C	
W1TE	179,400	325	184	C	
W1DO	63,075	145	145	C	
W1CC	13,158	86	51	C	
K1ZM	9,198	73	42	C	160
AA1BU	4,002	46	29	C	160
KE1Y	58,140	285	68	C	80
W1ZZ	89,964	357	84	B	10
KY1B	26,304	137	64	B	10

Maine

KA1IS	598,302	773	258	B	
N1AO	219,474	411	178	B	
K1MY	951,345	1215	261	C	
W1CEK	224,472	398	188	C	
K1MV	56,661	187	101	C	
NY1E	634,056	1822	116	C	10
KA1PRD	88,695	365	81	A	10
KA1RLI	74,646	319	78	B	10
KA1AIF	19,470	118	55	C	10

New Hampshire

W1XV	1,872	26	24	A	
WS1A	1,138,977	1253	303	B	
KG1V	294,120	516	190	B	
WB1EDI	277,905	485	191	B	
WA1ZYX	98,829	237	139	B	
K1HI	1,514,412	1426	354	C	
N1SP	657,804	764	287	C	
K1BD	520,446	683	254	C	
WQ1H	396,717	593	223	C	
WE1USA	346,185	1099	105	B	10
K1BV	67,275	325	69	B	10

Rhode Island

K1SD	1,347,192	1458	308	B	
KS1J	1,296,759	1381	313	B	
K1VSJ	567,162	778	243	B	
KB1LN	73,530	215	114	B	
W1OP	560,070	762	245	C	
W1WFZ	314,766	402	261	C	
WA1MKS	71,799	263	91	C	20
W1RFQ	54,000	225	80	C	10
N1YKH	4,836	52	31	B	10

Vermont

W1ECH	246,279	439	187	B	
AA1SU	200,700	446	150	B	
K1KD	163,485	315	173	B	
W1WS	68,688	212	108	B	
W1ZS	68,688	212	108	B	
K2MME	20,460	110	62	B	
KA1LDS	11,760	70	56	B	
W1ZK	927,447	1007	307	C	
WB1GQR (W1SJ, op)	527,055	857	205	C	
KK1L	169,440	353	160	C	
N1PEA	167,904	352	159	C	

Western Massachusetts

W1KT	729,261	813	299	B	
KX1X	465,570	739	210	B	
AE1B	393,720	680	193	B	
W1TO	59,388	202	98	B	
W1RZF	1,418,055	1411	335	C	
KK1DX	944,520	926	340	C	
KD1KI	599,949	749	267	C	
W1SRG	454,176	608	249	C	
N1FUS	74,100	325	76	B	10
N1HHQ	10,824	88	41	B	10

2

Eastern New York

W2ENY	304,500	500	203	B	
WT2JG	236,991	401	197	B	
K2SIG	212,925	425	167	B	
WF2B	133,245	329	135	B	
N2MTG	66,744	206	108	B	
W2PS	869,934	1174	247	C	
K2XF	842,499	933	301	C	
N1JP	719,862	839	286	C	
W2YK	718,815	865	277	C	
K2EP	645,606	806	267	C	
W2ZU	361,152	576	209	C	
NA2M	348,090	566	205	C	
N2LH	27,612	156	59	C	20
WX2N	36,783	183	67	B	15
K2ANT	40,068	212	63	B	10
N2VZA	37,572	202	62	B	10
KC2CRO	15,228	94	54	B	10
W2WHO	5,301	57	31	B	10

NYC-Long Island

K2DO	765,765	1155	221	B	
WB2AYQ	421,104	566	248	B	
KG2FH	204,180	410	166	B	
N2LEB	203,625	375	181	B	
K2TV	180,180	429	140	B	
N2LDV	43,488	151	96	B	
K2DL	5,733	49	39	B	
W2YG	160,962	386	139	C	
N2GC	3,960	40	33	C	
WB2AMU	14,688	96	51	B	40
NS2W	22,743	133	57	B	20
K2MFY	219,024	676	108	B	10
N2UN	165,870	582	95	C	10
W3EH	34,944	182	64	B	10

Northern New Jersey

KR2Q	1,110,600	1234	300	A	
W2JEK	10,626	77	46	A	
K2WA	335,400	559	200	B	
W2QU	139,524	302	154	B	
N2NYR	22,365	105	71	B	
N2LT	3,439,146	3001	382	C	
K2WK	2,284,200	2350	324	C	
N7UN	1,661,352	1624	341	C	
W2EN	1,380,030	1465	314	C	
N2TTT	212,148	332	213	C	
W2UDT	211,041	393	179	C	
W2YR	202,404	404	167	C	
N2MH	188,475	359	175	C	
W2AZK	134,064	294	152	C	
N2ST	99,960	238	140	C	
WA2QNW	391,524	1106	118	C	20
AE2JL	24,864	148	56	B	15
WA2BKN	34,368	179	64	C	10
K2YSY	25,560	142	60	C	10
N2OPJ	7,881	71	37	C	10

Northern New York

NG2C	36,855	189	65	B	10
N2JNZ	25,110	155	54	A	10

Southern New Jersey

K1JT	192,780	378	170	B	
N1IBM	123,930	270	153	B	
KA2YKN	67,098	211	106	B	
W2FGY	24,000	100	80	B	
KC2DPV	9,522	69	46	B	
K2JF	2,610	30	29	B	
N2MR	601,020	795	252	C	
WW2Y	10,206	81	42	C	160
K2BQW	103,761	427	81	B	10

Western New York

W2TZ	1,409,676	1487	316	B	
K2CS	435,960	692	210	B	
WB2ABD	272,244	463	196	B	
N2LQQ	147,030	338	145	B	
KM2L	117,612	297	132	B	
W2FUI	111,930	287	130	B	
K2QO	47,526	178	89	B	
W2IV	17,487	87	67	B	
W2LU	1,125,072	1202	312	C	
NA2A	474,240	608	260	C	
WR2V	296,814	518	191	C	
K2FR	292,617	533	183	C	
AA2MU	280,125	375	249	C	
WF2Y	182,712	331	184	C	
KW2J	160,866	331	162	C	
WE2T	75,582	247	102	C	
W2VO	912	19	16	C	160
N2WK	26,226	141	62	C	40
N2CU	15,600	100	52	B	15
K2ZJ	354,456	1094	108	C	10
NA2X	85,860	318	90	C	10
N2USB	35,685	183	65	B	10
KB2QCW	19,398	122	53	B	10
N2OPW	13,671	93	49	B	10
KC2DGC	4,107	37	37	B	10
KB2SG	2,178	33	22	B	10
K2CY	1,440	24	20	A	10

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Delaware

N9GG	31,188	113	92	B	
KC3AJ	178,893	417	143	C	

Eastern Pennsylvania

KB3TS	435,024	636	228	A	
W3NTD	139,062	301	154	B	
KQ3F	2,170,800	2160	335	C	
N3DL	1,399,032	1143	408	C	
WT3W	1,234,548	1278	322	C	
K3ZA	750,741	997	251	C	
K3KFD	607,431	869	233	C	
N3KR	508,152	683	248	C	
N3RJ	436,800	700	208	C	
W3BYX	313,548	493	212	C	
K4JLD	225,498	413	182	C	
WB3JIS	186,000	400	155	C	
AD3Z	179,172	316	189	C	
NN3Q	174,420	306	190	C	
W3KV	172,368	378	152	C	
W3BEN	153,057	313	163	C	
W3JRY	128,652	302	142	C	
KC3TL	98,640	411	80	C	
K3SV	13,965	95	49	C	80
KB3AGZ	38,391	191	67	B	20
K1DS	12,150	81	50	B	10

Maryland-DC

W3UJ	675,552	908	248	B	
KE3VV	506,112	659	256	B	
N3UR	212,226	434	163	B	
N3UMA	210,330	342	205	B	
K1EFI	159,858	321	166	B	
N3FX	103,983	253	137	B	
N3EYB	94,878	251	126	B	
W3DF	88,773	233	127	B	
W3EE	54,693	177	103	B	
N3SEO	19,998	101	66	B	
NN3SI (WA4FXX, op)	14,076	92	51	B	
K3ZO	2,926,458	2658	367	C	
K2PLF	2,285,490	2059	370	C	
N3AM	1,735,650	1450	399	C	
K3SA	768,600	840	305	C	
AJ3M	618,744	812	254	C	
KF3BE	576,975	785	245	C	
W3YD	323,748	529	204	C	
W3AZ	321,048	546	196	C	
W3UL	311,178	478	217	C	
N3HXQ	282,240	480	196	C	
K3UG	214,968	424	169	C	
N3GBP	186,507	391	159	C	
W3CP	50,292	254	66	B	10
K3NCO	45,360	216	70	B	10
W3INK	41,856	218	64	C	10
W2BZR/3	28,608	149	64	C	10
WA3EEE	26,550	150	59	B	10
WA3SWA	5,508	51	36	B	10

Western Pennsylvania

WA3SES	128,736	288	149	B	
WA3GPP	60,375	175	115	B	
WA3EQJ	10,098	66	51	B	
AB4XS	407,694	571	238	C	
WN3VAW	219,441	379	193	C	
W3IQ	123,009	313	131	C	
K3RON	89,250	250	119	C	
WB3EPE	74,061	211	117	C	
WB0IWG	66,576	304	73	A	10
N3WAV	23,433	107	73	C	10

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Alabama

W4AUB	57,942	222	87	B	
K4AB	3,288,480	2720	403	C	
W4NTI	394,680	598	220	C	
AG4W	4,998	49	34	C	80
K4WI	721,806	2039	118	C	10

Georgia

KU4OH	461,538	666	231	B	
KT4ZB	249,039	413	201	B	
K4OGG	34,020	140	81	B	
KB4BBC	28,548	122	78	B	
WA4TII	1,128,750	1075	350	C	
K4BAI	236,052	474	166	C	
W4CEB	66,171	161	137	C	
K4GSX	4,608	48	32	A	20
K6EID	142,506	522	91	B	10
WF9B	24,420	148	55	B	10

Kentucky

W4LC	76,692	308	83	B	
N4HT	890,400	1120	265	C	
K4IU	214,668	402	178	C	
N4XM	828	23	12	C	
KG4BIG	34,200	200	57	B	10
KD4CSW	18,360	120	51	B	10

North Carolina

W4WS (N4VHK, op)	1,456,389	1551	313	B	
WA1EHL	561,792	836	224	B	
W2CS	188,502	353	178	B	
KF4OAD	127,395	285	149	B	
KE4WZY	122,688	288	142	B	
AA0KO	116,724	274	142	B	
K4WES	106,920	264	135	B	
KF4VMT	101,844	276	123	B	
KV4CN	69,030	195	118	B	
AE4EC	35,904	136	88	B	
NC4NC	551,001	649	283	C	
N4UH	447,675	635	235	C	
N4CW	403,176	628	214	C	
N4AA	300,696	536	187	C	
NW6S	297,228	527	188	C	
N4TL	126,900	282	150	C	
W4WNT	117,963	257	153	C	
KA8FSM	107,004	241	148	C	
KV4N	71,955	205	117	C	
W4YDY	62,916	196	107	C	
NC4MI	61,380	186	110	C	
K4MGN	54,516	154	118	C	
W4MR (AA4NC, op)	149,592	542	92	C	40
KZ2I	23,664	136	58	C	40
W2AY	100,440	372	90	C	20
W4ZV	981,837	2577	127	C	10
N5FPW	45,792	212	72	B	10
WA4DWC	16,218	106	51	B	10
KG4CCX	4,704	49	32	B	10
K5LZT	741	19	13	B	10

Northern Florida

WA4IMC	892,440	1110	268	B	
AD4RE	242,694	417	194	B	
N4IPH	38,916	138	94	B	
W9WGN	30,240	120	84	B	
WA8NAZ	260,253	459	189	C	
W7QF	140,448	304	154	C	
N4EK	20,193	127	53	C	20
KX2J	19,764	108	61	B	20
KC4JE	5,565	53	35	B	20
K4VUD	592,455	1555	127	C	15
KC4LJD	38,025	195	65	A	10

South Carolina

W4HGW	139,500	300	155	B	
KR4PB	33,150	130	85	B	
W1WEF/4	2,916	36	27	B	
K4DLJ	1,668,009	1621	343	C	
W3VT	555,891	721	257	C	
AA4V	506,325	785	215	C	
K0COP	79,500	250	106	C	
W4JKC	29,388	158	62	C	40
WB4NRI	20,904	104	67	C	20
K4TSU	33,750	150	75	B	10
N2FY	23,940	140	57	C	10

Southern Florida

WA2CPP	127,890	290	147	B	
KB1HC	425,019	547	259	C	
N4BG	38,352	188	68	C	10

Tennessee

K4BEV	563,562	786	239	B	
W4GMM	548,775	813	225	B	
N5TWV	147,423	313	157	B	
N2BR	145,290	290	167	B	
WD4OHD	135,864	306	148	B	
W4NI	32,994	141	78	B	
N4JN	8,190	70	39	B	
K4LTA	618,540	793	260	C	
KE4OAR	30,825	137	75	C	
W4OGG	25,272	117	72	C	
KF4ZR	1,242	23	18	B	15
WD4K	426,624	1408	101	C	10
K4WX	372,402	1217	102	B	10
WD4PTJ	45,120	235	64	B	10
KG4CKX	24,696	147	56	B	10

Virginia

W3MGL	23,598	114	69	A	
AD4TJ	13,776	82	56	A	
K4UVT	229,146	422	181	B	
K4EP	131,355	315	139	B	
N3ZYU	85,050	225	126	B	
N3TG	70,272	192	122	B	
K1SO	64,233	183	117	B	
KS4JB	41,118	154	89	B	
WB4DNL	31,740	115	92	B	
W4PWF	22,113	91	81	B	
KV4DJ	18,360	90	68	B	
K4ZW	4,621,194	3694	417	C	
N4RV	2,828,601	2229	423	C	
N4MM	889,878	1067	278	C	
W4JVN	701,475	995	235	C	
N4GU	358,794	643	186	C	
W2YE	270,237	431	209	C	
W0YR	181,902	427	142	C	
K4VV	178,398	374	159	C	
W4NYY	151,392	332	152	C	
N6MW	117,585	201	195	C	
W4YE	110,922	278	133	C	
W4IF	96,750	258	125	C	
K5VG	72,192	188	128	C	
N8CH	27,720	120	77	C	
WA4MA	27,594	146	63	B	20
N4BJB	3,150	42	25	B	15
KD4HZG	1,500	25	20	B	15
N4EUK	2,508	38	22	A	10
W4IM	1,173	23	17	A	10

West Central Florida

N4IG	946,950	1070	295	B	
WC4E	527,085	795	221	C	
K4XS	245,127	809	101	C	40
K4LQ	17,649	111	53	C	40
KF4KSN	17,712	123	48	B	10

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Arkansas

KF5PN	111,000	250	148	B	
KG5RM	30,879	141	73	B	
WD5CNC	10,080	80	42	B	
W5RZ	149,760	312	160	C	
N5QYC	33,456	164	68	C	20
KD5GDA	12,726	101	42	B	10
KB5EKX	5,880	56	35	B	10

Louisiana

KM5QG	292,803	511	191	B	
W5WZ	270,864	513	176	B	
W5LA	149,952	352	142	B	
KZ5D	1,055,814	1181	298	C	
WM9M	11,214	89	42	C	40
W5WMU	324,060	982	110	C	20
W5CTV	8,190	70	39	C	10
N8OO	487,179	1463	111	B	10

Mississippi

N5PA	129,183	289	149	B	
KB5FET	104,544	288	121	B	
WA5SWX	33,930	130	87	B	
W5EHM	516,177	691	249	C	
K2FF	1,650	50	11	C	10
KE6JGJ	429	13	11	B	10

New Mexico

W5GZ	263,088	464	189	B	
KM5WP	29,970	135	74	B	
N6ZZ	1,401,456	1552	301	C	
W5JRP	37,386	186	67	B	20
K5AM	623,025	1775	117	C	10
N7DF	596,403	1791	111	C	10
KC5LFV	16,377	103	53	A	10
K5OI	4,230	47	30	A	10

North Texas

WD5K	1,434,510	1485	322	B	
K5RA	255,816	408	209	B	
NF5W	255,558	446	191	B	
NN5T	125,955	311	135	B	
WK5K	38,610	130	99	B	
N5JR	1,279,608	1628	262	C	
K5OT	1,171,200	1280	305	C	
K5ZO	1,142,856	1221	312	C	
N5TY	362,889	661	183	C	
W5GN	299,292	509	196	C	
N1QXV	25,935	133	65	C	
K5MR	207,834	737	94	C	40
W5FO	30,030	154	65	C	40
KN5L	47,328	232	68	B	15
W5RNF	45,696	224	68	B	15
K5RX	890,760	2284	130	C	10
W5KQJ	65,100	310	70	C	10
KM5LO	14,208	128	37	B	10
K6AZA	2,772	44	21	C	10

Oklahoma

K0CIE	375,132	727	172	B	
N5RXF	327,600	525	208	B	
WD0GTY	36,579	137	89	B	
W0PAN	24,816	94	88	B	
NA5B (W5AO, op)	648,000	1728	125	C	10

South Texas

KA5PVB	77,172	218	118	A	
WA5IYX	478,470	778	205	B	
KE5LQ	407,043	637	213	B	
N5DD	330,837	499	221	B	
W9DX	237,357	447	177	B	
WA5SAJ	142,065	287	165	B	
W5QCL	122,256	283	144	B	
N5RLQ	104,148	263	132	B	
AJ4F	42,333	137	103	B	
K5EJL	37,392	152	82	B	
KD5EDO	24,720	103	80	B	
W5GCX	513,765	735	233	C	
KM5TY	87,912	264	111	C	
KB2RRV	19,251	93	69	C	
N5KC (W5ASP, op)	57,000	250	76	C	15
N5AW	209,475	665	105	B	10

West Texas

KE5OG	45,264	164	92	B	
N5DO	77,964	356	73	C	40
NZ5M	1,404	26	18	B	20

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East Bay

K6XV	107,061	281	127	B	
KF6BIR	54,120	220	82	B	
KF6PKG	50,676	206	82	B	
KE6QR	16,497	141	39	B	
KE6ZSN	208,953	639	109	C	
N6NG	126,948	298	142	C	
KG6HM	9,240	88	35	B	10

Los Angeles

K6RO	1,292,760	1330	324	B	
WB6NFO	180,000	400	150	B	
K6ASK	152,736	344	148	B	
KQ6MU	93,720	284	110	B	
KN6DQ	80,649	261	103	B	
W6FFH	62,418	206	101	B	
W6RCL	35,280	147	80	B	
N6ED	2,195,559	2097	349	C	
N6AA	500,556	707	236	C	
W7RF	182,628	356	171	C	
N6OPR	175,422	346	169	C	
N6IC	136,710	310	147	C	
KB6FB	122,484	346	118	C	
K6SE	61,275	215	95	C	
K6TV	54,378	171	106	C	
N6UB	7,638	67	38	C	
KU6T	28,416	148	64	B	20
W6AFA	321,930	1022	105	C	10
KF6YAN	5,760	64	30	C	10
K6CEO	1,728	32	18	B	10
KD6LME	36	4	3	B	10

Orange

W6SA	201,465	407	165	B	
KQ6VQ	129,744	318	136	B	
W6ZQ	38,628	174	74	B	
AC6TK	19,008	99	64	B	
AA6PW	455,532	748	203	C	
WW6O	402,936	652	206	C	
K6ACZ	374,247	501	249	C	
WA6BFW	147,960	360	137	C	
K6HRT	77,559	251	103	C	
AC6WD	83,664	336	83	B	15

Santa Barbara

WA6FGV	217,503	429	169	B	
KW6PE	23,220	180	43	B	
W6TK	1,060,080	1262	280	C	
WA5VGI	625,464	876	238	C	
NN6DX	46,182	179	86	C	
N6HK	19,488	116	56	C	20
W7CB	171,000	600	95	C	10
W6HYK	44,019	219	67	B	10
NV6I	14,985	111	45	B	10
KD6PQF	13,734	109	42	B	10

Santa Clara Valley

AE6Y	537,732	766	234	B	
N6NF	448,140	770	194	B	
W6PLJ	305,520	536	190	B	
N6IJ (NI6FW, op)	63,765	195	109	B	
K6ITL	40,977	157	87	B	
N6IV	1,587	23	23	B	
N2ALE	780	20	13	B	
NN6XX	638,316	894	238	C	
K6GT	457,074	758	201	C	
AJ6V	347,328	576	201	C	
W6ISO	289,737	511	189	C	
K6XX	228,000	608	125	C	
K6III	194,922	357	182	C	
W6ISQ	99,750	266	125	C	
K6HNZ	325,152	1129	96	C	10

San Diego

W6QU (W8QZA, op)	378,144	624	202	A	
W6CN	312,360	548	190	A	
WN6K	681,750	1010	225	B	
W6JVA	104,394	274	127	B	
AA6EE	16,929	99	57	B	
AK6R	1,084,455	1385	261	C	

San Francisco

K6UM	260,058	487	178	B	
AD6G	64,020	220	97	B	
W6ESJ	29,760	155	64	B	15

San Joaquin Valley

AD6JK	85,800	260	110	B	
K6CSL	62,379	239	87	B	
WC6H (NU6S, op)	2,511,495	2499	335	C	
N6TNX	47,436	134	118	C	
WB6QVI	31,758	158	67	C	
N6TNW	13,104	78	56	C	
KA6BIM	511,302	1397	122	C	10

Sacramento Valley

N6WR	30,996	164	63	A	
N6JM	450,870	665	226	B	
WF6O	123,984	328	126	B	
W6EO	9,417	73	43	B	
W6QEU	467,625	725	215	C	
W6IXP	344,568	586	196	C	
KO6IS	174,654	313	186	C	
K6DB	106,038	258	137	C	
K6BEW	88,179	247	119	C	
K6RN	56,772	249	76	C	15
W6RKC	29,412	172	57	C	15
K6KAY	142,881	491	97	B	10
KF6OBS	14,472	134	36	C	10

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Arizona

N7VY	430,992	656	219	A	
NQ7X	80,154	219	122	A	
WN7J	514,800	780	220	B	
KX7J	62,496	217	96	B	
K2DI	4,680	40	39	B	
K7TR	309,288	526	196	C	
NF7E	287,832	536	179	C	
N7JXS	100,224	288	116	C	
K7ON	99,735	305	109	C	
KN5H	85,542	269	106	C	
KC7V	77,400	258	100	C	
K6TIM	17,787	77	77	C	
W7UPF	98,208	372	88	C	15
AA7A	469,368	1272	123	C	10
W7ZMD	129,600	450	96	C	10
W7AYY	81,000	360	75	C	10
W7YS	47,436	236	67	C	10
KE4GDQ	27,258	154	59	B	10
W7/VA3FP	7,866	69	38	B	10

Eastern Washington

WS7V	448,560	712	210	B	
KC7WUE	41,580	210	66	B	
KI7AO/M	34,560	144	80	B	
KD7CPO	32,922	186	59	C	
W7LGG	44,712	207	72	C	10

Idaho

KW7N	158,685	355	149	B	
KJ7TH	676,044	844	267	C	
K0TO	195,978	367	178	C	
W7II	190,920	344	185	C	

Montana

KE7NO	213,942	394	181	B	
KK7QJ	71,100	237	100	B	
KS7T	283,140	660	143	C	
KC7UP	252,753	487	173	C	
KK7VC	98,532	276	119	C	
K7BG	160,800	536	100	C	10
K7ABV	84,315	385	73	C	10
KC7NX	28,014	161	58	B	10

Nevada

KC7DB	281,220	545	172	B	
N7ZT	588,708	828	237	C	
W7EB	419,580	1295	108	C	15

Oregon

W7YAQ	950,880	1120	283	B	
W7YVK	122,223	311	131	B	
N7EMC	67,830	238	95	B	
KR7X	67,200	224	100	B	
K7AIA	33,864	166	68	B	
W7GG	2,709,720	2509	360	C	
K0JJ	368,280	558	220	C	
W7PXL	36,480	152	80	C	
KK7CG	8,514	66	43	C	
K7EM	210,105	805	87	C	40
W7EJ	806,577	2117	127	C	15
W7FP	275,880	836	110	C	15
KA7FEF	8,640	96	30	B	10

Utah

W0DET	89,232	286	104	B	
NT7Y	74,256	221	112	B	
KJ7CU	517,104	798	216	C	
K8EI	115,710	290	133	C	
W8EQA	65,520	280	78	C	15

Western Washington

W7/JR1NKN	9,912	118	28	A	
AA7PM	306,432	532	192	B	
N7FL	274,890	539	170	B	
KB7PKC	158,760	378	140	B	
W7GTO	74,052	242	102	B	
AB7RW	47,214	183	86	B	
NA7R	34,875	155	75	B	
N6TPT	28,320	118	80	B	
KC7WDL	21,384	162	44	B	
N7TT	1,620,402	1882	287	C	
W7QN	273,525	521	175	C	
WA2OCG	63,504	216	98	C	
K7NAV	41,958	222	63	C	20
W7WA	987,228	2493	132	C	15
KV7X	47,925	225	71	A	15
W7CL	41,790	199	70	A	10
AD7U	26,796	203	44	B	10
W7SAW	15,525	115	45	B	10

Wyoming

NQ7Q	39,690	147	90	A	
KD7RX	38,280	145	88	B	
N7JT	35,784	142	84	C	

8

Michigan

N8CN	618,894	942	219	B	
K8CV	225,720	456	165	B	
KE8FO	144,096	316	152	B	
KT8X	105,444	348	101	B	
WA8OLD	57,600	192	100	B	
N8NX	53,298	189	94	B	
AA8U	39,564	157	84	B	
N8WTH	19,890	102	65	B	
KE8GG	1,371,249	1539	297	C	
WQ7B	1,343,991	1529	293	C	
NE8I	905,472	1048	288	C	
AA8PA	595,560	709	280	C	
W8TWA	205,590	385	178	C	
N8LIQ	50,172	226	74	B	20
W8UD	345,555	1097	105	C	10
K8IR	93,480	380	82	B	10
KC8LTL	14,628	106	46	B	10

Ohio

WA8RCN	442,035	705	209	A	
N8XA	223,200	372	200	A	
KI8CS	681,429	877	259	B	
KF8K	681,138	958	237	B	
W8UPH	380,289	637	199	B	
W8TTS	192,348	411	156	B	
W8DD	167,739	391	143	B	
K8MR	164,565	345	159	B	
W8IDM	162,855	329	165	B	
KC8HWV	149,205	343	145	B	
AF8C	139,830	395	118	B	
N8SSE	123,624	303	136	B	
N8WEL	98,952	248	133	B	
WT8P	88,854	251	118	B	
KA8PTT	88,452	234	126	B	
N8TXI	75,327	211	119	B	
N8FWA	75,285	239	105	B	
K8VUS	63,936	192	111	B	
AA8BV	44,550	165	90	B	
KG8DH	30,000	125	80	B	
W8JGU	743,166	1007	246	C	
KF8JW	185,310	355	174	C	
K8KH	167,772	341	164	C	
K8LN	128,877	323	133	C	
N2DPF	61,425	225	91	C	
W8MHB	50,787	171	99	C	
KB8BTA	21,168	112	63	C	
WB8ZWY	546	14	13	C	
K8DX	1,239,540	2830	146	C	15
ND8DX	358,020	1020	117	C	15
KU8E	435,456	1344	108	C	10
KA8NRC	53,460	220	81	A	10
WA8RJF	45,582	214	71	A	10
AA8IV	31,842	174	61	B	10
WA8NVW	9,240	77	40	C	10
KC8CSD	9,048	58	52	B	10
KI8FB	3,354	43	26	B	10

West Virginia

W8OP	194,544	386	168	B	
K2UOP	1,326,645	1395	317	C	
K3JT	1,255,248	1516	276	C	
KB3AUG	1,028,775	1075	319	C	
W8WEJ (W8BAR, op)	855	19	15	C	160
N4SEA	171,456	608	94	C	10

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Illinois

K9JE	349,632	607	192	B	
K9YA	296,769	529	187	B	
W9FGH	216,300	412	175	B	
N9BBM	197,802	407	162	B	
AA9QT	169,248	344	164	B	
N9NW	99,060	254	130	B	
KG9JP	63,648	156	136	B	
K9OWC	58,032	156	124	B	
W9LYN	49,050	150	109	B	
W9HL	42,471	143	99	B	
KB9CYL	37,800	175	72	B	
KB9HGI	31,185	135	77	B	
WD9FEN	27,900	124	75	B	
KE9EX	26,334	114	77	B	
K9NA	25,086	113	74	B	
W9DY	16,821	89	63	B	
W9GB	16,770	86	65	B	
WB9Z	4,178,310	3239	430	C	
K9BGL	1,827,660	1835	332	C	
WA9TPQ	517,806	774	223	C	
K9DN	480,816	742	216	C	
K9UQN	365,370	641	190	C	
W9GIG	198,648	372	178	C	
N9WKW	189,024	358	176	C	
K0RL	163,215	351	155	C	
N9NT	147,840	320	154	C	
W9OA	128,232	312	137	C	
AA9DM	95,940	260	123	C	
WA9CCQ	67,035	205	109	C	
AA9IV	576	16	12	C	80
N9HCA	102,240	426	80	C	20
W9BNR	29,700	165	60	C	20
W9CY	26,412	142	62	C	20
W9OF	79,980	310	86	C	15
KG9X	645,840	1794	120	C	10
N9JF	331,200	1104	100	B	10
K9ZO	306,612	1002	102	C	10
N9LCR	177,612	722	82	C	10
K9QVB	158,886	582	91	B	10
NN9K	143,598	526	91	B	10
KB9PPT	59,736	262	76	B	10
N9MBK	46,575	225	69	C	10
KB9JIZ	22,185	145	51	B	10

Indiana

N4TZ	1,041,768	1113	312	B	
K9SH	463,887	621	249	B	
N9DR	161,370	326	165	B	
K9LVK	104,784	296	118	B	
K9TSM	73,179	519	47	B	
W9RE	4,949,697	3919	421	C	
W9BS	788,085	1055	249	C	
WB9LRK	49,536	172	96	C	
KC9TV	7,038	51	46	C	
KB5EAM	44,064	216	68	B	10
WA9PYH	3,360	40	28	B	10

Wisconsin

AF9J	7,626	62	41	A	
K9OP	214,863	383	187	B	
AA9TB	140,580	330	142	B	
WI9M	106,896	262	136	B	
WQ9N	23,010	118	65	B	
K9QH	1,500	25	20	B	
W9OP	749,844	954	262	C	
KB9BUM	630,168	868	242	C	
KB9KEG	262,269	483	181	C	
W9GXR	24,840	138	60	C	40
KF9VJ	29,829	163	61	B	15
K9CAN	154,656	537	96	C	10
KB9NIV	38,391	191	67	B	10

0

Colorado

N0KE (at WB0GAZ)	641,556	852	251	A	
WA0JYC	375,114	619	202	A	
WB0HZL	169,218	357	158	A	
W0HEP	91,806	214	143	A	
KI0II	47,736	156	102	A	
W0ETT	354,564	588	201	B	
N0NR	80,196	164	163	B	
K0GAS	453,456	752	201	C	
W0OSK	287,424	499	192	C	
AB0IO	69,597	209	111	C	
W0ZP	37,386	201	62	C	
K0DE	2,592	32	27	C	
K0RI	7,524	76	33	B	40
W0TM	55,440	240	77	C	20
KG0ZI	274,815	985	93	C	15
K0CL	882,279	2391	123	C	10
N0IBT	36,714	211	58	B	10

Iowa

N0RKX	341,532	537	212	B	
WN0G	228,657	451	169	B	
AA0AI	89,271	273	109	B	
KB2FSK	66,792	184	121	B	
NR0X	1,834,668	1804	339	C	
W0PPF	159,408	369	144	C	
W0NFL	93,534	238	131	C	
W0ETC	408,888	1262	108	C	10
NE0P	15,141	103	49	C	10
AB0HF	14,508	124	39	B	10

Kansas

KB0WPY	122,544	296	138	B	
K1LR	414,480	628	220	C	
KA0EIC	27,492	116	79	C	
N0UU	63,600	265	80	C	15
KB0MZG	156,729	587	89	B	10
K0LLS	6,360	53	40	B	10
N0NB	5,355	51	35	C	10
WA5BOW	4,332	38	38	B	10

Minnesota

N0UR	313,992	588	178	A	
N0HJZ	277,656	503	184	A	
WA0VBW	179,772	422	142	A	
AC0W	1,491,963	1559	319	B	
KW4T	494,730	690	239	B	
WB0GGM	220,836	478	154	B	
KC0CN	202,860	420	161	B	
KT0R	864,300	1075	268	C	
N5IN	769,014	909	282	C	
W0MRD	321,480	564	190	C	
WA0MHJ	221,943	443	167	C	
K0AD	26,880	112	80	C	
K0IHG	5,040	56	30	B	15
K0CAT (K9WIE, op)	357,237	1179	101	C	10
KF0GX	16,224	104	52	A	10

Missouri

KI0MB	299,505	487	205	B	
KI7WO	185,808	392	158	B	
K2HT/0	164,160	320	171	B	
KI9A	1,041,150	1262	275	C	
K0DAN	434,079	699	207	C	
W0TT	174,432	316	184	C	
K0DAT	150,249	319	157	C	

North Dakota

WI9H	132,714	303	146	C	

Nebraska

NF0N	275,049	501	183	B	
K0SZ	198,534	406	163	B	
NU0C	102,000	250	136	B	
KC0FUD	91,770	230	133	B	
KB0WHY	14,691	83	59	B	
WA6POZ	188,877	377	167	C	
N0LGU	40,044	188	71	B	10
N0OFR	28,731	157	61	B	10

South Dakota

KD0EE	341,940	556	205	C	
WD0BMR	33,858	114	99	C	
WB0ULX	40,110	191	70	B	10
KA0VME	22,194	137	54	B	10
N0VEK	5,292	42	42	B	10

Maritime-Newfoundland

VE1JS	655,557	1007	217	B	

New Brunswick

VE9WH	89,253	211	141	B	
VE9MY	404,670	658	205	C	

Nova Scotia

VE1RX	37,440	240	52	C	15

Newfoundland-Labrador

VO1BC	474,912	776	204	B	
VO1WET	1,578,720	2080	253	C	

Quebec

VE2AWR	584,766	819	238	B	
VE2GWL	170,307	381	149	B	
VE2LHP	14,151	89	53	B	
VE2EM	12,750	85	50	B	
VE2AYU	1,703,130	1985	286	C	
VA2FB	378,624	986	128	C	10
VE2PIJ	24,966	146	57	B	10
VE2XL	19,305	143	45	B	10

