Official Journal of
ARRL
The national association for AMATEUR RADIO

QST

devoted entirely to
AMATEUR RADIO

November 1999

QST reviews:

- **Patcomm PC-9000 HF/6-meter transceiver**
- **High Sierra HS-1500 mobile antenna**

Packet Meteor Scatter

Wrapping up the DSP-10

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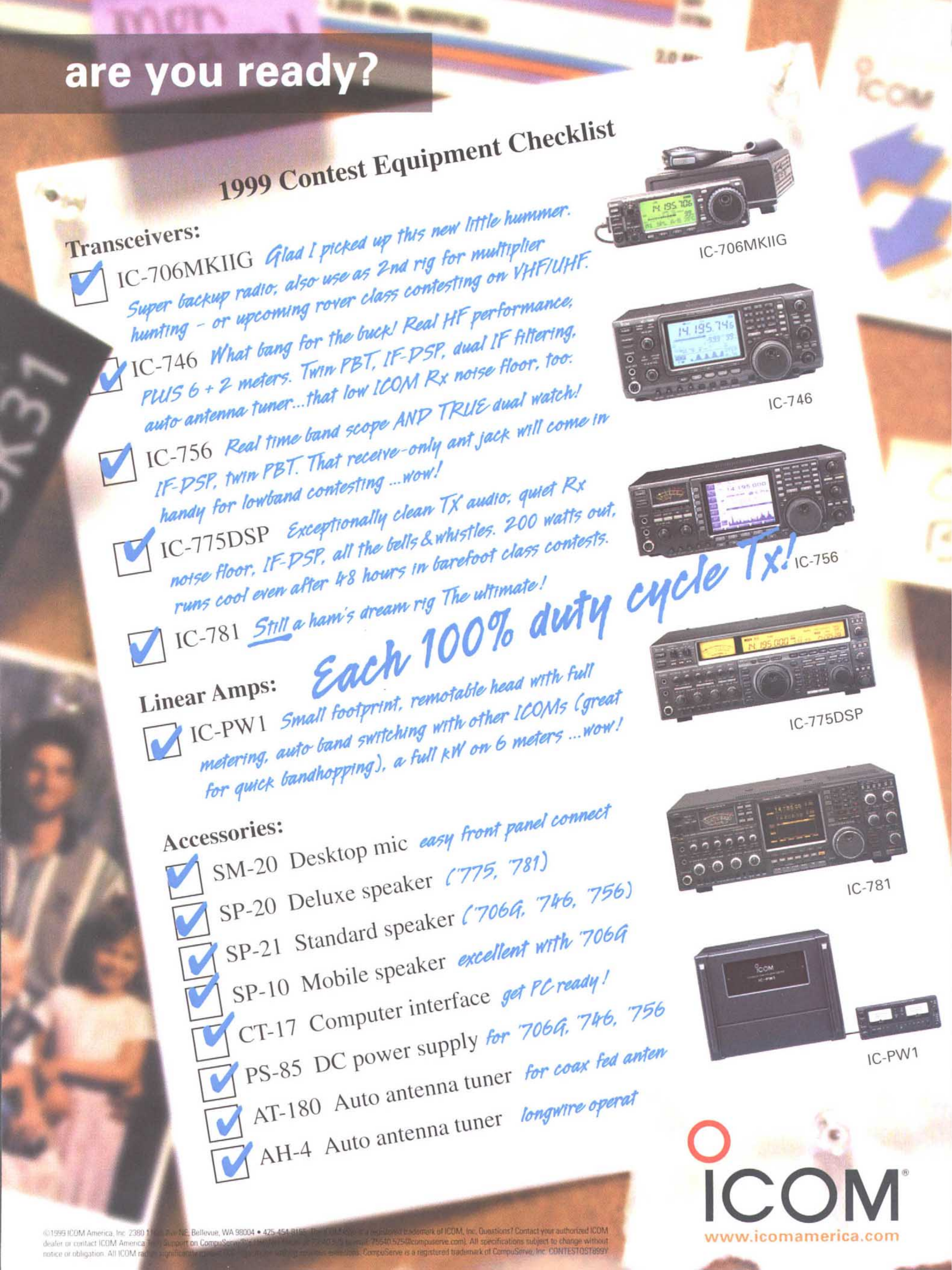
are you ready?
1999 Contest Equipment Checklist
Transceivers:
IC-706MKIIG Glad I picked up this new little hummer. Super backup radio; also use as 2nd rig for multiplier hunting – or upcoming rover class contesting on VHF/UHF.
IC-746 What bang for the buck! Real HF performance, PLUS 6 + 2 meters. Twin PBT, IF-DSP, dual IF filtering, auto antenna tuner...that low ICOM Rx noise floor, too.
IC-756 Real time band scope AND TRUE dual watch! IF-DSP, twin PBT. That receive-only ant jack will come in handy for lowband contesting ...wow!
IC-775DSP Exceptionally clean TX audio; quiet Rx noise floor, IF-DSP, all the bells & whistles. 200 watts out, runs cool even after 48 hours in barefoot class contests.
IC-781 Still a ham's dream rig The ultimate!
Each 100% duty cycle Tx!
Linear Amps:
IC-PW1 Small footprint, remotable head with full metering, auto band switching with other ICOMs (great for quick bandhopping), a full kW on 6 meters ...wow!
Accessories:
SM-20 Desktop mic easy front panel connect
SP-20 Deluxe speaker ('775, '781)
SP-21 Standard speaker ('706G, '746, '756)
SP-10 Mobile speaker excellent with '706G
CT-17 Computer interface get PC ready!
PS-85 DC power supply for '706G, '746, '756
AT-180 Auto antenna tuner for coax fed anten
AH-4 Auto antenna tuner longwire operat
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SATELLITE	N/A	3000 + Miles	N/A	World Wide Digital	*1 3000 + Miles	*1 3000 + Miles	N/A	N/A	N/A	N/A	N/A	*2 3000 + Miles	*2 3000 + Miles
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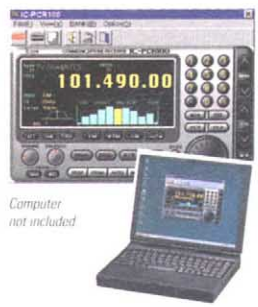

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Volume 83, Number 11

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Technical

33 *HamWeb:* A New Approach to Mobile Data Services
Bridging the gap between amateur packet radio and the Internet with common 1200-baud TNCs. *John Hansen, W2FS*

37 VolksRTTY II: for RTTY, AMTOR and PACTOR
Part 2—Finishing and testing this versatile HF modem. *Terry Mayhan, K7SZL*

42 The DSP-10: An All-Mode 2-Meter Transceiver Using a DSP IF and PC-Controlled Front Panel *Bob Larkin, W7PUA*
Part 3— It's time to tweak your new radio and put it on the air.

46 An Automated Meteor-Scatter Station *Ev Tupis, W2EV*
Drag out your packet TNC and try an exciting APRS experiment this month.

50 A Tracking Signal Generator for Use with a Spectrum Analyzer *Wes Hayward, W7ZOI, and Terry White, K7TAU*
Build this handy piece of test gear.

68 Product Review *Joe Bottiglieri, AA1GW*
QST evaluates the Patcomm PC-9000 HF/6 meter transceiver and the High Sierra HS-1500 multiband mobile antenna.

News and Features

9 "It Seems to Us. . .": Them and Us

15 DC Currents *Steve Mansfield, N1MZA*
Congress tries to dodge "train wreck redux"; Satellite reform dominates telecom agenda.

28 The KL7AK Expedition to Mekoryuk, Alaska
Earlier this year two hams were invited to share their love of radio with the Nuniwarmiut Cup'iq Eskimos. *John Reisenauer Jr, KL7JR/VE8JR*

31 "Build It and They Will Come" *Murray Green, K3BEQ*
When Amateur Radio operators and local officials worked together in Maryland, the result was a vintage radio "field of dreams."

53 How to Run a Hamfest in 63 Quick and Easy Steps
"Professional" advice on making your next hamfest a success. *Don Gagnon, WB8HQS*

57 Sharpening the Edge of Amateur Innovation *Peter Coffee, AC6EN*
The ARRL needs *your* help to guide Amateur Radio technology into the next century.

77 Happenings *Rick Lindquist, N1RL*
ULS for amateur service slowly getting up to speed; *Mir* ham station closes down; balloting scheduled in four ARRL divisions; W3CI trades fine for long-term suspension; FCC designates Michigan ham's license for hearing; FCC relaxes rules for spread-spectrum; more…

New Ham Companion

58 The Doctor is IN

RF safety and 6-meter repeaters; measuring antenna radiation patterns; computers and packet radio; more!

60 PTTSound *Salvador Esteban, EB3NC*

Build this handy transceiver interface and enjoy working PSK31, SSTV, Hellschreiber, RTTY and other modes with your computer sound card.

62 Radio Waves and the Ionosphere *Ian Poole, G3YWX*

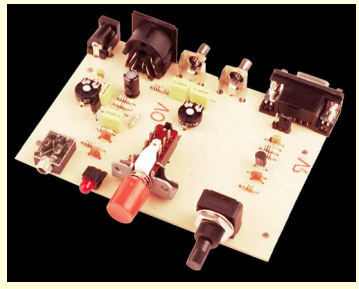
The ionosphere makes long-distance radio communication possible below 144 MHz. Find out why.

65 Keeping Track of OSCAR: A Short History Amateur Radio's Race for Space *Gil McElroy, VE1PKD*

As we await the launch of the Phase 3D "supersat," it is helpful to look back at the beginning of the Amateur Radio satellite program.

67 Test Your Knowledge *H. Ward Silver, N0AX*

Polish your homebrew skills with this tricky quiz.



60

Operating

94 1999 ARRL International DX Contest Phone Results *Dan Henderson, N1ND*

101 General Rules for All ARRL Contests

104 1999 ARRL 160-Meter Contest Rules

105 1999 ARRL 10-Meter Contest Rules

Departments

At the Foundation	91	Public Service	81
Contest Corral	93	Section News	107
Coming Conventions	89	Silent Keys	92
Correspondence	24	Special Events	90
Feedback	74	Strays	41, 49, 56, 67, 82, 88, 106
Ham Ads	152	The World Above 50 MHz	86
Hamfest Calendar	89	This Month in Amateur Radio	26
Hints and Kinks	75	Up Front in *QST*	19
How's DX?	84	W1AW Schedule	74
Index of Advertisers	174	We're at Your Service	10
New Products	41, 45, 49, 76	75, 50 and 25 Years Ago	92

Our Cover

This month we put the finishing touches on the DSP-10 2-meter all-mode transceiver. Designed by Bob Larkin, W7PUA, the DSP-10 has become one of the most popular projects ever published in *QST*. Read the last installment of Bob's article in this issue. *(DSP-10 photography by Joe Bottiglieri, AA1GW)*

Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $34 per year in the US and possessions, $47 elsewhere, payable in US funds. Age 65 and over, with proof of age, $28 (US only). Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Life membership is also available. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $34 per year postpaid in the US and possessions, $47 elsewhere. Single copies $5 in the US.