Ontario

VE3XN	1,117,665	1461	255	B	

VE3WIB	782,100	1100	237	B	
VE3BUC	496,587	749	221	B	
VA3SWG	334,560	680	164	B	
VE3STT	320,370	590	181	B	
VE3GD	146,010	310	157	B	
VE3SKX	110,802	313	118	B	
VA3IX	40,890	235	58	B	
VA3TEE	31,356	134	78	B	
VE3YQY	13,440	70	64	B	
VA3TE	12,012	77	52	B	
VE3XDT	8,319	59	47	B	
VE3EJ	5,513,712	3728	493	C	
VE3KPU	522,291	833	209	C	
VA3POS	6,498	57	38	C	80
VA3MG	320,358	998	107	C	20
VE3KZ	749,439	2031	123	C	15
VE3MQW	93,138	361	86	B	15
VE3HG	27,081	153	59	C	15
VA3UZ	699,696	1808	129	C	10
VE3RM	475,956	1469	108	C	10
VA3DX	240,759	723	111	B	10
VE3PPN	6,771	61	37	B	10

Manitoba

VE4RA	110,418	239	154	B	
VE4IM	588,240	817	240	C	
VC4X (VE4VV, op)	294,210	934	105	B	10

Saskatchewan

VE5SF	786,255	989	265	B	
VE5CPU	612,591	941	217	C	
VE5AAD	6,222	61	34	B	15

Alberta

VE6BF	17,472	91	64	A	
VE5UA/6	748,272	1048	238	C	
VE6EPK	94,920	280	113	C	
VE6EX	31,464	184	57	B	20
VE6JY	863,232	2248	128	C	15

British Columbia

VE7ZBK	258,960	520	166	B	
VE7VR	124,440	305	136	B	
VE7NA	101,016	276	122	B	
VE7IN	47,724	194	82	B	
VE7HA	2,040	34	20	B	
VE7QO	284,820	505	188	C	
VE7XO	221,712	496	149	C	
VA7CC	8,775	75	39	C	40
VA7RR	935,280	2598	120	C	15
VE7VF	77,976	342	76	B	10
VE7NS	74,640	311	80	B	10
VA7DX	67,275	299	75	B	10
VA7TK	56,826	287	66	B	10

Northwest Territories

VY1JA	193,284	364	177	C	

Single Operator Assisted

1

KI1G	5,790,720	3770	512	C
KS1L	4,344,480	3360	431	C
AA1QD	1,972,116	1889	348	C
N1DG	1,708,488	1464	389	C
K5MA	1,678,896	1572	356	C
K1JN	1,438,815	1351	355	C
AA1V	1,313,280	1216	360	C
N1DD	1,279,386	1258	339	C
N8RA	1,089,012	1202	302	C
K1JE	997,857	1011	329	C
N1NQD	991,230	893	370	C
W1LLU	914,544	1044	292	C
KE1KD	869,022	847	342	C
K1ST	722,085	805	299	C
K1OA	661,887	879	251	B
W1HR (W1JCC, op)	647,856	818	264	C
NR1DX	633,759	721	293	C
WO1N	519,480	585	296	B
K1TS	429,312	688	208	B
W1BIH	426,888	539	264	C
W6FC	411,546	607	226	B
K1RV	306,999	443	231	C
KV1J	279,300	475	196	C
K1TW	271,872	472	192	B
K1TH	249,600	416	200	C
K1AE	245,964	398	206	C
NC1N	199,287	363	183	B
K1SF	73,776	212	116	C
K1KU	61,236	189	108	C
K1VV	17,472	91	64	C

2

W2RE	4,722,771	3371	467	C
N2TX	4,667,646	3118	499	C
K2XA	3,922,425	2925	447	C
K2BU	3,562,299	2587	459	C
N2NT	3,382,950	2374	475	C
W1GD	3,111,552	2336	444	C
K2TR	2,123,970	1706	415	C
N2ED	1,671,588	1574	354	C
N1EU	1,599,156	1326	402	C
KD2KS	1,469,412	1372	357	C
W2TV	1,373,886	1202	381	C
K2ONP	1,320,384	1196	368	C
N2MG	1,224,468	1204	339	C
W2GDJ	1,158,522	1318	293	C
K2BX	1,029,447	1069	321	C
KF2O	843,741	723	389	C
AA2WN	819,918	902	303	C
K2WB	809,190	810	333	C
N2WKS	730,800	725	336	C
WB2WPM	701,190	795	294	C
WT4Q	668,997	861	259	C
N2ATX	631,584	774	272	C
K5KG	607,560	610	332	C
N2VW	602,556	674	298	C
W2LE	511,161	707	241	C
K2QMF	322,728	476	226	C
NA2U	226,872	274	276	C
WA3RHW	112,230	290	129	C
KG2MY	89,700	230	130	C
KD2P	71,595	185	129	C
KF2VX	68,817	203	113	B
N2BIM	24,219	117	69	C
K2FL	22,776	104	73	C

3

K3WW	5,080,320	3360	504	C
K3MM	3,753,468	2543	492	C
N3AD	3,665,382	2758	443	C
K3PP	3,217,044	2362	454	C
AA3B	2,938,614	2257	434	C
K3NZ	2,676,636	1996	447	C
W3FV	2,046,780	1644	415	C
K3NW	1,927,116	1614	398	C
W3MF	1,915,176	1604	398	C
KE3VN	1,587,627	1389	381	C
N3ZA	1,380,540	1211	380	C
W3IZ	1,298,187	1269	341	C
K3ND	1,246,332	1132	367	C
W3MM	1,065,300	1060	335	C
K3CP	1,041,078	1039	334	C
W3EKT	1,016,232	1052	322	C
WB3CIW	909,450	1075	282	C
AA3RC	720,792	846	284	C
W3CC	674,583	637	353	C
K3BSA	518,580	645	268	C
W3OU	481,185	629	255	C
K3TG	219,300	425	172	C
W8FJ	139,440	280	166	C
K3IXD	50,958	149	114	C

4

K3KO	409,224	578	236	C
N4JED	252,948	428	197	B
KB7UV	215,172	417	172	B
KO4MR	68,052	214	106	C
KR4QI	22,050	105	70	C

5

K5NA	2,612,814	1966	443	C
KR5V	1,405,773	1433	327	C
N5ER	1,000,980	1005	332	C
K5NZ	414,036	636	217	C
K1DW	13,020	70	62	B

6

N6ER	452,880	740	204	C
KI6T	340,032	506	224	C
K6FO	192,168	314	204	C
K6JAT	161,370	326	165	C
NF6R	70,329	197	119	C
NK6A	23,427	137	57	B

7

W7OM	1,008,045	1179	285	C
K7ZO	559,062	918	203	C
N7RO	350,532	642	182	B
W7CT	229,770	414	185	C
W7HS	136,800	285	160	B

8

N8TR	2,975,700	2275	436	C
NC8V	380,562	697	182	C
N8PCN	355,914	507	234	B
KI8IZ	158,100	310	170	B
K8DJC	41,400	184	75	C

9

K9NR	1,079,121	1019	353	C
WO9S	567,675	841	225	C
N9PQU	294,336	438	224	C
KF9ZZ	246,078	434	189	B

0

N0AT	1,576,368	1424	369	C
K0OB	777,480	1045	248	C
K0IL	367,164	564	217	B
KB0VVT	61,740	196	105	B
KG0US	53,856	187	96	B
KK0DX	14,430	74	65	B

VE

VE5CMA	73,872	216	114	B
VE3SYB	14,760	82	60	B

Multioperator Single Transmitter

1

K5ZD (+W2SC,K1XM)	6,730,380	4170	538	C
KV1W (+W1CSM,N6RFM, K1MBO,W1NR)	6,199,875	4125	501	C
AA1ON (+W1RH,AA1IZ,KC1YR)	4,045,743	2977	453	C
K1VR (+AA1AA,K1EP)	2,276,703	1769	429	C
KA1ZD (+K1ZZ)	1,636,635	1417	385	C
K1GW (+K1KA,W6PH,KB1T)	1,371,942	1353	338	C
AA1JD (+AA1LH,NC1M,K1GWB)	1,294,650	1370	315	C
NC1I (+N1SR)	838,500	1075	260	C
N1AU (+K1GU)	814,500	905	300	C
W1YK (W1NT,N2YHK, ops)	507,654	714	237	C
WB1GEX (+KB1DFG)	225,144	424	177	C

2

KY2J (+NA2N,WA2JQK)	4,293,999	3231	443	C
K2KV (+WM2V,N2GA,KS2G,N2QW, KA2D)	2,676,048	2264	394	C
W2RD (+W2XT,KB5U,N2VM)	2,583,315	2065	417	C
K2KQ (+W2WB)	2,128,950	1710	415	C
W2MU (at W2XL) (W2XL,N2SA,N2MFZ, KD2NE,WB2AQU, ops)	1,677,312	1456	384	C
AB2DE (N2KPB,N2ZR,KC2AVE,N2ZAS, KB2IZB, ops)	1,187,472	1144	346	C
N2LBR (+WA1KKM)	832,464	984	282	C
WB2KHO (+KB2NOW)	662,640	880	251	C
N1XL (+K3GH,KC2DKD)	466,293	697	223	B
AA2UP (+N2XBD)	284,073	529	179	C
N2CK (+N2UIO)	215,712	428	168	B
WB2ELW (W2IV,KD2QV,KD2KK, KC2DGC,K2CF, ops)	36,192	208	58	C
WB2JSM (+KC2CBA)	26,460	126	70	C

3

W3BGN (+K2TW)	6,285,270	3953	530	C
NE3F (+KS3F,NT3V,K3ATO)	2,993,076	2342	426	C
N1WR (+N3WZR)	1,424,136	1372	346	C
N3PUR (+K3MD)	834,000	1000	278	C
WX3B (+N3SB,KA3BGZ)	779,688	1092	238	C

4

K4RF (+K4EA,K4SZ)	2,912,055	2339	415	C
NT4D (+KS4XG,N3QYE)	2,204,235	2013	365	C
KU4FP (+KG4EWV)	265,800	443	200	B

5

AA5NT (+N5NJ,WD5FLK,W5WW,N5EE)	3,258,072	2446	444	C
N5YA (+WXOB,N5KB,K5WO,N5KR, N5UM,KM5UB,KK7JS, OH7WV)	3,198,624	2563	416	C
N5CQ (+KM5FA,AB5K)	3,186,549	2523	421	C
N1LN (+WD0BCE,K7LEX,KM5LA, WA5MLT)	1,775,928	1736	341	C
W5JE (+W5NF,WB5OFN,K5JUC, K5JMB,KC5TMU)	303,774	514	197	C

6

W6YX (W6KNS,W6LD,N7MH, ops)	1,546,452	1591	324	C
K6ZM (K6WG,RA0FC,RWOFC, ops)	1,530,372	1747	292	C
KR6RF (+ops)	1,320,123	1699	259	C
W6OVO (+N4DLA/6)	222,906	383	194	C
W6TDM (N7FF,KA6AUR,KA6KGI, W6SKI, ops)	102,480	305	112	C
W6YRA (AC6YV,KU6T, ops)	5,976	83	24	C

7

K7RI (+ops)	1,476,468	1764	279	C
K7MZ (+NY4I)	49,644	197	84	C
W7FIO (KA5IMS,W7EYL,KD7GKB, KB7SKA,KC7LVS,W7ACC, ops)	44,988	163	92	C

8

K8AZ (+K8NZ,ND8L,NW7Q,W8GN, W8KIC,WB8K,WT8C)	5,961,684	3778	526	C
K8CC (+KE8OC,W8MJ,WD8S)	4,211,736	3106	452	C
N8NR (+N8NR,N8BJQ,N8TPS)	3,847,140	3190	402	C
W8LBZ (WA8VOE,WA1FXT,N8MQB, KI8BV,KC8BOM, ops)	29,682	194	51	B

9

WN9O (+W9IU)	2,685,312	2072	432	C
KD9ST (+KA9SQR,KA9SQS,KB9EXE)	1,900,080	1680	377	C

0

W0GU (N2IC,K0KR, ops)	4,924,920	3608	455	C
KF0FN (+WD0T)	1,821,204	1971	308	C
N0FW (+KE0A,KC0BUD,KE0T)	1,707,264	1976	288	C
KF0GV (+N0LIW)	1,179,261	1389	283	C
K0OU (+KB0RTH)	456,912	668	228	C
K0BJ (+KC0HBR)	322,224	548	196	C

VE

VE6AO (VE6JO,VE6KC,VE6TC, VE6WSI, ops)	1,629,360	1860	292	C

Multioperator Two Transmitters

K1AR (at K1EA) (+K1DG,W1MD,W1JCC)	11,435,802	6641	574	C
N3RS (+N3RD,N3ED,N2SR,NZ3O)	9,557,757	5679	561	C
N2RM (+WM2H)	5,968,596	4052	491	C
KB1H (+KB1DFB,NB1U,AA1CE, N1XS,N1BU,N1LYA,W3TB,K1EBY)	5,742,492	3836	499	C
K9XD (+N9VVV,JK3GAD)	5,499,711	4157	441	C
N2MM (+K2UT,KD2P,KG2MY,N2SC, WA2VUY,K2PS)	5,368,950	3690	485	C
K2RD (+W1CU)	4,782,585	3287	485	C
N1RR (+WM1K,KM1P,K2CIW,KU4BP)	4,603,704	3272	469	C
W6XR (+ops)	4,556,748	3191	476	C
W3GNQ (+N3OC,W2ZZ,WR3Z,WI2T, W3RFC,W3GNQ)	4,480,428	3268	457	C
N5TW (+NA4M,W5TD,KE9IT,WQ5G, K5TM,WS4G,N5XD,N5IW, K5EWS,K5PI)	4,270,779	3303	431	C
K2DM (+K3ZM)	4,052,511	2943	459	C
W8ZA (+K3DNE,K3UG,K8OQL,N8II)	3,454,491	2623	439	C
W6EEN (+PA5AT,N6RT,W6SR,W6ORD)	3,242,160	2736	395	C
W2CG (+W2NO,K2WJ)	3,142,512	2512	417	C
W4CAT (KG4ENY, N4JN, K4OOO, W4NI, K3CQ, KE4OAR, W9WI, W4PA, K4RO, K1KY, KQ6I, ops)	3,004,680	2555	392	C
N0MJ (+N0MAJ,W0PRJ,N0CMJ, KC0GHQ,KC0HGK,W0GJ,KL7YL, N0WBS)	2,711,700	2300	393	C
K1ZO (+ops)	2,098,497	1789	391	C
VE1JF (+VE1AMJ,VE1MOO,VE1MR, VE1HS)	1,648,017	1813	303	C
K6NO (+K6SG,K6RC)	1,388,577	1433	323	C
VE5RI (VE5FN,VE5WI,VE6EZ,VE6FW, ops)	1,167,480	1410	276	C
VE3MIS (VE3XAP,VE3IMG,VE3HEE, VE3TKI,VE3JMY,VA3UA, ops)	763,830	1035	246	B
K4WPM (+AK5E,AD4QB,K4QFF, KS4CG)	719,082	878	273	B
WR4F (+W4UDX)	508,326	637	266	C
K8DAC (KB8QO,KC8JMX,KC8LBH, ops)	480,240	696	230	C
WR3L (+N3NT,AA3SC)	132,912	426	104	C
KZ1O (+KB8BAL)	56,160	160	117	B

Multioperator Unlimited Transmitters

KC1XX (+K1GQ,W1FV,KC1F,AD1C, KB1AWE,KM3T)	19,610,580	9460	691	C
W3LPL (+K1HTV,K1RA,K1RZ,W2GG, ND3F,K3MQH,KE3Q,K3RA,W3UR, KD4D,N4QQ,N5OKR)	18,015,732	8754	686	C
K3LR (+N3GJ,K8GL,K9VV,N9RV, W2RQ,K3UA,N3RA,N2NT,N2NC)	17,744,616	8724	678	C
K9NS (K9DX,K9GS,K9HMB,K9PW, K9RO,K9RS,KS9W,N9FH,W9RM,ops)	14,225,484	7444	637	C
W1GQ (+KB1SO,KW1DX,N1SNB, K2TE,K1ZR)	12,589,776	6948	604	C
K1RX (+KR1G,KF1V,WA1S,K1EPJ, WC1M,AA1SI)	10,974,651	6169	593	C
K1TTT (+W1TO,K1MK,NJ1F,NT2X, N9KAU,JJ4HNN,K2SIG)	10,927,683	6357	573	C
W4MYA (+K4MA,K4WMA,KF4QQY, N4DEN,N4ZJ,W4DR,W5HJ,W4HZ, W4NM,WB4GVZ,WK4Y)	10,745,880	6010	596	C
W3PP (+AA1K,N3KW,KD3UC,W2GJ, N3HUV,W3OR,KW3Z,K3FT)	9,792,372	5924	551	C
W1FJ (+ops)	8,756,748	5103	572	C
N6RO (+K3EST,N6BV,K6AW,KM6F, KG6B,K6EP,N6BZA)	7,993,566	5194	513	C
W3EEE (+N3BNA)	5,010,780	3631	460	C
W0AIH (+WR0DK,AC0X,NE9U, KB9TTO,AA0ZZ,KB0VRV,AE9D, N9ISN,KB9UIC,K0TG)	4,964,478	3398	487	C
K3ANS (+WF3H,K3YD,W3ZL,KC3WX, K3ZTJ)	4,862,430	3335	486	C
W3CF (+N3MKZ)	4,699,695	3443	455	C
K3II (+K3CT,K3NG)	2,293,680	2012	380	C
AD4TR (+WB2QLP,KE4FGH,KF4WZH)	1,006,848	1216	276	C
K6IDX (+KH8A,W6OAT)	780,498	786	331	C
NM3K (+AA2D)	759,600	844	300	C
KB5TX (W5XW,KM5SY,KD5OEG, AB5UE,KK5RZ,KD5ILM,KE5GL, ops)	81,270	258	105	B
W4MOT (KN4HX,KE4ESU,N3CU, KT4XK,KN4HX,KG5CHW, WA4CSQ,KN4FA,KD4EXN, ops)	70,686	187	126	C

DX

Single Operator

Africa

Tanzania

5H3US (K8MN, op)	454,260	1130	134	C	

Nigeria

5N0W (OK1RK, op)	331,740	1843	60	C	15

Senegal

6V6U (K3IPK, op)	4,035,582	5154	261	C	

Ghana

9G5ZW (OK2ZW, op)	307,272	1736	59	C	10

Zambia

9J2FR	873,735	1879	155	C	

Morocco

CN8NK	121,128	721	56	B	15

Madeira Island

CT3KY	11,223	87	43	B	
CT3KN	502,647	1279	131	C	

Canary Islands

EA8AH	4,916,430	5895	278	C	

Egypt

SU9ZZ	735,423	1417	173	B	

Mali

TZ6DX (K4RB, op)	246,183	617	133	C	

Asia

Israel

4Z5FW	19,032	122	52	B	
4Z5JQ	8,487	69	41	B	
4Z5FL	4,371	47	31	B	
4Z1GY	33,441	157	71	C	
4X1VF	44,352	308	48	C	10

Kuwait

9K2/SQ5DAK	31,464	184	57	C	

West Malaysia

9M2JI	4,368	52	28	B	

Singapore

9V1RH	2,952	41	24	C	

Taiwan

BV2TL	17,496	108	54	B	
BV7FF	3,780	60	21	C	15

China

BY4BNS (KT8X, op)	91,476	308	99	B	
BA4DW	2,394	38	21	B	20

Armenia

EK4JJ	18,603	159	39	B	20

Kyrgyzstan

EX2T	127,413	429	99	C	
EX2X	50,880	320	53	C	20
EX0Y	93,240	555	56	B	15
EX8MIO	44,556	316	47	B	10
EX8MDA	9,744	116	28	B	10

Turkmenistan

EZ8CW	390	13	10	B	

South Korea

HL5UOG	19,824	112	59	B	
DS5ACV	3,525	47	25	B	10

Thailand

HS1CKC	189	9	7	C	20

Japan

JR4DAH	184,710	470	131	A	
JH1HRJ	163,674	433	126	A	
JA2JSF	163,350	450	121	A	
JA1YNE (JP1OGL, op)	140,301	393	119	A	
JA6GCE	124,830	365	114	A	
JL1ARF	1,214,022	1891	214	B	
JA1CG	1,141,920	2080	183	B	
JM1LPN	780,084	1398	186	B	
JA5EO	213,828	692	103	B	
JA2BY	194,292	514	126	B	
JH6OPP	137,352	388	118	B	
JH6FTJ	131,943	427	103	B	
JE7DOT	121,473	409	99	B	
JA1XRH	112,860	342	110	B	
JD1BIA	88,704	336	88	B	
JR1MRG	67,338	261	86	B	
JA1BUI	60,543	217	93	B	
JA1XUY	58,650	230	85	B	
JA0BMS/1	55,902	242	77	B	
JA2BQX	53,784	216	83	B	
JH6TYD	49,164	241	68	B	
JG2REJ	48,843	201	81	B	
JA2OJ	48,672	208	78	B	
JA4KTE	46,413	191	81	B	
JA3ARM	43,575	175	83	B	
JF2SKV	41,625	185	75	B	
JA1AB	40,482	173	78	B	
JP1PZE	33,522	151	74	B	
JJ3TBB	33,453	177	63	B	
JA1OZK	32,640	170	64	B	
JA2GHP	30,615	157	65	B	
JH8KYU/1	30,450	175	58	B	
JA5GSG	30,096	176	57	B	
JP1SPV	27,258	154	59	B	
JA5ATN	26,895	163	55	B	
JH1RDU	26,838	126	71	B	
JA3HPD	24,192	128	63	B	
JH1RMH	15,759	103	51	B	
JA1XPU	13,500	90	50	B	
JG1OWV	11,178	81	46	B	
JA2BEY	10,320	80	43	B	
JH2WHS	10,062	78	43	B	
JH2QZA	8,733	71	41	B	
JA1KK	8,640	72	40	B	
7K2GMJ	6,336	64	33	B	
JL3RDC	4,374	54	27	B	
JI2VLM	3,780	45	28	B	
JF7GDF	3,402	42	27	B	
JJ1GWF	3,192	38	28	B	
JA9EJG	2,625	35	25	B	
JA3WFQ	2,553	37	23	B	
JA1STY	660	22	10	B	
JF7PHE	585	15	13	B	
JM2RUV	168	8	7	B	
JM3HYL	120	8	5	B	
JA1ELY	2,110,275	2825	249	C	
JA8RWU	2,101,344	2968	236	C	
JA0JHA	2,023,932	2972	227	C	
JH7DNO	2,014,053	2809	239	C	
JH7AFR	1,811,700	2684	225	C	
JR3NZC	1,277,151	2161	197	C	
JI2KVW	1,266,912	1992	212	C	
JA2FJP	687,918	1489	154	C	
JA2BNN	662,460	1220	181	C	
JA1CPY	498,960	1080	154	C	
JA2FSM	490,728	1016	161	C	
JA1PCY	490,644	1062	154	C	
JF2FIU	377,400	925	136	C	
JR1LEV	82,368	264	104	C	
JH1HIC	74,676	254	98	C	
JA1KAL	70,587	253	93	C	
JE0EHE	57,420	220	87	C	
7J1ABD (WA6URY, op)	54,549	209	87	C	
JA8TEZ	31,680	165	64	C	
JR1WYV	18,150	121	50	C	
JA5IP	10,764	78	46	C	
JA1QCQ	9,159	71	43	C	
JT1FBB	1,122	22	17	C	
JM1NKT	720	24	10	B	80
JA8NFV	72,663	457	53	C	40
JA3CE	972	27	12	C	40
7M4BEN	91,206	563	54	C	20
JF2BDK	47,628	294	54	C	20
JH0EPI	12,876	116	37	B	20
JR7OMD/2	7,290	81	30	B	20
JH1UUT	5,832	72	27	B	20
JE1GZB	3,933	57	23	B	20
JH0HON	2,394	42	19	B	20
JA9PPC	197,334	1154	57	C	15

JR1MQT 178,416 1008 59 C 15
JH7NPF 129,276 756 57 B 15
JH9URT 95,370 578 55 B 15
JH7QXJ 82,152 489 56 C 15
JI3OPA 76,608 456 56 C 15
JA5APU 37,728 262 48 C 15
JL3VUL 23,760 180 44 B 15
JA1EM 11,124 103 36 B 15
JA3LEZ 10,404 102 34 B 15
JI8BUR 7,347 79 31 B 15
JI8GZS 5,832 72 27 B 15
JH1JNR 5,664 59 32 C 15
JJ1JRH 4,698 58 27 C 15
JF0EBM 3,243 47 23 B 15
JH2BTM 2,835 45 21 B 15
JK1BII 2,280 40 19 B 15
JQ1AHZ 1,683 33 17 B 15
JA6YAI (JQ6PNK, op)
1,536 32 16 C 15
JA9SCB 1,512 28 18 A 15
7L3DGP 1,218 29 14 B 15
JG1GCO 507 13 13 B 15
JE0VFV 405 15 9 B 15
JA7ADV 351 13 9 B 15
JF1OZL 273 13 7 A 15
JR1BSV 264 11 8 B 15
JE3BMU 252 14 6 C 15
JF2FKJ 72 6 4 B 15
7J2YAF (JA1KSO, op)
465,687 2631 59 C 10
JH5FXP 328,320 1920 57 C 10
JA3ZOH (JR4ISF, op)
280,314 1611 58 C 10
JF1SQC 179,037 1047 57 B 10
JR1UJX 176,436 1014 58 C 10
JF8OGB 158,862 913 58 C 10
JR8OGB 157,992 908 58 C 10
JH0BDK 149,655 907 55 B 10
JF3BFS 141,588 828 57 B 10
JH8SLS 141,417 827 57 C 10
JR4PMX/1 132,588 762 58 B 10
JA7BEW 128,466 793 54 B 10
JA0QWO 128,184 763 56 C 10
JA7NVF 127,848 761 56 B 10
JA3MDG 111,888 666 56 B 10
JA7ERJ 88,881 559 53 C 10
JG2TKH 86,295 523 55 B 10
JQ1UXN 80,136 477 56 B 10
JA1CQT 57,105 405 47 B 10
JR4GPA 53,214 362 49 B 10
JI3ERI/1 36,576 254 48 B 10
JA1EEG 31,536 219 48 B 10
JA6UBK 31,455 233 45 C 10
JH2AVO 25,530 185 46 B 10
JI1HFJ 23,100 175 44 B 10
JA7AMK 21,294 169 42 B 10
JH1CML 20,868 148 47 B 10
JG3KIV 17,958 146 41 C 10
JA6EFT 17,280 144 40 B 10
JR3CVO 17,220 140 41 B 10
JA1ALX/9 12,096 144 28 B 10
JG1TVK 10,500 100 35 B 10
JH1HPH 9,690 95 34 B 10
JF2AII 9,603 97 33 C 10
JH3DMQ 9,078 89 34 A 10
JR2TRC 7,440 80 31 B 10
JA6IP 7,035 67 35 B 10
JK7QYZ 6,351 73 29 B 10
JF1OIJ 5,760 64 30 B 10
JJ3APB 5,427 67 27 B 10
JA1DOY 5,292 63 28 B 10
JA6QDU 4,455 55 27 B 10
JQ3UDL 4,437 51 29 B 10
JJ3OOZ 3,450 46 25 B 10
JH1PXY 3,105 45 23 B 10
JJ2PUG 2,268 36 21 C 10
JA3BBG 1,596 28 19 B 10
JH1TUX 1,440 30 16 B 10
JF3WNO 1,176 28 14 A 10
JF2VAX 450 15 10 B 10
JA1AAT 147 7 7 B 10
7K2PBB 120 8 5 B 10
JA9XAT 75 5 5 B 10
JM4UZM 36 4 3 B 10
JI7NHE 30 5 2 B 10

Mongolia

JT1CS 54,750 250 73 B

Lebanon

OD5/OK1MU 74,817 489 51 C 10

Turkey

TA3BN 40,200 200 67 B
TA3J 450 15 10 B 40
TA3YJ 12 2 2 B 40

Asiatic Russia

UA0KCL 85,284 309 92 A
RZ0SR 272,640 710 128 B
RZ9OU 219,996 582 126 B
RA0FN 65,928 268 82 B
RA9AN 51,543 207 83 B
UA9CR 5,814 57 34 B
RU0AT 5,766 62 31 B
RW9QA 810 18 15 B
UA0ZBK 2,482,704 3284 252 C
RK9JWV (RA9JP, op)
224,790 590 127 C
RA0AM 192,546 563 114 C
RV9BB 152,490 442 115 C
UA9JDP 133,920 465 96 C
UA0ANW 119,952 392 102 C
RZ9UA 225,330 1295 58 C 20
RI9C (UA9CDV, op)
154,926 906 57 C 20
RK9KWB 73,428 422 58 C 20
RA0BA 40,560 260 52 C 20
UA9LAC 31,443 223 47 C 20
UA9MAZ 2,214 41 18 B 20
UA0FDX 169,650 975 58 B 15
RA0FF 97,128 568 57 C 15
UA0SJ 10,146 89 38 B 15
UA0APP 5,670 63 30 B 15
RV9SV 41,184 312 44 B 10
UA9OW 41,040 304 45 C 10
RA0CCV/3 7,728 92 28 A 10
RW0QJ 4,692 68 23 C 10

Kazakhstan

UP6F (UN7FZ, op)
129,780 420 103 B
UN9FD 663 17 13 B
UP4L (UN7LZ, op)
614,265 1321 155 C
UP6P (UN6P, op)
462,462 1001 154 C
UN7D (UN7DA, op)
4,071 59 23 B 20
UN8DG 4,134 53 26 B 15
UN9GC 55,650 371 50 B 10

Hong Kong

VR2BG 44,469 183 81 C

Europe

Croatia

9A1CMS (9A5AHD, op)
183,000 488 125 B
9A3CY 43,200 225 64 B
9A4SS 216,150 550 131 C
9A2YC 153,816 442 116 C
9A2VR 5,880 98 20 C 80
9A5YA 3,456 64 18 C 80
9A4X 36,270 310 39 C 40
9A7R 124,758 717 58 C 20
9A2L (9A2VJ, op)
140,592 808 58 C 15
9A4BT 12,765 115 37 B 15
9AY2K (9A9A, op)
438,480 2436 60 C 10
9A5K 287,271 1623 59 C 10
9A5V 215,055 1215 59 B 10
9A2RD 138,504 796 58 B 10

Malta

9H1DE 107,868 356 101 B

Portugal

CT1EAT 604,992 1096 184 B
CT1DYV 183,396 527 116 B
CT1AOZ 244,440 1358 60 C 20
CT1BWW 50,250 335 50 B 15
CT1ETE 17,160 130 44 B 15
CT1DVV 456,402 2494 61 C 10
CT1GFK 297 11 9 B 10

Fed. Rep. of Germany

DK7ZH 149,076 404 123 B
DL8SDC 119,382 394 101 B
DL3DRN 113,184 288 131 B
DK6BT 88,596 276 107 B
DL4WA 82,344 292 94 B
DL5WS 77,556 281 92 B
DL7QU 46,842 211 74 B
DL1DWT 46,209 211 73 B
DL3ZAI 37,446 158 79 B
DJ0TP 35,856 166 72 B
DF5PP 29,502 149 66 B
DK1YY 16,638 94 59 B
DL3YEI 9,198 73 42 B
DL4VAB 7,056 56 42 B
DL1HSR 2,997 37 27 B
DL8SDI 2,793 49 19 B
DL3KDC 1,581 31 17 B
DL8PC 1,545,600 2300 224 C
DL2DX 1,257,498 2117 198 C
DJ3HJ 879,600 1466 200 C
DL9NDS 632,100 1204 175 C
DF6QV 404,916 823 164 C
DL6RDR 313,182 822 127 C
DL1PT 63,840 266 80 C
DJ1XT 59,532 242 82 C
DL6DVU 35,577 177 67 C
DL6AG 23,364 132 59 C
DL3LAB 15,480 172 30 C 80
DJ7AA 513,132 2804 61 C 20
DF7YU 88,290 545 54 B 20
DL4JYT 2,142 42 17 B 20
DK2OY 263,703 1441 61 C 15
DL7PP 140,007 791 59 C 15
DL5ME 92,220 530 58 C 15
DF9ZP 471,060 2617 60 C 10
DL8UD 384,267 2171 59 C 10
DL2DBH 268,308 1542 58 C 10
DK3KD 253,464 1432 59 C 10
DL7ANR 183,396 1054 58 C 10
DL6NDN 95,160 610 52 C 10
DL4FAY 69,984 432 54 B 10
DL6UNF 59,280 380 52 C 10
DL2DN 47,664 331 48 C 10
DL7VXX 22,197 151 49 C 10
DL9ZWG 20,862 183 38 B 10
DJ0BX 19,680 164 40 B 10
DK7AN 7,161 77 31 B 10
DL6EG 6,048 84 24 B 10
DL0GDS 5,670 70 27 C 10
DL1FMG 4,608 64 24 B 10
DL4JTW 3,744 52 24 B 10
DL3ME 2,835 45 21 B 10
DF5RF 6 2 1 A 10

Spain

EA4ABW 7,488 64 39 A
EA3GHZ 332,055 785 141 B
EA4TX 144,432 472 102 B
EA3NA 69,192 248 93 B
EA3OP 67,518 242 93 B
EA3EVR 39,960 180 74 B
EA1APS 35,280 210 56 B
EA5AFH 32,832 152 72 B
EA3ESJ 23,187 131 59 B
EA7CWV 17,577 93 63 B
EC3AHT 10,260 90 38 B
EA3AAW 8,748 81 36 B
EA2LB 7,854 77 34 B
EA3DVJ 6,786 87 26 B
EA1BVP 4,752 44 36 B
EA5FWW 504 14 12 B
EC2BAH 243 9 9 B
EA5BHK 849,750 1375 206 C
EA5FID 294,309 617 159 C
EA1BPO 141,456 421 112 C
EA3GHQ 104,328 414 84 C
EA1GL 67,584 256 88 C
EA3FAJ 50,298 202 83 C
EA1ZH 36,855 195 63 C
EA3BTJ 10,440 116 30 C
EA5CMQ 4,554 46 33 C
EA1DVY 48 4 4 B 160
EF1CFD 18,135 195 31 B 80
EA3BHB 86,625 525 55 C 20
EA3QP 58,512 368 53 C 20
EA1AAW 9,408 98 32 C 20
EA3CT 3,213 51 21 B 20
EA1AUT 216 9 8 C 20
EA1DLU 178,425 975 61 C 15
EA3KT 30,870 210 49 B 15
EA5TN 2,538 47 18 B 15
EA4WF 354,960 1972 60 C 10
EA3AR 241,920 1344 60 C 10
EA7FTR 153,990 885 58 B 10
EA4ET 139,896 804 58 C 10
EA5DWS 119,187 697 57 C 10
EA5AVD 64,638 399 54 B 10
EA1ACP 45,900 300 51 B 10
EA7AKJ 28,980 210 46 B 10
EA3DUZ 27,048 196 46 C 10
EA3ATM 19,782 157 42 C 10
EA4CWN 10,914 107 34 B 10
EA7GSU 7,290 81 30 C 10
EA1GA 828 23 12 C 10

Ireland

EI4DW 839,232 1488 188 C
EI/EA3BOX 179,832 508 118 C
EI8GP 170,145 995 57 B 10

Moldova

ER5DX 62,220 244 85 B
ER1LW 741 19 13 B 40

Estonia

ES5RW 275,724 666 138 C
ES5CX 2,178 33 22 B 15
ES4RO 26,838 213 42 C 10
ES6PZ 26,445 215 41 C 10

Belarus

EW8DA 12,600 100 42 B
EU1UN 212,760 788 90 C
EW2AA 117,315 495 79 C
EW3EW 1,053 27 13 C 80
EU6DX 48 4 4 B 80
EW6AF 13,566 119 38 C 20
EU1SA 105,300 650 54 C 10
EW6DF 17,664 184 32 B 10
EW6DX 17,205 155 37 B 10
EU6FF 8,280 92 30 B 10
EU4EU 3,456 48 24 B 10
EW1AAV 1,836 34 18 C 10

France

F5BEG 226,044 546 138 A
F5TDK 593,607 1229 161 B
F8BJI 211,689 547 129 B
F5TVG 87,318 231 126 B
F5ICC 68,523 251 91 B
F5TYY 41,004 204 67 B
F5MFL 30,396 149 68 B
F5PBL 16,038 99 54 B
F5MLJ 14,700 100 49 B
F5JX 4,590 45 34 B
F5BBD 199,800 555 120 C
F5NBK 97,002 317 102 C
F5RZJ 49,446 402 41 C 40
F5NBX 31,302 282 37 C 40
F5CCX 8,064 96 28 C 20
F8CMZ 1,092 26 14 B 20
F6HMQ 269,100 1495 60 C 15
F8BPN 212,580 1181 60 C 15
F6DRP 5,175 75 23 B 15
F5LBL 238,950 1350 59 C 10
FB1BON 146,376 856 57 B 10
F8CNR 23,865 185 43 B 10
F8PMO 10,656 96 37 B 10
F5NQL 9,600 100 32 B 10
F6FTB 6,144 64 32 A 10

England

G3FNM 63,516 268 79 A
G0MTN 319,005 765 139 B
G3VAO 235,152 568 138 B
M0CQS (N0KV, op)
135,930 394 115 B
G4NXG 97,200 300 108 B
M0BEX 66,339 273 81 B
G3NAS 49,392 168 98 B
M6T (G4PIQ, op)
3,121,284 3956 263 C
G3TMA 692,244 1407 164 C
G4IUF 86,130 290 99 C
G3UFY 24,570 130 63 C
G2VJ 5,124 61 28 B 20
M4T (G0VQR, op)
3,420 60 19 B 20
G0EYO 7,176 92 26 B 15
G4JVG 103,797 607 57 C 10
G2QT 49,200 328 50 C 10
G0NWY 39,312 312 42 B 10
G4AHJ 17,160 130 44 B 10

Northern Ireland

GI0KVQ 183,732 502 122 B
GI0OUM 21,417 121 59 B

Jersey

GJ2A (K2WR, op)
345,693 829 139 C

Scotland

MM/W3LEO 72,390 254 95 B
GM3POI 444,150 1175 126 C
GM3BCL 215,946 558 129 C
GM7R (GM0NAI, op)
437,190 2470 59 C 10
GM0EGI 34,050 227 50 A 10

Wales

GW0AJI 70,716 284 83 B

Hungary

HA2A 320,991 781 137 A
HA6PX 305,460 1697 60 C 10
HA0NAR 236,826 1338 59 C 10
HA0IT 51,606 366 47 B 10

Switzerland

HB2FAP 1,213,461 1917 211 C

Italy

I8OCA 256,212 647 132 B
IK4QJM 180,375 481 125 B
IZ2ABN 115,551 347 111 B
IK2WZQ 102,678 314 109 B
IO3Z 88,266 313 94 B
IK5WGK 83,808 291 96 B
IK1ZOE 78,936 286 92 B
IK1RQQ 76,995 295 87 B
IK2SVF 71,724 278 86 B
IK2WYI 46,200 220 70 B
IK4RQJ 41,514 187 74 B
IK7RVY 38,304 304 42 B
IZ2BHQ 27,864 129 72 B
IK5YJK 21,375 125 57 B
IK7YZF 18,471 131 47 B
IK7WUE 17,496 108 54 B
II3L (IV3KAS, op)
11,466 91 42 B
IU0K (IK0STM, op)
7,998 62 43 B
I2WIJ 6,612 58 38 B
IK4CBM 4,209 61 23 B
IN3PEE 900 20 15 B
IZ4COW 987,189 1621 203 C
IK6GPZ 407,040 848 160 C
IT9WPO 115,938 339 114 C
IK2RJZ 98,700 350 94 C
IK4QIB 70,029 251 93 C
IZ5BRO 69,960 440 53 C
IV3EPO 57,519 231 83 C
IZ6BTN 49,275 225 73 C
IK2BCP 38,178 202 63 C
IQ2X 33,984 177 64 C
IZ1ANZ 15,120 112 45 C
IZ0BPI 5,100 50 34 C
I4AVG 34,194 278 41 C 80
IQ3A (IV3TAN, op)
538,842 2897 62 C 20
IT9ICS 81,276 521 52 C 20
IK8WEJ 52,650 351 50 C 20
IZ4AQL 3,150 50 21 C 20
IR2W (I2EOW, op)
296,322 1703 58 C 15
IK2DUU 279,540 1553 60 C 15
IK3STG 20,160 168 40 B 15
IZ2DAY 3,528 49 24 B 15
IY4W 374,040 2078 60 C 10
IR1A (IK1GPG, op)
359,460 1997 60 C 10
II2Y 195,078 1066 61 C 10
IT9ZTX 171,738 987 58 C 10
IK1HSS 141,417 827 57 C 10
IT9EQO 140,940 810 58 C 10
I8UZA 136,116 796 57 C 10
I1COB 110,385 669 55 C 10
IU1W (I1WXY, op)
105,336 627 56 B 10
II2K (IK2UCK, op)
66,462 418 53 C 10
IK2ODD 61,200 400 51 B 10
IQ0A (IK0XBX, op)
25,461 207 41 B 10
IZ7CDB 13,500 125 36 B 10
IV3KSE 8,712 88 33 B 10
IK1ZOF 3,645 45 27 B 10
IK4VFB 3,168 44 24 B 10

Sardinia

IS0IGV 123,384 388 106 B
IS0VBH 37,386 201 62 B
IS0FBK 2,106 39 18 B
IS0GSR 169,974 994 57 C 10

Svalbard

JW5NM 109,230 662 55 C 15

Norway

LA2HFA 20,178 118 57 B
LA9AU 21,504 112 64 C
LA5JX 71,766 443 54 B 10
LA6YEA 63,666 393 54 C 10
LA2JR 29,172 221 44 B 10
LA3JT 8,256 86 32 B 10

Luxembourg

LX1JH 372,150 827 150 B
LX0RL 372,141 1253 99 C
LX2SM 141,417 827 57 C 10

Lithuania

LY2LA 543,585 1085 167 B
LY3CY 48,825 217 75 B
LY1DS 15,453 101 51 B
LY3BH 9,108 69 44 C
LY3BS 74,850 499 50 C 40
LY2BM 252,900 1405 60 C 20
LY2BLQ 13,776 112 41 B 15
LY2ZZ 354,060 1967 60 C 10
LY2HM 48,384 336 48 B 10
LY3BY 13,950 155 30 B 10

Bulgaria

LZ2AU 65,175 275 79 B
LZ2JE 21,672 172 42 B
LZ1AQ 10,455 85 41 B
LZ2WM 105,060 340 103 C
LZ1HB 85,956 551 52 B 10
LZ1PM 33,354 218 51 C 10
LZ2GS 1,845 41 15 B 10

Austria

OE7AJT 20,790 126 55 B
OE8SKQ 304,263 1719 59 C 15
OE1EMS 346,320 1924 60 C 10

Aland Islands

OH0B 2,291,832 3336 229 C

Finland

OH2LYP 124,926 443 94 B
OH1MM 6,120 60 34 B
OH8RQ 4,050 45 30 B
OH5LF (OH1WZ, op)
3,072,000 4096 250 C
OH3JR 127,125 375 113 C
OH9W (OH6EI, op)
76,500 340 75 C
OH3GD 210 10 7 B 40
OH1BOI 1,680 35 16 C 20
OH6AC (OH6CS, op)
258,042 1483 58 C 15
OH6Y (OH6YF, op)
203,904 1152 59 C 10
OH9MM 158,205 995 53 C 10
OH1XT 101,598 574 59 C 10
OH3RR 95,076 556 57 C 10
OH1NOA 7,020 90 26 B 10
OH5PA 6,888 82 28 B 10

Czech Republic

OK1BA 175,392 504 116 B
OK1TC 155,430 471 110 B
OK1FHI 101,268 348 97 B
OK2SGY 46,410 238 65 B
OK2TBC 43,200 200 72 B
OK2SPS 14,364 114 42 B
OK2BHE 2,016 32 21 B
OK2FD 1,714,518 2586 221 C
OK1DUO 559,872 1152 162 C
OK1JAX 4,158 77 18 C 80
OK1FPS 1,440 32 15 C 80
OK1IE 17,544 172 34 C 40
OK/K3TW 3,213 51 21 B 20
OK1CAZ 378 14 9 B 20
OK1MD 190,800 1060 60 C 15
OK2HZ 29,892 212 47 B 15
OK1GW 24,510 190 43 A 15
OK1DVK 243 9 9 B 15
OK2RZ 483,669 2643 61 C 10
OK8ANM (at OK5H,UR4LRQ, op)
196,968 1132 58 C 10
OK1KT 114,015 691 55 C 10
OK2ABU 96,831 609 53 C 10
OK1AVY 81,648 486 56 C 10
OK1TD 57,081 359 53 B 10
OK1XC 52,938 346 51 B 10
OK1DSZ 51,597 351 49 B 10
OK1DEK 39,345 305 43 C 10
OK2BJT 37,224 264 47 C 10
OK1SI 34,560 256 45 B 10
OK2ZJ 27,984 212 44 B 10
OK1FUA 27,600 200 46 A 10
OK2VP 11,256 134 28 B 10
OK1AIJ 2,322 43 18 A 10

Slovakia

OM5NL 133,227 393 113 B
OM4DN 126,873 381 111 B
OM3YK 105,294 322 109 B
OM3NA 1,753,110 2718 215 C
OM7M (OM5ZW, op)
10,800 144 25 C 80
OM7RC 720 20 12 C 20
OM4KK 34,524 274 42 B 10
OM3KWZ (OM7AC, op)
27,594 219 42 B 10
OM6AR 5,382 69 26 B 10

Belgium

ON6ML 85,728 304 94 B
ON5UM 55,860 196 95 B
ON4BG 22,680 126 60 B
ON5JD 8,712 66 44 B
OT0T (ON4UN, op)
58,926 427 46 C 80
ON4UN (ON4MA, op)
448,899 2453 61 C 10
ON7NQ 244,122 1403 58 B 10
ON4TO 97,440 580 56 B 10
ON4CAS 88,275 535 55 B 10
ON4XG 22,698 194 39 B 10

Denmark

OZ1ACB 120,870 395 102 B
OZ7RJ 94,575 325 97 B
OZ9Y 330,774 1901 58 C 10
OZ7HVI (OZ1AA, op)
7,476 89 28 B 10
OZ1AKN 756 21 12 B 10

Netherlands

PA9RZ 17,640 105 56 A
PA1TT 95,160 305 104 B
PA0RBS 60,945 239 85 B
PA2NJN 27,648 144 64 B
PA3HGF 13,920 80 58 B
PA0IJM 248,400 600 138 C
PA1BX 70,125 275 85 C
PA3CAL 7,776 81 32 B 15
PI4TUE (PA3EZL, op)
313,290 1770 59 C 10

Slovenia

S57J 735,435 1385 177 B
S59D 57,780 214 90 B
S50S 2,688,924 3766 238 C
S51TA 1,500,948 2892 173 C
S55A 910,035 1605 189 C
S53Z 502,080 1046 160 C
S54E 1,680 40 14 C 160
S57O 18,135 195 31 C 80
S53M (S55OO, op)
109,725 665 55 C 40
S51CK 142,395 863 55 C 20
S57AW 381,555 2085 61 C 15
S57IIO 160,362 906 59 B 15
S57JUN 6,699 77 29 B 15
S50K 434,700 2415 60 C 10
S58D 325,680 1840 59 C 10
S50Q 303,300 1685 60 C 10
S51AY 291,042 1702 57 C 10
S57NWG 150,684 866 58 C 10
S58WW 129,276 756 57 B 10
S52GP 107,250 650 55 C 10
S57NMQ 106,344 633 56 B 10

Sweden

SM6B (SM6AGR, op)
157,563 427 123 B
SM4AIO 152,490 442 115 B
SM0FM 21,306 106 67 B
SM5TSP 18,315 111 55 B
SM7HSP 9,960 83 40 B
SM3ARR 9,240 77 40 B
SM5UFB 2,886 37 26 B
8S0W (SM0NJO, op)
2,484 36 23 B
SK3W (SM5IMO, op)
2,980,152 4088 243 C
8S4Z (SM4SET, op)
447,921 951 157 C
SM6WQB 359,127 849 141 C
7S4A (SM4ATJ, op)
204,216 536 127 C
SM7BJW 123,120 380 108 C
SM0J 27,690 142 65 C
SM7DXQ 26,820 149 60 C
7S2E (SM2DMU, op)
34,443 267 43 C 40
SK0HB (SM0WKA, op)
16,380 156 35 B 20
SM0GKF 288 12 8 A 20
SM2CEW 129,108 742 58 C 15
SM2T (SM2EZT, op)
97,104 578 56 C 15
SM6ADW 33,354 218 51 C 15
8S7A (SM7CRW, op)
288,360 1602 60 C 10
SM3D (SM3WMU, op)
8,484 101 28 B 10
SM7FTG 4,002 58 23 B 10
SM0BWM 84 7 4 B 10

Poland

SP1EOI 150,228 428 117 B
3Z6V (SP6DVP, op)
72,900 243 100 B
SP7A (SP7FQI, op)
49,275 219 75 B
SQ4CUX 36,924 181 68 B
SP9HQC 31,482 159 66 B
SP7LHX 27,300 140 65 B
SP3XR 23,616 192 41 B
SP3IMM 15,300 102 50 B
SP3GHK 14,478 127 38 B
SQ7BCG 14,076 92 51 B
SP5BNB 11,466 98 39 B
SP9MCU 5,796 69 28 B
SP3BVI 5,220 58 30 B
SP9ELM 5,184 54 32 B
SP2FGO 44,526 181 82 C
SP7FDV 41,208 202 68 C

SP9VRY 828 23 12 C
SP7VC (at SP7GIQ) 118,674 694 57 C 40
SN6O (SP6IHE, op) 9,720 120 27 C 40
SP2PIK (SP2WKB, op) 408,273 2231 61 C 20
SP6RGC 2,400 40 20 B 20
SP4SHD 1,485 33 15 B 20
SP7GIQ 360,540 2003 60 C 15
SP9XCN 54,600 325 56 B 15
SP9RVD 26,226 186 47 B 15
SP5BB 16,899 131 43 B 15
SP6IXF 304,200 1690 60 C 10
SP9LJD 230,100 1300 59 C 10
SP5LCC 30,624 232 44 B 10
SQ9IET 12,576 131 32 A 10
SP5CGN 10,464 109 32 B 10
SQ8GBN 3,000 50 20 B 10
SO7VH 378 14 9 B 10

Greece

SV2AEL 24,750 150 55 B
SW1W 17,640 120 49 B
SV1DPI 84 7 4 B 80

Bosnia-Herzegovina

T94MZ 64,680 392 55 C 15
T94DO 59,517 389 51 C 10
T92M 15,000 125 40 B 10

European Russia

RV3AR 34,506 162 71 A
RA3WA 297,000 660 150 B
UA4LU 247,248 606 136 B
RA3DNC 104,178 358 97 B
RV4LC 44,688 196 76 B
RZ6BR 39,237 319 41 B
RA3AF 36,234 198 61 B
RA4UAT 22,869 121 63 B
UA4RF 18,315 111 55 B
UA1WAL 18,207 119 51 B
RW4YA 9,180 85 36 B
RV3YR 2,376 33 24 B
UA3BL 376,650 775 162 C
RK6AW 200,880 540 124 C
RN3RQ 156,366 438 119 C
RV1CC 107,568 332 108 C
RK3DH 67,770 251 90 C
UA3BZ 25,404 146 58 C
RZ1AZ 11,988 74 54 C
RA4NF 11,316 82 46 C
UA6ART 1,404 26 18 C
UA3UND 12 1 4 C
RW3DU 60 4 5 B 80
RM4W (RW4WR, op) 245,700 1365 60 C 20
UA3QDX 146,910 830 59 C 20
RA4LW 120,384 704 57 C 20
UA4LDP 1,092 26 14 B 20
RA1AKE 1,050 25 14 B 20
RN3QY 185,745 1015 61 C 15
UA4HTT 180,804 988 61 C 15
UA3ABJ 94,080 560 56 B 15
RA3RCL 70,896 422 56 B 15
RV3ACA 45,150 301 50 C 15
RX1CQ 16,974 138 41 B 15
UA6LP 2,052 36 19 B 15
RA3AJ 173,178 1069 54 C 10
UA6LV 140,418 807 58 C 10
RK6CZ 100,980 612 55 C 10
RN3QO 71,850 479 50 B 10
RA4CC 62,550 417 50 C 10
UA3LHL 28,782 234 41 B 10
RU3DVR 20,241 173 39 B 10
RU3DD 19,656 168 39 B 10
RU3WR 15,660 145 36 C 10
RA3OU 15,228 141 36 C 10
RA3XO 13,320 120 37 B 10
RV3LO 7,857 97 27 B 10
RA3DGH 4,968 69 24 B 10
UA3AD 390 13 10 B 10

Ukraine

UT1UA 97,566 322 101 B
UU4JO 49,896 216 77 B
UY5TE 2,886 37 26 B
UT4MW 1,740 29 20 B
UR3IWA 630,720 1460 144 C
UT3UA 79,248 254 104 C
UT5JAP 12,798 79 54 C
UT4EK 9,417 73 43 C
UT7MD 4,929 53 31 C
UR3QCW 936 24 13 C
UT1T (UR7TZ, op) 28,500 250 38 B 20
UR8MA 200,751 1097 61 C 15
UT0U (UT5UDX, op) 179,100 995 60 C 15
UU2JZ 160,362 906 59 C 15
UR6MX 92,736 552 56 C 15
EN7M (UX2MM, op) 89,712 534 56 C 15
UX7MM 36,000 240 50 B 15
UT5UGR 15,120 140 36 C 15
UT0D 225,207 1317 57 C 10
UU0JX 199,125 1125 59 C 10
UT7L (UR4QKD, op) 94,122 581 54 C 10
UT8IM 75,816 468 54 C 10
UZ5U (UT4UO, op) 61,620 395 52 C 10
UY9VY 29,040 220 44 C 10
UR5FGN 27,477 213 43 B 10
UT7QL 26,199 213 41 C 10
UU4JMG 22,113 189 39 B 10
US5EAE 2,655 59 15 B 10
UR5VDX 1,260 30 14 A 10
UR5XAJ 1,248 26 16 C 10
UR5FCM 900 20 15 A 10
UR5YDZ 510 17 10 A 10

Latvia

YL2MF 9,768 88 37 A
YL2KO 1,052,025 2075 169 C
YL2SM 18,810 165 38 C 10
YL3BZ 11,232 117 32 B 10

Romania

YO3APJ 587,385 1145 171 B
YO5KTK 201,495 505 133 B
YO8FR 98,196 334 98 B
YO7ARY 58,968 252 78 B
YO9AHX 3,000 40 25 B
YO6SD 2,886 37 26 B
YO8DHD 12,600 100 42 C
YO6BZL 32,226 262 41 B 20
YO8ROO 6,966 86 27 B 20
YO8DDP 20,538 163 42 B 15
YO4AAC 216 9 8 A 15
YO9GZU 1,386 33 14 A 10

Yugoslavia

YU7KWX 667,332 1332 167 B
YU1OJ 231,813 599 129 B
YU7AM 45,144 198 76 B
YZ1SG 1,716 26 22 B
4N1K (YU1XA, op) 15,066 162 31 C 80
YT0T (YU1FJK, op) 7,488 104 24 C 80
YT7A 47,400 395 40 C 40
YU7BW 25,863 233 37 C 40
YU1JW 381,189 2083 61 C 20
YT1BB 378,993 2071 61 C 20
YZ9A 303,378 1714 59 C 20
YU1BX 1,302 31 14 B 20
YU7JX 241,782 1366 59 C 15
YT7KF 200,364 1132 59 C 15
YU1HFG 43,299 283 51 B 15
YZ1U (YU1QD, op) 293,580 1631 60 C 10
YU7GMN (4N7DW, op) 208,506 1178 59 C 10
YU7AL (4N7RGH, op) 201,840 1160 58 C 10
YU7KMN (YZ7DM, op) 200,622 1153 58 B 10
YT7W (4N7TW, op) 164,640 980 56 C 10
YU1NW 128,142 791 54 B 10
YU1ANT (YU1YV, op) 97,344 624 52 C 10
4N1N (4N1LB, op) 63,492 407 52 B 10
YU7KM 32,637 253 43 B 10
YU7SF 14,652 148 33 B 10
4N1JA 5,751 71 27 C 10

Macedonia

Z31JA 1,144,410 2062 185 C
Z32AF 17,157 133 43 C 20
Z31GX 175,044 1006 58 C 10

North America

Barbados

8P6EX 420,432 922 152 C

Cuba

CO2II 995,565 2141 155 B
CO8ZZ 85,800 520 55 B 80

Saint Martin

FS/K8HTP 174,405 1057 55 C 10

Panama

HO3A (HP3XUG, op) 64,320 268 80 B
3E1AA 437,721 2473 59 C 20

Alaska

WL7CMK 400,932 1036 129 B
KL7/NO7F 130,626 738 59 C 15

Virgin Islands

NP2DJ 37,536 184 68 B
KV4FZ 28,098 223 42 C 160

Puerto Rico

WP3R (KB3AFT, op) 7,254,090 7218 335 C
KP4VP 247,296 896 92 C

St Maarten Saba St Eustatius

PJ8/W1USN 27,720 210 44 B 10

Guatemala

TG0AA (IK2NCJ, op) 549,585 3105 59 C 15

Costa Rica

TI7/N4MO 293,643 1659 59 B 10
TI2DLL 173,394 1014 57 B 10

Antigua & Barbuda

V26P (W5AJ, op) 21,480 179 40 C 160

Belize

V31JP 5,815,071 6273 309 C

St Kitts & Nevis

V47KP 5,090,715 5387 315 C
V44NK 243,939 1333 61 C 10

British Virgin Islands

VP2VF 422,994 2431 58 B 10

Turks & Caicos Islands

VP5A (KQ3V, op) 4,257,162 4746 299 B

Mexico

XE2AUB 373,191 1367 91 B
XE1BEF 62,100 345 60 C
XE1L 106,920 660 54 B 10

El Salvador

HU1A (YT1AD, op) 5,686,092 5542 342 C

Cayman Islands

ZF2NT (N6NT, op) 6,435,558 6442 333 C
ZF2DR (K5RQ, op) 5,238,477 5651 309 C
ZF2JB (KK9A, op) 269,748 1524 59 C 40
ZF2AH 495,030 2845 58 C 10

Oceania

Fiji

3D2TC 697,221 1519 153 B

Philippines

DU1SAN 144,054 453 106 C
DU1ODD 9,021 97 31 C 20
4F9EAQ 2,016 32 21 B 15
DU1LER 5,022 62 27 B 10

Hawaii

KH7R (KH6ND, op) 6,676,188 6703 332 C
NH7A 4,017,402 4362 307 C
AH6IM 120,042 702 57 B 15

Marshall Islands

V73CW (AC4G, op) 1,410,750 2090 225 B

Australia

VK4EJ 370,188 1092 113 B
VK5EMI 2,142 34 21 B
VK5GN 1,393,821 2223 209 C
VK8AV 4,080 40 34 C
VK3GK 3,588 46 26 B 15
VK2KPP 328,140 1823 60 C 10
VK4UC 146,682 843 58 C 10
VK2UZ 75,600 450 56 C 10

Pitcairn Island

VP6BR (OH2BR, op) 1,503,000 2505 200 B

Indonesia

YB1XUR 35,292 173 68 B
YC8TXW 936 24 13 B
YB3ASQ/9 275,274 746 123 C
YB0ZAD 504 14 12 B 20
YC8RRK 10,944 114 32 C 15
YC0LOW 22,440 170 44 B 10

New Zealand

ZL1ANJ 1,018,455 1579 215 C

South America

Chile

CE8EIO 1,127,448 2237 168 C
CE6ABC 173,106 978 59 C 15
CE8SFG 244,440 1358 60 C 10
XQ3ZW 4,860 60 27 B 10

Bolivia

CP1FF 82,296 381 72 C

Uruguay

CX9AU 44,583 193 77 B
CX8CP 424,800 2400 59 C 10

Ecuador

HC1HC 364,266 2058 59 C 10

Galapagos Islands

HC8N (K5TR, op) 7,645,056 7408 344 C

Colombia

HK6PSG 462,510 1142 135 B

Argentina

LU1VK 88,200 300 98 A
LU9HO 705,087 1497 157 B
LO7H 581,202 1374 141 B
LU2NI 452,640 943 160 B
L44D (LU4DA, op) 105,444 404 87 B
LU5FF 35,670 205 58 B
LU1BR 496,350 1103 150 C
LU1FAM 191,052 1098 58 B 20
LU2FT 156,078 897 58 B 15
LU6FF 43,920 305 48 C 15
LU4FM 447,987 2531 59 C 10
LT1A (LU3CT, op) 393,588 2262 58 C 10
LU6FUQ 332,688 1912 58 C 10
LP1F 262,740 1510 58 B 10
LU1VEW 174,174 1001 58 B 10
LW1EGD 166,896 976 57 B 10
LU1FC 159,030 930 57 B 10
LU1FGE 105,840 630 56 B 10
LU5EVK 98,484 566 58 B 10
LW9DAH 61,902 362 57 B 10
LU7VCH 25,944 188 46 A 10
LU5JKG 13,038 106 41 B 10

Peru

OA4SS 2,620,026 3594 243 B
OA4CVT 14,934 131 38 C 40
OA4AHW 4,500 60 25 B 10

Aruba

P40B (P43P, op) 4,766,400 4800 331 C

Brazil

ZX2B (PY2MNL, op) 1,093,176 2169 168 B
PT2AW 119,394 402 99 B
PY2YU 78,936 286 92 B
PY7YL 48,462 197 82 B
PY3FBI 39,690 210 63 B
PR7FN 4,752 48 33 B
PY2WVT 297 11 9 B
PY2NY 331,632 784 141 C
PV8IG 684 19 12 C
PY5EG 107,358 617 58 C 40
ZX5J (PP5JR, op) 308,700 1715 60 C 20
PR7AR 363 11 11 B 20
ZW5B (PY2KC, op) 392,055 2215 59 C 15
PQ5W 328,686 1889 58 C 15
PY2APQ 29,970 222 45 A 15
PP5UA 410,988 2362 58 C 10
ZV5A (PY5GU, op) 382,800 2200 58 C 10
ZX4Y (PY4OY, op) 282,138 1594 59 C 10
PY5HSD 150,684 866 58 B 10
PY2NDX 55,890 345 54 B 10
PY2EDY 24,564 178 46 B 10
PY2LED 8,019 99 27 B 10
PY3BM 6,177 71 29 B 10
PY2TST 3,762 57 22 B 10

Fernando de Noronha

PY0FF 370,992 2096 59 C 15

Venezuela

YV5AAX 71,526 262 91 B
YW1A (YV1AVO, op) 325,500 1750 62 C
4M3Y 4,725 63 25 C
YV3AZC 127,716 734 58 C 80
4M5E (YV5NWG, op) 133,209 779 57 C 40
YV3DX 17,433 149 39 C 20
YV2FEQ 58,800 392 50 B 10

Paraguay

ZP5SAT 472,026 1042 151 C

Single Operator Assisted

Asia

JH4UYB 1,095,219 1667 219 B
JQ1BVI 642,546 1467 146 C
7L4IOU 560,628 1074 174 B
JR2DOL 495,900 1102 150 C
JH4NMT 438,840 920 159 C
JQ1NGT 121,662 751 54 C
HL1/JI1EFP 46,053 301 51 B
JH5OXF 21,045 115 61 B

Europe

YL8M (YL2KL, op) 2,352,987 3549 221 C
OK1DG 668,682 1218 183 C
IZ5AXA 581,976 1096 177 C
RV3BR 474,306 982 161 C
PA3EWP 366,366 2002 61 C
OM1CW 301,584 1648 61 C
G4OJH 282,420 1569 60 C
PA7FM 250,560 1392 60 C
DK7ZT 206,226 513 134 C
LY1DR 177,876 486 122 C
I8NHJ 139,374 801 58 C
9A1CHP (9A6NHH, op) 80,028 494 54 B
9A4KA 47,499 223 71 B
PA0MIR 18,963 147 43 B
OM2DX 10,881 117 31 C

Multioperator Single Transmitter

Asia

JA7YAA (JE7HLZ,JH0ORW,JH0NZN, JG7PSJ,JM1QPR,7M1JAS, 7K4SHF,+op) 1,987,500 2650 250 C
RK9CZO (RX9CAZ,RA9CDH, ops) 374,517 873 143 C
JA4YPE (JF3EBO,JN4MUC,JI4RDO, ops) 21,780 121 60 B
JN1YUU (7M4WVB,7M4JVV,7M4NBR, 7M4UVV,7M4WIK,7N4HIL,7M4UUC, ops) 9,030 70 43 B

Europe

TM1C (F5ITK,F5MUX,F5TRO,F6CTT, ops) 4,907,646 5801 282 C
DL0WW (DK3GI,DL6RAI, ops) 3,746,376 5118 244 C
EI8IR (+EI8GS) 3,444,720 4630 248 C
DL8OH (+DL1IAO,DL2MEH,DL4NAC) 3,083,184 4212 244 C
OE2S (OE2GEN,OE2LCM,OE2MON, OE2VEL, ops) 2,799,234 3793 246 C
UZ7Z (UR5ZLY,UR7GG,UR7ZZ, UT0ZZ,UT4ZO, ops) 2,623,140 3835 228 C
OH3MMM (OH1VR,OH3WW,OH6LI, ops) 2,540,025 3763 225 C
OH7M (OH4XX,OH6LNI,OH7KD, OH7MHL,ops) 2,463,552 3666 224 C
HB2AUS (+HB9BYT,HB9CXZ,HB9DPD, HE9EEX, ops) 2,326,338 2994 259 C
OH8L (OH8LQ,OH8MCT, ops) 2,314,575 3429 225 C
DL1FEL (+DJ6QT) 2,018,457 3381 199 C
M2H (G0REP,G3MXH, ops) 1,841,562 3054 201 C
OL5Q (OK1HRA,OK1FLC,OK1VSL, OK1INC,OK1FFU, ops) 1,743,147 2807 207 C
RI3A (RA3DKE,RK3FM,RK3FT, RU3DGD,UA3ASZ,RV3BA, ops) 1,687,578 2666 211 C
LX1NO (+TF3CW) 1,682,928 2697 208 C
GW8GT (GW0MAW,GW4JBQ, ops) 1,354,197 2671 169 C
IK1SLE (+ops) 1,342,653 2249 199 C
SK0UX (SM0TQX,SM0JHF,SM0DRD, SM0XEU,SM5CCT, ops) 1,267,680 2224 190 C
TF3IRA (TF3AO,TF3HP,TF3MLT, TF3RJT,TF3VGT, ops) 1,120,977 2211 169 C
S50R (+ops) 1,084,710 1730 209 C
SK3IK (+ops) 994,788 1812 183 C
R3K (RV3FF,RX3DCX,RN3DC, ops) 834,678 1599 174 C
IO2L (I2OKW,IZ2ACZ,IZ2AVK,IZ2HAJ, ops) 731,601 1443 169 C
IQ3X (IV3HAX,IV3SKB, ops) 545,280 1136 160 C
M4U (G0DVJ,G4EYE,G4YJQ,M0CGE, G4WHK,G3YYZ,G0OZS,M1DSY, G7HOW, ops) 478,710 985 162 C
IV3HYD (+IV3RAV,IV3RCH) 468,639 1021 153 C
3Z0I (+ops) 459,795 1057 145 C
EA5FFC (+EA5BX,EA5GMO,EA5ZI, EA7IO) 447,525 975 153 C
LZ2K (LZ2NP,LZ2YO,LZ4HM,LZ4QY, ops) 440,628 1006 146 C
DL0BKR (DJ3PY,DH2PK,DJ1ER, DH1PRA,DL6EN,DL5WJ, ops) 438,672 988 148 B
RK6AYN (+RN6BP,RU6AV,RW6ACM, UA6AH,RV6ARU) 364,104 778 156 C
SP9KDU (SP9AVZ,SQ9FMU, ops) 89,817 329 91 B
EJ3RCW (EI7IG,EI4FBB+ops) 59,280 260 76 B
UR4RWO (UT5RQ,UT0RW, UR5RMO, op) 24,978 181 46 C
UT4UWL (+ops) 6,696 72 31 C 15
DN1MA (+logger) 6,375 85 25 C 10