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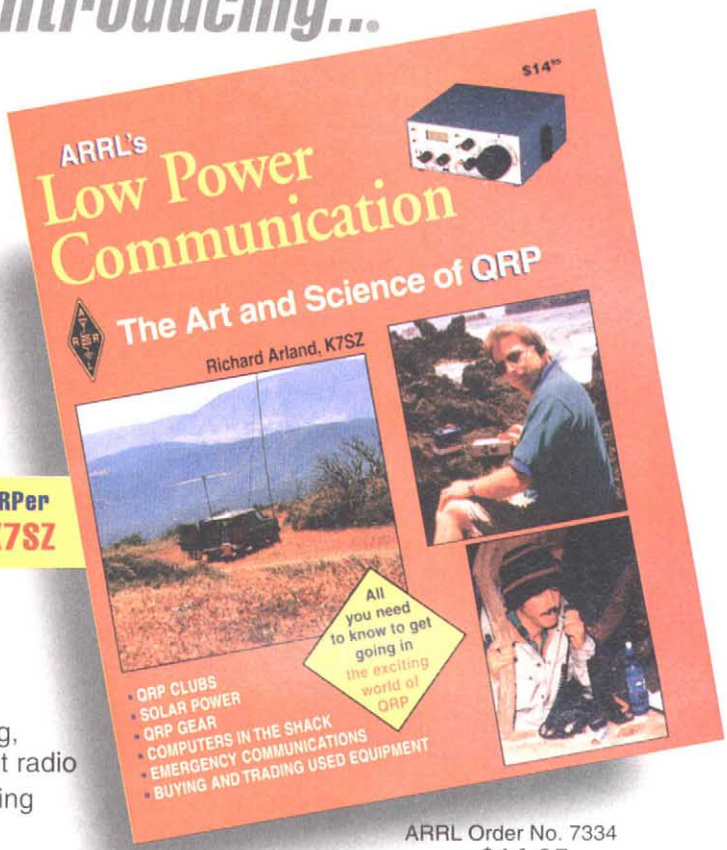

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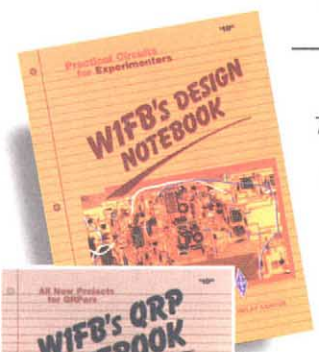

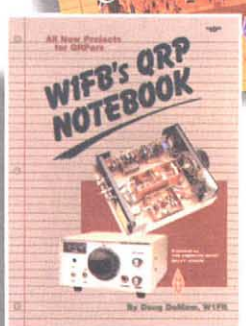

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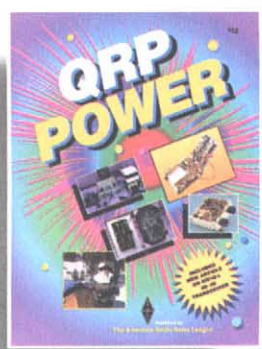

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"It Seems to Us..."

Them and Us

It's a bad sign whenever one group of radio amateurs refers to some other group of radio amateurs as "them." "They" don't share our values. "They" don't respect what we are doing (which is, of course, more important than what "they" are doing). "They" can't even understand concepts that seem so simple to us; there must be something wrong with the system if "they" can get a license. If you're not one of us, you're one of "them."

Amateur Radio encompasses a large and growing number of interest groups, each pursuing a particular facet of our common avocation while using a common, limited resource: the radio spectrum that is allocated for amateur use. Sometimes the radio spectrum is likened to real estate, with the FCC serving as a zoning board (and with the advent of auctions, also serving as a broker). In reality the radio spectrum is more like the high seas, with the FCC writing the rules of navigation; the object is to avoid collisions, not to restrict development. This is particularly true within a radio service that is mostly self-regulated, as the Amateur Radio Service is supposed to be.

What does "self-regulated" mean? Does it mean that amateurs enforce the FCC rules themselves? Not at all. Amateurs have no enforcement authority. Self-regulation is more akin to self-discipline. What we do (and don't do) on the air is not simply governed by the FCC rules, but is also determined by our mutual respect for one another. When we permit that mutual respect to erode, the value of our common resource—our amateur allocations—erodes right along with it.

The very first principle in "The Amateur's Code" sums it up nicely: "The Radio Amateur is **considerate**...never knowingly operates in such a way as to lessen the pleasure of others." This is a much higher standard than that set by the FCC rules. It means that we should respect others' interests even as we expect them to respect ours.

Translating a high-sounding principle into daily practice is seldom easy, and in the world of Amateur Radio it becomes increasingly difficult as our separate interests diverge while our allocations remain more or less static. Consider the example of the HF digital modes. By common practice that is reflected in band plans adopted by the three IARU regional organizations, digital operation is confined to certain portions of the HF bands. As new digital modes are introduced and popularized, prior patterns of activity must shift to reflect the new reality. It's a dynamic process that is governed by no one but the operators themselves.

Once in a while someone will suggest that a "better" system would be to set aside so many kilohertz for Baudot RTTY, so many for Clover, so many for packet, so many for PACTOR, so many for PSK31, and so on. If they think about it some more it usually doesn't take them long to realize that such a system would be woefully inefficient and inflexible, and ultimately unenforceable.

The same is true of the phone bands. Once in a while someone will dust off the old notion that the bands should be channelized. Wouldn't it be better if we all kept 3 kHz away from each other? If the supply of channels exceeded demand, perhaps so—but it doesn't. One price of using a crowded band is that one must be willing to tolerate some interference—to be flexible, to work around it, to outfit ourselves with good receivers and filters, to use directional antennas. Under the FCC rules, no one—no net, no group, no individual—owns any frequency in any amateur band; we must all cooperate in making the most effective use of our bands. Sometimes that means shifting a few hundred hertz to bring interference from one source down to a tolerable level without landing too hard on top of someone else. Once again, it's a dynamic process. How well it works is in direct proportion to the good will of the operators.

It's not just an HF issue. In September we highlighted the problems caused by casual FM operation in the satellite and weak-signal subbands of two meters. Neither is it simply an FM problem. A similar situation exists in the 70-cm band, where FM, ATV, packet, satellite, and weak-signal operators must respect one another's needs; now that some of the restrictions on spread spectrum have been relaxed it's time to add spread spectrum experimenters to that list.

Someone whose only window to Amateur Radio is a VHF/UHF FM rig has a very limited view of the possibilities that are open to them. Members of interest groups who possess the knowledge and the equipment to explore the wider range of possibilities have an opportunity—no, an obligation—to share their broader perspective. Shame on us if we treat fellow radio amateurs as the enemy, and not as potential recruits to our own enthusiasms.—*David Sumner, K1ZZ*

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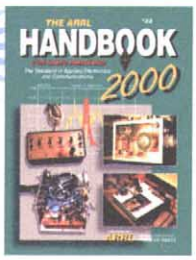

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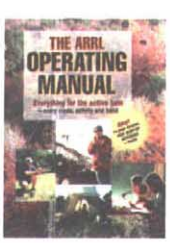

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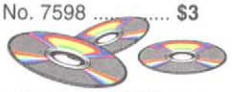

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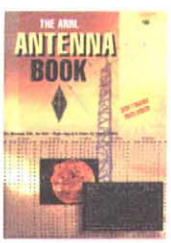

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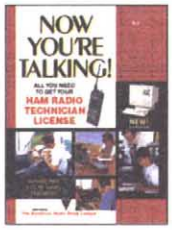

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DC Currents

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.

Congress Tries to Dodge "Train Wreck Redux"; Satellite Reform Dominates Telecom Agenda

As Congress struggled to wrap up the 13 major spending bills for fiscal year 2000 before the current fiscal year ran out, reform of the satellite business dominated the telecommunications agenda. The spending bills (appropriations measures moved through the 13 major committees) are probably the most important items on any Congressional agenda, but also among the most difficult to move cleanly through the process without collecting heaps of political baggage along the way. That baggage led to the unhappy "train wreck" scenario that wounded Congressional leadership 1995. The appropriations bills are viewed on The Hill as "must pass" items, and little forward motion is expected on other major legislation until these bills move through the system.

On the telecommunications front, the satellite television business continues to dominate the action, with bills passing in both the House and Senate to reform a variety of licensing and copyright issues arising from the continued growth of satellite distribution of television signals. Differences between the House version, HR.1554, and the Senate version, S.247, have led to a conference to resolve the disparities. Both bills build on the 1994 Satellite Home Viewer Act, regarded as landmark legislation. In addition to licensing and copyrights, the new bills contain provisions on the use of subscriber information, payment of royalties, who may carry and retransmit satellite signals, and what households are served, with a focus on ensuring coverage for rural subscribers.

The House Telecommunications Subcommittee has looked into the possibility of relaxing FCC rules on broadcast ownership, and legislation has been introduced in both houses. An FCC reform measure is also said to be waiting in the wings on the House side, but no further information on that legislation was available when we went to press.

ARRL Says LA County Experimental Video Proposal a "Foot in the Door"

• A recent application by Los Angeles County for an experimental license to develop a downlink video system for police and fire tactical operation on 2402-2448 MHz has been called a "foot in the door" to the existing Amateur Radio allocation in ARRL comments filed in opposition to the application.

The LA County proposal seeks authorization to develop an experimental system using four 10-MHz channels to transmit video images from helicopter-borne cameras to five remote receiving sites with active tracking antennas, where they would then be re-transmitted by terrestrial links to served agencies. The system would serve law enforcement, fire, disaster relief and other public safety services. The proposal targets the 2402-2448 MHz band as one that is "underutilized," and says that incumbents on the band, including "radio astronomy research, amateur radio and…industrial medical instrumentation…" would not suffer interference.

The ARRL comments note that the proposal goes well beyond an experimental application and is tantamount to a request to construct a complete system intended to be operated on a continuing basis. Moreover, says the ARRL, the proposal's contention that the band is "underutilized" is not supported by evidence. The ARRL suggests that, if the FCC is inclined to grant any portion of the experimental application, that it ought to authorize the use of a single 10-MHz video band with a single transmitter aboard a single helicopter.

National Weather Service Bill Creates Cloud Over SKYWARN

A provision in a bill authorizing appropriations for the National Weather Service, National Oceanic and Atmospheric Administration and other government weather services has unneccesarily raised fears that Amateur Radio related activities such as SKYWARN may be endangered. The provision, Section 3(c) entitled "Competition with Private Sector", has also triggered concern on the part of some that the bill could reduce the government's ability to monitor and issue severe weather warnings. The provision has been championed by commercial weather services that provide fee-based "cloudy and warmer" style weather forecasts to commercial broadcasters.

Contrary to rumors, the bill, HR.1553, generally can be construed as strengthening the National Weather Service's role in the dissemination of severe weather warnings, because it specifically designates the service as the sole issuer of severe weather warnings.

NWS and NOA authorizing legislation hasn't passed the Congress for six years, and cynics among us note that there is no reason to suppose this bill will be any different and make it into law. Even so, the "private sector" provision in question has also drawn fire from the White House because it muddies an existing policy of the Department of Commerce (the parent agency of the National Weather Service) that calls for commercial and government weather services to "work together to determine the most efficient ways in which they can provide the best possible weather services to the public." A Statement of Administration Policy notes that the provision "could create confusion about who is responsible for specific marine and aviation weather forecasts," and recommends removing the section. Strong opposition from the National Weather Service would likely trigger a presidential veto.

The bottom line is, should the provision survive scrutiny in the Senate, HR.1553 still should not interfere with SKYWARN.

Amateur Spectrum Bill Continues to Gain Support

The Amateur Radio Spectrum Protection Act, HR.783, continues to gain support with 112 cosponsors by the time we went to press and, as usual, several more waiting in the wings. Support remains bipartisan, with approximately equal numbers of Republicans and Democrats. While nothing is certain in politics, any further progress on the bill is not likely at least until the second session of Congress commences next year. The next step would be for the House Commerce Committee (and its Telecommunications Subcommittee) to decide to treat the bill as a "stand alone" item, to amend it onto some other piece of legislation, or to decide to do nothing and let it languish. Cards, letters and phone calls from ARRL members to their Representatives can help to ensure that the latter course of action does not happen!

Thanks to all of the ARRL members who have already written! And, for those who haven't written but plan to, visit the ARRL Web site at **http://www.arrl.org/govrelations/hr783.html** for a sample letter and addresses.

Cosponsors for HR.783
Introduced by Rep. Michael Bilirakis (R-FL-9th) (In order of sign on):

Frank Pallone, Jr. (D-NJ-6th)
Michael R. McNulty (D-NY-21st)
Ronnie Shows (D-MS-4th)
Nathan Deal (R-GA-9th)
Patsy T. Mink (D-HI-2nd)
Robert A. Underwood (D-GU-delegate)
John E. Baldacci (D-ME-2nd)
Sam Farr (D-CA-17th)
James M. Talent (R-MO-2nd)
Stephen E. Buyer (R-IN-5th)
Dale E. Kildee (D-MI-9th)
Norman D. Dicks (D-WA-6th)
Owen B. Pickett (D-VA-2nd)
Barbara Cubin (R-WY-1st)
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Jo Ann Emerson (R-MO-8th)
George R. Nethercutt, Jr. (R-WA-5th)
Robert B. Aderholt (R-AL-4th)
David L. Hobson (R-OH-7th)
Michael G. Oxley (R-OH-4th)
Dan Burton (R-IN-6th)
Bernard Sanders (I-VT-At Large)
Sonny Callahan (R-AL-1st)
Deborah Pryce (R-OH-15th)
Michael F. Doyle (D-PA-18th)
Steven R. Rothman (D-NJ-9th)
Ron Klink (D-PA-4th)
Greg Walden (R-OR-2nd)
Rick Boucher (D-VA-9th)
Charles H. Taylor (R-NC-11th)
Sanford D. Bishop, Jr. (D-GA-2nd)
Donna Christian-Christensen (D-VI-delegate)
Ken Bentsen (D-TX-25th)
Thomas H. Allen (D-ME-1st)
Bob Schaffer (R-CO-4th)
Frank R. Wolf (R-VA-10th)
George Miller (D-CA-7th)
Dave Weldon (R-FL-15th)
Virgil H. Goode, Jr. (D-VA-5th)
Peter A. DeFazio (D-OR-4th)
Louise M. Slaughter (D-NY-28th)
Charles T. Canady (R-FL-12th)
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Dennis Moore (D-KS-3rd)

Bioeffects, Preemption Bills Introduced in House

♦ Representative Bernard Sanders (VT-At Large-I) has introduced a bill that calls for the US Secretary of Health, Education and Welfare to conduct a study of the effects of "radio frequency emission on human health." The bill, HR.2835, would provide $10 million for the study to be used for grants to "appropriate public and private entities" to carry out the study. Not surprisingly, given Representative Sanders' long time concerns about the proliferation of telecommunications towers in the Green Mountain State, a companion bill, HR.2834, would expand and "clarify" State and local authority to regulate the placement, construction and modification of broadcast transmission and telecommunications facilities. The bill is specifically intended to counter an FCC proposed rule (MM Docket No. 97-182) that would expand federal preemption over state and local zoning and land use ordinances for placement, construction and modification of broadcast facilities. While neither of these bills directly affects Amateur Radio, how far they move through the legislative process will be a harbinger of congressional policy in the important areas of "bioeffects" and federal preemption. The ARRL will monitor them carefully.

Media Hits

• Bob Thomas, KS4NG, and his wife Debbie, KE4VGK, were featured in a full-page article in the *Erwin Record* in Tennessee. The article covered the many pleasures of ham radio as well as the emergency communications activities of the Unicoi County Amateur Radio Service.

• An editorial in the *Los Angeles Times* included Amateur Radio operators as one of the neighborhood resources LA-area residents ought to be aware of in their preparation for a potential earthquake disaster.

• The York ARES/RACES Service's work with York County, Pennsylvania's 250th Anniversary Parade was featured in an article in the *York Daily Record*.

• John Ohm, W8IS, is "Hooked on Ham Radio," according to a full-page article in the *Livingston County Press*. The Michigan newspaper chronicles John's life-long interest in Amateur Radio and features large, color photos of his well-organized ham shack.

• Thanks to the hard work of PICs, PIOs and other ham volunteers after Hurricane Floyd, Amateur Radio emergency operations got a substantial amount of media coverage, at least judging from the reporters who contact ARRL for information. A quick look at the log shows media as diverse as *The Hartford (Connecticut) Courant*; WLVI—channel 56 in Boston; WCCO—channel 4 in Minneapolis; New England Cable News; WFTS—channel 28 in Tampa, Florida; and WGGB—channel 40 in Springfield, Massachusetts. North Carolina SM Reed Whitten, AB4W, worked with a local freelance writer who had called ARRL and expressed interest in doing a story. Whitten took him to a state EOC news briefing and gave him a tour of the North Carolina EOC, including the Amateur Radio station.

• The *Suburbanite* newspaper covering the Akron, Ohio suburbs of Green, Coventry, Franklin, Springfield and Lakemore carried a comprehensive story on how Summit County SKYWARN activities operate and contribute to public safety. The article mentions Bob Watkins, N8QNJ, Pat Morrow, N8OQP, and Chris Havlik, N8UKM.

• Don Godwin, N7FLT, was depicted on the front page of *the Bozeman Daily Chronicle* "practicing emergency communication" at the Bozeman, Montana Emergency Operations Center as part of a Y2K test conducted by emergency services in the area. Other hams mentioned in the article included Don Wilson, KC7EWZ, Mike Lamb, N7ML and Bob Leo, W7LR.

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In spite of rumors to the contrary, the ARRL CAN'T increase sunspot activity, but you CAN add a S-unit or more to your signal with a TEN-TEC amp. It's a great time to add an amp in the shack. Three models defy the sunspots with 550, 600, or even 1000 watts output. TEN-TEC amps run full rated power in SSB and CW (AMTOR & PACTOR, too), no matter how long the QSO. Conservative design, rugged construction, and backed by our legendary TEN-TEC service. Now if the ARRL would just solve that pesky QSB problem...

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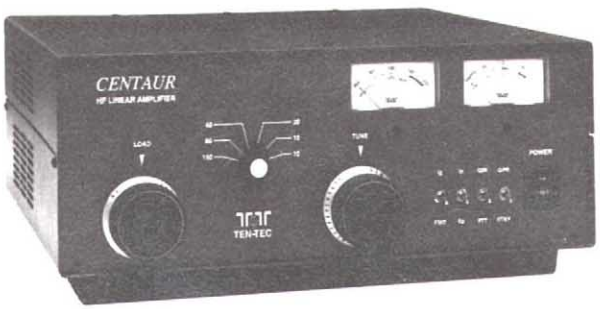

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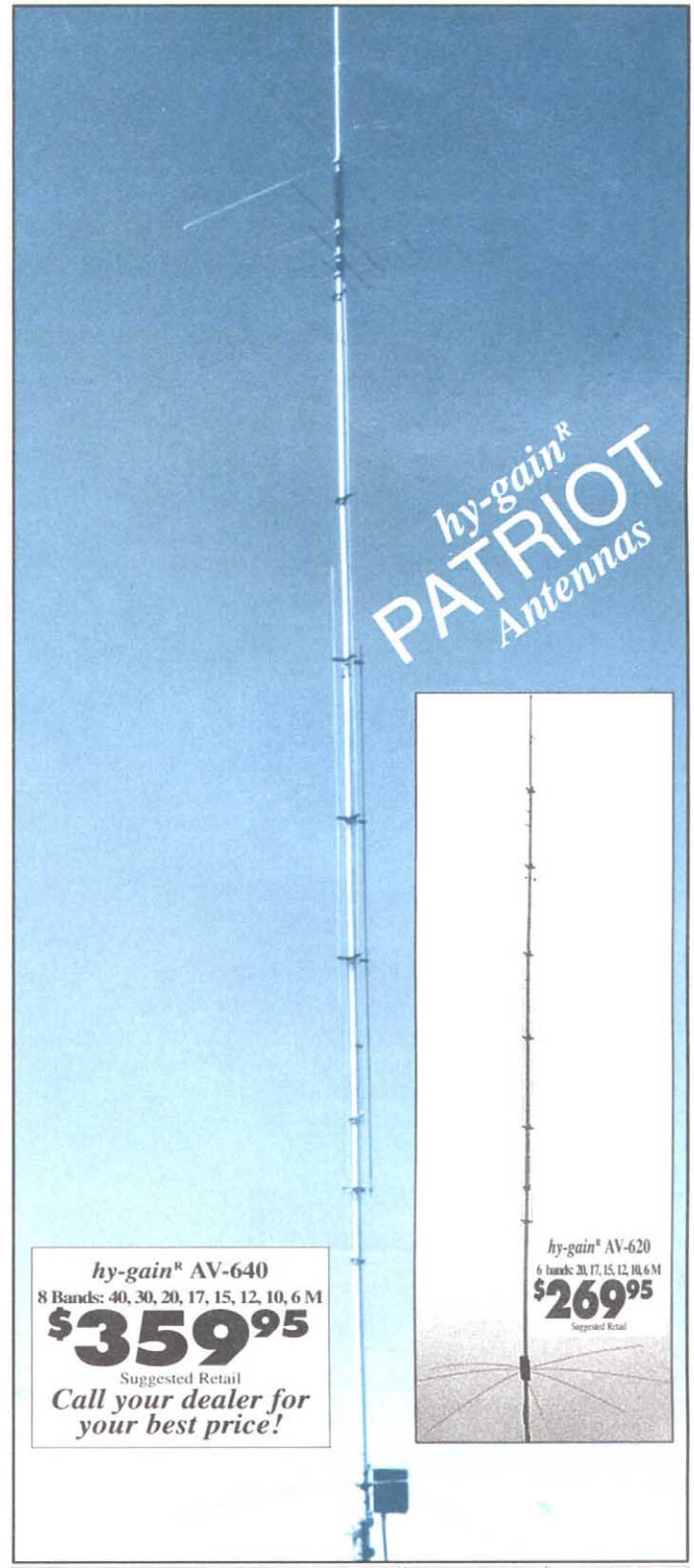


Specifications	AV-620	AV-640
Bands covered (meters)	6,10,12, 15,17,20	6,10,12,15, 17,20,30,40
2:1 VSWR Bandwidth (KHz)		
40M	N/A	150
30M	N/A	175
20M	500	500
17M	500	500
15M	500	500
12M	500	500
10M	1500	1500
6M	2000	1500
VSWR at resonance (typical)	1.5:1	1.5:1
Power handling (watts output) key down 2 minutes	1500	1500
Vertical radiation angle (degrees)	17	17
Horizontal radiation angle (degrees)	360	360
Height (feet)	22.5	25.5
Weight (pounds)	10.5	17.5
Wind surface area (square feet)	2.4	2.5
Wind survival (mph)	80	80

Up Front in QST

SARAH WISEMAN

Cleared for takeoff! John Wiseman, KE3QG, takes off in his hang glider from Jack's Mountain, Pennsylvania while Jeff Harper, N3VJG, stays in touch with John on 2-meter FM simplex (147.50 MHz).

A "bright idea!" What do you do with a bunch of glass antenna/feed line insulators? Bob, NF7E, made one the centerpiece of a birdhouse crafted in a miniature lighthouse motif.

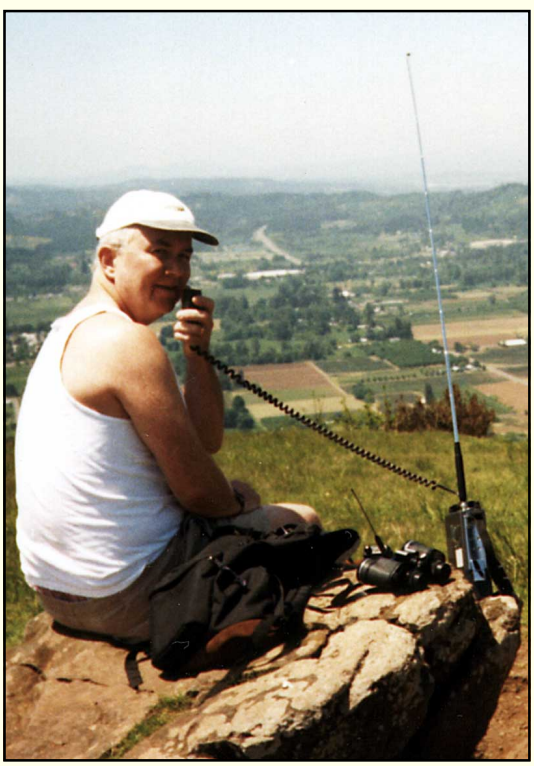
Meet the weatherman. Glenn Field from the National Weather Service office in Taunton, Massachusetts (right) was the guest speaker at a SKYWARN training seminar last spring in West Warwick, Rhode Island. Also on hand was Martin Mendleson, N1JMA, the ARRL Rhode Island Section Emergency Coordinator (left).

"Does food taste different in space?" That was one of the many questions posed to astronaut Dr Laurel Clark, KC5ZSU, by students from Holloman Middle School in Alamogordo, New Mexico. For 45 minutes Dr Clark fielded questions on 20 meters from the W5RRR station at the Johnson Space Center in Texas. The Alamogordo Amateur Radio Club used their station, K5LRW, as the other end of the link.

A special-event station of one. Dave, KK7RP, took it upon himself to set up an Amateur Radio demo station at the Fernley, Nevada Air Show last summer. He passed out lots of ham information, including a large number of Archie comics to the kids, and worked DX for the passersby.

Ultimate mobile? Don, KH6DX, achieved his six-band Worked All Continents using the mobile station shown here. Don is on the air on all HF bands—including 160 meters. In fact, he is one of the few hams who have ever earned a Worked All Continents award on 160 meters from a mobile station.

On December 26, 1998 Jack Carter, KC6WYX, made contact with a student operator named Jia at BY4BZB in Shanghai. Six months later Jack delivered his QSL—in person! From left to right, David Wei, Jack Carter, Jia and Sun Huan Sheng, the supervisor of BY4BZB.