North America

VP5B (K4ISV,K4CN, ops) 8,498,052 8356 339 C
8P9Z (K3KG,K4FJ, ops) 6,627,060 6694 330 C
XE2MX (+XE2L,N6KI,K6AM) 4,343,922 4686 309 C
XE2EBE (N6RT,AA6DP, ops) 3,089,736 3301 312 C
V31DX (+ops) 2,779,308 3228 287 C
VP9ID (+N2KJM,N2TTP) 1,197,003 1891 211 B

Oceania

T32B (W0CP,KK0T) 3,619,809 4623 261 C

South America

P40V (AI6V,P43A, ops) 7,419,015 7295 339 C
PJ4G (K2NG,NO2R, ops) 6,059,724 6332 319 C
LU1NF (LU8NA,LU1NDC,LU1NAF, LU2NAA,LU4NAZ+ops) 1,509,453 2607 193 C

Multioperator Two Transmitters

Europe

IR4T (I4UFH,I4JMY,IK4UPB,IK4MHB, IK2SGC,IK2QEI, ops) 6,189,336 7316 282 C
RU1A (RW1AC,RA3AUU,RV1AW, RX1AA,RA1ARZ, ops) 4,476,150 6090 245 C
LA8W (LA4DCA,LA5KO,LA9HW, ops) 3,983,376 5354 248 C
EA5DFV (+EA5ON,EC5CPL) 2,609,334 3717 234 C
RM6A (RA6CO,RA6CM,UA6AN, ops) 2,562,672 3682 232 C

North America

6D2X (K2UA,K5TSQ,K9NW,W5VW, WE9V,XE2XDX,XE2YNE,XE2YNS, ops) 11,223,927 10659 351 C
KL7Y (+KL7FH,WA2GO,KL9A,AL7PJ, NL7Z) 7,062,198 8231 286 C
WP2Z (N2TK,K3OO, ops) 6,871,005 7135 321 C
PJ8A (ND5S,W8EB, ops) 613,536 1232 166 B

Oceania

DX3T (DU3AR,DU3JFK,DU3MIB, DU3KQA,DY3XEX, ops) 6,633 67 33 B

South America

PY3MHZ (PY3AFS,PY3ADY,PY3BZA, PY3FOX,PY3MM,PY3PAZ,PY3TMR, PY3YY, ops) 122,268 443 92 C
PY2ECP (+PU2NYV) 57,069 373 51 B

Multioperator Unlimited Transmitters

Asia

JH7PKU (+JA9SSY,JG1ILF,JN3PYQ, JO1BMV,JR5KDR) 3,195,801 4113 259 C
JA6ZLI (JJ6WYS+op) 193,929 509 127 C

Europe

RW2F (LY4AA,RA2FA,RN2FA,UA2FB, UA2FF,UA2FM,UA2FZ, ops) 5,148,729 6333 271 C
9A7A (9A7V,9A8A,9A2ME,9A3OS, 9A3TR,9A4PA,9A4RX,9A6DM, ops) 4,093,164 5091 268 C
LY7A (LY3IT,LY3RJ,LY3HD,LY2NKJ, LY2KZ,LY3DA,LY1EE,LY2NK, LYB-26,LYR-346, ops) 1,739,835 2829 205 C
PI4CC (PA3BAG,PA3EPD,PA4LA, PB0AIU,PB4CC, ops) 752,199 2107 119 C
SY1D (SV1DNW,SV1DKL,SV1DKR, SV1DZB, ops) 218,784 688 106 C

North America

KL7RA (+AL7IF,N1TX,NL7Y,KL7TC, KL7XD, ops) 5,989,440 7340 272 C
T48RAC (+ops) 4,471,602 4702 317 B

Oceania

AH0P (JM1LTA,JG2CEZ,JH0SPE, ops) 263,064 776 113 C

Checklogs:

4Z5GV, 8P6SH, CT1GWC, CT2GZT, DH5MM, DL1ARD, DL1DQJ, DL2ZAV, DL3TD, DL4VBS, DL5NA, DL6HTA, DL6NEJ, DL7BY, DL8DZV, EA1BOI, EA1OT, EA1OZ, EA3BJM, EA3URR, EA5CMQ, EA5DCL, EA5FXS, EA5TS, EC2AFA, ER1IM, EW6DI, EX8W, HA3UU, IK3XTY, IK4GRO, IV3BKH, JA1BMJ, JH7LRS, JK2VOC, K2LP, K7EFB, K9RSW, KC4KFT, KG8XQ, LB8AE, LU9APM, LY1DT, M0CJA, N4KG, N7WI, N9HDE, OK1DMP, OK1GS, OK2PCX, OK2PPM, PA0RBO, PP7ZZ, PS8ET, PS8NF, PT7WA, PY1NX, PY2KPY, PY2TVQ, RA0CAH, RA3AD, RA3DPD, RA3MB, RA9FF, RM4W, RN3FT, RU6LA, RW3DDG, RW4WE, RW6AML, RW9MZ, RW9TA, RW9TA, S57M, S59DBC (S55OO, op), SM0BNK, SM0UGV, SM5OK, SP1BLE, SP1DMD, SP2JJD, SP3CUG, SP9GFI, SQ4GXO, SV/0K1YM, UA0YAY, US7MQ, VP8ON, W0RTK, W2UH, W3FQE, W7GSW, W8VE, WA2BMH, WA3WFW, WA4IUN, WW3S, YC0IEM, YL2LY, YL2SW, YO6BGT, YU7CB, 9A3GW, OD5NJ, YV5USB, K7CAR, KB6LEA, N1PGA, N8WK, W1FM, WB2ZTH

Disqualification: HG1S

SECTION NEWS

The ARRL Field Organization Forum

ATLANTIC DIVISION

DELAWARE: SM, Randall K. Carlson, WB0JJX—Soon the holidays will be upon us, and folks will be taking to the road to visit friends and relatives. During this time of year the weather becomes increasingly harsh and trouble on the road can be a dangerous thing. Ham radio puts us in a unique position to be able to help our fellow hams and travelers in times of difficulty. So as the seasons turn colder, how about helping out and make an effort to monitor your local repeater on a regular basis for those that who might be having difficulty. Nothing feels better than being able to do something to help someone out of tough situation. Tfc: (Aug) DTN: QNI 179 QTC 14 in 23 sess. DEPN: QNI 25 QTC 2 in 4 session. 73 Randall.

EASTERN PENNSYLVANIA: SM, Allen R. Breiner, W3TI—SEC: Eric Olena, WB3FPL. ACC: Steve Maslin, N3ORH. OOC: Alan Maslin, N3EA. STM: Paul Craig, N3YSI. SGL: Allen Breiner, W3ZRQ. TC: Lawrence Thomas, AA3PX. ASMs: Ron Creitz, KB3CFV, Vince Banville, WB2YGA, Dave Heller, K3TX, George Law, N3KYZ, J. Yogi Bear, WB3FQY, Harry Thomas, W3KOD. It took quite a while before I got an e-mail address and find that it has its advantages. If the sender fails to enter their call letters, QTH and address, it becomes extremely difficult for the SM to reply. KB3CWG and K3BSX have volunteered their service as an LGL. W3ZRQ, the SGL, is receiving communications from area operators who are beginning to see advantages of having a Local Government Liaison appointee in their area who can assist with local zoning regulations before getting involved in a tower erection hassle. NG3F has accepted the Emergency Coordinator position for Juniata Co. It's that time of the year when radio clubs nominate and elect new officers. Don't forget to report the names and address of your newly-elected officials and keep them current with the SM. League affiliated clubs must file a report annually and Special Service Clubs every two years. Those members of the Delaware-Lehigh ARC who supplied communications for the 10th annual Red Cross Lehigh Run were KA3ONZ, KE3AW, KB3CSS, N3QZT, KB3DEC, N2DH, KB3CSR, N3SNZ and W3JD. Montgomery RACES members WA3AKK, N3OMA, W3GSC, W3BNQ and WD0ESL assisted their local Fire police with communications for the Methodist Church Bikeathon. Thanks and kudos to all the club bulletins we receive with information about your club activities. With the beginning of school, it is time for clubs to think about setting up their license instruction classes. The EPA section traffikers under the leadership of STM N3YSI, held their annual family picnic at New Ringgold and noted their QRP rigs work out great from that location. Next year's picnic will be held at the same location on Saturday, July 19. STM Paul says, if you want to try something different in Amateur Radio, check into the PTTN training net that meets every evening on 3610 kHz at 6:30 PM. Or you might try your hand at sideband phone traffic by calling into the EPA emergency phoine and traffic net that meets every evening at 6:00 PM on 3917 kHz. You could even meet our youngest and newest net control, KB3BBR, who operates in the traffic nets between her school homework. 73, N3YSI. Tfc: W3IPX 187, N3YSI 154, N3EFW 86, W3IVS 62, W3UAQ 51, W3NNL 33, KB3CEZ 28, W3JKX 27, N3JSO 14, AD3X 14, W3TTW 13, KA3LVP 10, W3HK 7, KB3DDL 7, N3ZXE 7, N3AO 6, N3AS 6, W3TI 5, N3IRN 4, KB3BBR 3, W3BNR 2, KB3CKD 2, N3KYZ 2, W3DAB 1, W3KOD 1, K3ARR 1. Net Reports: EPA 95, EPAEP&T 69, PFN 27, PTTN 24, SEPTTN 21, D3ARES 13, MARCTN 7, MCOES 4, LCARES 3.

MARYLAND/DC: SM, Bill Howard, WB3V, 410-551-6775 wb3v@arrl.org— MDC Section Web homepage http://users.erols.com/wb3v/mdc/. CARR EC N3JIA rpts 64 members, 3 sessions of the Net which meets on 145.410 MHz with liaison to MEPN, MDD, and MSN by KE3FL, and to BTN, WVPN, DTN, MEPN, Central Net, and Western Net by W3VK. Rich rpts contact with the Maryland Wine Festival Bike Tour. An AEC report recvd fm W3V and OES rpts recvd fm KE3FL 21 net ck ins on emer pwr. WX3F 3 net ck ins on emer pwr; N3JIA 2 net ck ins on emer pwr. HOWARO WA1QAA rpts the training classes in directed net operation and formal traffic for new ARES/RACES members and those who desire a refresher. 5 members attended. CHAR EC W3TOM rpts 28 members, 4 sessions of the Charles County Amateur Radio Emer Service Net on 145.390 MHz with liaison to MEPN, and 1 SKYWARN training class. In Basic I training class were: KB3EFS N3QHC N3YR N3OK KB3DXT N3JDG N9TSA N3IPN WA3ZGD N3YSY, D Kincaid, WB8OYG K3DSP KB3EKU K3MZV N3QXX, K Martin, N3YZU N3JTN, C Norris, N3VIO KA3ZZH, B Price, N3JTJ N1WR, M Sach Sr., N3YRZ WR3Z, J Smith, N8AVX N3ZIY N3WZU N3IDX N3YYF KB3BWR, and KA3ZYG. In Basic II were KA3VNF W3TOM KB3EFS KF3AA N3QHC KB3EPA N3JTG N3ZIZ N3YR N3OK K3GRG KB3DXT N3JDG N9TSA N3IPN WA3ZGD N3YSY, D Kincaid, WB8OYG KR3A K3DSP KB3EKU K3MZV N3QXX, K Martin, N3YZU N3JTN, C Norris, N3VIO KE3RE KA3ZZH N1GOD, B & D Price, N3JTJ, M Sach Sr., N3YRZ WR3Z, J Smith, N8AVX KA3GRW N3ZIY N3WZU N3IDX N3YYF KB3BWR and KA3ZYG. FRED EC N8AAY rpts 8 members, 4 sessions of the FRED ARES Net on 147.06. Eric and RO Roy, N2CSQ, resolved the RACES EOC ant problem. Eric is looking at the new EMCOM training certification program as a base for future training. WASH EC KD3JK rpts 41 members, 11 sessions of the WASH ARES/RACES Net and the Four State Net which maintains liaison to MEPN. Bob rpts ARES participation in the Hawk Triathlon, W3YGC was the sweeper for both events. Participants included N3ODA WB3FHV N3MVR N3VGS KB8ZQM KB8WHW KB3AOO N3NHW K3ABH WA4IBY KD3JK N8UKC K2AVA and W3YGC. With the nets: NET/NET MGR/QND/QTC/QNI: MSN/KC3Y/31/54/267,MEPN/N3WKE/31/48/469, MDD/WJ3K/62/302/875, MDD Top Brass: KJ3E 238, AA3SB 162, AA3GV 178, BTN/AA3LN/no report, SMN/KE3OX/no report. Tfc: KK3F 2419, N3QA 425, KJ3E 398, AA3GV 169, W3YVQ 131, AA3SB 92, N3WK 79, N3DE 68, W3CB 52, KC3Y 46, N3WKE 32, KB3AMO 28, K3CSX 25, N3ZKP 15, N3EGF 14, N3KGM 10, W3VK 9, WA1QAA 8, WA3WRT 5, KE3FL 2, July WB4FDT 86. PSHR: KJ3E 271, KK3F 207, W3YVQ 160, AA3SB 135, W3VK 135, N3WK 133, AA3GV 131, N3ZKP 126, W3CB 122, N3WKE 118, KC3Y 95, KB3AMO 86, K3CSX 76, WA1QAA 75, KE3FL 72.

SOUTHERN NEW JERSEY: SM, Jean Priestley, KA2YKN, (@K2AA) e-mail ka2ykn@voicenet.com. ASM: W2BE K2WB W2OB N2OO N2YAJ. SEC: N2SRO. STM: K2UL. ACC: KB2ADL. SGL: KB2WKY.OOC: K2PSC. TC: W2EKB. TS: W2PAU WB2MNF AA2BN KD4HZW WB3IJB WA2NBL KA1AOR N2QNX N2XFM. As Radio operators, we have much to be thankful for this holiday season and throughout the year. Now it is up to us to help keep our bands clean and respectful. Riley Hollingsworth has taken giant steps. But he needs us to insure they stay clean. Amateurs mourn the death of 2 Silent Keys. John Glowacki, WT3V, is mourned by JSARS. He was dedicated to many aspects of radio including VE Testing and Packet. Traffic handling has lost "a great one", N2XJ. Carl A Felt, Jr a ham's ham, became a SK in June at the age of 91. Honor them by helping other hams and especially new hams just coming into the hobby. Traffic report, August: QNI rpts; W2CC NJPN 191, K2PB NJSN 73, WA2OPY NJM 185, AG2R NJN/E 244 and NJN/L 199 (above with NNJ). JSARS KC2ATQ 396, SJVN WB2UVB 281, KJ4N/2 158, KB2RTZ 86, AA2SV 75, K2UL 62, K2UL-4, 50 WB2UVB 36, WA2CUW 16, N2VQA 13, KA2CQX 11, W2AZ 6, KB2VYZ 5, KB2VSR, KB2YBM KC2ETU 1. PSHR; KB2RTZ 246, K2UL 172, WB2UVB 164, KJ4N/2 144 AA2SV 121, KA2CQX 98, WA2CUW 95, N2VQA 61.

WESTERN NEW YORK: SM, Scott Bauer, W2LC — Congratulations to Vivian Douglas, WA2PUU (Onondaga Cty EC), the state Amateur Radio communications coordinator, Nancy Kirch, KF1L (DEC), of Binghamton, the host city communication chairman, and Jack Smith, KB2YEN, Broome County EC who organized the emergency communications for the Empire State Games held from July 27 through July 30, 2000, in Binghamton, NY. Thanks, K2TDV, for use of the 146.13/73 and 146.295/895 repeaters, which are linked together, and were used to cover the Empire State Games for the duration of the event. There were 120 hams involved in the operation at 41 venues in Broome, Cortland, Tioga and Tompkins counties in WNY, including the swimming events in the Cortland area and the sailing events in the Ithaca area. All participants were major contributors to the event. However, a special thanks goes to Andy, KB2LUV, Howie, N2VJV, Nancy KA2HQF, and Ford, AB2HS, for their efforts. The Empire State Games is held at a different site each year. A few dedicated hams have traveled to each location, they are: Nancy Coe, KA2HQF, of Clay (since the early 1980s). Vivian, WA2PUU, of Syracuse and Jim W2BCH of Camillus, who I believe have both worked every year. For Viv and Jim, this year makes a total of 32 games, 20 summer games and 12 winter games. Thank you, Vivian, and Jim! Great job to all who participated. You've made WNY very proud of you! Net Summaries:

Net	NM	Sess	QNI	QSP	Net	NM	Sess	QNI	QSP
BRVSN	WB2OFU	31	197	7	CHN	W2EAG	31	150	22
CNYTN	WA2PUU	31	381	67	EBN	WB2IJZ	23	372	0
ESS	W2WSS	31	312	78	NYPHONE	N2LTC	31	193	253
NYPON	N2YJZ	31	323	105	NYS/E	WB2QIX	31	302	143
NYS/L	W2YGW	31	245	238	NYS/M	KA2GJV	31	192	71
NYSCN	W2MTA	4	17	4	NYSPTEN	KD2V	31	338	43
OARCN	N2KPR	4	40	5	OCTEN/E	KA2ZNZ	31	1696	205
OCTEN/L	KA2ZNZ	31	699	211	OMEN	K2DYB	1	5	1
STAR	N2NCB	28	251	11	STTHN	KC2AWA	9	51	3
TIGARDS	W2MTA	4	14	3	WDN/E	N2JRS	31	607	75
WDN/L	W2GUT	31	549	62	WDN/M	KB2VVD	31	585	44

Traffic (August 00), * indicates PSHR, # for BPL: N2LTC*# 799, KA2ZNZ*# 631, KA2GJV* 331, W2MTA* 237, NN2H* 217, W2FR* 148, WB2QIX* 148, N2KPR* 128, WI2G* 93, NY2V* 89, KG2D* 70, W2PII* 59, W2LC* 55, KC2EOT* 54, W2GUT* 53, KA2DBD* 47, AF2K* 38, N2CCN* 37, KB2ETO* 28, KA2BCE* 24, K2DN* 22, K2GTS* 19, N2WDS* 19, KB2WII* 8, WA2UKX* 8, WA2GUP* 1. Digital; Stn Rx/Tx: N2LTC 161/101, KA2GJV 3/0, K2DN 0/0, NY2V 0/5.

WESTERN PENNSYLVANIA: SM, John Rodgers, N3MSE. ASM-ARES: WB3KGT. SEC: N3SRJ. ASM-Packet: KE3ED. OOC: W3ZPI. PIC: W3CG. STM: N3WAV. TC:WR4W. DEC-SO: KD3OH. DEC-N1: N3QCR. DEC-N2: KA3UVC. DEC-S1: KA3HUK. DEC-S2: N3BZW. DEC-Rapid Response: N3HJY. DEC-OES: K3TB. Chris Robson, KB3A, has resigned as the OOC for the section due to an increased volume of work with his business. I want to thank Chris for his service and especially for his friendship. I have asked Chris to remain on the section staff in an advisory role. Ralph Ofchinick,W3ZPI, has been appointed as the new OOC. As we approach the holiday season I want to take a moment to thank the many amateurs that volunteer and promote the Amateur Radio service. Your efforts are indeed appreciated. Any of the clubs in the section that would like me to attend a club meeting or event is asked to send me a request, and I will include the event on my calendar for the upcoming year. I enjoy the opportunity to meet with as many amateurs as possible at the various activities and discuss issues of concern to the members that I represent here in Western Pennsylvania. As we move into the twenty first century, let's continue to build the future of Amateur Radio. Our future is in the youth of today. I encourage everyone to do all that is possible to work with young people to introduce Amateur Radio to them and help to get many licensed. Offer to work with schools for the "School Club Roundup." Contact scout groups and offer a demo or to assist as an advisor for some of the merit badges. As we approach the New Year let us all strive to build our future in amateur radio and work to promote the service to the young people of today. A Happy Thanksgiving to you and your families. 73, John Rodgers, N3MSE, WPA-SM, n3mse@arrl.org.

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. ACC: N9KP. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. DEC-Central: N9FNP. DEC-S/W: KB9AIL. Every two years each nuclear power plant holds a graded exercise. The Starved Rock RC has been making plans to assist with the drill set for October 4 in LaSalle. During the last two exercises, local hams helped out at the Grand Ridge, Brookfield, Seneca and Manlius townships and also at the Etna Road EOC. There have been many favorable comments from local, state and federal officials on the superior volunteerism and professionalism exhibited by Amateur Radio Operators. Hamfesters RC reports their 66th annual hamfest, held August 13 in Peotone, was another great success. Few radio clubs can trace their annual events back to the era of FDR. The Peoria Area ARC was treated to a martial arts demonstration during a recent meeting by members of the Gillespie family. Tae Kwon Do karate, weapon demonstrations, and board breaking highlighted the program. The Schaumburg ARC recently marked their 25th anniversary with a picnic and fox hunt. A special event station was also on the air to mark the occasion. Nearly two dozen repeaters have been de-coordinated this year according to the Illinois Repeater Association. Another group of repeaters are facing de-coordination as well. In some cases this is due to a lack of response from the repeater trustee. If your club's coordination status is in doubt, contact the IRA frequency coordinator, K9VXW via e-mail at cberg@grayfox.svs.com or visit the IRA Website at www.enteract.com/~ira. North Shore RC has produced a nice magnetic sign for members to display on their vehicles. The new design features the club name and repeater frequency. NSRC members took a few moments at a recent meeting to discuss the PSK31 mode, which is growing in popularity. The Kishwaukee ARC operated special event station W9S during the Northern Illinois Steam Power Show. The club operated all four days of the event on 20 and 40 meters. August traffic: K9CNP 115, NN9M 55, W9HLX 39, WB9TVD 34, ND9T 31, NC9T 24, W9FIF 11, WA9RUM 6. ISN Report de WB9TVD QNI 198, QTC-83, Sessions 30. 9RN de KB4UBX sessions 62, traffic handled 256, average per session 4.12, rate of traffic 3.12, total time 80 min., percent represented IL 93% check ins NN9M, W9HLX, N9PLM, NS9F, WB9WOC. W9VEY Memorial Net report de K9AXS 6 with 200 check-ins.

INDIANA: SM, Peggy Coulter, W9JUJ—ASM for Resources & Recruitment, W9IH. SEC: K9ZBM. ASEC: WA9ZCE. STM: W9FU. OOC: KC9V. TC: W9MWY. BM: KA9QWC. ACC: N9RG. Sympathy extended to the families and friends of Silent Keys 8/22, Harold A. Pride, W9WQC, Evansville; 9/5, George McGrath, W2VKY, Evansville: They will be missed. Art Hopkins, WA9VQO, has resigned as SGL due to health reasons. He has been one of my faithful appointee's since I have been SM (10 yrs). Thank you Art for all you have done in the past. It has been greatly appreciated. Hope some of you have attended at least one of the workshops that W9IH and W8ISH has held. They are really worth while. There will be another one shortly at New Castle. Hope you can plan to attend. The 21 Repeater Group provided communications for the Michiana Bicycle Club annual tour. Over 1100 registered to ride. This ride was 52 miles on 1st day and 58 miles 2nd day. Hams taking part were N9ZTF, KB9HIO, W9BRW, N9VSR, W9EFA, WA9UGP and KA9KOG. Did you know the Clark Co AR was organized in 1953. They have been active during parades, homecoming days and lots of bad wx. For your info, I am not on the Internet. Only have e-mail, so don't pass me anything to retrieve from the Internet. Just can't do it. Congratulations to WT9U placing 3rd in the IN division of the ARRL 10 Meter Contest. Also congratulations to N9CAR Summitville who was awarded the 1000th Worked All County Certificate by CQ Magazine. NM's ITN/W9ZY, QIN/KJ9J & K9PUI, ICN/K8LEN, WN/AB9AA, VHF/W9FU.

Continued on page 114.

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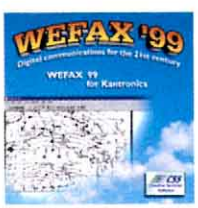

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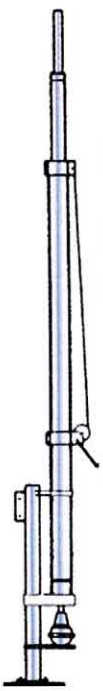

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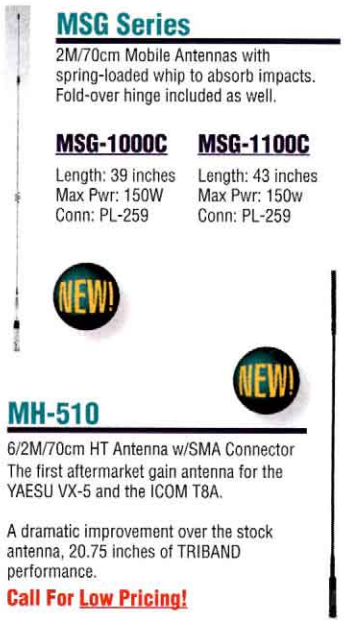

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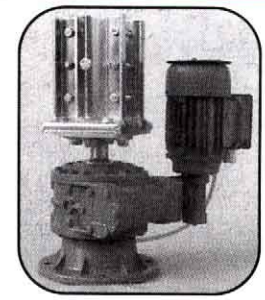

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73! Sandy, AC1Y and Helen Ann, KA1KBY

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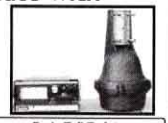

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QIN	3656	1430/0000				
July	87	51	387	33		
Aug	106	42	434	40		
ICN	3705	2315	85	14	325	28
IWN	3910	1310	2298	–	310	31
IWN VHF Bloomington			519	–	465	31
IWN VHF Kokomo	715		–	155	31	
IWN VHF Northeast	1230		–	620	31	
Hoosier VHF nets (13 nets)			1340	34	1208	57

D9RN Total QTC 256 in 62 sessions IN represented by K9QBR, W9UEM, N9KNJ, WB9QPA, W9WN, KB9NPU and W9POX. 9RN Total QTC 210 in 62 sessions IN represented by KJ9J, KO9D, K9PUI, N9HZ, WB9UYU, and W9FC. Tfc: W9FC 398, W9ZY 113, KJ9J 92, W9UEM 85, WB9QPA 83, W9FU 79, K9GBR 70, AB9AA 59, KO9D 58, K9PUI 52, W9JUJ 49, N9KNJ 37, KA9QWC 36, KA9EIV 33, KB9NPU 26, W9BRW 18, K8LEN 14, W9EHY 8, N9HZ 6, K9OUP 5, K9DIY 5, WB9NCE 5, K9ZBM 4, K9CUN 4, K9RPZ 4, AB9A 4, K9SXM 2.

WISCONSIN: SM, Don Michalski, W9IXG—SEC: WB9RQR. STM: K9LGU. ACC: K9FHI. SGL: AD9X. OOC: W9RCW. PIC: K9ZZ. TC: K9GDF. ASM: K9UTQ, W9RCW, W9CBE. BM: WB9NRK. It is with deep regret to inform you that W9FZC, John LaBlonde, is a SK. John was a member of CWRA and was instrumental in starting the popular Swap Net on the 146.88 repeater. Roy Peterson, K9FHI, has been appointed the new ACC replacing Bette Kratz, KF9ZU, who has moved to Arizona. Roy was the previous SM and his experience will be invaluable in working with the section clubs. Welcome back! Congratulations to Richard Regent, K9GDF, current TC and former SM, for receiving the prestigious ARRL A-1 Operator award! August 9RN report shows Wisconsin with 96% representation. Thanks, folks! HVARC reports 105 QSOs for the K9S special event on September 2 & 3. Special events are great fun for clubs and it is real easy to apply for a 1X1 special event call. Just go to http://www.arrl.org/arrlvec/1x1.html to apply. If you need advice on running these events, contact me. Nels Harvey, WA9JOB, has been working with the NFCC, National Frequency Coordination Council, ARRL and FCC. Our deep appreciation to Nels for his efforts on this tough job! Now that summer is over, it is time to start ham classes. Our hats off to clubs that already have them planned. The ARRL has a very good video series that can help your club instructors. We've run several Technician classes over a weekend using these tapes and *Now You're Talking* so I can advise you how to start a class based on them. Section repeaters should consider using the courtesy beep to indicate weather status: "I" for inclement, "S" for severe, and "N" when a net is in progress. 73, Don, W9IXG w9ixg@arrl.org. Tfc: K9JPS 960, W9IHW 879, W9YPY 552, W9RCW 495, N9TVT 475, K9GU 416, WZ7V 385, W9CBE 148,K9FHI 116, N9BDL 82, K9LGU 77, AG9G 68, KE9VU 61, N9CK 60, W9YCV 59, W9UW 44, KB9ROB 39, N9KHD 34, K9HDF 33, W9BHL 31, AA9BB 30, WB9ICH 26, KG9B 26, KA9BHK 24, N9JIY 17, W9ODV 14, WD9FLJ 14, KA9FVX 9, K9UTQ 6, W9PVD 1.

DAKOTA DIVISION

MINNESOTA: SM, Randy "Max" Wendel, KM0D—In late August, I took my family camping to Bemidji and Ely. I met David Quam, W0CIA, who happened to lives on the lake we were camping at. He took us on a boat ride on Andrusia and over to Cass Lake. Saw bald eagles and loons. While traveling thru Grand Rapids, Blake Rickbeil, N0WSH, gave me the full tour of the fire cache. They have a room with full station and a great relationship with the department there. We had a great trip. I'm ready to upgrade from a tent to a camper-trailer. After a few thunderstorms, it seems like a good idea! By now, the MIMS tapes have been making their way around the ARES groups in MN. Understanding the incident mgmt structure helps us realize the organizational efforts behind disaster recovery. ARES in MN is looking at how we can utilize packet radio statewide especially during activations by the DEM when comms are beyond reach of normal VHF/UHF-range and when HF propo is poor. Reminder to Web users...go to ARRL Web site to your member-data-page and check the option box to receive Division/Section e-mails. A reminder to all of our ARRL nets. Still looking for clubs (ARRL affiliated too) and major cities to participate. Among various activities on the ARRL nets, we also provide the resource as a means for handling traffic as a public svc. Recently within a week's time, we had traffic for two highly ham-populated cities in MN (one up north, the other in the south), but no takers there on the net. Please participate in your ARRL nets. Silence isn't golden on our airwaves. Here they are again: ARRL voice nets: 3860 kHz 12 noon, 5:30 PM 7 days/week ARRL CW nets: 3605 kHz 6:30 PM, 9:50 PM 7 days/week. Tfc: WO0A, W0LAW, WA0TFC, KB0OHI, KB0AII, K0PIZ, W0HPD, K0WPK, KB0AIJ, W3FAF, W0WVO, K0PSH, KA0IZA, KN9U, WD0GUF, N0JP.

NORTH DAKOTA: SM, Bill Kurtti, WC0M—I'm sorry to report that W0PVG is a Silent Key. Norm has been a steady Data & WX member for as long as I can remember. Enjoyed attending the Dickinson picnic again, We were glad to Have K0QB, Dakota Division Director, come up for the event. We all enjoyed hearing N0QAV sing the Ham Operator Blues with all that participated in the Saturday night sing along. Also, the Friday Night gang sang for us Sunday morning. Sorry that the chicken dance was not performed as usual. I would not attempt it with my 2 left feet, but it's a joy to watch all ages enjoying that event. Tfc: N0RDJ 1. HF net reports by KB0XT HF Net mgr. Data Net 3937 kc 6:30 PM CST daily 29/591/15. Wx Net 8:30 AM CST M-S 24/592/38. Goose River Net 1995 kc 8:30 AM CST Sunday 4/38/0.

SOUTH DAKOTA: SM, R.L. Cory, W0YMB—Pennington Co ARES was called out on Sunday, Aug 27, to furnish com-

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You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

NEW

Call your favorite dealer for your best price!

MFJ-259B **$259.95**

Call or write for Free Manual

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $139.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. *Save $5!*

New! Tunable Measurement Filter™

MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

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MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

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Tech Help: (662) 323-0549

More hams use MFJ SWR Analyzers™ than any others in the world!

munications for the Red Cross and other units at the largest forest fire in South Dakota history. The fire was near Custer in the Black Hills of SD. They did 24 hr, around the clock duty. The fire burned about 90,000 acres. EC KØLEW and his crew did an excellent job. They deactivated on Tues and Wed went on standby basis. They also helped fire departments that had hams and equipment on their trucks. Cell phones were severely restricted due to hilly terrain. Communications were to Red Cross shelters in Custer, Hill City and Rapid City. The fire came within 4 miles of the 146. 85 repeater. On Aug 19-20, a special-events station commemorating the end of the WWI was on the air from under the wing of a B29 at Elsworth Air Base. Over 1000 contacts were made worldwide. Chapter 102 of QCWA provided some of the operators. NØIGP has set up a Web page on the Internet. Prairie Dog ARC also operated a special event station for Riverboat Days Celebration at Yankton on Aug 18-20.

DELTA DIVISION

ARKANSAS: SM, Roger Gray, N5QS, e-mail n5qs@arrl.org - I just got back from the Mena hamfest, and as usual had a really good time with lots of old friends and we met some new ones. The weather was cool and wet for the first time in what seems like months. Speaking of the weather, the hot dry weather has caused a serious fire hazard in most of Arkansas, and there have been several serious fires around the state. Remember tornadoes and hurricanes are not the only natural disasters we need to be ready for. One instance where we can help is multi-department fires where the different departments can't talk to each other on their radios. We can fill the gap. Another important role we can play is arranging for refreshments during fires for the firefighters who can lose a lot of body fluid in 100 + heat while wearing protective equipment. Providing these services frees up firefighters to fight fires while we help where we can. It is time to follow up on the school stations and presentations. I have good reports from 2 schools in my local area, and would like to hear from elsewhere in the state. Please let me know what progress you are making. August reports follow. Tfc: KC5TMU 175, K5BOC 107, K7ZQR 97, AB5AU 20, W5RXU 17, KO5E 10, W5HDN 9, WB5HIL 8, KA5MGL 6, KC5UEW 3, ARN 84, APN 25, AMBN 16, OZK 4.