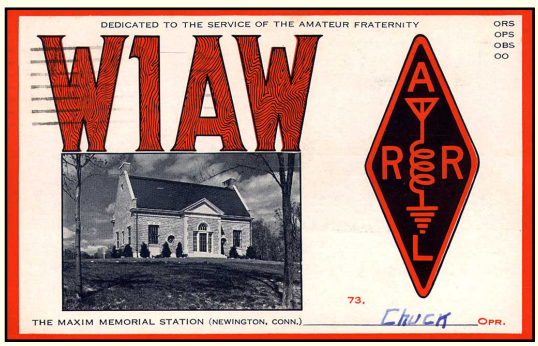


Getting a little altitude. When you're working 6 meters, a bit of elevation never hurts. Doug, N7CNH, found about 1500 feet of it on the summit of Mt Pisgah, southeast of Eugene, Oregon.

It's a lamp. No, wait, it's an antenna. Jim, N6VNU, is an apartment dwelling ham with severe antenna restrictions. Even taping a 2-meter wire dipole in the window is forbidden. So, Jim Ford, K8ZBA, picked up this lamp at a thrift store for 90 cents, installed an extended "rubber duck" antenna in the top, and discreetly routed the coax through the lamp and out the bottom. When placed near N6VNU's apartment window, it works like a champ.

Let us gather 'neath the shelter. Last May the Vicksburg, Mississippi, Amateur Radio Club hosted "ARRL Day in the Park" at Riverfront Park on the banks of the mighty Mississippi.

Top of the Tops. At the 1999 Dayton Hamvention Alfredo Luciano, LU6DJX, received the Lifetime DX Achievement Award. Alfredo is the highest-ranking DXCC Honor Roll member outside of the US with 384 countries confirmed. From left to right, George Wagner, K5KG; Alfredo Luciano, LU6DJX; Bill Kennamer, K5FUV (ARRL Membership Services Manager) and Reinaldo Szama, LU2AH.



QSL memories. In 1956 Bruce, a 16-year-old amateur signing K0CML from Webster Groves, Missouri, made contact with W1AW under the operation of Chuck Bender, W1WPR. In 1999 16-year-old K0CML had become 59-year-old W4OV living in Coconut Creek, Florida. While digging through boxes of memorabilia, Bruce discovered the long-forgotten W1AW QSL. It shows the Maxim Memorial Station, minus the Headquarters building that would not appear on the site for a number of years to come.

Two new stamps to celebrate Amateur Radio. In Spain the Union de Radioaficionados Espanoles (URE) celebrates its 50th anniversary with a stamp issued by the Spanish postal authorities this year (left). In Ecuador another attractive stamp (right) was recently issued to honor the 75th anniversary of the Guayaquil Radio Club.

FT-8100R
The versatile FT-8100R Dual Band Mobile offers rugged RF design, 50 Watt (VHF)/35 Watt (UHF) power output, 310 memory channels, Dual Receive (VV/UU/VU), Enhanced Smart Search,™ CTCSS Encode, and a TX Time-Out Timer. (ADMS-2E programming software available.)

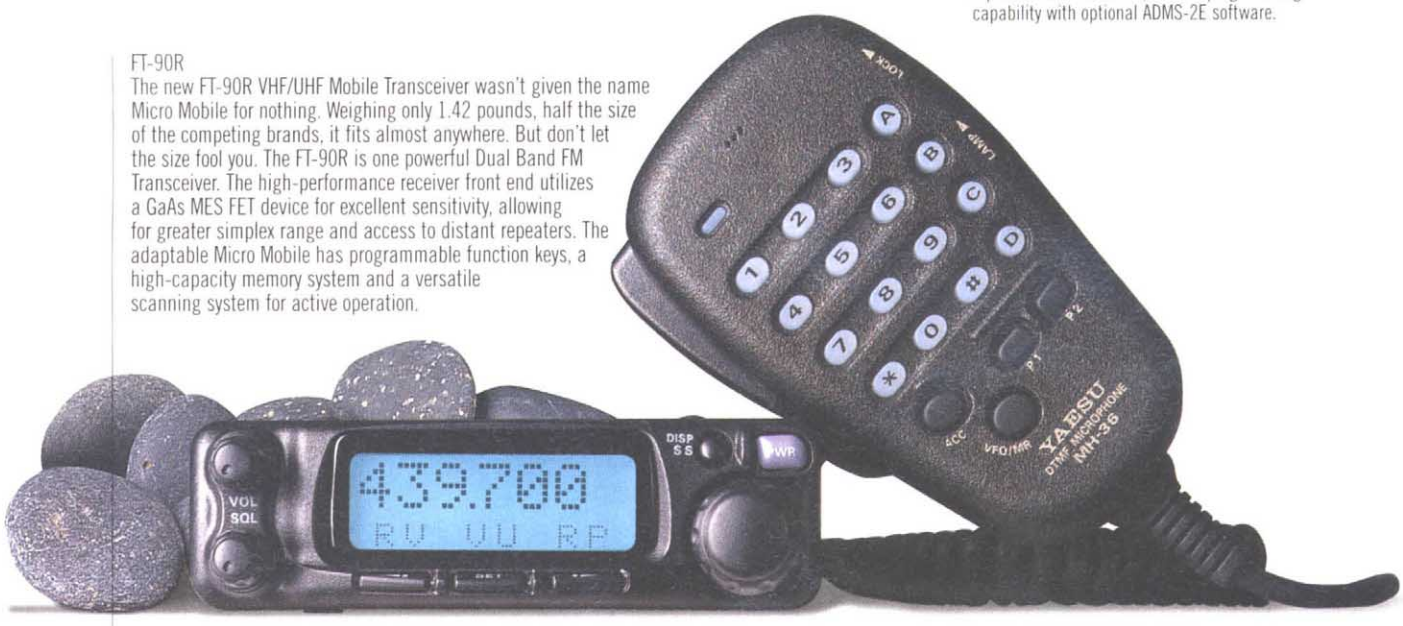
FT-100
This ultra-compact HF/VHF/UHF 100W Transceiver provides SSB, CW, AM, FM and AFSK coverage of the HF, 6M, 2M and 70 CM bands. Features include 300 memory channels, built-in Electronic Memory Keyer, DSP, IF Shift, IF Noise Blanker, and CTCSS/DCS.

FT-3000M
This 70W high-powered 2M FM Mobile provides extended UHF receiver coverage, AM Aircraft RX, and is MIL-STD approved. The FT-3000M features 81 memory channels, Smart Search,™ CTCSS/DCS, optional ADMS-2E programming software, and is 1200/9600 Baud Packet compatible.

FT-290RII
Ideal for base, vacation, or expedition use, this 25 Watt 144 MHz Multimode Transceiver is outstanding for emergency, travel, or weak-signal DX work. Optional battery pack allows over-the-shoulder portable use for search-and-rescue operation.

FT-2600M
This heavy-duty VHF FM Mobile is encased in a durable aluminum die-cast chassis/heatsink assembly, and manufactured to MIL-STD 810 requirements. Features include 60 Watt power output, 179 memory channels, direct keypad frequency entry from microphone, Alphanumeric memories, and PC programming capability with optional ADMS-2E software.

FT-90R
The new FT-90R VHF/UHF Mobile Transceiver wasn't given the name Micro Mobile for nothing. Weighing only 1.42 pounds, half the size of the competing brands, it fits almost anywhere. But don't let the size fool you. The FT-90R is one powerful Dual Band FM Transceiver. The high-performance receiver front end utilizes a GaAs MES FET device for excellent sensitivity, allowing for greater simplex range and access to distant repeaters. The adaptable Micro Mobile has programmable function keys, a high-capacity memory system and a versatile scanning system for active operation.



LITTLE BIG MOUTH.

Life is an adventure. So whether you're on expedition or vacation, you will probably encounter some rough going along the way. And when you do, you'll be glad that your mobile transceiver is a Yaesu. With units small enough to install almost anywhere and rugged enough to achieve military approval for shock and vibration, Yaesu is the obvious choice for dependability. Its exceptionally clear signal and wide dynamic range tame even the most crowded bands, and provide outstanding protection from intermodulation in urban areas. Learn more about Yaesu products on the web at www.yaesu.com

YAESU ...leading the way.

FT-50RD
This durable, multi-featured 5 Watt Dual Bander is manufactured to rigid MIL-810 standards. Featuring wideband frequency coverage,* CTCSS/DCS operation, Dual Watch, 112 memory channels, and Digital Voice Storage.

FT-51R
This full-featured 5 Watt Dual-Band Handheld includes dual receive, 120 memory channels (80 if Alphanumeric), Auto Tone Search, Spectra Scope, and V/V, U/U and V/U operation.

VX-1R
The pocket-sized VX-1R is small in size only. Featuring Smart Search,™ DCS/CTCSS, Dual Watch, ARTS,™ wide-band coverage (76–999* MHz plus AM BC). The VX-1R provides 291 memory channels, and puts out ½ Watt (1 Watt w/optional E-DC-15 DC Adapter).

* Cellular Blocked

FT-11R
This compact 2M Handheld features 150 memory channels (75 if Alphanumeric), 10-memory DTMF Autodialer, Automatic Battery Saver (TX/RX), backlit Keypad, and are available in 1.5 Watt and 5 Watt versions.

FT-411E
The affordable FT-411E is compact and durable. This 5 Watt VHF FM Handheld features a die-cast case, 40 memory channels, 10 DTMF memories, built-in VOX, CTCSS, and multiple scan modes.

FT-23/33R
These ultra-compact, 5 Watt VHF FM Handhelds feature rugged die-cast aluminum cases, 10 memory channels, optional CTCSS, and multiple scan modes. The FT-23R (2M) and the FT-33R (222 MHz) are easy to operate, and give outstanding performance.

FT-10/40R
These single-band handhelds are manufactured to MIL STD 810 specifications, featuring either 30 or 99 memories, CTCSS/DCS operation, Dual Watch, and are available in 2.5 Watt or 5 Watt versions, with four keypad options.

VR-500
This miniature Handheld Receiver provides FM, AM, SSB and CW reception on 100 kHz–1300 MHz, with 1091 memory channels, Smart Search,™ versatile Dot Matrix display, Band Scope, and Dual Watch.

VX-5R
Although Yaesu's newest Tri-Band Handheld Transceiver is the world's smallest, it offers the performance of a full-size unit. The VX-5R operates on the 50 MHz, 144 MHz and 430 MHz bands with 5 Watts of power output, along with ultra-wide receive coverage of the VHF and UHF spectrum, plus AM medium- and short-wave broadcast reception. The VX-5R is military rated, so its durable, lightweight design allows you to take it anywhere. It is equally suited to walking through the concrete jungle as it is to forging the raging rivers of a real one. Along with a temperature display, the optional barometer pressure sensor unit gives a read-out of barometric pressure and altitude.

TOUGH GUYS.

When you're small, you get picked on. Isn't that how it goes? Well not in Yaesu territory, because not only do we design compact handhelds for efficiency, but we give these clever little guys plenty of muscle. Yaesu handheld transceivers have earned the bragging rights for being the smallest handhelds with the most durable water resistant casings ever created. And packed inside the brawn are engineering accomplishments in performance that are unmatched in the industry. Our high-tech handheld transceivers provide clean power output on the VHF and UHF bands and offer revolutionary features that allows these tough guys to continually outperform the competition. Learn more about Yaesu products on the web at www.yaesu.com

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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.

THANKS, GAP

♦ It's central Florida in June 1999. Here come the legions of afternoon thunderstorms—the ones that make Florida the lightning capital of the nation. I rest easy, confident that I've taken all the right steps to protect my antennas. It would be difficult to improve on my safeguards, expect for the idea of installing a ring of golfers around the property with copper straps connecting their ankles to ground rods!

Of course, Murphy was not denied. A proverbial bolt from the blue found one of the antennas, namely a GAP Challenger. To my astonishment the heat from the stroke bent the vertical at a 45° angle. It was a clean bend; not a kink to be seen.

Fortunately, GAP Products makes its home here in Florida, so I disassembled the antenna and decided to take a trip to the plant. I didn't really think they could repair it, or would be even willing to look at it, but at least I had a good excuse to take a pleasant drive.

Upon arriving I met GAP engineers Richard and Chris. Not only did they immediately supply me with replacement parts and a 17-meter add-on kit, they took the time to give me a wealth of advice.

Don't let anyone tell you that Amateur Radio has lost the camaraderie of the "good old days." You rarely find this kind of friendliness in the consumer business world. We should be thankful for all the manufacturers who continue to support our fine hobby with considerate customer service.—*Stewart Logan, KF4LHC, Umatilla, Florida*

YOU GO, GIRL!