LOUISIANA: SM, Mickey Cox, K5MC—ACC: KM5YL. OOC: WB5CXJ. PIC: K5IQ. SEC: AC5TM. STM: KG5GE. LCW NM: W4DLZ. LTN NM: WB5ZED. Very sorry to have to report that WA5LHL is now a Silent Key. Audry was very active on LTN and DRN5 for many years, including serving as the LTN NCS on Sundays. He was an Elmer for many and will be missed by all who knew him. I want to thank AC5TM for joining the section's leadership team as the new SEC. All ARES and NTS participants should assist Tom however possible as he goes about his new duties. Other new appointments include W8YFS (Southeast DEC), KD5EWD (Jefferson Parish EC), WD5DWP (Orleans Parish EC), K5ER (Ouachita Parish EC), and K5OR (Technical Specialist). New officers for the Southeast LA ARC are WB5FBS (President), KB5SKW (Vice President), KI5LH (Secretary), and K5CAV (Treasurer). Thanks go to SARA for sponsoring a great hamfest this year in Shreveport. ACC KM5YL is doing an excellent job in helping many of our clubs keep their paperwork updated at ARRL HQ. Although we have been hit hard recently by the passing of WA5LHL and K5WOD, I'm happy to report a number of new stations checking in to either LTN or LCW or both. Everybody is invited to check in and join the fun on our section's traffic nets. Tfc: WB5ZED 1178 (BPL), K5IQZ 189, W5CDX 180, K5MC 106, KG5GE 43, K5DPG 19, KM5YL 8. PSHR: WB5ZED 207, K5IQZ 161, W5CDX 123, K5DPG 120, K5MC 114, KG5GE 97, KM5YL 44. Net Reports: sessions/QNI/QTC. LTN: 31/347/76.

MISSISSIPPI: SM, Malcolm Keown, W5XX—Section Web Page: www.arrlmiss.org. Web Master: K5IBM at k5ibm@arrl.net. ASM: N5JCG, N5EZX. ACC: N5JGK. BM: W5EPW. SGL: AB5WF. STM: KJ5YY. The Tupelo ARC Special Event Station at the Elvis Presley Festival resulted in over 850 QSOs in 30 counties and 48 states. Good Show! Put the annual ARRL Day in the Park on your schedule for October 14 from 10:00 until? at Pavilion 34 in Paul B. Johnson State Park south of Hattiesburg on U.S. 49. This year's festivities are hosted by the Mississippi DX Association and chaired by W5OXA. Lunch will be served around noon. Bring a dish! Bring your pick up full of junk and be ready to tailgate! The Tupelo ARC is having a picnic on the following weekend at Veterans Park near Tupelo. Contact WJ5K for details. W5WAF reports he had a great tour of ARRL Headquarters hosted by no less than K1STO, the Manager of the Field and Educational Services Division. Congratulations to K5YG on placing #7 High Power W/VE in the 2000 ARRL RTTY Roundup. Also congratulations to the K5MDX Multi-Op Crew that continues to run up top ten finishes in both US and worldwide contests. OO Report: K5XQ. PIO Report: W5KWB. EC Reports: KD5CKP, K5DMC, KD5FUO, WB5OCD, WA5TEF, KC5TYL, N5ZNT. Net Reports: sessions/QNI/QTC. MSPN 31/2841/55, MTN 31/89/44, MSN 31/1025/11, PBRA 31/703/10, Jackson Co ARES/RACES 31/535/23, MSSN 23/80/2, West Coast 2M ARES 14/140/4, NW MS ARES 5/33/0, JARCEN 5/99/0, MCARA 5/57/0, Lowndes Co ARES 5/79/0, Stone Co ARES 4/27/0, MBHN 4/24/0. PSHR: N5XGI 156, KB5W 142, K5VV 128, W5XX 94, KJ5YY 73. Traffic: KB5W 369, K5VV 104, N5XGI 60, W5XX 5.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ACC: WA4GLS. ASM: WB4DYJ. SEC: WD4JJ. STM: WA4HKU. PIC: KE4CES. TC: KB4LJV. The Cedars of Lebanon Hamfest was a success even with the rain that lasted until mid morning, a goodly number of hams turned out and had a great time. Bob McGraw, K4TAX, was guest speaker at the RATS Aug meeting. All enjoyed the discussion on EME QSO. The 2000-2001 RACK officers are: Bruce, K4PCK, Pres; Shella, KB4G, 1st VP; Wayne, KF4TBY, 2nd VP; Jim, KG4CFB, 3rd VP; H.P., KA4LEO-Sec, Carol, N4LF- Treas, Steve, KF4BTO, Act Chair; Jack, K4IBP, Edu Chair; David, K4PTZ, Hamfest Chair; David, AC4JF, Repeater Trustee Chair. WD4D gave a presentation on rptrlink, N9YNQ and Internet Radio Linking Project, VE7LTD, at the Aug JCARS

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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.

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MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¾Wx4½Hx15D in).

MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

MFJ's exclusive *Self-Resonance Killer*™ keeps damaging self-resonances away from your operating frequency.

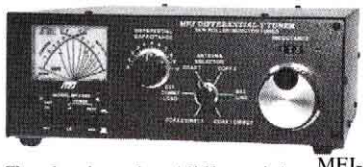
Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

MFJ *No Matter What*™ Warranty

MFJ will repair or replace your MFJ-989C (at our option) *no matter what* for one year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™



MFJ-986 **$329.95**

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10¾Wx4½Hx15 in.

MFJ-962D *compact* Tuner for Amps

MFJ-962D **$269.95**

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10¾x4½x10⅞ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 **$199.95**

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. 3½Hx10½Wx9½D inches.

MFJ-949E *deluxe* 300 Watt Tuner

MFJ-949E **$149.95**

More *hams use MFJ-949s than any other antenna tuner in the world!* Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 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 **$129.95**

The *most for your money!* Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek 10½Wx2½Hx7D in.

MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E **$119.95**

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 **$99.95**

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6½x2½ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B **$79.95**

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

MFJ-16010 **$49.95**

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 **$79.95**

MFJ-906 has lighted Cross-Needle SWR/wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95,** Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-922 *144/440 MHz* Tuner

MFJ-922 **$79.95**

Ultra tiny 4x2½x1¼ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-931 *artificial* RF Ground

MFJ-931 **$89.95**

Creates artificial RF ground. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire. Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. **MFJ-934, $169.95.** Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

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club meeting. BARC celebrated the 39th anniversary of the Bristol Motor Speedway and 52nd anniversary of NASCAR during Aug 16-29 by operating s special event callsign of W4B. The Transponder reported that the Dayton hamfest was a smashing success. Roy's (KE4TG) presentation on PSK31 was the ORARC's high point meeting of the year. Angie's (N6DWX) and Jerry's (N4EO) trip to Mexico was lots of hard work, but also a fulfilling experience. SRARC has purchased a trailer to be converted into a communications facility. Funding and work is needed for this project, so those interested persons should contact K1KY. It is always good to see hams helping in worthy projects, so congratulations are due to those SRARC people who assisted the American Diabetes Association's "Tour de Cure 2000" bike ride. Thanks to DARC members who helped during 4th of July celebration: KF4ZGJ, K4TTA, AF4XW & wife, Pat, WB4LYHP, WM4Q, AA5GX, KC4SXT WA4OVO, KB4KA, KD4TJO, KU4AW, K4WNY. Net sess/QTC/QNI: TMPN 31/37/2176; TCWN 27/13/157; TEMPN 23/53/735; TEPN 27/63/2396; TSCWN 20/13/94. DRN 5: 62 sess, 637 msg, TN rep 66% by W4OGG, KE4GYR, K4WWQ. Tfc: N4PU 50, KE4GYR 38, WA4HKU 36, W4SYE 16, WB4DYJ 14, WA4GLS 11, KI4V 10, WD4JJ 9.

GREAT LAKES DIVISION

KENTUCKY: SM, Bill Uschan, K4MIS—ASM: Tom Lykins, K4LID. SEC: Ron Dodson, KA4MAP. SGL: Bill Burger, WB4KY. STM: John Farler, K4ZVX. ACC: Todd Schrader, KF4WFZ. PIO: Steve McCallum, W2ZBY. TC: Scotty Thompson, KI4AT. BM: Ernie Pridemore, KC4IVG. At the Central KY Hamfest held August 20 in Lexington, the ARES operator of the year award was presented by KY SEC Ron Dodson. Winner of the award was the Scott County ARES group with special awards given to three hams. Ted James, WD4KYD, Gene Glass, WA4QAK, and Eric Westerfield, KE4KWR. At the Louisville Hamfest held in Bullit Co, Certificates of Merit will be presented to Joan C. Slayman, KF4SXH, Vernon Nunn, N4UL, and John Meyers, N4GNL. A Public Service Commendation is being presented to Stu Kratz, KO4BI. Check out the pictures on the KY ARES Website. Bob Stephens from the KY. Division of EM gave a very good presentation about KY DEM and the new communications system being installed at the State EOC.

Net	*QNI*	*QTC*	*Sess*	*NM*
KTN	2076	66	62	K4LID
KSN	181	36	31	KO4OL
TSTMN	525	36	31	KG4EAB
CARN	382	28	29	AD4EI
4ARES	553	31	31	WA4RRR

Tfc: K4AVX 41, KO4OL 36. PSHR: KO4OL 110.

MICHIGAN: SM, Dick Mondro, W8FQT (w8fqt@arrl.org). ASM: Roger Edwards, WB8WJV, (wb8wjv@arrl.net). ASM: John Freeman, N8ZE (n8ze@arrl.net). SEC: Deborah Kirkbride, KA8YKK (ka8ykk@arrl.net). STM: James Wades, WB8SIW (wb8siw@arrl.net). ACC: Sandra Mondro, KG8HM (kg8hm@arrl.net). OOC: Donald Sefcik, N8NJE (n8nje@arrl.net). PIC/SNE: David Colangelo, KB8RJI (dcolangelo@ameritech.net). SGL: John LaRock, K8XD (k8xd@voyager.net). TC: Dave Smith (DSmith@smithassoc.com). Youth Activities: Steve Lendzion, KC8MCQ (kc8mcq@arrl.net). BM: Thomas Durfee, Jr.,WI8W (wi8w@arrl.net). Congratulations go out this month to the newly elected officers of the Midland Amateur Radio Club, President Lee Hodges, KC8ITI; Vice Pres Bill French, N8NGQ; Secretary Mary Branson, KB8QYB; Treasurer Larry Macklin, N8CGP. Congratulations as well to the new officers of the Michigan Area Repeater Council, President Dennis Gaboury, W8DFG; Secretary Ron Huber, N8JAZ; Treasurer Joel Goldberg, W8HIU; Director Ron Gordon, W8YUC; Director Bill Kelley, KC8DBG. The new officers will take office on December 1, 2000. Bruce Winchell, N8UT has resigned as MARC Database Manager/Coordinator. My thanks to Bruce for his fine efforts in keeping the database current. My thanks to Gerry Crawford, K8GER (k8ger@arrl.net) of Luzerne for taking on the role as our Section JOTA Coordinator and don't forget JOTA is October 21-22 this year and if you need information please contact Gerry for this opportunity to introduce radio to our scouts. Traffic reports for August: KB8ZYY 297, K8GA 266, K8LJG 104, WB8SIW 97, W8RTN 91, AA8PI 81,N8FPN 75, AA8SN 60, WX8Y 57, N8JGS 55, K8AE 53, W8RNQ 42, K8KV 41, WI8K 38, K8UPE 32, W8YIQ 22, KC8GMT 21, K8JN 18, K8AI 14, K8ZJU 12, K3UWO 12, N8TDE 12, WA8DHB 11, KI8GR 8, N8EXS 3. Please support the following Section Traffic Nets: August 2000 NTS Net Reports.

Net	*QNI*	*QTC*	*Sess*	*Net Mngt.*	*Freq*	*Time*	*Day*
QMN	588	269	62	WB8SIW	3.663	6:30&10 PM	Daily
MACS	193	37	30	W8RNQ	3.953	11 AM	Daily (1 PM Sun.)
MITN	399	188	31	N8FPN	3.952	7 PM	Daily
UPN	1025	35	35	AA8SN	3.921	5 PM	Daily (Noon Sun.)
GLETN	601	78	31	VE3SCY	3.932	9 PM	Daily
SEMTN	475	62	31	WI8K	146.640	10:15 PM	Daily
VHF Nets	629	03	39	KB8ZYY	Various		

OHIO: SM, Joe Phillips, K8QOE, Fairfield, (to contact me, see page 12. The Ohio Section Conference at Columbus in September had plenty of news to report. First Carl Morgan, K8CM, resigned as OOC after two successful years and introduced his successor, Richard Kuns, KC8TW, of Fairfield. PIC Scott Yonally, N8SY, announced that "Zero Beat" newsletter of Alliance ARC (John Myers, KD8MQ, editor), won the 9th annual Ohio Ham Radio Newsletter contest. Second place was "The ZARC Carrier" of Zanesville ARC (Danny Grandstaff, KB8RIM, editor) and third place was "The Voice Coil" of Mahoning County (Youngstown) ARC (Andy Brincko, WA8ZLK, editor). Honorable mention, reported PIC Yonally, went to "SAARA SPEAKS" (Salem), Coshocton County ARA and the "Reflector"of the Huber Heights ARC. Then Ralph McDonough, K8AN of Adena, was introduced as the seventh winner of the Allan Severson, AB8P, Memorial award as Ohio Ham of the year. It was quite a news day. Richard Kuns, KC8TW, who became OOC on October 1, has for 27

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them in the palm of your hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low Ripple . . . Highly Regulated

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

Fully Protected

You won't burn up our power supplies!

No RF Hash!

MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV
45 Amp
$199.95
plus s&h

No RF Hash!

They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MightyLites™ . . . Mighty Features

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

NEW! 25 Amp MightyLite™

Super light, super compact switching power supply delivers 25 Amps maximum/ 22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. ***No RF Hash!*** Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ-4125
25 Amp
$109.95
plus s&h

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118
$74.95
plus s&h

MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h

New!
MFJ-1117
$54.95

MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! MFJ-1117, $54.95. For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

Free MFJ Catalog

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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FAX: (662) 323-6551; **Add s/h**
Tech Help: (662) 323-0549

All are protected by MFJ's famous No Matter What™ one year limited warranty.

years been with Procter and Gamble, Inc. and has been licensed since 1981. He has been an active Official Observer and runs electronic bulletin boards and Web pages for several Cincinnati area ham groups. Ralph McDonough, K8AN, is retired from Kroger Corp., and has held a ham license for over 50 years. He was the first SEC in the Ohio Section and ran ARES Forums at the Dayton Hamvention for more than a dozen years. He currently serves as a DEC for the 9th region of Ohio. OHIO SECTION CONGRATS... (A) To Ross Meganthaler, NS8C, Maumee, as the 2000 winner of the OSSBN Merit Award given annually to the traffic handler who has distinguished himself during the year, (B) To the Toledo Mobile Radio Association, who recently renewed Special Service Club in the ARRL. .. If your Ohio ham radio club isn't a Special Service Club of the ARRL, contact ACC Brenda Kurkowski, KB8IUP, (kb8iup@arrl.net) and see if your group qualifies and you wish to enjoy its special privileges....OHIO HAMFEST FOR NOVEMBER; (18) Grant ARC at Georgetown....de K8QOE. Now for traffic reports for August:

Net	QNI	QTC	QTR	Sess	Time	Freq	NM
BN (E)	121	69	239	31	1845	3.577	WD8KFN
BN (L)	162	60	268	30	2200	3.577	NY8V
OSN	136	15	492	31	1810	3.708	WB8KQJ
OSSBN	1638	364	2078	93	1030, 1615, 1845	3.9725	KF8DO
OH Section ARES					1700 Sn	3.875	WD8IHP

Tfc: WD8KFN 200, N8IO 163, W8STX 124, KD8HB 96, N8TNV 96, N8BV 91, WA8SSI 90, KA8FCC 89, N8DD 87, KA8CXG 71, N8RRB 64, W8BO 51, WA8HED 50, KC8HJL 48, W8PBX 39, WB8HHZ 38, KI8IM 34, N8CW 33, W8RG 31, WD8KBW 30, NY8V 30, NS8C 29, KA8VWE 27, KC8DWM 24, N8GP 23, KI8O 20, KD9K 20, N8YWX 19, KC8JKE 17, N8WLE 17, KC8HTP 11, KB8SBK 11, N8RAK 10, KC8KYP 9, N8GOB 9, N8IBR 9, K8JP 9, KX8B 8, AA8XS 8, KB8TIA 7, K8QIP 6, KC8HPR 4, WD8SIQ 5, KK8J 4, KB8SIA 3, N7CEU 3, K8WC 1. (Jul) KC8DWM 16, N8HIA 4, KE8FK 1.

HUDSON DIVISION

EASTERN NEW YORK: SM, Rob Leiden, KR2L—STM: Pete Cecere, N2YJZ. SEC: Ken Akasofu, KL7JCQ. ACC: Shirley Dahlgren, N2SKP. SGL: Herb Sweet, K2GBH. PIC: John Farina, WA2QCY. BM: Ed Rubin, N2JBA. OOC: Hal Post, AK2E. TC: Rudy Dehn W2JVF. ASM: Tom Raffaelli, WB2NHC. ASM: Bob Chamberlain, N2KBC. ASM: Andrew Schmidt, N2FTR. ASM: Richard Sandell, WK6R. ASM: Phil Bradway, KB2HQ. Net Reports (Aug 2000) Check-ins (QNI)/ Traffic handled (QTC+QSP): AES 43/6 CDN 311/116 CGESN 49/8 ESS 312/156 HVN 549/146 SDN 302/154 NYPHONE 193/507 NYPON 323/219 NYS/E 302/305 NYS/M 192/161 NYS/L 245/498. Section News: Volunteer for the NYC Marathon-1st Sunday in Nov! Let's get ready for Winter! Charge the batteries, check out the HT, keep blankets and flashlights in the car and answer the call from the EOC if it comes! 73 de Rob. PSHR: N2JBA 163, N2YJZ 151, WB2ZCM 146, KC2DAA 135, WA2YBM 130, W2JHO 122, WB2IIV 116, W2AKT 111. Tfc: N2YJZ 144, N2JBA 69, WB2ZCM 56, WB2IIV 46, KC2BUV 38, KC2DAA 33, W2JHO 21, W2AKT 19, WA2YBM 17, K2AVV 8, WA2BSS 2, KL7JCQ 1, KC2BUW 1.

NEW YORK CITY / LONG ISLAND: SM, George Tranos, N2GA. ASM: KA2D, N1XL, K2YEW, W2FX, KB2SCS. SGL: N2TX. SEC: KA2D. ACC: N2MUN. PIC-East: N2RBU. PIC-West: K2DO. TC: K2LJH. BM: W2IW. OOC: N1XL. STM: WA2YOW. Congratulations to Hudson Division Director Frank Fallon for his re-election to a third term as Director! Frank has done a great job representing our area on the ARRL board. Mark your calendars for Ham Radio University 2001 which will be held January 21, 2001, at Babylon Town Hall Annex in North Babylon. There will be many new forums and an expanded program. November section hamfests: MIARC on November 26 in Patchogue. The NYC Marathon is Sunday, Nov. 5 - volunteers are needed. Check the NLI Webpage at www.arrlhudson.org/nli for more information on upcoming events. NYC/LI VE exam list follows: Manhattan: BEARS, ABC Cafeteria, 125 West End Ave at 66th Street, Contact Jerry Cudmore W2JRC at 212-456-5224 for dates & times; East Village ARC, 2nd Friday at 7 PM, Laguardia HS, Amsterdam Ave and West 65th Street, Manhattan. Contact Robina Asti KD2IZ at 212-838-5995; Columbia University VE Team, 3rd Monday at 6:30 PM, Watson Lab, 6th Floor, 612 West 115th Street, Manhattan. Contact Alan Crosswell, N2YGK, at 212-854-3754; Queens: Hellenic ARC, 4th Tuesday at 6:30 PM, Pontion Society, 31-25 23rd Ave, Astoria, NY. Contact George Anastasiadis, KF2PG, at 516-937-0775. Nassau County: Grumman ARC (W5YI), 2nd Tuesday at 5 PM, Northrop-Grumman Plant 5, South Oyster Bay Road via Hazel Street, Bethpage, NY. Contact Bob Wexelbaum, W2ILP, at 631-499-2214; LIMARC, 2nd Saturday at 9 AM, NY Institute of Technology, 300 Building, Room 311, Northern Blvd, Greenvale, NY. Contact Al Bender W2QZ at 516-623-6449. Suffolk County: Great South Bay ARC, 4th Sunday at 12 noon, Babylon Town Hall, ARES/RACES Room, 200 East Sunrise Hwy, North Lindenhurst. Contact Tom Carrubba at 631-422-9594; Larkfield ARC, 2nd Saturday in Feb, May, Sep, Nov, Huntington Town Hall, Room 114. Contact Stan Mehlman, N2YKT, at 631-423-7132; Peconic ARC, exams held January, April, July, and October on next to last Friday at 6:30 PM at Southold School, Oaklawn Ave, Southold, NY. Contact Ralph Williams N3VT at 631-323-3646. Mid Island ARC, last Weds of each month at 7 PM at 36 Dew Flag Rd, Ridge NY 11961, Contact: Mike Christopher W2IW at 631-924-3535. Report all changes to N2GA before the 12th of the month. Report all changes to N2GA before the 12th of the month. Tfc: WB2GTG 354, N2AKZ 100, W2RJL 82, KB2KLH 76, WA2YOW 28.

NORTHERN NEW JERSEY: SM, Jeff Friedman, K3JF—Net and traffic reported by STM Dave, WB2FTX:

MFJ ACCESSORIES

MFJ W9INN Balun Box

MFJ-912
$49.95

Lets you use coax from your antenna tuner to the MFJ-912 mounted outside your ham shack. The MFJ-912 converts the unbalanced coax to a balanced transmission line (ladder line). Provides szame function as an internal balun except it is located away from tuner. Giant 2 core balun wound with *Teflon*® wire connected to high voltage ceramic feedthru insulators. Handles full legal power with ease. 3¼x2¼x7 inches.

MFJ Artificial RF Ground

MFJ-931
$89.95

Creates artificial RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF ground- ing. Greatly improves your signal if you're using a random wire or long wire antenna with an ineffective ground. Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020
$189.95

Throw this tiny MFJ 20 Meter CW transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 Watts output, semi/full break-in, much more. *Free* manual. See *free* MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

Super Active Antenna

MFJ-1024
$139.95

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna... quiet ...excellent dynamic range...good gain ...low noise...broad frequency coverage...excellent choice". Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz. Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC w/MFJ-1312, $14.95.

Cross-Needle SWR Meter

MFJ-815B
$79.95

Peak/Average Cross-Needle SWR/Wattmeter shows SWR, forward/reflected power in 2000/500 and 200/50 Watt ranges. 1.8-60 MHz. Mechanical zero. SO-239 Connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $14.95.

MFJ Coax Antenna Switches

MFJ-1701
$49.95

MFJ-1702C
$29.95

MFJ-1704
$69.95

Select any of several antennas from your operating desk with these MFJ coax switches. They feature mounting holes and automatic grounding of unused terminals. One year *No Matter What*™ limited warranty.

MFJ-1701, $49.95. 6 position antenna switch. SO-239 connectors. 50-75 Ohm loads, 2 kW PEP, 1 kW CW. 10x3x11/2 inches. DC-60 MHz.

MFJ-1702C, $29.95. 2 positions plus new Center Ground. 2.5 kW PEP, 1 kW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 Ohms. 3x2x3 in. Now has lightning protection. **MFJ-1702CN, $34.95.** N-Connectors.

MFJ-1704, $69.95. 4 position cavity switch with lightning surge protection. Center ground. 2.5 kW PEP, 1 kW CW. 50 dB isolation at 500 MHz. 50 Ohms. 6¼x4¼x1¼ inches. **MFJ-1704N, $79.95.** N-connectors.

MFJ Compact Speaker Mics

Compacts
MFJ-296I or
MFJ-286
$19.95

MFJ's compact speaker mics have first-rate electret mic element and full size speaker to give superb audio on transmit and receive. Earphone jack, PTT, lightweight retractable cord. Gray. 1¼x2x3 inches. **MFJ-296I** fits Icom, Yaesu, Radio Shack and Standard. **MFJ-286** fits Kenwood.

MFJ Mini Speaker Mics

Minis
MFJ-295I or
MFJ-295Y
$15.95

MFJ's mini mics give excellent audio from electret mic element and speaker. Has swiveling lapel/pocket clip, PTT button, earphone jack, lightweight retractable cord. Tiny 2x1¼x¼ inches. Order **MFJ-295I** for Icom, Yaesu, Alinco, Radio Shack and Standard; **MFJ-287** for Kenwood; **MFJ-295Y** for Yaesu R-series; **MFJ-285WC** for Alinco credit card radios.

Dry Dummy Loads for HF/VHF/UHF

MFJ-260C
$34.95

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260C, $34.95. VHF/HF Air cooled, non-inductive 50 Ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 650 MHz. 2½x2½x7 inches. *MFJ-260CN, $39.95, N connectors.*

MFJ-264
$69.95

MFJ-264, $69.95. Versatile UHF/VHF/HF 1.5 kW load. Low SWR to 650 MHz, usable to 750 MHz. 100 Watts/10 Minutes, 1500 Watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 inches. *MFJ-264N, $74.95, N connector. MFJ-5803, $4.95, 3 foot patch coax cable with PL-259.*

MFJ Low pass Filter

MFJ-704
$49.95

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive *Teflon® Dielectric Technology*™ capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/RFI protection. Full legal power 1.8-30 MHz. Has handy mounting tabs.

MFJ-702, $24.95. 200 Watts Low Pass TVI filter.1.5-30 MHz.

Full Color FAX

MFJ-1214PC
$149.95

Use your computer and transceiver to receive, display and transmit brilliant full color news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII, and CW. Animate weather maps, display 10 global pictures simultaneously. Zoom any part of picture or map. Manager lists over 900 FAX stations. Automatic picture capture and save.

MFJ Iambic Paddles

MFJ-564
$49.95

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers. Chrome/Black.

MFJ/Bencher Keyer

MFJ-422D
$144.95

The best of all CW worlds -- a compact MFJ Keyer that fits right on the Bencher Iambic Paddle! Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4⅛x2⅝x5½ inches.

MFJ-422DX, $79.95. Keyer only for mounting on your Bencher or MFJ Iambic paddle.

"Teflon" is a registered trademark of Dupont

High Pass TVI Filter

MFJ-711
$24.95

Don't let harsh TVI ruin your DXing and your wife's favorite soap opera! Keep peace with your family and your neighbors. MFJ's exclusive *ShieldBreaker*™ high pass filter effectively suppresses annoying TVI! Wipe out TVI caused by broadcast, commercial, two-way, amateur and CB radios operating below 30 MHz. Use between cable, antenna and TV/VCR. For 75 Ohm cable or 300 Ohm twin lead.

12/24 Hour LCD Clocks

MFJ-108B
$19.95

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to-see. Brushed aluminum frame.

MFJ-112B
$24.95

MFJ-112 shows hour/minute/second, day, month, date, year at any QTH on world map. 12 or 24 hour display. Daylight savings time feature.

VHF SWR/Wattmeter

MFJ-812B
$34.95

Covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4½x2¼x3 in.

Code Practice Oscillator

MFJ-557
$29.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable. 9-Volt battery or 110 VAC with MFJ-1305, $14.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ inches.

MFJ Multiple DC Outlet

MFJ-1118
$74.95

Use your rig's 12 VDC power supply to power two HF/VHF rigs and six more accessories with this MFJ high current multiple DC outlet. 2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 gauge power cable. 12½x2½x2½ inches.

MFJ-1116, $49.95. 8 DC outlets, voltmeter, on/off switch, RF bypass, fuse.

MFJ-1112, $34.95. 6 DC outlets.

Free MFJ Catalog
and Nearest Dealer . . . 800-647-1800

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MFJ . . . the world leader in ham radio accessories!

Net	*NM*	*Sess*	*QNI*	*QTC*	*QSP*
NJM	WA2OPY	31	185	43	38
NJPN	W2CC	35	191	17	17
NJSN	K2PB	30	152	4	4
NJN/E	AG2R	31	244	77	64
NJN/L	AG2R	31	199	55	51
CJTN	KB2VRO	31	247	32	31
NJVN/E	N2RPI	31	426	34	29
NJVN/L	N2OPJ	31	289	40	35

Tfc: KC2AHS 65, N2OPJ 40, N2RPI 38, W2JG 37, KB2VRO 35, W2MTO 28, K2VX 26, K2PB 20, W2CC 20, N2GJ 9.

MIDWEST DIVISION

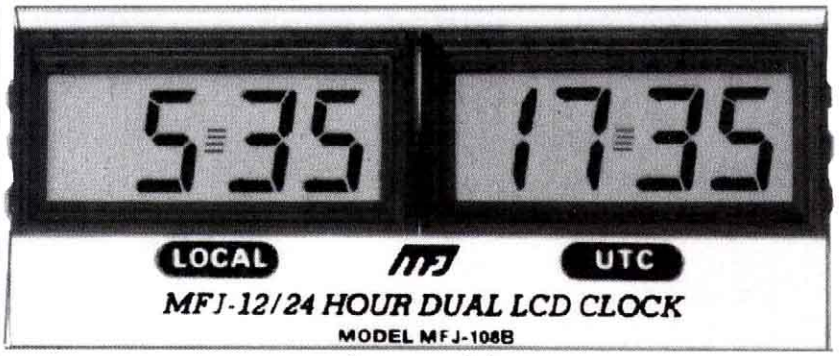
IOWA: SM, Jim Lasley, N0JL—ASM: N0LDD. SEC: NA0R. ACC: N0IJP @ KE0BX. BM: K0IIR @W0CXX. SGL: K0KD. The monthly breakfast at Country Kitchen for the Ottumwa group looks to become a monthly no exam, paperwork exam session. Seems the examiners find the need to eat also! UHF and VHF have been hopping and N0SM reports good TV DXing. The Tri-State group in Cresco now has a tone that they say sounds like an FM station: 103.5! They say to stay tuned for news! Have you noted that the RF safety rules are now in effect for all of us. Check the League Web site for the full rules. I received a newsletter from the Southwest Iowa Amateur Radio Club of Council Bluffs this month. I thank you. They report the Red Oak 146.655 machine is now 1n a much high location and with much improved coverage. They also provided some beautiful pictures of their FD. Amazing what you can do with a now with a good color printer. SEITS is hoping to get more of the members involved by starting the nomination process for officers earlier than usual. I understand they are going Nowhere from FMARC again. How was it out there in Nowhere, II? They are also trying to do an inventory of club equipment. Wonder if that is also going nowhere. I regret to report the loss in early September of KB0DD. From the report, it looks like the Iowa City club had a great FD. The River City Radio Rag (RCRR) carries a nice review of the FT-100. CVARC printed an excerpt from the NEC dealing with our antenna installations. Most have probably never seen a copy of the NEC, let alone read it! 73 de N0JL. Newsletters were received from OARC, TSARC-N, SWIARC, SEITS, FMARC, ICARC, CVARC. Tfc: W0SS 241, KA0ADF 80, N0JL 9.

KANSAS: SM, Orlan Cook, W0OYH— ASM/ACC/OCC: Robert Summers, K0BXF, SEC Joseph Plankinton, WD0DMV. STM: Ron Cowan, KB0DTI. SGL: Marshall Reese, AA0GL. PIC: Scott Slocum, KC0DYA and TC Frank Neal, N8FN. The ARRL KS State Convention went well enough to pay the bills with 430 registered. That is 6% of the KS ham population. Not all were from KS though. 56 ARES/NTS mbrs attended our Section meeting. Wendell, W0TQ presented Norman Dillman, N0JCC, of Manhattan, the Kansas Amateur of the Year 2000 Award. See the "KAR"newsletter for more, available by email orlan@swbell.net and see http://www.colossus.org/kar/ for Kansas info. Allow me to recognize our Net Managers: Louie, WB0YWZ, of 2 weather nets 6:45 AM & 6 PM Dy, Bill N0KFS of KSBN 6:30P Dy & KPN 8AM W,S, S, all 3920 kHz, Jay AB5PA of CSTN 12:30 PM Dy 7253 kHz, Tom, WB0ZNY of 2 CW nets 7 & 10 PM Dy 3610 kHz, Ron, KB0DTI, of the QKS-SS Kansas slow speed CW net. Jul. Kansas Nets: sessions/QNI/QTC, KSBN 31/933/85. KPN 23/277/17 KMWN 31/549/428 KWN 31/625/401 CSTN26/1794/81 QKS 59/280/70 QKS-SS vacation SEC61/640/21 QNS KB0AMY KC0AUH N0BTH K0BXF WD0DDG WD0DVM N0LJR W0PBV KB0WEQ TEN 256 msgs 62 sessions Kans 68% w/KB0DTI AA0OF KX0I K0PY W0WWR NB0Z WB0ZNY W0SS mgr. DTRN60/593/288 Ks 96% N0KJ KB0AMY W0FE W0OYH W0WWR KB0DTI BBS W1AW BBS Bul/Per/NTS AA0HJ 15/426/4. Tfc: W0WWR 129, NB0Z 57, KB0DTI 43, W0OYH 43, N0RZ 5, KX0I 15 N0ZIZ 4 OBS WA0DTH 12.

MISSOURI: SM Dale Bagley, K0KY—MO Traffic Nets, Daily: SSB 3.963 MHz 5:45 PM CW 7:00 PM and 9:45 PM. Kent Trimble, K9ZTV, was appointed Net Manager for the Missouri Traffic Net, sometime referred to as the MON net. Kent is a life member of the ARRL, and has great background in traffic handling. The month of August was filled with activities in the MO Section. SMARC in Springfield, MO lead by Hamfest Chairman Woodie Moore, W0ODY, and he SMARC members produced a fine Hamfest. Which included several well- attended forums. The Westside Hamsters ARC were presented their Charter of Affiliation at their regular meeting. Their efforts are increasing the awareness of Amateur Radio in the area. The ARRL MO State Convention in conjunction with the CMRA Hamfest in Columbia, MO, turned out great. Thanks to the hard work by Dewey Bennett, WM0H and the CMRA membership. Large numbers of section appointees attended and participated in some excellent forums. Steve Ewald, WV1X, of ARRL HQ staff did a fine job at the ARRL Forum as did Midwest Director Wade Walstrom, W0EJ. Patrick Boyle, K0JPB MO SEC, lead the ARES forum and moderated the Red Cross, MOVAD, & MARS forum. Tom Hammond, N0SS and Rich Beckwith, WN0X, presented a program on QRP. There was also a large turn-out for the Missouri Repeater Council Meeting. The St Charles Hamfest, sponsored by the St. Charles ARC was a success again this year. The Hamfest was well ran by the St Charles ARC membership under the leadership of Ken Fieser, KB0VLN. The Hamfest featured some excellent forums. In last month's column, Jason Tuggle's call sign was listed incorrectly. His call is N9OOC, and he has been appointed as an OO. Net/Sess/QNI/QTC: (Aug) WARRCI 4/100/0; MTN 31/407/67; Audrain ARC 4/57/1; Rolla Billboard 30/394/8; QCWA 35 5/60/0; MTN (CW) 57/125/26. Tfc: K9ZTV 61, KE0K 68. (Jul) QCWA 35 4/48/0; WARRCI 5/129/0; MTN 31/385/45; Macon ARC 4/57/0; N0ATH rptr 98 QNI; Rolla Billboard 30/437/7; Jackson Co ARES 5/50/0. Tfc: KE0K 60.

NEBRASKA: SM, Bill McCollum, KE0XQ—ASMs: W0KVM, N0MT, WY0F, WB0ULH & WB0YWO. There was an excel-

MFJ 24/12 Hour Clocks



Shown actual size

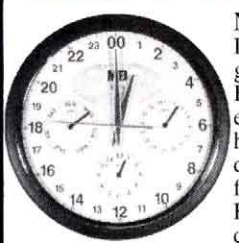
Dual 24/12 hour LCD Clock

MFJ-108B

$19.95 plus s&h

MFJ-108B dual clock has separate 24 hour and 12 hour displays. Lets you read both UTC and local time simultaneously. Features huge high-contrast 5/8 inch LCD numerals that makes it easy to read across the room. Mounted in solid brushed aluminum frame with sloped face for easy viewing. Synchronizable to WWV for split-second timing. Quartz controlled for excellent accuracy. Long life battery included. 4½Wx1D x2H in. MFJ's famous *No Matter What*™ one year limited warranty. *$6 s&h.*

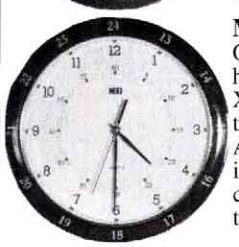
DXer's Wall Clocks



MFJ-125, $29.95. 12 inch DXer's Quartz wall clock gives 24 hour time plus more. Has three smaller independently settable dials for 12 hour time, day of week and date. No more day/date confusion when logging DX! Highly visible, easy-to-read dials! Has Seconds hand.

MFJ-115, $24.95. Set this 24 hour clock to UTC/ GMT and you can determine the time in any time zone of the world at any time of the day. Premier world cities encircle its colorful world map face to indicate time zone. 12 inch face is easy to see across room. Has Seconds hand.

MFJ-105C, $19.95. *World's most popular ham radio wall clock!* True 24 hour Quartz movement. Huge 12 inch black face with large white numerals give excellent visibility across room. Attractive gold colored hour, minute and seconds hands.



MFJ-126, $24.95. 12 hour Quartz movement gives 12 hour time on inner dial (for XYL) and 1200 to 2400 hour time on its outer dial (for you). Attractive clean, white face is highly visible. Real glass cover! Handsome hunter green trim. Has seconds hand.

Hi-Contrast LCD Clocks

MFJ-119B, $49.95. Giant LCD Display 24/12 Hour Clock. Has *giant* see-across-the-shack 2¼ inch time digits. Digital calendar or clock modes. Displays inside temperature (F/C), relative humidity, month, date and day of week. Handsome hunter green and tan color. Wall mount. 8½x9 inches.

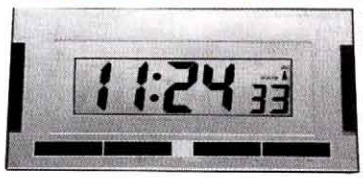
MFJ-118, $24.95. 24/12 hour clock has jumbo 1¼ inch LCD digits. Displays 24 or 12 hour time, year, month, date, and day of week. 100 year full calendar. Hang on wall or desk mount. 5¾Wx2½Hx½D in.

MFJ-107B, $9.95. 24 hour UTC Clock has large 5/8 inch LCD numerals. Synchronizable to WWV. Solid brushed aluminum frame lasts for years. Long life battery included. 2¼x1x2 in.

MFJ-112, $24.95. 24/12 Hour World Map LCD Clock displays time in *every time zone in the world*. Selected time zone flashes on LCD world map. Displays 24 or 12 hours, minutes, seconds, year, month, date, day, time zones, cities. Single button accesses pre-set second time zone. Alarms for two time zones. Adjusts for daylight savings time.

MFJ-152, $24.95. Read Indoor *and* Outdoor temperatures *and* 24/12 Hour time at-a-glance on huge 3/4 inch LCD digits! Choose F or C. Stores minimum and maximum temperature readings. Has backlight for in-the-dark viewing, outdoor temperature sensor with ten foot cable.

Solar Atomic Clock



MFJ-123, $79.95. **MFJ's** *exclusive* solar powered *Eternity Atomic Clock*™ works for an "*eternity*"! Never need batteries! Never need to set time! **Whopping** LCD display is 2 inches tall and 6¾ inch wide -- clearly visible across the room. **Choose** 24 or 12 hour time.

MFJ-116, $14.95. Big bright 5/8 inch LED digits. 24 or 12 hour, 9 min. ID timer, battery back up. Black. 110VAC.
MFJ-116DC, $19.95. 12 VDC, plugs in cigarette lighter. *Great for motorhomes and truckers!* 12 hour only.

Monster Display *Atomic Clock* with PinPointAccuracy™

MFJ-120, $69.95. 24/12 hour *Atomic Clock* automatically receives WWVB for millisecond accuracy. Monster 2 inch LCD characters. Reads relative humidity and temperature (F or C). Has alarm. Attractive metallic copper color. Use on desk or mount on wall. Giant 8x10½Wx¾D inch showpiece.

MFJ-388 **$29.95** **MFJ *CyberEAR*™** **Tiny** powerful MFJ *CyberEar*™ plugs in and loops over ear -- captures and amplifies sounds by 12 dB! Extends your hearing range, helps you hear every word at hamfests and club talks -- even if you're on the back row! Great for eyeball QSOs. 30 day money back if not absolutely delighted. *Not a hearing aid.*

7 Band WeatherAlert

MFJ-8200 **$29.95** plus s&h

Receive continuous weather info/ warnings on all 7 weather channels: 162.4/.425/.45/.475/.5/.525/.55 MHz from 380 U.S. locations 24 hours/day. Also includes AM/FM radio, spotlight, siren, flashing light for emergencies. Water resistant cabinet. Shoulder strap. Great for hamfests, DXpeditions, camping.

14-in-1 *HamTool*™

MFJ-7604 **$19.95** plus s&h

Ham Radio's most versatile tool! This 14-in-1 tool pocket-size toolbox is all you need for putting up antennas or working on rigs. Includes needle-nose pliers with wire cutters and jaws for gripping. Has flathead and Phillips screw drivers, knife, ruler, file, punch, more! Stainless steel, belt carrying case.

HamGear™ Waistpak

MFJ-6200 **$15.95** plus s&h

MFJ's *Ham Gear*™ *WaistPak*™ is the perfect hamfest, DXpedition or field day hands-free carry-all. Has amazing 9 spots to put your ham radio gear, tools, accessories and refreshments. Foam padded and comfortable. Made of heavy duty twill burlap for long life. Features tough webbed belting with solid plastic buckle.

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lent story in the Kearney Hub on August 21, about KC0HOX and KC0HIE. KC0HOX has had some health problems recently and we wish him a speedy recovery. The Lincoln ARC racked up 1800 man hours of communications support for the Nebraska State Fair. Seventeen Amateur operators provided communications support for the Bellevue Police Department during the Arrows to Aerospace parade on August 19. This year's special event station at Pioneer Village was a success. 205 contacts were made and the farthest was Japan. The AK-SAR-BEN ARC Flea Market attracted nearly 350 attendees. Congratulations go to Bill KA0VXK for winning the $250 gift certificate. Net Reports: MID NE 2M ARES: QNI 353, QTC 5 & 31 sessions. NE STORM NET: QNI 1033, QTC 10 & 31 sessions. Lincoln/Logan ARES: QNI 110, QTC 2 & 12 sessions. W0IRZ Memorial Net: QNI 57, QTC 3 & 4 sessions. NMPN: QNI 1575, QTC 5 & 31 sessions. MARES: QNI 206, QTC 2 & 4 sessions. NE 40M NET: QNI 391, QTC 20 & 30 sessions. Traffic Totals: K0PTK 98, KE0XQ 18, W0RWA 12, WY0F 8, KA0DOC 2, W0EXK 2, W0UJI 2, WB0ART 2, W0WHY 2. PSHR: KA0DBK 79, KB0YTM 34, KC0HOX 44.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—BM: KD1YV. OOC: WA1TJT. PIC: W1FXQ. SEC: WA1D. SGL: K1AH. STM: K1HEJ. TC: W1FAI. It was great to see so many of you at The New England Division Convention in Boxboro. The committees sure did their usual FB job. To those of you who have not attended, there's really something magical about Boxboro—it's a wonderful tradition every two years so mark your calendars now for last weekend in August 2002—it's worth it! Heck, we even survived the power outage just before the banquet! It was real nice to see our old CT friend Luck, KY1T, and catch up on the news. Michelle, N1PNT, did a wonderful job with the youth forum. Clubs throughout CT are getting their programs ready for the fall. The Southern Berkshire ARC operated at the Goshen Fair for three days. They gave out a record number of "First Steps to CW Proficiency" certificates to kids who tapped out their names on a straight key. At this writing, the Shoreline ARC and members of ARRL Staff are planning to participate at Scout Show 2000 at Hammonassett State Park. The Shoreline Club will operate using the call K2BSA/1. I am hoping to attend this very fine event—we must encourage young people to join our ranks! Don't forget JOTA weekend of October 21. Why not invite some scouts in your area to your stations and give someone the thrill of operating! For fast-breaking news, watch for my on-air bulletins and electronic newsletters which you may subscribe to on the ARRL Members Page. C U next month! 73. Net sess/QNI/QTC/NM: WESCON 31/266/71/ka1gwe; NVTN 23/83/39/KB1CTC; ECTN 31/290/56/WA4QXT; CPN 31/233/80/N1DIO; CN 24/84/34/N1AEH. Tfc: NM1K 2710, KA1VEC 500, KE1AI 165, KA1GWE 120, KB1CTC 113, WA4QXT 80, KB1ETO 8.

EAST MASSACHUSETTS: SM, Joel Magid, WU1F— August Net and traffic report submitted by STM Bill Wornham, NZ1D.

Net	*Sess*	*QTC*	*QNI*	*QTR*	*NM*
EMRI	62	94	170	452	K1SEC
EMRIPN	29	99	169	545	WA1FNM
EM2MN	3	73	273	386	N1LKJ
HHTN	31	43	265	360	N1IST
CITN	31	68	258	476	N1SGL
WARPSN	4	12	38	NA	K1BZD
NEEPN	3	6	10	NA	WA1FNM
CHN	31	22	150	285	W2EAG

Tfc: W2EAG 334, NZ1D 149, N1LKJ 107, WA1FNM 83, WA1LPM 58, K1SEC 56, KD1LE 44, N1IST 32, N1SGB 30, K1BZD 26, WA1TBY 25, N1LAH 25, N1TPU 23, N1AJJ 23, WA1VRB 10, KB1EB 9, N1BNG 8, N1TDF 8, N1XQC 6.

MAINE: SM, Bill Woodhead, N1KAT—The summer came to a spectacular end for me personally with my participation in the National Lighthouses On the Air event. N1OXA, KD1OW, and son found ourselves at the most perfect place anyone could hope to spend 24 hrs. Our assignment from the Androscoggin ARC was to put the Marshall Point Light in Port Clyde on the air, and we did in fine style. Once up and operational, it was a unique experience to find ourselves on the receiving end of a pile up. Arrangements had been made to spend the night, and when the morning came, an RF enhanced double rainbow woke me up. A quick muster of the rest of the crew drew "Oohs!"&" Ahs!" at the breathtaking site. Fortunately, we were able to capture the moment digitally and on film. Other Maine lighthouses were on the air, but I'm sure none were able to boast such a sunrise. Congratulations to all who participated, and looking forward to next year's event. The next Maine State Convention is scheduled for Mar 30 & 31 at the Ramada Inn in Lewiston. Time and space is still available to accommodate a variety of talks. Express your ideas to Rick, N1WFO or Ivan, N1OXA. 73, Bill, N1KAT. Tfc: W1KX 103, W1QU 52, W1JX 33, K1UNQ 24, KA2ZKM 21, KA1RFD 21, N1JBD 20, W1BLT 20, W1JTH 18.

RHODE ISLAND: SM, Armand Lambert, K1FLD—This year's Boxboro ARRL Convention was the best yet with great weather and good friends in attendance. The Wouff Hong initiation at midnight was well attended, and finally yours truly and spouse, Simone, KA1YVF, were in the participating crowd along with Riley Hollingsworth and others that survived the midnight ordeal. / Riley did mention that we hams need to recruit new members, and to do the walk not just the talk that is to get involved in community activities and promote Amateur Radio. / In the News: The Newport County Radio Club has rebuilt their repeater setup and moved it to 145.450 with an S9 signal into Woonsocket, many thanks to Mike, W1MPB, Mike, K1CW, Charles, W1CG, John, AA1JS, Bob, AA1LG, Jim, KC1SD, Michael, W1MFS, and John, W1WLG, for their combined efforts in support of club activities. /Dan KA1BNO has announced the availability of a brochure compiled by himself and Bill,

MFJ *tunable* Super DSP filter

Only MFJ gives you tunable and programmable "brick wall" DSP Filters

MFJ's *tunable* super DSP filter automatically eliminates heterodynes, reduces noise and interference *simultaneously* on SSB, AM,CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite.

You get MFJ's *tunable* FIR linear phasse filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 57 dB attenuation 75 Hz away.

***Only* MFJ gives you 5 *tunable* DSP filters. You can tune each lowpass, highpass, notch, and bandpass filter including optimized SSB and CW filters. You can *vary* the bandwidth to pinpoint and eliminate interference.**

***Only* MFJ gives you 5 *factory* pre-set filters and 10 *programmable* pre-set filters that you can customize. Instantly remove QRM with a turn of a switch!**

MFJ's *automatic notch* filter searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much that SSB signals sound like FM.

The *automatic* notch and *adaptive* noise reduction can be used with *all* relevant tunable pre-set filters.

***Automatic gain control* (AGC) keeps audio level constant during signal fade.**

U.S. Patent D374,010
MFJ-784B
$249.95

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in MFJ's exclusive *tunable* FIR bandpass filters.

You can tune the center frequency from 300 to 3400 Hz, and vary the bandwidth from 30 Hz to 2100 Hz -- from super-tight CW filters to wide razor-sharp Data filters.

You can use two tunable filters together. For example, tune one to mark, one to space and set bandwidth tight for a super sharp RTTY filter.

Tunable highpass/lowpass filters

You can tune the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create custom filters for voice, data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milliseconds. It's so fast, that even *interfering* CW and RTTY signals can also be eliminated.

You can *selectively* remove unwanted tones using the two *manually tunable* notch filters -- an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

Adaptive Noise Reduction

Noise reduction works in all filter modes and on all random noise -- white noise, static, impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

15 *pre-set* filters -- factory set or you custom program

You can select from 15 *pre-set* filters. Use for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode.

If you don't like our pre-set filters, you can program your own -- an MFJ exclusive! Save center frequency/bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 programmable filters.

Plus more . . .

A push-button bypasses your filter -- lets you hear the *entire* unfiltered signal.

2½ Watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. use 12 VDC or 110 VAC with MFJ-1315, $14.95. Cable Pack, MFJ-5184, $7.95, includes receiver cable, DC cable, 2 open-end TNC cables.

New Features

MFJ's exclusive *tunable Spotting Tone*™ -- accurately tunes even the narrowest CW filter.

MFJ's exclusive *Adaptive Tuning*™ -- tuning rate automatically becomes finer as you narrow bandwidth -- makes narrow filters easy-to-use.

MFJ's exclusive *FilterTalk*™ -- sends precise filter settings in Morse code.

Has automatic notch with variable aggressiveness, new quieter 2½ Watt audio amplifier, new speaker switch keeps phones always active.

Manual and automatic notch can be used together. Noise reduction, automatic notch and custom filter you saved in memory is selected.

You get an accurate easy-to-use input level indicator, improved manual notch in the CW mode, adjustable line level output, more Mark-Space frequencies and baud rates for data filters and automatic bypass during transmit for monitoring CW sidetone, voice or data by sensing the PTT line.

Firmware Upgrade

For MFJ-784, order **MFJ-55, $29.95**. Gives you most features of the MFJ-784B.

60 dB Null *wipes out* noise and interference

MFJ-1026
$179.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker because interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network*. You can combine two antennas to give you various directional patterns. You can null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312B, $14.95. 6½x1½x6¼ inches.

MFJ-1025, $159.95. Like MFJ-1026 less built-in active antenna, use external antenna.

Add DSP to any Multimode

MFJ-781
$129.95

Add "brick wall" DSP filtering to any TNC or multi-mode data controller. Copy signals buried in noise and QRM. Under severe QRM, DSP greatly improves copy of Packet, AMTOR, PACTOR, GTOR, Clover, RTTY, SSTV, WeFAX, FAX, CW -- nearly any digital mode. Automatic gain control, On/Off Bypass switch. Plugs between transceiver and multi-mode. Uses 10-16 VDC or 110 VAC with MFJ-1312B, $14.95. 4½x2½x5 inches.

DSP for your MFJ-1278/B

MFJ-780
$99.95

Plug a MFJ-780 "brick wall" DSP filter into your MFJ-1278/B multi-mode and you won't believe your eyes when you see solid copy from signals completely buried in QRM! MFJ-1278/B automatically selects the correct DSP filter for Packet, AMTOR, Pactor, RTTY, ASCII, FAX, Color SSTV, Navtex or CW. Plug in a MFJ-780 and copy signals that other multi-modes can't. *Some soldering needed.*

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WA1RI, listing the ARRL affiliated radio clubs in RI along with their Web sites, VE sessions and contact persons./ Congratulations to Bill, WA1RI, and Jolene on their granddaughter, Abigail Lynn Maxwell. 73 till next time, keep hamming and Happy Thanksgiving to all.

VERMONT: SM, Bob DeVarney, WE1U—As I write this, intense preparations are going on for communications at the Burlington Air Show this coming weekend. Amateur Radio Operators will be helping to support the Red Cross, who will, in turn, be supporting nearly all EMS and Police operations throughout the weekend. We will be using a combination of amateur and commercial frequencies, including some nifty commercial radio gear we were able to get from Red Cross National such as a commercial repeater with a lowband vhf link. Lots of handhelds to program and distribute to the teams in the field, and to the folks manning the first aid tents. All in all, a perfect opportunity for us to show off what we are capable of contributing in times of need. I also know that hams helped out over the weekend up here at Shelburne Farms with the Fall Harvest Festival. I've long said that we hams do a super job of communicating amongst ourselves, but a poor job of communicating to the general public what we're doing. If you have a public service event coming up, and would like some help getting it publicized, e-mail me, or let me know somehow, and I'll do my best to help you get it publicized. You'll also likely see it mentioned here in the Section News. 73 de WE1U.

WESTERN MASSACHUSETTS: SM, William C. Voedisch, W1UD, w1ud@arrl.org—ASM: N1NZC. ASM (digital) KD1SM. STM: W1SJV. SEC: K1VSG. OOC: WT1W. Molly Bish, a lifeguard, at the town beach in Warren, MA, was missing and believed abducted. The Warren area is out of range for most communications. AA2T and SWC EC N1LKT, with the help of Qubog ARC pres John, K1UJT, organized a cross-band link. For three days, until the police and civil service got additional commo equipment, this was the only communications for the police and volunteer search and rescue teams. As usual, WMA was in the forefront. Congrats to all you people! A job very well done. NOBARC had their Field Day on Windsor Hill. Their flea market was a success as well. It seems great to get some news for a change. MARA furnished a crew for the annual Lonsjo Bicycle Race in Fitchburg and the TT trails on Mt Wachusett. Bands are in great shape and people headed over the world on DXpeditions. Looks like winter and spring will be outstanding for DX operation. Tfc (July): N1ISB 18, W1ZPB 220, K1TMA 123, N1RLX 1, KD1SM 8, W1SJV 9, W1UD 192. (June) K1TMA 131.

NORTHWESTERN DIVISION

ALASKA: SM, Kent Petty, KL5T — Anchorage and Fairbanks hamfests were tremendous success! Great job by all, and special thanks to Greg Milnes, ARRL NW Director, Gordon West, and others for making the trip. The field organization is still in need of Boy and Girl Scout liaisons — please contact KL5T if you feel up to the task...it's awfully important. We are still looking for a sponsor for our state PRB-1 effort. Will your state representative be willing to help? Contact your State Government Liaison, Rob Wilson, AL7KK for input. HF nets: Sniper's Net 3920 1800 AST, Bush Net 7093 2000 AST, Motley Group 3933 2100 AST, and Alaska Pacific Net 14292 M-F 0830 AST. Please report communication drills and exercises, emergency communication activations, and public service activities on FSD-157 to KL5T. Net sess/QTC/QNI/NM: Alaska Snipers Net 31/0/909/KL7GG; Alaska Morse Wire Net (July/Aug) 3/3/6/AL7N. Tfc: AD4BL 3.

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—Despite the high numbers of wildfires this season, amateurs were only called upon mostly for Red Cross efforts in some locations. Possibly e-mail kept firefighters in touch with their families this time. Want to find out if your station is RF exposure compliant? Go to the Radio Club of Tacoma Website at: www.w7dk.org to bring up a calculator. Simply fill in the blanks and it tells you if you're compliant. STM Don W7GB reported Harvey, KA7EKL, and Harvey, K7GXZ, handled message traffic on the CW nets from the Idaho State Fair in Boise. In memoriam: Gary Heden, AB7PI, and Vic Doerrheim, KD7AHH, both of Spokane became Silent Keys. There were 9 out of 10 OO reports for August. 73/KA7CSP. Net Activity: WSN: QNI 687, tfc 269; Noontime Net: QNI 8868, tfc 287; WARTS: QNI 3213, tfc 89. Tfc: K7GXZ 430, W7GB 285, KA7EKL 260, K7BFL 54. PSHR: W7GB 139, K7GXZ 127.

IDAHO: SM, M.P. Elliott, K7BOI — OOC: N7GHV. SEC: AA7VR. STM: W7GHT. Once again a GREAT CW exposition was held during the Western Idaho State Fair with many area hams participating. The event also attracted TV coverage. With the messages handled 3 hams made BPL for Sept. Congratulations to KB7GZU, W7BOI and W7GHT! The ID Section now has a Web presence! Go to "id_arrl.homestead.com/mainpage.html" and check it out. The site will have current ID ARRL news, a staff listing, club listing, educational programming ideas and other useful items. If you think of something that should be added to the Web site let me know. 73 — Mike, K7BOI. Tfc: KB7GZU 682, W7GHT 650, W7BOI 568, W6ZOH 249, WB7VYH 96, and N7MPS 16. PSHR: W7GHT 198, WB7VYH 104, and N7MPS 56. Net (SESS/QNI/QTC/ Mgr.): FARM-31/2455/127/ W7WJH; NWTN-31/1233/62/KC7UND; IDACD-23/431/41/K7UBC; IMN-31/328/337/W6ZOH.

MONTANA: SM, Darrell Thomas, N7KOR—Amateur Radio Operators continued to be involved with the massive wildfire situation in the Montana Section during August. Several clubs and individuals in Western Montana were put on standby for a possible RACES Activation and American Red Cross Shelter support. On August 20th a call was put out on the local repeater in the Helena area from the communications director of the 70000 acre fire at Townsend, MT, for assistance. Dispatchers at the scene had been on duty in excess of 48 hours without relief. Two hams K7MT and AA7OG responded within an hour to support the operation and were joined by KC7NBU and KC7PSE who handled the night shift. These hams handled all the normal and emergency communications of the fire. They spent 2 days at the scene. In Southeast Montana,

MFJ *pocket size* Morse Code Tutor

Learn Morse code fast, anywhere . . . LCD display lets you check your copy instantly . . . Easy no-code beginner's course . . . Takes you beyond Extra Class . . . Customized Practice . . .Plain English QSOs . . . Word Recognition Mode™ . . . Interactive Mode™ . . . No memorization . . . Never run out of practice!

Learn Morse code anywhere, anytime with this *MFJ Pocket Morse Code Tutor*™!

Take it everywhere! Enjoy code at home, work, on vacation, on a plane or in a hotel -- anywhere!

A large LCD display reads out letters, numbers and punctuation in *plain English*. See code as it is being sent!

MFJ's proven *Beginner's Course* takes you from zero code speed to solid copy fast!

Realistic plain English QSO practice helps you pass your FCC Code exam.

High-speed practice takes you to Extra Class and beyond . . .

Practice copying *entire* words -- not individual characters. Instant word recognition makes you a true, high-speed CW pro.

InstantReplay™**--** check copy instantly!

MFJ's interactive mode lets *you* set the pace -- *you* decide when to copy the next group and how many -- *not the tutor*.

Easy-to-use -- choose from menus on LCD -- *no instruction manual needed!*

Beginner's Course

QST rate MFJ tutors *"the clear choice for beginners"*. Follows ARRL/VEC format. Learn small fixed sets of characters. Previously learned sets are combined with new sets to reinforce all you have learned.

InstantReplay™

Practice copying, then instantly replay to check your copy on the LCD display.

Custom Character Sets

Having trouble with certain characters? Build and save 3 custom sets of 16 characters for extra practice -- *an MFJ exclusive*.

Realistic Plain English QSOs

Practice copying *realistic* on-the-air style plain English random QSOs. Gets you ready to pass your FCC test and upgrade. Also builds confidence for your first *real* contact.

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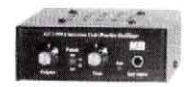

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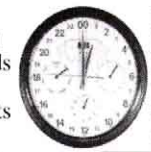

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the members of the Yellowstone Radio Club were called to the scene of a fire east of Billings MT to coordinate mutual aid among responding agencies. As the month ends, we still have hams involved in many ways from handling communications to hose lines. Thanks and congratulations to all for a fine job representing the volunteer spirit of Amateur Radio. Net/QNI/QTC/NM MTN 1701/53 N7AIK IMN 328/337 W6ZOH. PSHR: N7AIK 123.

OREGON: SM, Bill Sawders, K7ZM—ASM: KK7CW. SEC: WB7NML. STM: W7IZ. SGL: N7QQU. OOC: NB7J. STC: AB7HB. ACC: K7SQ. Dick Frey, K4XU, has accepted the position as Official ARRL DXCC Card Checker. Dick, President of the Central Oregon DX Club, is an avid dx'er and world-class contester. Many of you remember Dick being the top design engineer for Ten Tec and the Harris Company. He is presently in the same prestigious position for Advanced Power Technology in Bend. Ed Corey, K7OC, of the Hoodview Amateur Radio Club, has accepted the appointment as HF Awards Manager, and is responsible for validating WAS and 5-Band WAS applications. Both men have accepted a heavy responsibility in maintaining the integrity of these prestigious awards. Lyle Nelson, W6OFF, has resigned from the Official Observer program. A retired Air Force Colonel, Lyle has worked on a VE team for many years, and was also a Technical coordinator for Douglas County before moving to Coos Bay. Thanks, Lyle, for a job well done. The annual Oregon QSO Party, will return to its original May weekend. Too many other contests were on during this years August trial, and several participants requested the return to Spring. The 2001 event will be a one-day affair, scheduled for Saturday, May 12th. Mark your calendars now, and plan a fun-filled day operating and representing your county in the 2001 OQP, and keep in touch. NTS traffic totals for August: W7IZ 169, N7DRP 167, W7VSE 77, KC7SRL 65, N7YSS 41, KA7AID 10, KC7SGM 7, KK1A 5.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—The Shoreline ACS team recently participated in a Costco Safety Fair and during the same week participated in a packet exercise. This was with the Kirkland, and Bellevue ACS teams. The disaster scenario was to have a radio transmission tower into a nursing home creating a mass casualty incident, plus eliminating all communications enabled by the tower, such as cell phones. The King Co Medical Services team under the direction of DEC Marina, N7LSL, has also participated in helicopter rescue training. Reporting via SEC N7NVP we find that Don Deadrick, WL7FQ, Whatcom Co EC reports his unit demonstrated their communication skills at the Ferndale Old Settler's Parade and Chuckanut Car Club Rally. They also demonstrated the communication van for British Petroleum (BP) Co. In Pacific Co, EC Emily Wolfe, KB7L, is off to a running start. Her team helped with a Bike Run and a 911 outage. They conducted a bunny hunt to sharpen their DF skills. The Cowlitz Co fair saw lots of Ham support and even signed up some people for the next Ham class. Cowlitz Co members provided base support for the well organized RAW 2000 (Ride Around Washington) bike ride that starts in Wahkiakum Co, travels through Cowlitz Co and ends at the Clark Co Fairgrounds. K7YFJ's Clark Co team had fun at the Pedal the Pinchot bike ride and the Evergreen Fly-in. Hopefully all the training this past summer has sharpened our skills enough to deal with whatever the up coming winter throws at us. The recent edition of the RN-7 newsletter looked like a combined hospital report of all injuries and illnesses of traffic handlers. Hope everyone will soon be back on the air full time. The very small number of OO reports recently given for poor operating skills attests to the excellent behavior of those who have recently upgraded. To those new to HF, try a little traffic handling, a different aspect of public service.

PACIFIC DIVISION

EAST BAY: SM: Andy Oppel, KF6RCO—Hats off to Chair KE6WRE and a crew of over 100 MDARC members for putting on another excellent Pacificon convention! Congrats to KC6TYB on her upgrade to Extra. CCC recognized the upgrades of KE6CQP to Extra and KD6AGA to General. EBARC congratulated AI3X on becoming a US citizen and welcomed new members KG6CFU and Andrew McAfee (no call yet). HRC provided communications for the Skyline 50K Run while ACSCT did the same for the Run for the Parks in Alameda, and at the same time on the same repeater! With carefully selected tactical call signs, it all went smoothly. VVRC conducted a successful fire watch over the 4th of July with 16 members participating: KF6KFP, KF6VBJ, W6OMF, K6HEW, N6ZGB, N6WVF, KA6FDI, KF6PQW, KF6VBI, KA6IPE, WH6AB, NI6V, K6ZU, K6DME, KD6JSB and K6OLL. ORCA has formed a work group to assemble a new EOC RACES station: WB6NER, KF6VOG, W6BUR, WA6CUY, KF6GZY, N6TQS, W6THD, AD6ME, W6UAB, KD6MP, K6JAT and W6LL. Tfc: W6DOB 666. PSHR: W6DOB. BPL: W6DOB. Tfc nets: NCN1/3630/7PM; NCN2-SLOW SESSION/3705/9PM; NCN-VHF/145.21/7:30PM; RN6/3655/7:45pm & 9:30PM; PAN/3651/7052/8:30 PM.

NEVADA: SM, Jan Welsh, NK7N—ASM: Dick, W6OLD. TC: Jim, NW7O. OES: Joe, N7JEH. W6LOA - John Ryan was appointed EC for the Tahoe Basin Area. NV SEC Paul Cavnar-NN7B and Sacramento Valley S. SEC Bill Penninton-WA6SLA, worked together on this as the area includes part of Sacramento Valley, two states, two Pacific Division sections and six California and Nevada counties. The NV ARES HF net on 3965 kHz is growing thanks to AB7WZ. I was able to reach net control with borrowed NVIS antenna courtesy KE7DB, and am now proud owner of same. Excellent activity report from AC7EL-EC (was AEC) on emergency survival course, training in CPR, 1st aid, light rescue plus demo for Girl Scouts and new AEC, Sam Musselman-KE7VBU. KB7REO-EC reported on joint ARES and AF MARS supplying Comm on Indian Springs to Lake Mead Dr. detail and SKYWARN activities. N7CPP traffic reports had emphasis on training. N7JEH activity report on Pony Express event, they used W7LKO repeater and services of many amateurs. 73, Jan.

PACIFIC: SM, Ron Phillips, AH6HN—ASMs: Harry Nishiyama, KH6FKG, Lee Wical, KH6BZF.Jim Reid KH7M.

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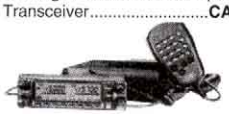

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Stu Johnston, NH6DR. Dennis Niles, KH6XT. Dan Spears, KH6UW. SEC: Dennis Carvalho, KH7H. TC: Chuck Cartwright, AH7Y. PIC: Russ Roberts, KH6JRM. ACC: Bob Schneider, AH6J. Lee Wical, KH6BZF, reports that the Battleship USS Missouri Amateur Radio Club has finished it's planning and has moved into the implantation phase of finishing the Missouri's radio room cleaning up existing equipment. Lead by USSBMARC President, Ned, KH7JJ, the existing Missouri radio room, off the port side of the ship's main deck, is being readied to install the Amateur Radio club equipment. A complete station has been provided by the Navy League, to which the club is very grateful. John Peters, K1ER/KH6 is the director and trustee of the club call sign, KH6BB, has worked with Lee, KH6BZF, who contacted Ms Mae Lowe, widow of KH6BB, to secure permission to obtain Bola's old call sign. John worked hard with the FCC to obtain this call sign in remembrance of both the USS Missouri and Bola Lows. The "BB" call sign is in keeping with the ship's naval number, BB-63. Some million visitors per year will view the ship's radio room and therefore be exposed to Amateur Radio. Thanks, Lee for the info. Our section OOC, Dan Spears, has been busy getting new people interested in becoming OOs. Also, Dan and group have reported MI on Oahu and has forwarded the info to HQ. Keep up the good work, Dan. Tim Hayes, NH0H, the new DEC for Saipan reports a total of ARES members @ 21. Tim has set up a local net for check-ins and drills. Good work, Tim. The County of Hawaii has awarded a contract to the Amateur community on the Big Island for enhanced emergency comm. More on that later. Thanks to all for the inputs for this report. Mahalo & 73.

SACRAMENTO VALLEY: SM, Jerry Boyd, K6BZ—Congratulations to the NCCC for another very successful California QSO Party. Great operating event! Check the Section Web Page for information concerning the various ARES Nets which occur weekly. Those nets can be used to discuss general items of interest as well as emergency communications issues. Enjoyed visiting with many amateurs from around the Section and Pacific Division at PACIFICON. Congratulations to MDARC for another fine convention. A new, cooperative effort between this Section and the Nevada Section has resulted in the appointment of a "cross section boundaries" EC to serve the "Tahoe Basin". W6LOA has been appointed to that position by the Nevada SM. This is important because of the cross over by hams needed when a problem occurs in the Tahoe Basin on either the CA or NV side. The work on this project was done by SEC (South) WA6SLA, and NV SEC NN7B...Thanks! The River City ARC and Sierra Foothills ARC operated a special event station and Amateur Radio info display at the California State Fair. Congratulations on a job well done. Until next month, 73 de K6BZ.