♦ It was great to read a story about a little girl earning the big ticket (and so fast). I was really moved by the article "Help Your Child Earn a Ticket" by Brian and Zane Wruble in the July *QST*. It's more amazing to hear that a "girl" did it instead of a young boy because tradition has dictated that only boys could excel in electronics. I'd like to see more girls do what Zane did. Good job, Zane!—*Cathy Lynn Stanfill, KF6TIW, Huntington Beach, California*

CW AND FIELD DAY

♦ What's happening with CW and Field Day? Although I have always enjoyed Morse code, I just recently discovered the fun of CW ragchewing. My friend Tony, VA3AJC, and myself practiced daily and decided to try CW on Field Day.

We knew it might be hard going. Our speed was somewhere between 12 and 15 WPM. Yet we found that hams were courteous and slowed down for us if necessary. So, we thought we could manage.

You can imagine our surprise when Field Day began. Every station seemed to be transmitting perfect Morse at (what seemed to us) an undecipherable 25 or 30 WPM. Not only couldn't I follow the code, I couldn't even distinguish dits from dahs in some cases!

Extra points are awarded for CW, presumably because of the skill required to operate. But where is the skill in setting up a computer to drone out endless "CQ FD" messages? It seems to me that SSB illustrates better use of operator skills than mechanized Morse does.

I responded to some with "QRS." Occasionally they would comply, but mostly not. I tried my own hand-sent CQ and did get some responses, at reasonable speeds, for which I am grateful. Ironically, when the band died down, a few stations were still pounding out their 25-WPM CQs without response. If they had just slowed down a bit, they could have had another contact—with me.

This isn't sour grapes. I like CW and would hate to see it die, but for any new hams trying the mode, I can only imagine that their reactions would be similar to mine. Perhaps it's time for the ARRL and RAC to re-think their Field Day CW strategy. Let's make it fun for everyone and reward true operator skill and effort.—*Earle Laycock, VE3XEL, Mississauga, Ontario, Canada*

CALL SIGN MESS

♦ I agree with Jay Craswell, W0VNE, in the October 1999 "Correspondence." The FCC has created a terrible mess by allowing hams to retain their call signs when they move to other call sign districts.

Remember when you heard a W6/K6 on 40 meters and you immediately knew the band was open to California? Not anymore! That 6-land call sign could now belong to your next door neighbor.

I was one of those hams criticizing this situation, and then I realized that I was part of the problem. I'm an amateur from Michigan (K8ON), now transplanted to Florida.

The fix only took a few weeks. Now when you hear this former Michigan ham on the air, you will know that I am a fixed station in the fourth call sign district. I have been a ham for 40 years, and an Amateur Extra for 39 years, and I still gave up my 1 × 2 call to fix the problem. It is just another call sign, after all. I urge other "mixed up" hams to follow suit and apply for new call signs for the correct call sign districts.—*Joe Abad, K4OLA, Tampa, Florida*

MEDDLESOME CROWS

♦ I was puzzled when my TA33 beam antenna suddenly died. I checked everything possible on the ground with no solution. Because the beam is 55 feet up on a guyed tower, it is no easy task to lower the antenna for inspection. I used my binoculars to no avail.

I assumed there was a problem with the connection between the coaxial feed line and the driven element of the antenna, but I knew that the conductors were firmly secured. The shield of the coax, in fact, was attached with a 1/2-inch-thick piece of flexible braid, and the braid was soldered to a lug on the element.

Biting the bullet and lowering the antenna seemed to be the only option remaining, but then my wife contracted with a tree service to prune our large maple. When I saw their "cherry picker" lift I asked if they could take me up to the antenna. "No problem," they replied, and up I went.

Suddenly the TA33 was within touching distance. As we gingerly edged closer I saw that the braid was missing altogether! The solder lug was still there, but only fragments of the braid remained. Those fragments had been clearly pulled and teased out of place. I always wondered why crows were so attracted to my antenna. Now I knew the answer—they were robbing the braid for nesting material!

It was a quick trip down in the bucket to fetch a soldering iron and a piece of solid wire, then back up to the beam, and in no time the repairs were finished. The antenna was working again—crows not withstanding!—*James Helms Jr, W6UOI, Arcadia, California*

WHERE HAVE ALL THE LAPTOPS GONE?

♦ Our ARES group wanted to put together "shelter boxes" complete with a PC running *ARESPACK* software for remote emergency message printing. But we wanted to keep current drain as low as possible. Low-power laptops seemed to be the answer, but we couldn't find an affordable source.

It just so happened that the local power company was having a computer sale. They had many used 386 low-end laptops that were now considered obsolete. No one wanted them—except the local Amateur Emergency Service! After a full format of the hard drive, a *DOS* reload and installation of *ARESPACK*, these laptops became just what the emergency service doctor ordered. With two packet stations running *ARESPACK*, it takes only a few keystrokes

to fetch a blank emergency message, format it, connect, remotely place the printer online, print the message and get an acknowledgement that the message was printed. All this with a 1-A PC current load!

I'd suggest that your ARES group ask local businesses if they would be willing to help with donated or loaned "older" computer equipment needing a good home. By the way, the Utah County Amateur Radio Service wrote *ARESPACK* for the express purpose of facilitating emergency radio communications via packet radio. You'll find it on the Web at **http://www.ucares.org/**.—*Joe Tokarz, KB9EZZ, Ottawa, Illinois*

WHY MODIFY?

♦ I recently purchased a new radio, and I've been searching the Web for more information about my toy. However, I've discovered a disturbing trend—everybody wants modification information, known simply as "mods."

As I look at message boards on various Web sites I see that people want mods that expand their radio's transmit capability to frequencies outside the amateur bands. They want mods that allow them to receive cellular telephone signals. They want mods to allow their radios to do things the manufacturers never intended. Unfortunately, legitimate questions usually are ignored on these same message boards (or else someone will respond with something like, "So you got any mods, or what?").

Why, as licensed amateurs, do we need radios that are capable of transmitting on every frequency the radio can receive? Why do we need to be able to receive cellular signals? Why do we need to endanger warranties on very expensive gear just to get some new transmit and receive ranges that we will never and should never use? If you're licensed for MARS/CAP, you can legally have your radio's capabilities expanded by the manufacturer, so you have no need even for these "mods." Let's start using some common sense before modifying our gear.—*Darren Zimmerman, KL0PE, Anchorage, Alaska*

HAM CAMARADERIE

♦ Being deployed with the United States Navy on a recent port visit to Zeebrugge, Belgium, I had the great opportunity to meet a few wonderful hams. Not only did I meet Belgian amateurs, I encountered hams from other navies who were participating in the Belgium Navy Days at Zeebrugge.

While giving tours on board our ship, I had the pleasure of speaking with Paul, PA5UL, from the Dutch Navy. Paul invited me along with his host Rudy, ON4AGV, to a club meeting in nearby Knokke-Heist that evening. Rudy, along with the many club members, extended every courtesy to us at the ON4BRN clubhouse, and later in the local community. Rudy also invited us to participate with the ON4BRN, the Belgium Royal Navy special event station operating at the Navy Days celebration.

So on Sunday, 18 July 1999, I dragged my weary bones (due to a trip to Paris the previous day!) over to the ON4BRN tent. Upon arrival the crew graciously accepted me into the group and we commenced to talk radio. Although they made an honorable attempt to get me to operate 20 meter CW, I had to decline since my code speed was nowhere near what I was hearing on the band at the time. I did, however, get to guest operate on 20 and 40 meter voice with marginal success, unlike PA5UL, who had a pile up on 40 meters for the better part of the afternoon.

When all was said and done, and Navy Days had concluded, we all pitched in to break the station down. As I leave beautiful Belgium, I will forever have the memories of the times I spent with the ON4BRN group and their hospitality. The food was wonderful and the local beverages were excellent! The Knokke-Heist club has left a deep impression in my mind of how an organization can make you feel at home.

I'm grateful to ON4AGV, PA5UL and Rod, CT1BXT, for reminding me that all hams have that special thing called radio in common, and that wherever we go there will always be a friend. Although Belgium is along way from my home in Mississippi, it is only a millisecond away by radio.—*Todd Shelton, KE6JGJ, Gautier, Mississippi*

PLAIN LANGUAGE?

♦ It's always interesting to read the views of the former police chief of Coronado, California, Jerry Boyd, now K6BZ. His latest article in the September *QST* "Public Service" column ("A Case for Plain-Language Message Handling") reminds me of the reminiscences of Brad Wells in "Future Shock" in the September 1988 *QST*.

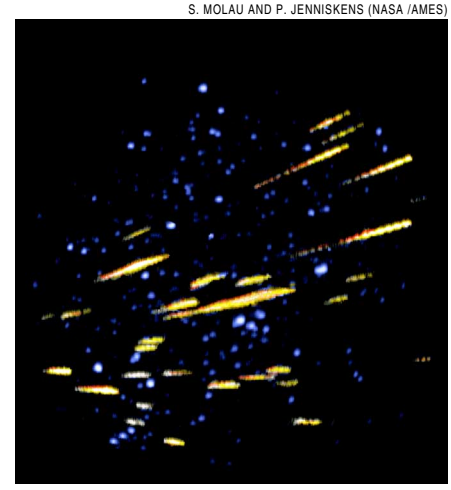
Jerry, past chair of ANERCOM in 1989, and author of several articles in *QST*, is a visionary when it comes to Amateur Radio public service communication. I was disappointed, however, by his apparent lack of knowledge concerning the message handling techniques used by hams today on HF and VHF.

Jerry's contention notwithstanding, plain-language communication has been the Amateur Radio norm for years. In fact, the ARRL has discouraged the use of cryptic language such as the "10 codes." Q codes and other abbreviations are a necessity on CW for the sake of efficiency, of course, but plain-language communication is the standard in most other applications.

Amateurs involved in public service work are well acquainted with both tactical and strategic message handling methods for communicating. What is especially important is to make use of proper and clear techniques for the transmission of message authorizations in our handling of high priority and emergency message traffic during times of disaster.—*William W. Thompson, W2MTA, Section Manager, Western New York and Chairman NTS Eastern Area Staff, Newark Valley, New York* QST

This Month in Amateur Radio

S. MOLAU AND P. JENNISKENS (NASA /AMES)



A storm of Leonid meteors captured on film as they blaze through the upper atmosphere in 1998. Will we witness a similar show from the Leonids this year?

Will November 1999 be remembered for its "extraterrestrial visitors?" The **Leonid** meteor shower is making a repeat performance November 14-21, with the peak forecast for November 18 at 0200 UTC. The Leonids have been known to produce spectacular showers every 33 years as comet Tempel-Tuttle heads back into the inner Solar System. As the meteor particles are swept up by the Earth's atmosphere they disintegrate and leave ionized trails that reflect radio signals. Last year's shower produced impressive results and many believe this year will be the same or better.
If you have a 2 or 6-meter FM transceiver and a packet TNC, you can participate in a fascinating **meteor-scatter experiment** using the Automatic Position Reporting System (APRS). See "An Automated Meteor-Scatter Station" by Ev Tupis, W2EV, in this issue.

November is also famous for **Sweepstakes**. At 2100 UTC on November 6 the CW operators will launch into their frenzied quest for the coveted "Clean Sweep." Phone operators will get their chance November 20. See page 88 in your October *QST* for details. Another hot autumn contest is the CW portion of the **CQ World Wide DX** competition on November 27 and 28. See "Contest Corral" in your October *QST*.

BOB CAMPBELL

The *Edmund Fitzgerald* cruises down the St Mary's river only six months before she was to meet her fate on a stormy November night. Listen for N8F on the air this month from the Great Lakes Shipwreck Museum.

On November 10, 1975, the ore freighter ***Edmund Fitzgerald*** sank during a storm in Lake Superior. The tragedy became immortalized in song (Gordon Lightfoot's "The Wreck of the *Edmund Fitzgerald*"). Members of the Stu Rockafellow Amateur Radio Society will be operating N8F from the Great Lakes Shipwreck Museum November 6-7 to commemorate the event. "Special Events" has complete details.

November 11 is **Veterans Day** and several special-event stations will take to the airwaves to honor those who served our nation. Listen for K0USN in Colorado Springs, Colorado; N5VA in Albuquerque, New Mexico; KA9NLX in Arlington Heights, Illinois; and WA2VJA in Nutley, New Jersey. See "Special Events" in this issue.

W6LX

A father/daughter Sweepstakes combo. John Zitzelberger, W6GL, is at the rig while Rebecca Zitzelberger, KF6KQL (age 10), manages the log.

Head south of the Mason Dixon for two popular hamfests this month: the **Alabama State Convention** in Montgomery November 13, and the **Florida State Convention** in Tampa November 20-21. If you prefer to stay north, check out the **Indiana State Convention** in Fort Wayne on November 13-14. "Coming Conventions" in this issue has the information on these gatherings and many more.

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ATR-15, $399. Handles 1500 Watts RF output. Slightly less on 160 Meters. Bandswitched T-Network, peak reading SWR/ Wattmeter, covers 1.8-30 MHz, 6 pos. antenna switch, balun. 13½ W x5½x13¼ in. Perfect for AL-80B/AL572.

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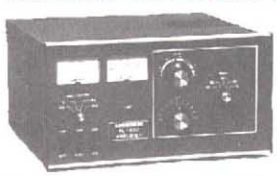
AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with Eimac® 8877 ceramic tube



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Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

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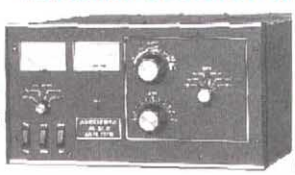
with Eimac® 3CX1200A7 tube



AL-1200

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Suggested Retail

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By John Reisenauer Jr, KL7JR/VE8JR

The KL7AK Expedition to Mekoryuk, Alaska

Amateur Radio is a vast and varied hobby, but for Rick, KL7AK; Bob, WL7QC; and me, it's all about understanding new cultures, making new friends and exposing others to ham radio.

From 3000 feet above the decaying Bering Sea ice came our first glimpse of the tiny Nuniwarmiut, Cup'iq Eskimo village of Mekoryuk, on remote Nunivak Island. Our chartered Twin Otter airplane circled slowly before descending to the narrow gravel runway. Village spokesman Moses Whitman Sr met us there.

I'd been communicating with Moses for the past few months for permission to visit his island and give Amateur Radio demonstrations. Our arrival was greeted with enthusiasm. Rick, KL7AK, and I had long wanted to visit one of Alaska's *inhabited* remote islands (we're usually set up on deserted islands in the middle of the Gulf of Alaska).

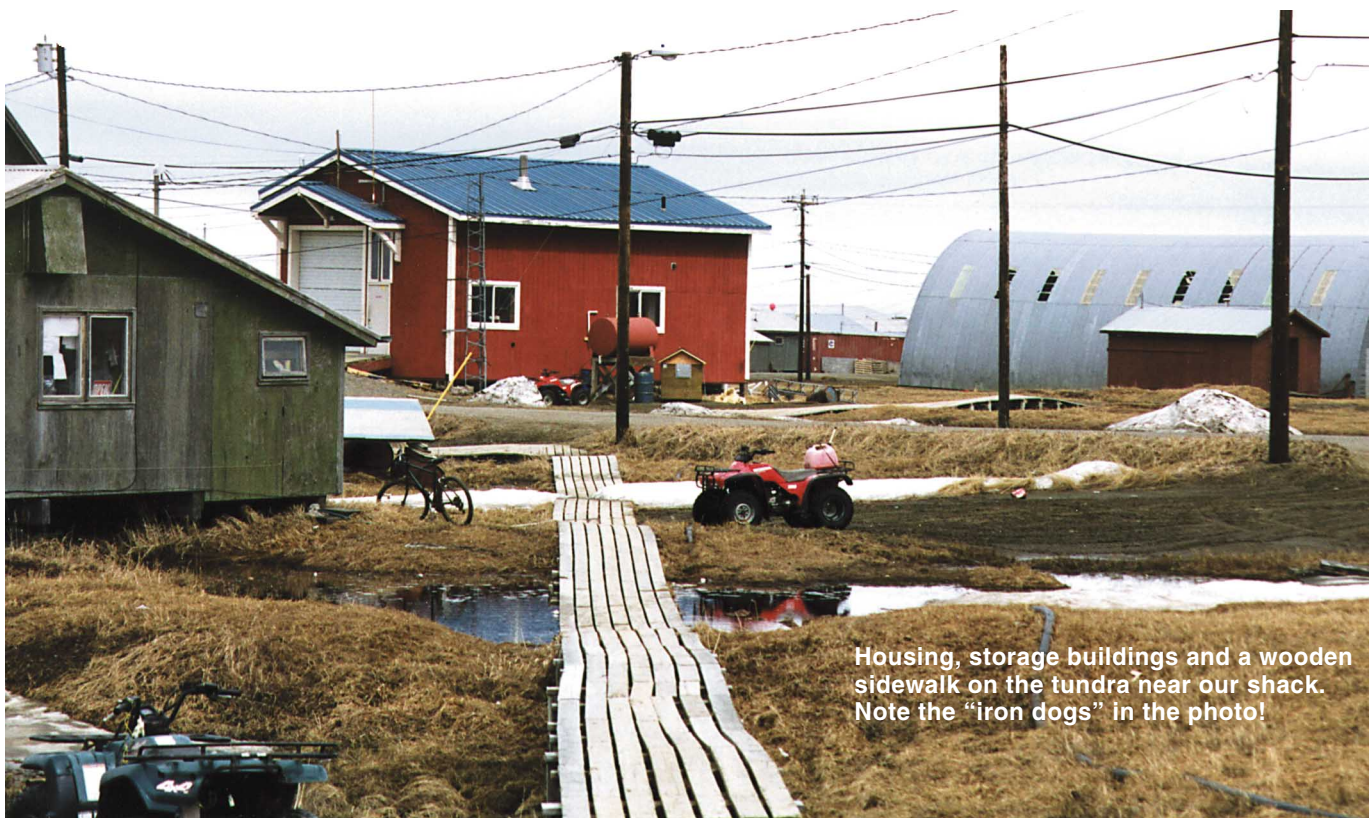
Part DXpedition, part cultural exchange, these ops discovered that making new Eskimo friends in Mekoryuk—a remote village off Alaska's west coast—was simply unforgettable.

Moses is an avid shortwave listener and knew the importance of Amateur Radio. CB and marine VHF radio are now common on the island. Rick and I also told Moses how sought after his island (AK-027S and NA-074) was among island-chasing hams. He mentioned that Nunivak Island had hosted hams only once, back in 1991. He agreed that the island's children would probably enjoy ham radio—and they did!

Setting Up

Marshy Nunivak Island is dotted with pingos (low hills or mounds forced up by hydrostatic pressure in an area underlain by permafrost). On the high tundra, the arctic winds whip tall yellow grasses while the lower areas glisten in murky swamp water.

Three Eskimo fishermen helped us raise the tribander in the persistent breeze. That done, we soon learned that ac power was close at hand. The island has its own diesel generator, complete with overhead power



Housing, storage buildings and a wooden sidewalk on the tundra near our shack. Note the "iron dogs" in the photo!

lines that supply continuous power to most homes and businesses (two stores, a police station, a post office, a clinic, city hall and the airport runway).

Using the "armstrong method," we pointed the beam toward the middle of the US mainland. At 2208Z on June 4, 20 meters exploded with weak signals when Rick, KL7AK, unkeyed our primary station (an FT-900 transceiver and an A3S beam) on 14.260 MHz. Propagation was marginal and QRM from the calling stations made things frustrating.

A steady S5 noise level plagued us before Bob drove a three-foot-long copper pipe into the ground, ran a short cable and connected it to the rig. To our amazement, this mostly eliminated the noise, which dramatically improved our copy on weaker signals.

Rick and Bob worked the pileup while I set up our secondary station (an FT-747GX and a 17-meter wire vertical). Unlike Bob, I wasn't so lucky in finding a decent ground connection on the icy, slushy tundra.

By now Rick could hardly speak. The pileup had worn out his voice! I took over for two hours and was also sporting a sore throat. Bob jumped in while Rick and I prepared supper—freeze-dried chicken and noodles (it tastes better than it sounds). In our first 24 hours on the air we'd made only about 400 contacts with ops in 21 countries.

Where Are We?

Until only a few years ago, Nunivak Island (60° N, 166° W), 30 miles off Alaska's west coast, remained wild, remote and virtually tourist-free. Mekoryuk, the island's only village, is 149 miles west of Bethel and 533 miles west of Anchorage. Those are air miles, by the way. There are no roads to Bethel except for a winter ice road on the Yukon River.

The population of this tiny village totals only about 200 people, mostly Nuniwarmiut, Cup'iq Eskimos who have inhabited the island for some 2000 years. Best known for its musk oxen, Nunivak, Alaska's third-largest island, is home to more than 500 of these Ice Age beasts, whose fur provides fine wool called Qiviut. Reindeer roam freely on the island, half of which is classified as a wilderness area. Most families here engage in subsistence activities and most have fish camps. Salmon, reindeer, seal meat and oil are important staples. Most residents travel on ATVs (four-wheeled all-terrain vehicles), which are dubbed "iron dogs." They were everywhere.

Making New Friends

We camped out in sleeping bags at the lodge/community center. We put out the word that our door was open to anyone interested in learning about Amateur Radio. Several villagers stopped by and we soon learned that we were big news here!

Repeat visits by Juanita (8), Mariann (9) and Jonathan (7) seemed almost hourly. When Rick wasn't explaining radio etiquette to the youngsters, Bob was showing them great circle charts and talking about propagation (they knew what "skip" was from the village CBers). I was busy answering questions and capturing it all on video and film.

Our guests were fascinated by the incoming signals. One little guy said, "I'll bet you can't talk to Italy." Ten minutes later he left the shack in a flash to tell his mother he had heard two Italian stations!

Melanie and Jonathan did not pass up my invitation to say hello to Yuke, JA6LCJ/3, on 20 meters. Yuke was pounding in at 20 over S9. Other hams would often say hi to the kids in the shack, making them feel like celebrities. That made their day, especially when Yuke said he knew where Mekoryuk was!

Most of the children spoke English, while some of the elders conversed only in their native tongue. While walking on the tundra, the kids taught me a lot about their island. Melanie and Mariann laughed as a dozen Canadian honkers broke the silence—

Our shack. Musk ox hides can be seen in the background.

or was it when I said the tundra cranberries were bitter? The kids ate them like candy.

Musk ox hides hung everywhere in the village. Several homes had salmon drying outdoors on wooden racks. I mentioned that the abandoned machinery, appliances and other stuff scattered about seemed to be an eyesore. The young ladies explained that

Proof of the pudding! WL7QC (left) and KL7AK (right).

Operator Mariann, DXing with KL7AK.

KL7JR (left), KL7AK (center) and village spokesman Moses (right).

A close-up of our improvised G5RV support mast.

their people believe that everything (objects, people and animals, excluding dogs) has a soul and is part of the community. This is important to remember when visiting the bush: "What gets here usually stays here."

Still raining and cold, propagation improved on day two. Ops in Europe and Asia were now making the log. I relieved Rick at 6 AM to inherit a huge pileup. Russ, VE6VK, ran lists for us for several hours, which helped hundreds of operators work us instead of being shut out because of QRM and QSB.

After a few hours, signals were strong enough for us to work split. Hundreds more QSOs poured into the log. Propagation was weird. We had to work long path or off the back of the beam—or both—to hear the many stations calling us. Russ, VE6VK, said he was experiencing the same from Calgary. Others commented on the situation as well.

Saying Goodbye

Early the next morning we were in a new world of sunshine and clear blue skies. Signals were mostly five by nine now, which made the pileups more manageable. At 7 AM we dismantled the beam and the primary station. Bob would take the gear back to Juneau on the morning flight. Rick and I would leave on the afternoon flight to Bethel, and then Anchorage.

I nailed a couple of scrap 2 × 4s together to make a mast to support our G5RV dipole. By now we had about 1700 QSOs with

KL7AK and the gang: Lindsey (left), Jonathan (center) and Mariann (right).

ops in nearly 70 countries, which wasn't too bad, considering conditions.

Mariann, Jonathan and Melanie dropped by to say goodbye. I promised to send them books so they could get started in Amateur Radio. Rick, Bob and I had experienced another exciting and unique radio adventure in Alaska. We had befriended the people of Nunivak, who made a lasting impression on us.

Being in Alaska is like stepping into a beautiful postcard. We re-experienced the Last Frontier and rekindled the spirit of Amateur Radio. Amateur Radio just might give me a good excuse to travel the Northland. If that's so, I'm glad I thought of it!

You can contact the author at Box 4001, West Richland, WA 99353; **kl7jr@owt.com**. QST

3000 feet over the village of Mekoryuk.

By Murray Green, K3BEQ

"Build It and They Will Come"

A new radio and television museum is now "receiving" visitors near the nation's capital. This weekends-only treasure trove has a rich collection of electronics history.