SAN FRANCISCO: SM, Len Gwinn, WA6KLK—ASM: KH6GJV. SEC: KE6EAQ. KB2ZAK is a new EC in Del Norte County. He is also becoming active on HF and VHF. In Humboldt Co W6RA, W6BME, and W6DSB are now active on VHF SSB. KN6ZU on net/drill participation writes "Only through participation do we gain experience and insight. So take the opportunity when one has the chance to run a routine net and make some small errors rather than one you will regret forever. This is what Field Day is all about to me. Not the score in points, but the fact that you learn what it takes to go non-stop, and copy information accurately and fast. The fact that one has to set up a temporary station gives you the chance to learn what you need in your ready bag. Only through experience do you learn what to expect to go wrong in a disaster by being involved in practice, study, training, and the word of others who have been there in a real disaster and lived to share with you their experience." EARS of Sonoma County had a great turnout for their breakfast AND had a booth at the Sonoma County Air Show with lots of visitors. Marin County had a big turnout for their annual picnic. The Pacific Director, W6CF, has been to many of the Section club meetings lately and will be to more in the future.

SAN JOAQUIN VALLEY: SM, Donald Costello, W7WN—Where has the year gone so quickly? Thank you to all who attended the National Weather Service Spotter training program. The training took place in Merced at Mercy Hospital. Instruction was given by Dan Gudgel and Paul Jones who are both Amateur Radio operators. There were about 34 persons in the class. The Spotter program of NWS is yet another way Amateur Radio operators in the SJV Section can interface with emergency communications. The NWS office in Hanford has a very nice VHF/UHF station in the office and will soon be HF capable as well. The station is operated by local Amateur Radio operators from the Hanford area. Training sessions can be set up in other sites in the SJV Section for those interested. Club presidents are encouraged to send e-mail to me if interested in having a training session. w7wn@arrl.org. I will gladly forward your request to the NWS office in Hanford. I would like to thank Steven Mendenhall, Dan Gudgel and Paul Jones of the NWS for their work, often on their own time, in developing the SKYWARN program in SJV Section. Does your local radio club have an ARES group? If not please consider forming one. Special thanks go to Howard Watson, N3TNQ, of Merced for arranging for the use of Mercy Hospital conference facilities for the NWS training session and for the continuing ARES training sessions. Radio clubs of SJV please send stories of your clubs involvement in local public service for publication in the Section News. Send the stories to w7wn@arrl.org. As this Section News will break near years end I would like to extend best wishes for the Holiday Season from myself and the staff of the ARRL San Joaquin Valley Section.

ROANOKE DIVISION

NORTH CAROLINA: SM, John Covington, W4CC— SEC: KE4JHJ. STM: N0SU. BM: KD4YTU. TC: K4ITL. PIC: KN4AQ. OOC: W4ZRA. SGL: AB4W. ACC - vacant. http://www.ncarrl.org. Congratulations and welcome to our newest affiliated club, the Guilford Amateur Society. The charter of affiliation was presented during the ARRL meeting at the Shelby hamfest. Division Director Dennis Bodson, W4PWF, presented the charter to President John Shultz,

MFJ Contest Voice Keyer

Brand New design . . . Microprocessor controlled

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Can be computer-controlled by CT, NA, etc . . . Records received audio . . .

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own voice!

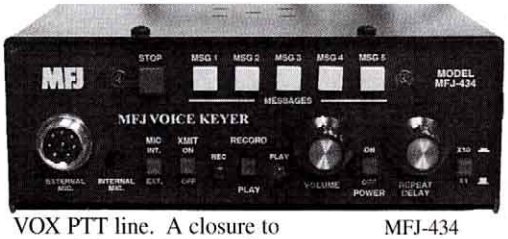
Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" and more! Contest by pressing a few buttons and save your voice.

You can record and play back five natural sounding messages in a total of 75 seconds. EEPROM technology keeps messages stored for up to 100 years -- no battery backup needed.

Repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes calling CQ so easy and it's also a great voice beacon.

A receive audio jack lets you record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by pressing the *Stop Button*, your PTT mic button or by your



VOX PTT line. A closure to ground via remote control or computer can also halt messages.

Has jack for remote or computer control (using CT, NA or other program and its interface). Lets you select, play and cancel messages.

The MFJ-434 is transparent to your microphone -- your mic's audio characteristics do not change when your MFJ-434 is installed. Dual controls make it easy to tailor audio level to match your voice.

MFJ-434
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All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

It's easy to use -- just plug in your 8 pin microphone cable and plug the MFJ-434 shielded cable into your transceiver's mic connector. Internal jumpers let you customize it to Kenwood, Icom, Yaesu, Alinco or Radio Shack rigs. Use your station or built-in microphone for recording.

Built-in speaker-amplifier lets you monitor stored messages. 3.5 mm speaker/headphone jack. SMT technology. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312B, $14.95. 6½Wx2½Hx6½D inches.

MFJ-73, $29.95. Remote Control Head with cable for MFJ-434.

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This *professional grade* MFJ Boom-Mic Headphones set is designed for contesting, DXing and traffic nets. Features *total comfort* design with leatherette padding for operating long hours.

Superb 3/4 inch thick padding on each ear and headband lets you wear your headset all day long! So super lightweight, you won't even know they're there! Headband adjusts for a perfect fit to keep out external noise.

The headphones' frequency response is enhnanced for communications to bring out speech fidelity that you never knew existed. Signals never sounded so crystal clear.

The flexible microphone boom lets you position the mic comfortably at an optimum distance to minimize silibant sounds.

MFJ's frequency tailored microphone element lets you bust through noise and QRM!

Extra-long 9⅔ feet of cable lets you move about your ham shack!

Has standard 1/4 inch jack for headphones and 3.5 mm jack for microphone. Build your own adaptor or use MFJ's pre-wired adaptors to match your transceiver. **Order** MFJ-5396 Y/K/I (YAESU, KENWOOD, ICOM respectively). $15.95 each.

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Both MFJ-392 and MFJ-396 have MFJ *No Matter What*™ one year limited warranty.

MFJ Communications Speaker

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MFJ 12/24 Hour DXers Watch

MFJ-181
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This *MFJ DXers Watch* lets you quickly check 12 hour local time and 24 hour time in time zones around the world. By noting day and night areas around its rotatable bezel, you can estimate which bands are open each hour to different parts of the world. You can even estimate best times of gray line propagation. It features a highly accurate *Japanese* quartz movement. Turn out the lights . . . *NiteGlo*™ hour, minute and second hands show up in the dark! Has date display. Well-known world cities encircle it's attractive world map face to indicate time zones. A durable stainless steel band adjusts to fit. Attractive giftbox has felt padding. A great gift!!!

MFJ 12/24 Hour LCD Clock

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K4JBS, with several other club members observing. The new official name for the club recently formed in Troy is the Montgomery Amateur Radio Society. Hope to have them affiliated soon also. Hurricane season reminds me how much we depend on hams at all levels throughout the state to help during disasters. In addition to the activity on the statewide nets, we depend tremendously on local nets to handle much of our traffic. There are three NTS Local Nets in NC: Central North Carolina Traffic Net (CNCTN), 146.82 MHz, 9:30 PM; Piedmont Coastal Traffic Net (PCTN), 146.88 MHz, 9:00 PM; and Eastern North Carolina Traffic Net (ENCTN), 146.685 MHz, 8:30 PM. We also have many non-NTS local nets that help pass our traffic. We could sure use some more NTS nets to provide some additional outlets for traffic, especially in the west and southeast. To become an NTS net, you must meet daily, have frequent liaison to section nets, and follow NTS rules during your formal session. Contact our STM, Don N0SU for more details. August Traffic: W4EAT 375, AB4E 260, K4IWW 142, NC4ML 132, N0SU 100, W4IRE 96, AA4YW 95, KI4YV 92, N4AF 68, W3HL 54, AC4DV 52, KE4JHJ 51, KE4AHC 35, W4CC 25, WD4MRD 17, NT4K 12, WA2EDN 12, AD4XV 10, KB8VCZ 9, KF4YHG 7, KE4YMA 5, N8UTY 4.

SOUTH CAROLINA: SM, Patricia M. Hensley, N4ROS—SC ARRL has made history this month by completing our first election for Section Manager in 14 years. Every prior SM was appointed or was an incumbent without opposition. The election results should be announced shortly; congratulations to that person. My OM, K8AFP, licensed for nearly forty-five years, has told me about the prestige and leadership associated with SMs in the past. Almost every amateur was a member of the ARRL, and the SM was truly the spokesperson for their Section. Unfortunately, this is no longer true. Only one-third to one-half the licensed amateurs are ARRL members, and much misunderstanding of the purposes and benefits of the ARRL exists among them. This results in division between groups instead of cohesion among the amateur fraternity. Many times, individuals who could make real contributions become frustrated and remain among the silent majority. The questionable status of Amateur Radio cannot sustain continual injuries and hope to exist intact as a viable team. In the future, Amateur Radio will change. We must ensure that it is a positive change by, once again, volunteering our individual skills, functioning cohesively as a group, and by supporting our elected Section Manager. Tfc: AF4QZ 122, KA4LRM 60, WA4UGD 49, W4DRF 45, KA4UIV 21, K4BG 21, WD4BUH 18.

VIRGINIA: SM, Lynn Gahagan, AF4CD—SEC: OOC: KR4UQ. STM: W4CAC. ASM/A: KE4MBX. ASM/B: W4TLM. ASM/C: TC, W4IN. ASM/D: KC4ASF. PIC: W2MG. Once again the Virginia Section leads the way. Congratulations to Terry Fox, WB4JFI, of Falls Church on being the recipient of the ARRL 1999 Technical Innovation Award. As the recipient of this award, Terry will receive a check for $500.00, and an engraved plaque to be presented at an ARRL convention. Are you interested and prepared to provide your community emergency communications, when the time is at hand? Perhaps you may want to check into one of the many section level nets to brush up on your NTS skills or, listen in to learn how to pass traffic. Our STM, W4CAC has put together a Web site which lists Virginia Local and Section Nets, the Fourth Region Net and the Eastern Area Net and their operating schedules. The address for the site is: http://w4cac.tripod.com/vastm/ The Net Manager for our Section CW Nets, WA4DOX runs the VSN (Va. Slow Net) each Tuesday at 7 PM 3680 kHz. The net is run at 13wpm or slower. Practice NTS messages are passed and this is a great place to sharpen your CW skills. Obie reports new operators are visiting the net. In fact he's talked me into joining the group and I could sure use the code practice! I am very pleased the ODEN (Old Dominion Emergency Net) has grown to where it is today. We have ARES and NTS members checking in and, now have several pieces of NTS traffic being brought to the nets. This shows how the two groups can and should work together to achieve our mutual goals of preparedness. One of the problems we are now faced with is time. We have so many people checking into the ODEN that sometimes everyone doesn't have a chance to comment. We are addressing that issue and look into possible solutions. Meanwhile please keep in mind that this is a training ground for new NCS. If you have never run a net before or, if you have and would like to give it a try, contact one of the Net Managers. The DXing this year has been great, and it appears that we will have another two years or so of excellent band conditions. Oh, and just a reminder don't forget the ARRL Sweepstakes coming up in November. This is a good time to work towards your WAS award! Very 73 de AF4CD. Tfc: W3BBQ 210, WA4DOX 138, KR4MU 109, W4CAC 85, K4YVX 70, AF4CD 60, K4MTX 53, K0IBS 44,WB4ZNB 32, AAA4AT 26,W4VIC 15, W4YE 9, N4FNT 8, W4JLS 8, WB4UHC 6, W4SEE 5, W4MWC 4, KB4CAU 3, K4JM 3.

WEST VIRGINIA: SM, O.N.(Olie) Rinehart , WD8V— The "Mill" is history, and it will be recorded as a good part of history. In my opinion, and I have heard several others express the same opinion, is that it was a very fruitful and productive State ARRL Convention and WV State Amateur Radio Council annual meeting. My thanks to those who conducted the forums and other meetings, all of which were well attended. Congratulations are in order for, not necessarily in any order but, WV Outstanding Amateur of the Year, Garry H. Ritchie, W8OI; First Place Highest Score Single Op WV QSO Party Dennis Bombardiere , W8YS; and WVSARC Field Day Highest Score by club or group registered with the Council, West Virginia Amateur Radio, Inc., WV8AR. A little different slant on the RFE/RFI situation. Not just that it is mandatory that you have read and understand the FCC regulations, and that your station remains in compliance, but "you owe it to your fellow living creatures to not radiate harmful interference." It makes it a little more binding that just satisfying the FCC doesn't it. At least once a year, I make an appeal so please if you have news of amateur radio in WV that is beneficial, or of value to others, or some group, club, individual has accomplished

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something worth while, please let me know by land, sea or on the air, so that I may include in this column. Contact me at WVFN 3.865 6:00 PM local; phone (304) 768-9534; fax (304)766-1068; cell (304)541-WD8V (9388) or e-mail **wd8v@arrl.org**. 73. Tfc: KA8WNO 161, WD8V 75, W8YS 170, W8WWF 60, KC8CON 35, N8BP 6, WD8DHC 51.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WB0TUB—ASM: Jeff Ryan, N0WPA. SEC: Mike Morgan, N5LPZ. STM: Mike Stansberry, K0TER. ACC: Ron Deutsch, NK0P. PIC: Erik Dyce, W0ERX. OOC: Karen Schultz, KA0CDN & Glenn Schultz, W0IJR. SGL: Mark Baker, KG0PA. TC: Bob Armstrong, AE0B. BM: Jerry Cassidy, N0MYY. Rocky Mountain Division Asst. Director (and former Director) Marshall Quiat, AG0X, has resigned his position citing health reasons. Shortly after receiving Marshall's resignation, the ARRL Board of Directors named him an honorary Vice President of the League. An honor well deserved, to be sure. Those of us residing in the Rocky Mountain division, and especially those of us here in Colorado have been the primary beneficiaries of Marshall's two decades of service to Amateur Radio, although as an ARRL director, Marshall has had an influence on ARRL policies and direction, benefiting hams nationwide. His tireless efforts supporting hams in need of legal advice is well known and without peer in our Section. When you run into Marshall at swapfests and other functions in the coming months, congratulate him on his League appointment, and thank him for his many years of service. Swapfests at Jeffco (Denver Radio Club) and the always popular Campfest (Mountain Amateur Radio Club) both took place on Aug. 20th and a few people actually attended BOTH!! Those are some really dedicated swappers. The DRC Swap included an ARRL forum hosted by RM Div Director Walt Stinson, W0CP. These forums are a great time to share your views with your elected officials and all should avail themselves of this opportunity. Any items for the column? Please e-mail them to me: **n0wpa@arrl.net** 73, de N0WPA. NTS traffic: AD0A 157, K0TER 64, N0UOD 58, KI0RP 58. CAWN: W0WPD 931, K0HBZ 561, W0GGP 505, N0FCR 468, K4ARM 404, W0LVI 389, W0NCD 335, WB0VET 266, KI0ND 239, N0NMP 217, N0DKK 114, AD0A 88, K0TER 55, N0UOD 35, KI0RP 30. CAWN: W0WPD 637, W0LVI 504, W0GGP 460, N0JUS 447, W0NCD 443, K0HBZ 436, K4ARM 371, WB0VET 316, N0NMP 299, N0FCR 222, KI0ND 196, WD0CKP 158, AA0ZR 121.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS & N5ART. SEC: K6YEJ. STM: N7IOM. NMs: WA5UNO & W5UWY. TC: W8GY. ACC: N5ART. New Mexico Roadrunner Net handled 125 msgs with 1199 checkins. New Mexico Breakfast Club handled 287 msgs with 1085 checkins. Yucca Net handled 24 msgs with 660 checkins. Caravan Club Net handled 13 msgs with 57 checkins. SCAT Net handled 2 msgs with 602 checkins. Four Corners Net handled 20 msgs with 432 checkins. GARS Net handled 10 msgs with 33 checkins. Rusty's Net handled 78 msgs with 783 checkins. Valencia County Net, handled 10 msgs with 47 checkins. Deming ARC Net handled 11 msgs with 70 checkins. Our NM State ARRL Convention August 26-27th went extremely well, and it was a real pleasure to have Bill Cross, W3TN, of the FCC, Walt Stinson, W0CP, our ARRL Division Director, and Rosalie White, K1STO, ARRL Field & Educational Services Manager, as our special guests. The convention was certainly a success and our special thanks to KM5EH, and his staff, for their fine job. Thanks also to our ARES SAR Crew for a very long, but successful, Rescue Mission from the 10,000 foot shear cliffs of the Sandia Mountains, during the convention. Alamogordo Hamfest and Banquet on August 5th. Special thanks to all their staff for such a nice event. The International Hamfiesta is scheduled for Oct. 28-29th. See "hamfiesta.org." The Socorro Hamfest is scheduled for Nov. 4th. So sorry to report the passing of KC7EN. Best 73, W5PDY.

UTAH: SM, Mel Parkes, AC7CP—I would like to wish everyone a Happy Thanksgiving, and hope your upcoming holidays are very eventful. I really enjoyed my visit to the Dixie Amateur Radio Club in St George last month. It was a great opportunity for me to meet many of our hams in the southern part of Utah. I would also like to say thanks to everyone throughout the state who participated in Jamboree On the Air this year! Your efforts are a great way to introduce young people to Amateur Radio. This time of the year is when most of our clubs begin their annual elections for officer for the next calendar year, please give some serious thought about how you can best serve your local club or Amateur Radio group. Start making plans to attend the Utah VHF society meet in February, and don't forget the Utah Hamfest . 73 de N5UVP.

WYOMING: SM Bob Williams, N7LKH—The Wyoming Section currently is placing special emphasis on expanding and refining the Section Emergency organization. The initial objectives are to have an EC in each county and to encourage emergency support people to be members of both ARES and RACES. There have been objections by some to membership in each of these emergency organizations, and I have yet to understand why. I would appreciate hearing from anyone what the objections are because I would like to fix the problems whatever they are. In addition, we shall attempt to identify the relationship between the emergency communications volunteers from the Section Amateur Radio community and the County Emergency Management Coordinators appointed by the Wyoming Emergency Management Agency. At present it seems to be based on the individual personalities of the EMC and the EC. A series of meetings is planned over the rest of this year to work these things. The principals will generally be the Section SM, ASM, SEC, RACES Coordinator and whoever else wishes to take part.

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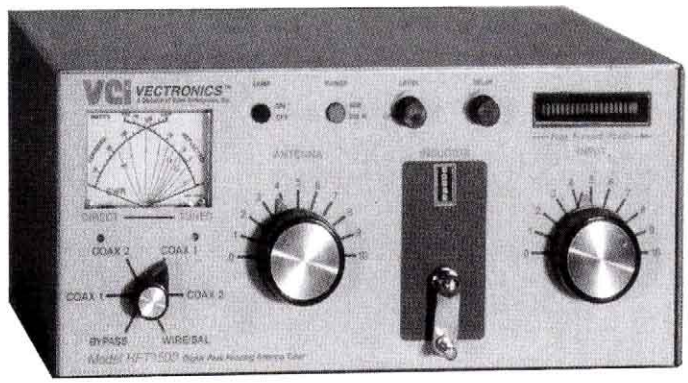

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SOUTHEASTERN DIVISION

ALABAMA: SM, Bill Cleveland, KR4TZ—ASMs: W4XI WB4GM KB4KOY. SEC: KC4PZA. STM: K4JSJ. BM: KA4ZXL. OOC: WB4GM. SGL: KU4PY. ACC: KV4CX. TC: W4OZK. PIC: KA4MGE. The Montgomery ARC will have its Hamfest on Saturday November 11, 2000, at the Montgomery Coliseum. Doors will open to the public at 9:00 AM. Talk-in is available from W4AP on the 146.84(-) repeater. Admission is $5.00 per adult. CAVEC Amateur Radio License exams start at 8:00 AM. For more information, please contact Dennis Rumbley, KS4UO (chairman) by phone at 334-409-9971, or by e-mail at ks4uo@arrl.net. Don't forget November Sweepstakes is this month. The CW Sweepstakes is in the first full weekend of November (Nov 4-6), and the Phone Sweepstakes is on the third full weekend in November (Nov 18-20.) For more detailed information look in the October *QST* on page 102 or visit the November Sweepstakes Website at http://www.arrl.org/contests. Before I end this report, since Thanksgiving is at the end of the month, I would like to thank everybody for promoting Amateur Radio and helping me with my section duties. I would like to thank my Section Staff: KC4PZA, K4JSJ, WB4GM, KU4PY, KV4CX, W4OZK, KA4MGE, KA4ZXL, W4XI, and KB4KOY. I would also like to thank some notable hams in the Section that contribute a lot to our service: WA4GQS, KC4RNF, AC4CS, AF4HE, and KE4YZK. Let's not forget the real important people: all the active hams in the Alabama Section! And finally, I would like to thank my family and the families of my staff for your support while we try our best to contribute to the Alabama Section. God bless & 73, Bill Cleveland, KR4TZ.

GEORGIA: SM: Sandy Donahue, W4RU—ASM/South Ga: Marshall Thigpen, W4IS. ASM/Legal: Jim Altman, W4UCK. SEC: Lowry Rouse, KM4Z. STM: Jim Hanna, AF4NS. SGL: Charles Griffin, WB4UVW. BM: Eddie Kosobucki, K4JNL, ACC: Susan Swiderski, AF4FO, OOC: Mike Swiderski, K4HBI. TC: Fred Runkle, K4KAZ. PIC: Matt Cook, KG4CAA. It is November, a month that has two fine events: Thanksgiving and the Lawrenceville hamfest sponsored by the Alford ARC at the Gwinnett County Fairgrounds, Nov 4-5. This has turned into Georgia's largest and most influential ham show and shouldn't be missed. All the manufacturers will have exhibits as well as several dealers. A huge flea market highlights the hamfest as well as forums for the ARRL, ARES, NTS and others. Also FCC enforcement guru Riley Hollingsworth, K4ZDH, will make an encore appearance answering your questions at a special forum on Saturday. Randy Bassett, KR4NQ, and his outstanding committee of Alford club volunteers are to be commended for all the hard work that goes into producing such an excellent ham radio event. Stop by the ARRL booth and say hello to W4RH and myself while you are there. On Labor Day weekend, W4NZJ and myself stopped by the West GA ARS picnic near Carrollton and thoroughly enjoyed ourselves. This club is mourning the passing of member Tony Arrington, KD4UIP. Our condolences to his family. New officers of the Bill Gremillion ARC (Newnan): Pres K4QFF, V Pres. N4HIC, Sec N9VRO, Treas K4WPM. The ARC of Savannah lost a member, Curt Spomer, WB4FMK, is a silent key. Likewise, the Ga Section sends our regrets to his family. Which brings up a reminder as we enter the holiday period. Take it easy on the Georgia roads this Thanksgiving. We want to see you again next year. 73 Sandy. Tfc (Aug): AF4NS 100, W4WXA 93, WB4GGS 93,WU4C 87, W4AET 51, K4WKT 40, AF4PX 17, K4JNL 10.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM, Capital District: K4VRT. ASM-East Central District, ASM-Florida Crown District: N4UF. ASM-West Central District: NR2F. ASM-E Panhandle District: WA4NDA. ASM-W Panhandle District: KO4TT. ASM-Suwannee District: W2DWR, ACC: WA4B. BM: N4GMU. OOC: W4QV. PIC: KF4HFC. SEC: WA4NDA. SGL: KC4N. STM: WX4H. TC: KO4TT. Anyone interested in an ARRL appointment should contact the staff person in charge of the respective program, ie, the SEC is the one to contact for an OES. Each one is listed above as to what program they represent. In this Section, they are delegated to authority to appoint or cancel the appointments under their jurisdiction. However, the SEC is authorized to appoint DEC and EC, and the STM is authorize to appoint the NM. The PIC appoints the PIO. NOFARS member Tom Castiglia, NO4A, was named recipient of the Florida Community College at Jacksonville award for Community Service for 2000. Congrats, Tom. City of Jax and JEA are installing an integrated radio system that will serve all city agencies including fire, police and JEA. Mike Key, N4GIH, is supervising construction of the system. National Weather Service office has a call sign, WX4JAX, now assigned for the Amateur Radio station. Although hurricane season so far has been a non-event for the Northern Florida Section, we may not be so fortunate between now and the end of the season. Whenever the State Emergency Operations Center in Tallahassee is activated on a level needing Amateur Radio, the Northern Florida Emergency Net (NFEN) will operate on 3950. Advance notices prior to the hurricane arriving will be given on the 3950 frequency on the NFAN net each day at 0800 Central and 0900 Eastern Time. Anyone desiring to become a Net Control Operator is urged to notify the Net Mangers K4VRT and K4JTD. We should have a Net Control Operator and an Alternate for each Net. The Net Managers themselves need some relief, so how about it? Let them know you will be available. 73 de Rudy. Tfc: KF4NFP 293, KE4DNO 240, K1JPG 188, AF4PU 135, NR2F 110, KE4PRB 107, K4DMH 60, AF4GF 48, K4JTD 36, AD4DO 36, KE4EZQ 35, AB4PG 32, WB2FGL 28, KB4DXN 28, N9MN 25, KM4WC 24, N4JAQ 22, W8IM 16, KG4EZQ 16, W4KIX 13, KJ4HS 9, WX4J 8, WB9GIU 6, KG4ELJ 3, WB2IMO 2, WA4EYU 2.

PUERTO RICO: SM, Víctor Madera, KP4PQ— El programa de exámenes del ARRL/VEC se expande a toda la isla. Habrá sesiones de exámenes en Arecibo, Aguadilla, San German, Ponce, Guayama, Fajardo y Barranquitas gracias a la "Inter" que nos ha cedido sus facilidades. Los exámenes en la UPR continúan como siempre. La actividad del "Lighthouse Weekend" que auspició el PRARL fue exitosa. Se lograron 2557 QSOs y 118 países. Felicitamos a WP3A, KP4KOE, KP4RAT, KP4EOP, KP4DX, WP4LNY, NP3IR y WP4LJG quienes operaron desde la isla de Caja de Muertos. Enviarán QSLs a todos los que la soliciten. Visitamos a Adjuntas a una actividad del grupo Radioaficionados en Acción. El modo PSK31 está tomando auge entre los radioaficionados del oeste. La actividad dedicada a Samuel Morse en Arroyo sigue progresando. Si le interesa operar desde allí en CW comuníquese con Julio, WP4LNY. Esta actividad la auspicia el PRARL, la FRA y el Municipio de Arroyo. Envíen información sobre sus intereses vía email a kp4pq@arrl.org.

SOUTHERN FLORIDA: SM, Phyllisan West, KA4FZI - SEC: W4SS. STM: KJ4N. ACC: WA4AW. PIC: W4STB. TC: KI4T. OOC: K4GP. BM: KC4ZHF. SGL: KC4N. DEC/ASM: N4LEM, WB9SHT, AA4BN, KD4GR, WB2WPA. For expanded Section News, see www.sflarrl.org or request e-mail. It is with sincere regret that I must accept the resignation of Joel Kandel, KI4T, as Technical Coordinator for our section. Joel was SFL TC for the past 17 years, working hard for our section in the area of antenna zoning ordinances as well as the toughest technical problems. Joel's business activities are very demanding. Travel outside the country as well as around the state are limiting his time and energy for ham radio activity. The section appreciates those 17 years of service, Joel. You have more that earned a break. We wish you well in your business endeavors and good health to enjoy your work and ham radio for many more years! The Indian River ARC put the Cape Canaveral Lighthouse "on-the-air" for the first time ever during the "International Lighthouses On-The-Air" special event. Using the SE call sign of N4L, they were considered rare DX because it was one of the few lighthouses in FL never yet on the air. Club members operated from COMM ONE and the club trailer. The Wellington ARC presented a timely program on protecting equipment from electrical surges and transients with MOV's, gas discharge tubes, LC Circuits, and zener type semi-conductors. FREE MOVs and installation instructions were given to attendees! A post-blow surge protector clinic was held to determine the cause of failure in items brought in from home. Palm Beach Co ARES has incorporated PBC ARES as a 501(C)(3). Not-For-Profit corporation with a 9-member Board of directors and several committees. The Not-For-Profit status is already opening many doors, including donations of meeting/training rooms. Manny and Dave will be presenting the benefits, pitfalls, and process of incorporation at the Melbourne Section Workshop. In other emergency activities: Chris, KD4DQY, reports that Vero Beach has a new G5RV antenna up at the EOC: Broward has an upcoming airport Certification Drill, which will include all ARES/RACES members: and Lee County has boosted emergency net check-in averages to 32. Recently, ARRL approved hamfests are: WPB Repeater Association in Palm Beach Gardens Oct. 21, and Port St. Lucie ARC on Nov 11. Best wishes for a successful event to both. Don't forget: New banners are available for use in the section by clubs and amateur groups for special events and hamfests. DECs and ASMs are: District 1, Brevard/Indian River/Osceola, N4LEM, Ray Kassis, DEC/ASM: District 2, Martin/Okeechobee/St Lucie, WB9SHT, Bruce Reid, DEC/ASM: District 3, Glades/Hendry/Palm Beach, AA4BN, Jim Sparks, DEC: District 4, Broward/Dade/Monroe(Keys), KD4GR, Jim Goldsberry, DEC/ASM: District 5, Collier/Lee/Monroe (Mainland), WB2WPA, Gary Arnold, DEC: Traffic Totals by KJ4N STM: WA9VND 626, KC4ZHF 350, KB4WBY 288, KA4FZI 231, KD4HGU 164, KD4GR 158, KE4IFD 125, K4VMC (club) 105, WB4PAM 88, KD4JMV 66, K4FQU 61, W4WDN 49, KT4XK 47, WB4CSQ 41, W8SZU 38, WA4EIC 32, KE4IDG 32, KG4CHW 21, KE4UOF 19, AA4BN 18, KE4WBI 17, W4WYR 15, K4OVC 9, K4ENA 2. 73, Phyllisan West, KA4FZI, SM SFL.

VIRGIN ISLANDS: SM, John Ellis, NP2B, St Croix— ASM: Drew, NP2E, St Thomas. ASM: Mal, NP2L, St John. SEC: Duane, NP2CY, St Thomas. PIC: Lou, KV4JC, St Croix. ACC: Debbie, NP2DJ, St Thomas. NM: Bob, VP2VI/W0DX, Tortola. VI section Website (http://www.viaccess.net/~jellis) Thursday September 8, a total of 15 people took exams on St Croix (a record) and 7 either upgraded or received new licenses. Continued interest in technical and help discussions on Caribbean Maritime Mobile Net, Sundays at 1130Z, on 7241 kHz. Bernie, WG3G, Gil, KP2U, and Carol AA2QH, providing folks using AirMail and WinLink 2000 with needed guidance. Lou, KV4JC, has new puppy - Curly (locally assigned call K9WAG). See Lou's Website (the one for the Caribbean Maritime Mobile Net) at http://www.viaccess.net/~KV4JC for info and pix of Curly. Contest season soon to be upon us, let's just get past those storms and get the antennas back up! Send section related e-mail to NP2B@atthehelm.com. St John repeater 146.63, St Thomas repeater 146.81 and St Croix machine on 147.25. Enjoy & 73, John NP2B.

WEST CENTRAL FLORIDA: SM, Dave Armbrust, AE4MR, ae4mr@arrl.org, http://www.wcfarrl.org— ASM: NA4AR. ASM-Web: N4PK. ASM-Legal: K4LAW. SEC: KD4E. TC: KT4WX. BM: KE4WU. STM: AB4XK. SGL: KC4N. ACC: AC4MK. PIC: AB2V. Please join me in welcoming Dr David Colburn, KD4E, as the new Section Emergency Coordinator. Allen Turck, KE4MPQ, has resigned as SEC due to other personal commitments. Be sure to check in to the WCF Section Net on 3.911 Sundays at 7:30 PM and the Informal Net MWF 9:00 PM on 3.911. August:

Net/NM	*QNI*	*QTC*	*Bulls*	*QND*	*Sess*
AIN/WA4ATF	66	3	4	97	3
Polk ARES/KE4VBA	122	0	5	144	6
SPARC/KF4FCW	436	32	0	818	31
Turtle/KT4TD	406	77	0	482	31
HCAN/KD4CQG	75	0	3	63	4
FMSN/KT4PM	282	35	0	417	31
TPTN/AD4IH	729	79	0	436	31
QFNS/KF4KSN	189	46	0	714	31
QFN/AB4XK	843	264	0	1073	62

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SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford Hauser, KD6XH—Summer vacation is over, and I have gone back to work. Yes, I finally found a job and can now afford Amateur Radio activities. Rick Paquette, W7RAP, has been appointed as an assistant section manager with the purpose of coordination of VE examinations through the state. I get many calls each month asking for the next scheduled VE testing and normally don't have the up-to-date information. Rick will be my single point of contact and will keep this data and be able to provide people with the necessary information. Please give him all the help he needs to do this important function. Rick can be reached at 520-794-0387. Ned Stearns, AA7A, has been approved for DXCC card checking. He is a member of the Central Arizona DX Association and will be available for card checking during major hamfest and other times as necessary. The Kingman hamfest was small but very nice and well done. Thanks to the Hualapai amateur radio club for a job well done. As of this date, the Old Pueblo Radio Club (OPRC) will still have their hamfest on 21 October 2000. Their president, George Lynch, KA1TY, was fatally injured in a skiing accident during the summer and was the primary planner for this event. I recently received a telephone call from a new operator asking the question of why repeaters have squelch tones (PL) listed and how can he modify his radio to be able to access these repeaters. I explained the concept of tone squelch and why these different tones were necessary. Then I helped him program the proper tone into his radio memory. The point of this is that we have many new operators that need assistance and help so they can enjoy the hobby. We need to be available to help these people as necessary. This will encourage them and also keep our hobby alive. 73, Clifford Hauser, KD6XH. ATEN 724 QNI, 14 QTC; 31 sess. Tfc: K7VVC 825, W7EP 14.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF — Please welcome our new ACC, Bill Leslie, WA6POK. Bill is also available at wa6pok@arrl.net for those of you who want to report club activities. If you are old fashioned, Bill also has one of those PHONES (626 579 1761). Joe Cira, KB6AXK, is now re-assigned as our STM. Joe Provenva, W6UPN, w6upn@arrl.net, is our OOC, and he is doing such a great job with his crew of OOs that only one or two have strayed out of the norm in the past month. Riley is writing to a few of our locals to be certain that they understand his rules. We also have a couple of unlicensed operators stirring up the troops. Some comments have been made about an all out Federal investigation for a multitude of violations. All FCC type violations should go to Joe, our OOC. Spud, K6KH, is in charge of planning our next Los Angeles Convention. Spud and his illustrious crew will be evaluating potential- future locations such as the "Fairplex" and other sights near the Burbank airport. Any and all worthwhile suggestions are welcomed. 73 de W6BF, Phineas.