Thanks to the officers and members of the Radio History Society (RHS), officials of Bowie, Maryland, and George Washington University, a new radio and television museum opened on June 12, 1999, in Bowie.

In addition to exhibiting vintage electronic equipment, components and memorabilia, the RHS hopes to help area kids get their Amateur Radio licenses. RHS instructors will be assisted by members of area ham clubs (some RHS members are not licensed operators).

The Museum is housed in the historic Harmel House, which was renovated and provided to the RHS by the city of Bowie. The Harmel House was built in 1905 and was the home of a shopkeeper (see the sidebar).

Radio, Radio and TV, Too!

The exhibits are fascinating for antique radio/TV buffs, radio amateurs and the general public. Viewing them is a walk through time that brings back memories for some, and provides real-world evidence of the electronic evolution for others. RHS members spent hundreds of hours preparing the museum exhibits and refurbishing many splendid wood cabinets that house much of the equipment.

Museum guests begin their visit exploring the earliest days of wireless telegraphy. These sets include equipment such as that used to alert the ship *Carpathia* to come to the *Titanic*'s aid.

The exhibition continues with the battery-operated sets of the 1920s, the small Depression-era cathedral sets and the large floor models of the 1930s and 1940s. It also includes Amateur Radio equipment such as the Hammarlund HQ-129.

The transistor era of the 1950s follows,

History of the Harmel House Museum

The Harmel House was owned by storeowner George McGaw and rented by his storekeeper, Abraham Edlavitch, a Russian immigrant who came to Prince George's County, Maryland, in 1888. The Edlavitch family eventually purchased the house in 1925. The Harmel family was the last owner; the city of Bowie purchased the little frame house to maintain the corner's rural heritage and prevent further development.

The city worked with the Radio History Society to develop exhibits, plan operations, organize volunteer rosters and build the collections. The city also renovated the building prior to the installation of exhibits.

The Radio-TV Museum is a showcase for our Amateur Radio heritage with gems such as this Hammarlund HQ-129 (inset).

An eye-catching collection of equipment and memorabilia.

The Radio-TV Museum (The Harmel House) in Bowie, Maryland. The home was completely renovated inside and out, thanks to the City of Bowie. *All photos by the author.*

The RHS Web Site

To learn more about the Radio History Society, point your Web browser to **http://www.radiohistory.org**. RHS President and radio and television personality Ed Walker, N3HFT, hosts a weekly three-hour radio program on WAMU FM, 88.5 MHz, from the Washington, DC, area, Sundays, from 7 to 10 PM. The program features old-time radio shows.

as does the history of television from the primitive mechanical sets of the 1920s to the tiny-screened, post-war (WW II) sets, to the high-definition TV sets of tomorrow. The HDTV set on display is on loan to the Museum and presently sells for about $7000!

Items You'll Want to See

- A part of the original transatlantic telegraph cable, found in the Sunken Forest at Rye Beach, New Hampshire, in 1979. The cable was started in 1857, completed in 1874 and operated until the 1920s.
- The first miniature tube. This Western Electric filament-type triode was designed for use in the trenches of WW I, but production began in 1919 and the tube was never used during the war.
- The tabletop radio made famous in the popular TV series, "The Waltons." The family was often shown seated around the kitchen table with the radio visible in the background. The introductory price of the radio was $89.95—a lot of money in the late 1930s!
- *The* DeForest Audion tube used by Edwin Howard Armstrong when he invented the regenerative receiver and the Armstrong oscillator in 1911/1912. (The tube was generously loaned to the RHS by Renville McMann of New Canaan, Connecticut.)
- A classic "Hopalong Cassidy" radio. The wire antenna is unique in that it's shaped in the form of a lasso. (For younger readers, Hopalong Cassidy was a fictitious cowboy TV star similar to, but not as famous as, real cowboys Roy Rogers and Gene Autry.)
- Several vintage microphones from the earliest days of broadcast radio.

These are just a few of the many historic, unusual and beautifully preserved items displayed throughout the Museum. A complete list would probably fill half of the magazine!

Summary

If you want to take a fascinating step into radio and TV history, the Harmel House/RHS museum is the place to go. As an added attraction, the building is in a quiet country setting that's surrounded by beautiful trees and green lawns. Although the site is fairly small, it's a great place to relax.

The Museum is open on Saturday and Sunday from 1 to 4 PM. Volunteer tour guides are available, or you can leisurely browse the exhibits by yourself. Group tours can be arranged by calling 301-390-1020. Admission is free!

Collecting, preserving and displaying historic electronic equipment is a monumental task. Our sincere thanks go to members of the RHS and the city of Bowie, Maryland. Some of the equipment displayed is part of our Amateur Radio heritage. We are most fortunate that the gear has not been allowed to deteriorate or linger in the dark corners of basements, attics and garages.

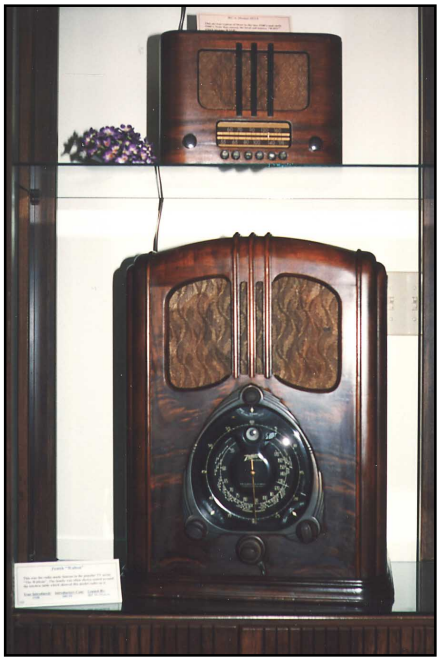
It's essential that this type of equipment be permanently displayed for present and future generations. The RHS and the city of Bowie recognized this and can be proud of their foresight and their worthy contribution to society. Without it, there would be no foundation to learn from; no memories to be stirred. "Build it and they will come." I know *they* will.

You can contact the author at 5730 Lockwood Rd, Cheverly, MD 20785; ***mgreen@erols.com***

Note: This article contains excerpts from the *Bowie Musings*, the Newsletter of the City of Bowie, Maryland, Museums Division. Permission to use the excerpts was obtained from Stephen E. Patrick, Curator and Editor.

Directions to the Museum

From the Washington, DC, Beltway (Interstate 495), take exit 19A (Route 50 East, Annapolis). Exit at route 197 and turn right (south). Drive about 1 mile to Mitchellville Road and turn right at the traffic light. Continue for 1-2 miles and watch for the red museum house on the left at the corner of Mitchellville Road and Mount Oak Road. From the Interstate it's about a 15-minute drive.



Historic broadcast receivers highlight the museum's collection.

Enormous indoor antennas like this one were common in American homes in the early part of the century.

City of Bowie Mayor G. Frederick Robinson was present at the museum dedication. The photograph on the wall shows David Sarnoff and Guglielmo Marconi in 1933 at the RCA Transmitting Center in Riverhead, New York.

By John Hansen, W2FS

HamWeb: A New Approach to Mobile Data Services

Dust off that 1200-baud TNC! Here's a way to put it to work again!

HamWeb is a new client/server software package that allows hams to access virtually any Internet data via amateur packet radio.[1] *HamWeb* is primarily designed to serve individuals who are operating mobile, but can also be used by fixed stations that lack direct Internet access. Most importantly, *HamWeb* is specifically designed to efficiently use the rather slow data rates now common in amateur packet radio. It's time to drag out that 1200-baud TNC that has been gathering dust in your closet and put it back into service; you might be amazed at what it can do!

The *HamWeb* server bridges the gap between the packet-radio world and the Internet. It receives requests for specific types of information or Web pages from packet-radio stations, initiates requests for the required data from the appropriate Internet site, processes the resulting information to significantly reduce its size, then transmits it via packet radio. All *HamWeb* data transmissions are performed in "unconnected" mode as UI (unnumbered information) packet frames (see the sidebar "Why Use UI Frames?"), so they can be received and processed simultaneously by everyone monitoring that server's frequency. Figure 1 shows how the arrangement works in practice on a simple request for a call-sign lookup for W2FS. A request-

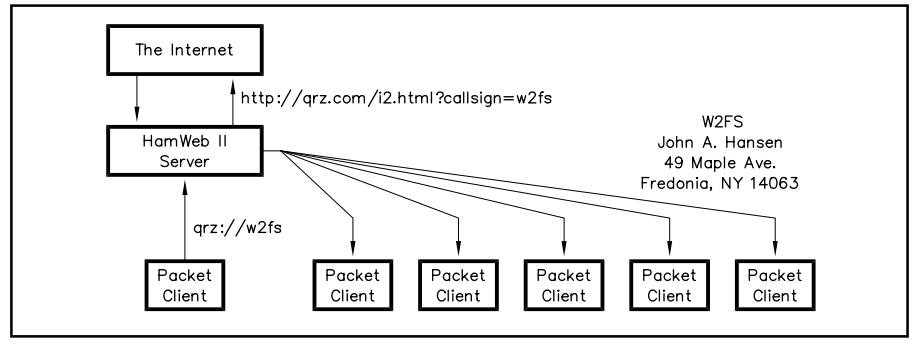


Figure 1—*HamWeb* system configuration.

[1]Notes appear on page 36.

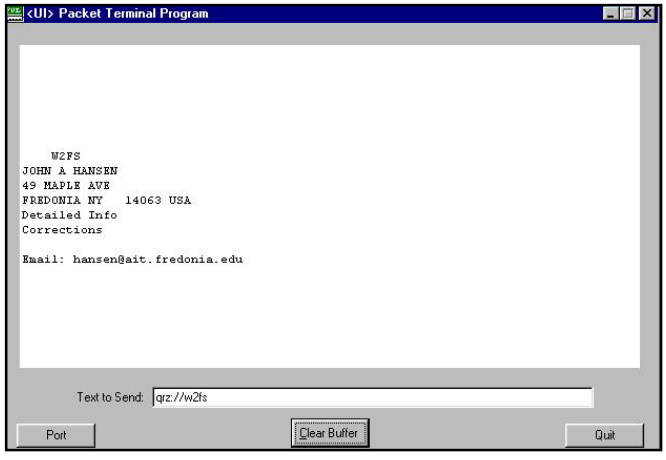


Figure 2—Output from call-sign look-up.

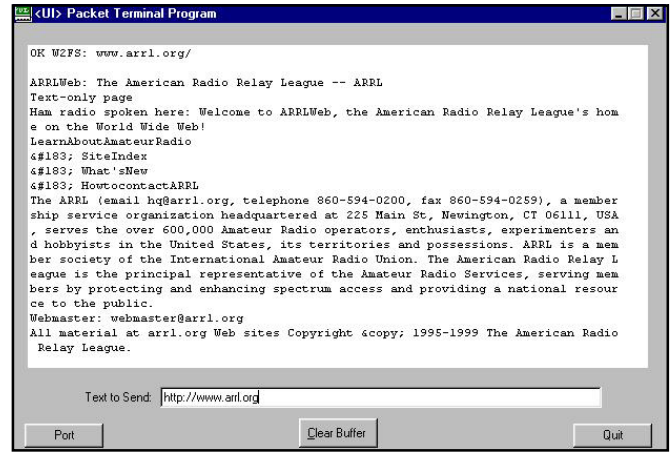


Figure 3—The ARRL home page on *HamWeb*.

ing station sends the line:

qrz://w2fs

The *HamWeb* server understands that the keyword **qrz** is a request for a call-sign look-up. It accesses the site **www.qrz.com** and retrieves a Web page that includes the address information for W2FS. *HamWeb* then strips off all the HTML (hypertext mark-up language) formatting tags, advertising and other extraneous material and transmits only the call-sign look-up information (see Figure 2).

Because the information is sent encoded in UI frames, any other packet station monitoring the frequency can also receive the information. That's not much of an advantage when the end user is doing a call-sign look-up. But when the transmitted data involves weather information, DX spots, sports scores or a wide range of other data, it might be a significant advantage to have the data transmitted to everyone at once.

Furthermore, the data moves very quickly because it is sent as a continuous stream. When using UI frames, no acknowledgement (ACK) packets are expected or allowed, so there is no need to pause between transmissions to wait for them. This results in a huge increase in throughput.

The *HamWeb* server delivers content from the Internet in one of three ways, depending on the type of request it receives. The server is capable of transmitting an entire Web page, just as it comes from the Internet, including all of the formatting tags. To access this mode, you simply preface your Web page request with the keyword

html://

At today's packet speeds, this is not very practical because of the large amount of data contained in most Web pages. As speeds increase, however, this might become a viable means of graphical Web browsing.