SAN DIEGO: SM, Tuck Miller, NZ6T, 619-475-7333— Hi folks, and may I be one of the first to wish you a very happy Thanksgiving. Please sit back a bit, and reflect on all that we have that we are thankful for. Our families, our jobs, our friends, our hobbies. I want to thank all those who give tirelessly, day in, and day out for public service. On a sad note, Kazuo, WA6BCC, informed me that over the weekend of September 9 & 10, that he had a special Olympic event in Coronado. Some folks from the Filimars should up on Saturday, which we thank them for, however no one showed up to help out on Sunday. This is of course very disappointing. We keep telling folks how Amateur Radio can help and benefit the public, so when the time comes to shine, we need to do just that. I have always tried to be upbeat in this column, however there are times we have to tell it like it is. We need to keep involved in the public arena. Keep our service out there, where the public can see us. Show them that we have earned our right to use the bands that we do. I hope everyone had a great time at the Southwestern Division Convention in Scottsdale this past month. Next year's convention will be held in Riverside, and then right back here in San Diego. Seems as if everyone loves coming to San Diego. Tfc: KT6A 471, KD6YJB 164, KF6YVQ 18, WA6IIK 2 PSHR: KT6A 138 KO6BU 52 Until next month... Remember, Helping Others.....Always Worthwhile!! 73, Tuck, NZ6T.

SANTA BARBARA: SM, Robert Griffin, K6YR, (k6yr@arrl.org)—SEC: Jack Hunter, KD6HHG (kd6hhg@arrl.net). STM: Ed Shaw, KF6SHU. (ed@radshaw.com). SGL: Paul Lonnquist, NS6V (paul@dock.net). ACC: Michael Atmore, KE6DKU (jatmore@telis.org). OOC: Howard Coleman, W6HQA (w6hqa@arrl.net). PIC: Jeff Reinhardt, AA6JR (jreinh@ix.netcom.com). TC: Warren Glenn, KM6RZ, (wglennrz@ix.netcom.com). ASM-Ventura: Don Milbury, W6YN (w6yn@arrl.net). ASM- Internet, Jack Bankson, AD6AD (ad6ad@arrl.net). DECs: Santa Barb-Dave Lamb, WA6BRW (wb6brw@arrl.net). SLO-Bill Peirce, KE6FKS (ke6fks@arrl.net) & Ven-Dave Gilmore, AA6VH (aa6vh@arrl.net). Ed Shaw, KF6SHU, in San Luis Obispo joins the ranks of the Amateur Auxiliary. Congrats on your recent OO appointment! The new ARRL W6 In-coming QSL Bureau Manager is Steve, N6QEK (neqek@arrl.net). Join the Section Reflector: Send a blank e-mail to: arrlsb-subscribe@egroups.com and be part of the Info Hotline. Receive instant updates on Section news-FREE! SB Sec Web: www.qsl.net/arrlsb/. Join in our Section NTS traffic nets: SCN slow speed NTS Net, M-F, at 1915 local on 3598 kHz & SCN/SB at 2100 local on 147.000+(131.8), 224.90- (131.8) & 449.300-(131.8). PSHR/Tfc: K6YR 168/585, KF6OIF 123/78, KE6MIW 99/32, KC6NBI 111/2 & AD6LW 118/-. Rob, K6YR.

WEST GULF DIVISION

NORTH TEXAS: SM, Don Mathis, KB5YAM—STM: KC5OZT. BM: KC5OZT. SEC: K5MWC. SGL: N5GAR. OOC: WB5UDA.ACC: WN5PFI. ASMs: KX5K, K5RE, KK5QA, KK5NA, N5JZ, KB5LWZ, KD5HIS, AD5X, W5GPO. Visit the section Web page at (http://www.lsic.net/net/ntexas.html) for the most current information. Jerry Combest, N5JL, now has the newsletter up and going. We are working on the mail list. There are about 50 or so bad mail addresses in the list that need to be fixed/purged. Let us know if you had wanted to be on the list and are not receiving the newsletter. Had a couple of real good demonstrations this last month with ATV. I have found that ATV is a real attention getter with younger potential Hams. I am seeing some good activities in process and being planned in the section for working with school agers. I would like to salute the Plano club, among others, for their planned school activities. Not only is this area important to our hobby, it is exciting seeing all of that energy and new ideas being brought into the hobby. Had a real good meeting at the Gainsville Hamfest. Thanks, Coy. Tfc: N5JZ 684, K5NHJ 597, KC5OZT 506, KB5WEE 324, W5AYX 123, WA5I 137, KC5VLW 117, N5GG 54, KB5TCH 54, KB5YAM 8, AC5UZ 4, N8QVT 1.

OKLAHOMA: SM, Charlie Calhoun, K5TTT—ASMs: N6CL, W6CL. SEC: KA7GLA. ACC: KB5BOB. PIC: WA9AFM. OOC: WA9VMY. SGL: W5NZS. STM: K5KXL. I want to share a couple of stories with you this month. First, I would encourage you all to become an elmer. I had the distinct pleasure to help a new ham, program his new HT. Howard McCloud, KC5RGC, spent many hours reading the question pool into a tape recorder and preparing his student for the exam. By coincidence, I was at the testing session for my extra upgrade, when his student Mikey Reiser, KD5LPE, a 12 year old blind ham, passed his exam. It was a wonderful gift that Mikey gave Mr. McCloud and myself in return for our assistance. I know Mikey will have great pleasure from his experiences with Amateur Radio. Congratulations Mikey! My second story is one of commendation for public service. On Sep 13, 18:00CDT, a vehicle was stolen in Tulsa with two infants still in the car. Hams activated almost immediately to assist the police department in locating the vehicle. Hams from all over the area assisted in the search. Every bit of information we could get from the police department encouraged us to continue the search. We set up grids and worked both stationary and moving positions until we had canvassed the entire city and surrounding areas. The search continued past 4:00 AM when there were no more leads from the police and we had covered everything we could think of. The children were not found that night. Thankfully, they were discovered the following morning, unharmed, on a rural road about 90 miles NE of Tulsa. Tfc: N5IKN 658, WA5OUV 604, KK5GY 575, KF5A 411, WB5NKC 148, K5KXL 141, WA5IMO 122, KM5VA 99, KE5JE 93, KI5LQ 75, WB5NKD 75, W5REC 25, N5FM 2.

SOUTH TEXAS: Ray Taylor, N5NAV—ASMs: NR5ED, N5WSW, W5GKH, K5DG, N5LYG, WA5UZB, KK5CA, K5EJL, W5ZX, WA5TUM, KB5AWM, WA5JYK, K5PFE, K5PNV, and K5SBU. STM: W5GKH. SEC: W5ZX. ACC: N5WSW. TC: KJ5YN. BM: W5KLV. OOC: W5JAM. SGL: K5PNV. November looks promising for a feast. On August 14 at 2 PM we activated ARES for Tropical Storm Beryl as it headed for the lower Texas coast. We were honored to have Jim Haynie, W5JBP, President of ARRL, as NCS from 6 AM to 7:41 AM, August 16, when we secured the net after all the EOCs closed. Beryl went inland in Mexico just below the tip of Texas causing some flooding and heavy rains in the Texas Rio Grande Valley. We then had several forest fires in South Texas. The fire in Newton County used the services of 12 hams to furnish the Red Cross communications from August 30 to September 8. We used 7285 for communications into Orange Red Cross Office, however most of the communications was handled on 2 meters in the field. K5SUB, DEC for the area, was in charge. The grocery stores and cafes in the area furnished the food (anything you wanted) while HEB Food Chain furnished bottle water. The Red Cross then delivered it to the field. I would like to thank all those volunteers who worked so hard for a week, the firemen, Red Cross workers, and the ham radio operators. They deserve the highest of honors. KF5TC became a SK at 1 AM on August 15. W5CTZ became a SK at 10 PM August 23. Both were very active on the traffic nets. You should be ready for the big feast on Thanksgiving Day. If you know someone who is not as fortunate as you, share a Thanksgiving dinner with them. Have a great November. Tfc: W5SEG 839, KA5KLU 449, W5KLV 223, W5TUK 185, W5GKH 118, W5ZX 73, N5NAV 38, N5OUJ 33, KØYNW 22, W5OYY 10.

WEST TEXAS: SM, Charlie Royall, WB5T, 915-944-0469, WB5T@arrl.org—ASMs: Cley, K5TRW. Ron, KB5HGM. Jerome, K5IS. Fred, W6VPI. Sandy, W5MVJ. SEC: Alex, N5LRH. OOC: John, KO5D. OBM: Frank, N5WT. New Appointments: EC, Brewster Co, District 5, Dave Cockrum, N5DO. EC, El Paso Co, District 5, Lewis Maxwell, KB5HPT. Traffic report, Region 5, Cycle 1 and 2 for Aug. In 62 sessions, QTC 637, QTR 1269 minutes @ average rate of .502 WTX represented 21 percent by N5XB. Proposal to be considered by amateurs in Districts 4 and 5: change the boundary between these two districts by placing Pecos Co and Terrell Co in District 5. Please send your comments to the WTX Section Manager at e-mail listed above, or by postal mail to 2063 Putter Dr, San Angelo TX 76904. See you at the Odessa Hamfest 4-5 Nov. The holiday season is fast approaching. Hope everyone enjoys a fun-filled Thanksgiving with family and friends. Until next time, 73 de Charlie, WB5T.

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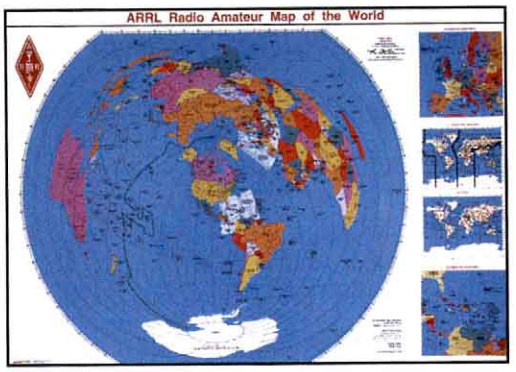

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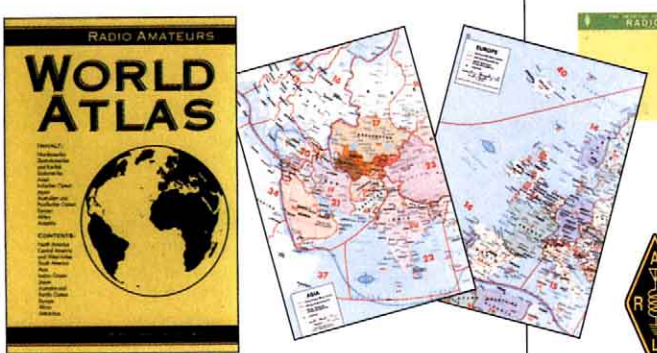

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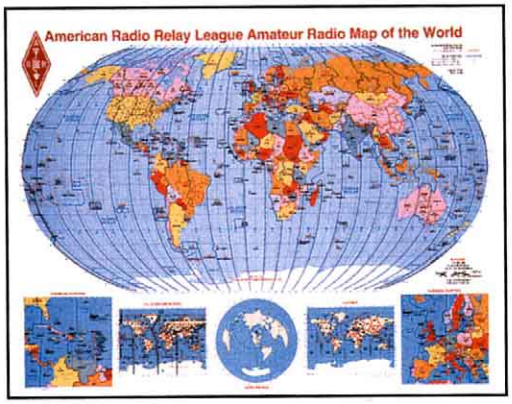

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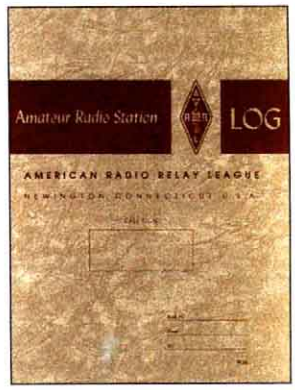

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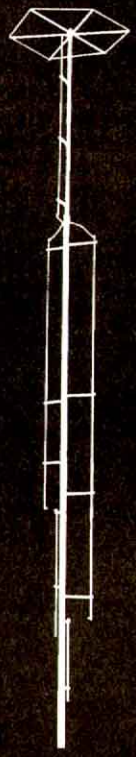

Voyager DX

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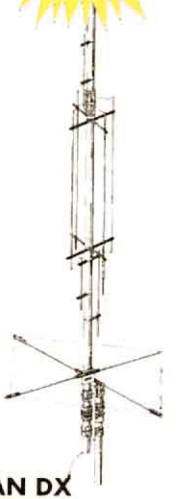

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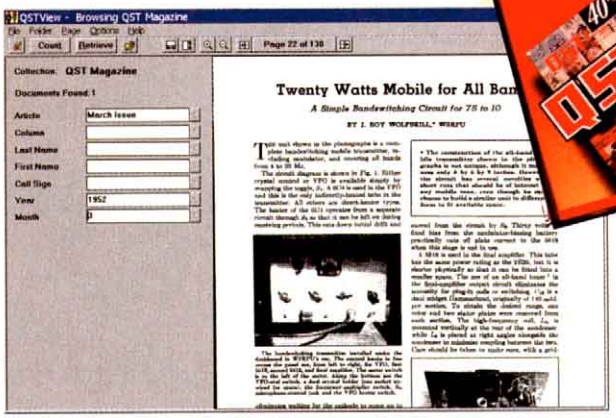

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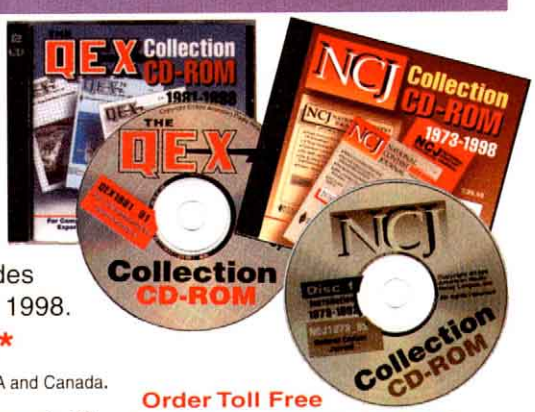

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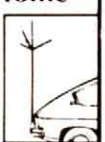

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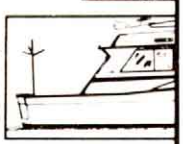

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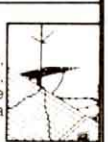

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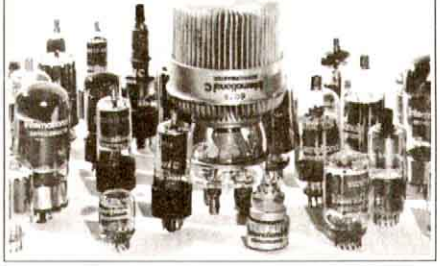

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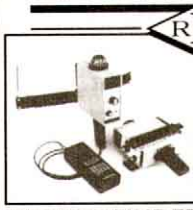

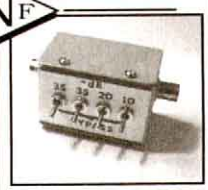

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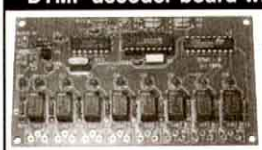

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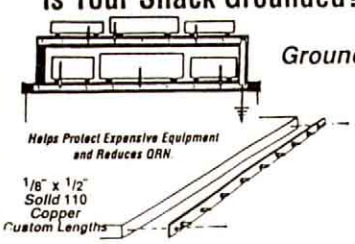

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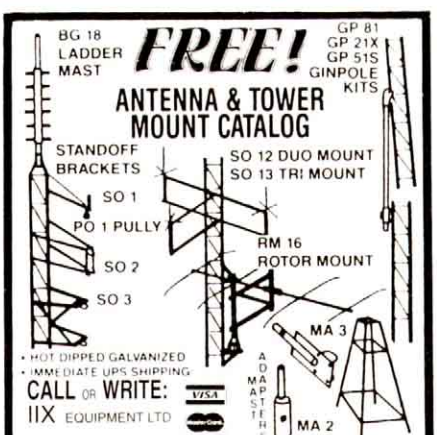

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1. Publication Title	2. Publication Number	3. Filing Date
QST	0 0 3 3 - 4 8 1 2	September 27, 2000
4. Issue Frequency	5. Number of Issues Published Annually	6. Annual Subscription Price
Monthly	12	$34.00

7. Complete Mailing Address of Known Office of Publication *(Not printer) (Street, city, county, state, and ZIP+4)*: 225 Main St., Newington, Hartford County, CT 06111-1494 — Contact Person: Debra Jahnke — Telephone: (860) 594-0297

8. Complete Mailing Address of Headquarters or General Business Office of Publisher *(Not printer)*: 225 Main St., Newington, Hartford County, CT 06111-1494

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor *(Do not leave blank)*

Publisher *(Name and complete mailing address)*: David Sumner, 225 Main St., Newington, CT 06111-1494

Editor *(Name and complete mailing address)*: Mark J. Wilson, 225 Main St., Newington, CT 06111-1494

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13. Publication Title: QST	14. Issue Date for Circulation Data Below: Oct-99 - Sep 00	Oct 00
15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies *(Net press run)*	174,430	169,422
b. Paid and/or Requested Circulation (1) Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. *(Include advertiser's proof and exchange copies)*	131,211	128,401
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16. Publication of Statement of Ownership
☒ Publication required. Will be printed in the November 2000 issue of this publication. ☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner: Mark J Wilson Editor — Date: September 27, 2000

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

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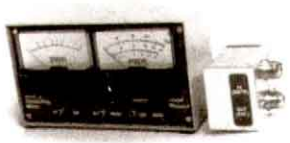

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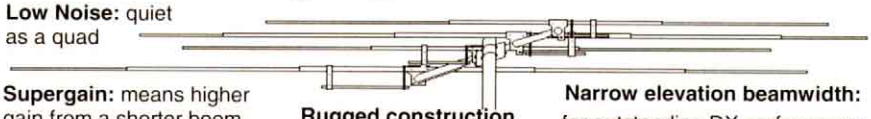

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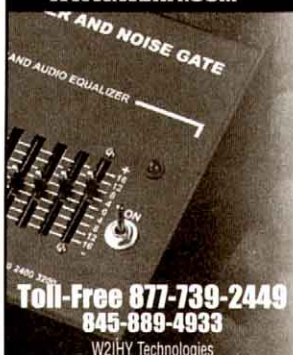

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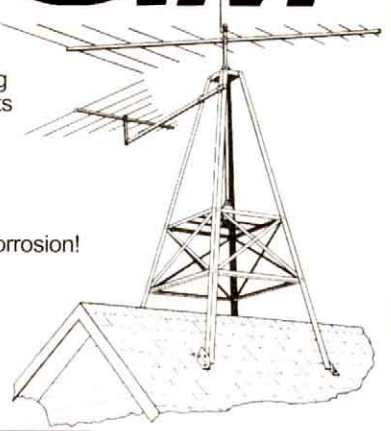

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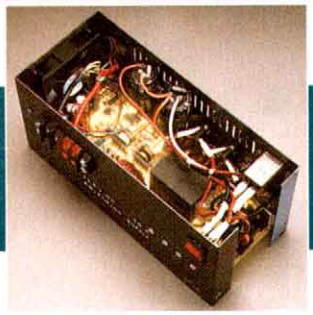

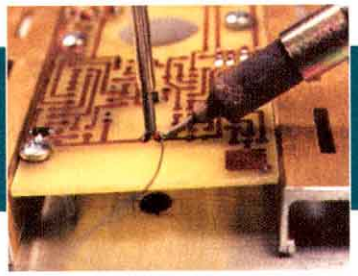

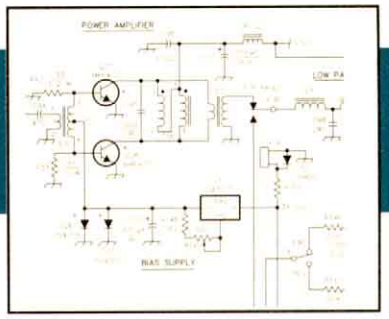

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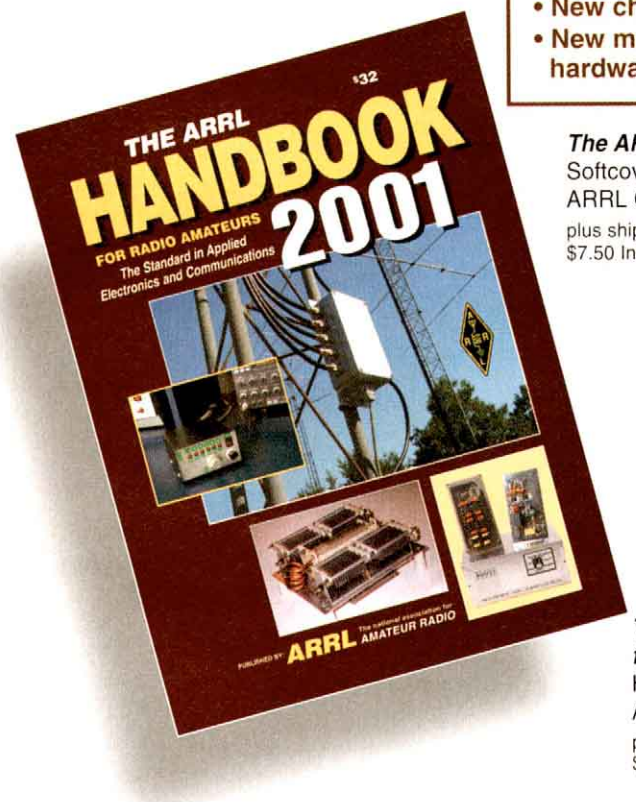

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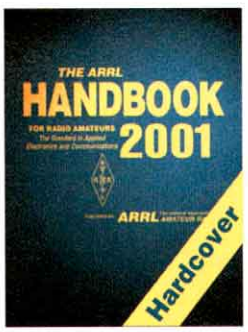

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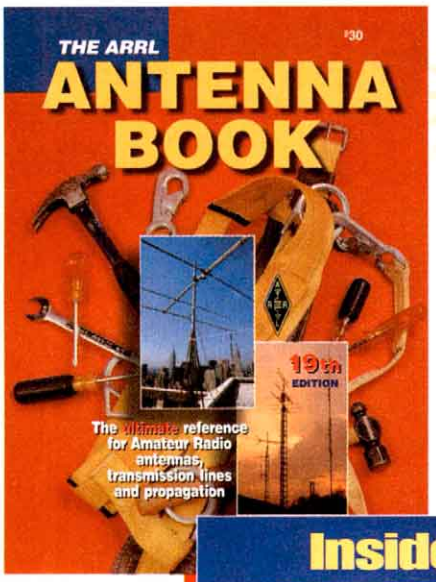

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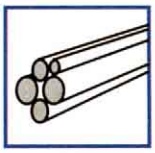
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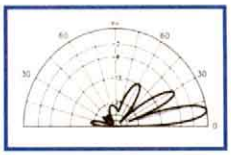
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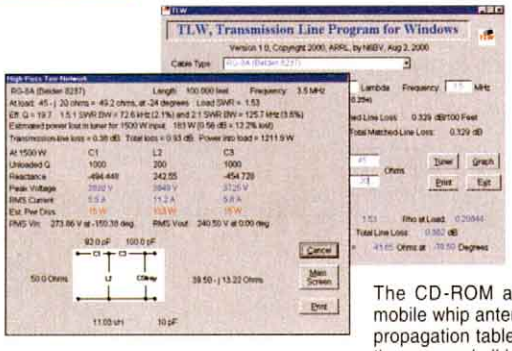

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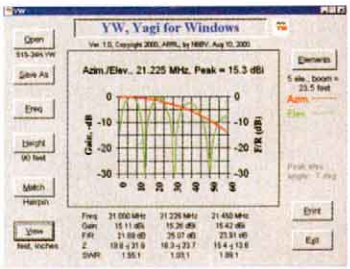
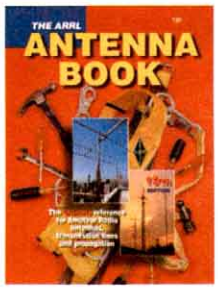
Analyzes Yagis and displays front-to-rear ratio (or front-to-back) and SWR over a range of frequencies you specify.



The CD-ROM also includes design and analysis software for Yagis, antenna tuners, mobile whip antennas, gamma matches, and log periodic dipole arrays. In addition, summary propagation tables are included for 155 different locations around the world for all months of the year and all levels of solar activity. **Use this data to tune in!**



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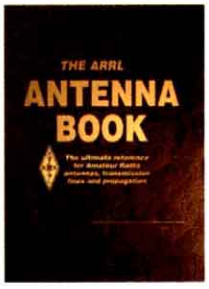

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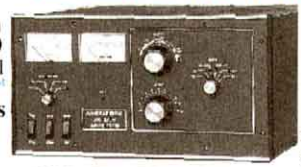

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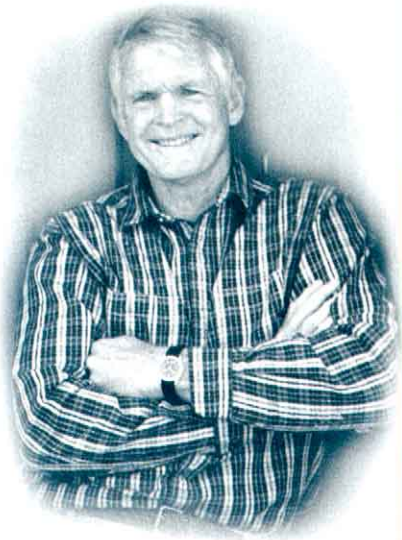

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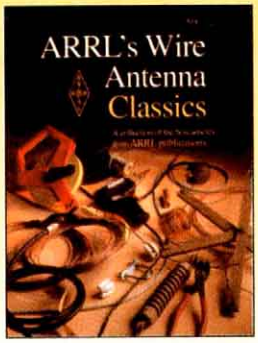

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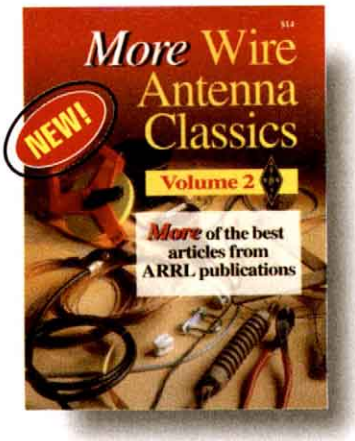

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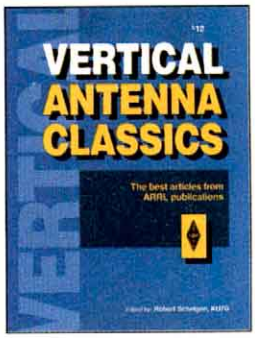

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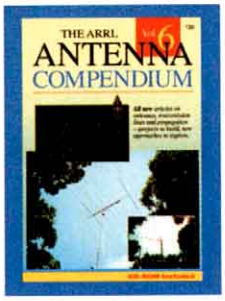

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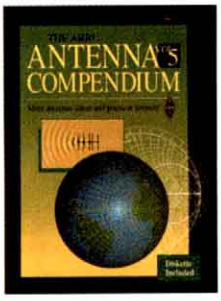

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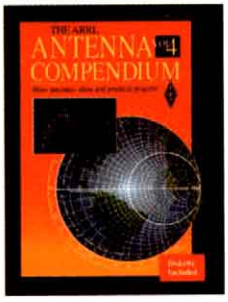

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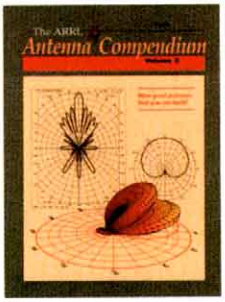

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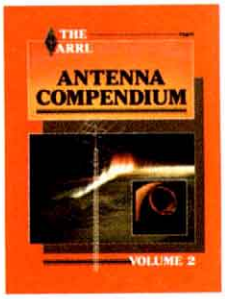

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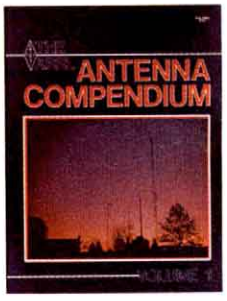

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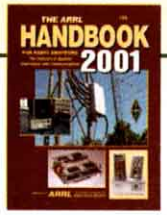

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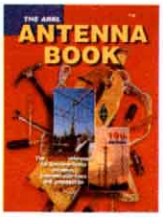

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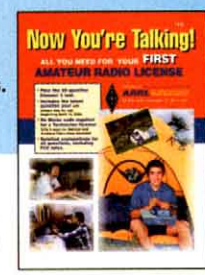

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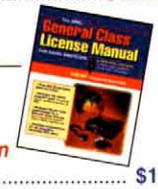

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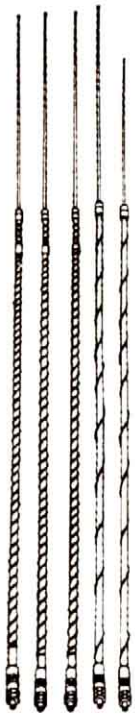

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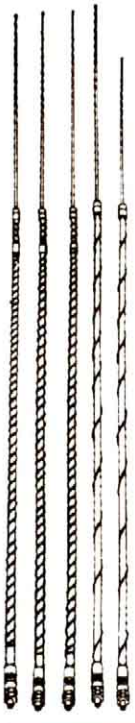

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Great 2m/70cm dual band mobile, 45/35 Watts, removable front panel, and more!

FT-100D ..... New!
The Yaesu FT-100D is an ultra-compact all mode transceiver for HF/6m/2m/70cm operation. The radio features a removable control panel, digital signal processing, CW memory keyer, built-in RS-232 interface, tone encode, 200 memory channels, VOX, and more. Supplied with a DTMF hand mic, DC power cord and mounting bracket.

FT-840 ..... New Lower Price!
The Yaesu FT-840 is an all mode HF transceiver with 100 watt output, optional FM unit.

IC-W32A ..... New Lower Price!
IC-Q7A ..... Icom Special!
IC-T7H ..... Icom Special!
IC-T81A ..... New QuadBand HT!
IC-T2H ..... Amazing Low Price!
IC-R3 . Video RX, Coming Soon!

IC-207H ..... Great Low Price!
The Icom IC-207H is a 2m/70cm dual band mobile transceiver featuring CTCSS tone encode/decode, 182 memory channels, removable front control panel, and more. Supplied with a back-lit DTMF hand mic, mounting bracket, and a DC power cord.

IC-PCR1000 ..... Icom Special!
IC-PCR100 ..... Icom Special!
IC-R8500 ..... In Stock!
IC-R75 ..... New, In Stock!
IC-R2 ..... In Stock!
IC-R10 ..... Icom Special!

G-2800SDX $1069
Heavy duty antenna rotator handles 34 sq. ft. of antenna load, and features 450° rotation, preset and variable speed.

G-1000DXA $479
G-800SA/DXA $319/399
G-450A $239
G-5500 ..... $589
G-550 ..... $289

VX-5R ..... Now In Stock!
Tiny 6m/2m/70cm triband HT, with CTCSS tone encode/decode/scan, high capacity Lithium-Ion battery pack, extended RX with AM/FM and FW Wide modes, and more.

FT-50RD ..... Yaesu Special!
VX-1R ..... Yaesu Special!

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"Brick-Wall" Selectivity

Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

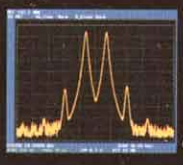
IDBT: A Breakthrough in Selectivity!

II. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.



Class A 75 W PEP IMD

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP , a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd- order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

V. Multi-Function Shuttle Jog Tuning/ Control Ring

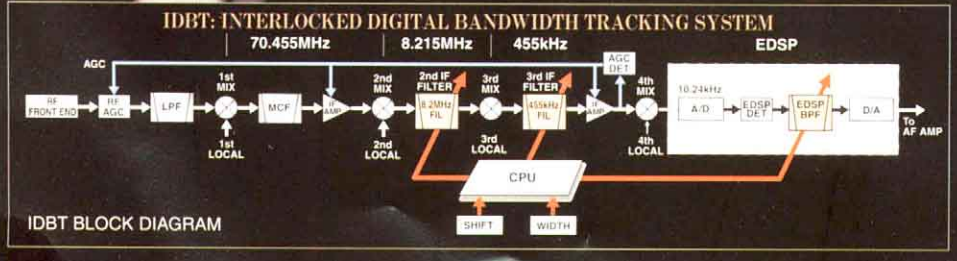
The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!

DC 30 V / 13.8 V Power Supply FP-29

Photo shows optional MD-100A8X Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP



IDBT BLOCK DIAGRAM

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There's a Kenwood in your Future!

World's 1st HF Backlit Front Key Panel

...The All New Kenwood All Band/All Mode Transceiver **Coming Soon!**

Never before has an Amateur radio product provided such high performance and versatility. The new Kenwood transceiver is in a class by itself and will no doubt become the most desired All band/All mode Amateur transceiver ever produced. With Amsat's Phase 3D soon on the horizon, Amateurs everywhere will be looking to the sky to experiment with this exciting breakthrough in our hobby. Kenwood's new transceiver offers full functions on all HF bands as well as 6 meters. This is just the right equipment you'll need for making quick contacts. You'll discover it's dependable performance combined with easy operation will provide Ham operators a level of enjoyment impossible until now. VHF/UHF 144/440/1200 MHz operation is also available on the main band. Additionally, the sub-band offers 144/440 MHz operations for satellite TX/RX.

The All band/All mode transceiver also offers the following features that you could be missing on your current All-band/All mode transceiver: True IF-Stage DPS with 100% digital filtering; built-in auto antenna tuner; the world's first HF backlit front key panel; 5 antenna ports; transverter ready; 9-pin db connector for easy PC interface; built-in TNC; DX packet cluster monitoring with direct go-to function for HF and 6 meter openings; CW auto-tune...to name just a few.

Not only does the new Kenwood transceiver provide the most features and performance of any All band/All mode transceiver but it delivers exciting versatility by offering a traditional station radio or mobile head/no controls (black box) unit. It also can be operated by the ARCP computer control program to take control of most functions direct from your PC.

KENWOOD
COMMUNICATIONS CORPORATION

AMATEUR RADIO PRODUCTS GROUP
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P.O. Box 22745, Long Beach, CA 90801-5745, U.S.A.
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