Secondly, you can access just the *text* of a Web page, without all the formatting information, by using the keyword

http://

Figure 3 shows the results of such a request for the ARRL's home page. Although this request can grab the text from *any* Web page anywhere in the world, I suspect that it will be primarily useful for accessing Web pages designed by hams specifically for this service. For example, someone could automatically transfer traditional PBBS bulletins to a Web page and have them available throughout the world without the relatively inefficient forwarding system now used. DX operators, who now occasionally put their logs on Web pages, could do so in such a way that they could be accessed using packet radio via *HamWeb*.

The third way of accessing the *HamWeb* server is likely to be most useful, at least at 1200 baud. A *HamWeb* server sysop can define specific services that are tied to individual Web pages through the use of keywords by a requesting station. The **www.qrz.com** page discussed earlier is one such example. Another example is a generic address and telephone lookup. For example, the Web page **www.switchboard.com** permits you to find the address and telephone number of anyone in the country who is listed in a local telephone book. Figure 4 shows an example of such a request. The user transmits

addr://John%Hansen%Fredonia%NY%

The **addr** keyword tells *HamWeb* to use the switchboard service. The words that follow the backslashes are parameters used by *HamWeb* to construct a request for John Hansen, who lives in Fredonia, New York. The server sends the request to the switchboard Web site, strips away all the extraneous material from the response it receives and transmits only a few dozen characters over the air. Thus data is communicated very efficiently and the information is provided extremely rapidly, even at 1200 baud.

A few sample "services" of this type are shipped with the *HamWeb* server. These include the ability to look up *Callbook* entries, address and phone numbers, and DX PacketCluster spots. However, *HamWeb* is specifically designed so that any sysop can specify particular services *without any knowledge of computer programming*. Developing services is extremely easy to do. Furthermore, because the Internet is inherently worldwide, services developed for one *HamWeb* server can easily be used on any other *HamWeb* server.

Setting Up a Server

Setting up a *HamWeb* server requires the *HamWeb* server software (which runs under *Windows 95* and *Windows 98*),[2] an Internet connection and a packet-radio station (see Note 1). When selecting a transmitter for the packet station, pick one that can handle a relatively high duty cycle. Although there are brief pauses between packet transmissions, the transmission is mostly one way, so the transmitter might be keyed a very high percentage of the time. The *HamWeb* server operates in KISS mode, so any TNC capable of supporting KISS should work fine. However, BayCom and HamCom style modems will *not* work in this application. Ideally, it would be great if you can operate split (either within band or crossband) so that stations sending requests would not have to share the frequency with the server dispensing information. Nevertheless, simplex operation works just fine, especially if your goal is to try the software and see if there is any demand for *HamWeb* service in your area.

Running *HamWeb* is simple: Just put the files in their own directory (folder) and run the program. The first time *HamWeb* runs, a dialog box asks you to specify the server call sign including SSID (eg, W2FS-3), the data rate and TNC type. It is very important that the data rate between the computer and the TNC match the data rate that you will be using on the air. For example, if you plan to run the system at 1200 baud on the air, the data rate between the computer and the TNC must also be 1200 baud. This may require your changing a switch setting on

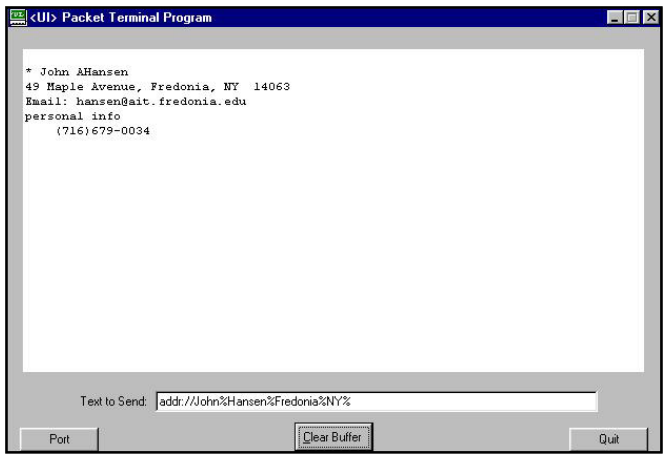


Figure 4—Switchboard address and phone look-up of *HamWeb*.

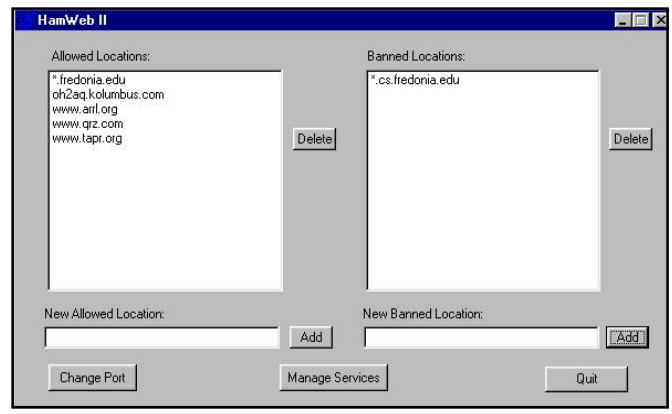


Figure 5—The *HamWeb* server main screen.

your TNC. It is essential that these rates match because the KISS mode has no means of flow control. If you send the data to the TNC faster than the TNC can transmit it, sooner or later the TNC memory will fill up and overflow because the TNC can't push the data out as fast as it is coming in. So, make sure the speed settings match.

After you've specified the required parameters, you are presented with the main *HamWeb* server management screen; this is shown in Figure 5. This screen's main purpose is to allow the sysop to manage user Web access. There are many Web sites containing material that is illegal to transmit using Amateur Radio (at least in the US). It is the sysop's responsibility to make certain that such sites are *not accessible* via *HamWeb*. This can be done in either of two ways. You may specify a list of *allowed* sites on the *left-hand* side of the screen. You may also specify a list of *banned* sites on the *right-hand* side of the screen. Only the site itself is specified, not the actual page. So list only that portion of the URL[3] referring to the host site. That is, list only the text that occurs before the first backslash. For example, you would include **www.arrl.org** not **www.arrl.org/news/**.

The *HamWeb* lists support the use of an asterisk as a wild card. Note, for example, in Figure 5, that one of the allowed sites is ***.fredonia.edu**. This means that *all* of the sites that end with **fredonia.edu** are allowed. However, suppose that I know that the Web sites that end with **.cs.fredonia.edu** are run by individuals with questionable taste. I can allow all fredonia.edu sites to be accessed *except* those that end with **.cs.fredonia.edu** by putting that location in the banned list. Where there is a conflict between the allowed and banned lists, listings in the banned list *always overrule* listings in allowed list.

Pushing the **Manage Services** button accesses the specific services provided by the *HamWeb* server. This brings up another dialog box that allows you to create, modify or delete existing services. Figure 6 shows this box with the address and phone number look-up service. A service is comprised of four elements. First, you must specify a keyword that the packet operator can use to call the service. In the case of address look-up, I've used **addr**. Second, you must specify the complete URL for the site. In the case of the address look-up service, it is:

www.switchboard.com/bin/cgiqa.dll?SR=&MEM=1&F=%1&L=%2&T=%3&S=%4&Submit=Search

Note that there are four tokens (replaceable parameters) in this URL: %1, %2, %3, and %4. These indicate the spots for insertion of the user-supplied parameters. For example, for a user command of:

addr://John%Hansen%Fredonia%NY%

John is inserted as the first parameter, %1, Hansen for %2, and so forth. Up to six different parameters may be used in the specification. You can determine what this URL template must be by using a standard Web browser such as *Netscape* or *Internet Explorer* and calling up the page that has the data you want. In this case, go to **www.switchboard.com**, select the page to look up a person, fill in the blanks with that person's name, city and state and then press the **ENTER** key to request the information. When the information appears on your screen, the URL appears in a box near the top of the screen. Simply use the resulting URL for the template, but for %1, %2, etc, substitute the values you had to specify to obtain the correct page.

The **Fetch Text After** and **Stop Fetching Text At** boxes specify which part of the returned Web page is transmitted. There are two ways to determine which values to place in these boxes. First, when you call up the required page using your Web browser, you can click on the **View** menu and select **Page Source**. This lets you look at the text being received via the Internet so that you can identify a word just before the text you want and a word just after the text you want to fill into these boxes. Because of the formatting tags that are littered through the file source code, however, it is sometimes difficult to pick out the text you want from the page information itself. A

Figure 6—Managing *HamWeb* services.

Why Use UI Frames?

The *HamWeb* server exclusively uses unnumbered information (**UI**) frames for data communication. Other popular packet-radio packages, including APRS and the PACSAT protocol (which serves as the basis for communication with most amateur digital satellites) use this method as well. Some have suggested that soon the use of unconnected packets will exceed the more traditional connected communication. Why is this?

When you connect to another station (or your local BBS) via packet radio you are using packet's traditional connected mode. Each chunk of information (a *frame*) is independently checked for errors and acknowledged as correct by the receiving station. This is the mechanism that ensures that packet provides virtually 100% error-free communications.

UI frames, on the other hand, are not necessarily directed at a particular station. The information is simply transmitted for anyone to receive and is not acknowledged by any of the receiving stations. Error checking is still performed at the receiving end by each receiving station, and any packets with errors are not displayed on the receiving terminal screen. However, packet-by-packet acknowledgements are not transmitted.

Generally speaking, communication using **UI** frames is more efficient than that which uses connected frames for two reasons. First, no time is taken up by acknowledgment transmissions. This saves both the air time that those transmissions would require and the time that is needed for each station to switch from receive to transmit. Instead, the transmitting station can simply send a continuous stream of data.

Perhaps more importantly, **UI** frames facilitate the communication of data to more than one station at once. One of the main advantages of radio links over wire links is that radio is inherently a point-to-multipoint communications medium. With voice transmissions we generally understand this and take advantage of it without a second thought. Imagine how inefficient voice nets would be if the net control station communicated with only one station at a time, repeating each transmission for each station on the net! This is essentially how connected-mode packet works. If five stations want the same information from a particular server, each connects individually to the server and the data is repeated five times. The use of **UI** frames allows this data to be communicated to all five stations at once. However, it does so at the expense of the integrity of the data stream. If one of the stations misses one of the frames, or finds that it is corrupted on receipt, there is no mechanism that will automatically cause the data to be retransmitted. Thus unconnected packets work best in an environment where either the server has a clear frequency, or where receipt of every single packet is not essential.

For many applications, data transmission using **UI** frames is vastly more efficient than the more traditional connected mode.—*John Hansen, W2FS*

simpler way to determine the proper contents of the two boxes is to initially specify this service leaving these two boxes blank. That way, the entire page is transmitted, except for the formatting codes. You can then examine the transmitted text to locate the words that occur just before and after the desired text.

In the current version of *HamWeb*, you can specify up to 200 different services. They are stored in a plain text file called *services.txt* that you can edit outside of *HamWeb*. You can create a Web page that contains a list of all the services your *HamWeb* server supports and then set up a keyword called **index** or **info** or **help** that returns the contents of that Web page.

Setting Up a Client

A *HamWeb* client is any program or hardware device that receives data from a *HamWeb* server and presents it to the end user. It is possible to access a *HamWeb* server with virtually any packet software you have available. *HamWeb* servers only respond to unconnected packets having the server's call sign as the destination address. So, set up your software so that the TNC **UNPROTO** parameter value is the call sign of the server you want to access. Also, set the **Mon** and **Mall** parameters to **ON**. Then, put the TNC into **CONVERSE** mode (usually by typing **K** and then the **ENTER** key). Do not attempt to actually initiate a connect request to the server. The server simply does not function in connected mode and will not acknowledge a connect request. After the TNC is in **CONVERSE** mode, send your information request to the server formatted as described earlier. When the server receives your request, it acknowledges by sending either:

OK W2FS: www.arrl.org/ *(acknowledging, for example, that W2FS has requested www.arrl.org/)*

or

W2FS: That Page Not Allowed *(if the page is not permitted by the server)*

Terminal Programs

The problem with using a generic terminal program is that the packets you receive from a server will have headers attached to them. This makes it harder to read the output, as it tends to appear broken up on your screen. It is readable, however, and it certainly is possible to access Internet data this way.

The *HamWeb* software package also contains a custom terminal program called *<UI>Term* that is specifically designed to access a *HamWeb* Server. The advantage of using this program is that it strips off all of the headers before displaying the retrieved text. Figures 2, 3 and 4 are screenshots taken while using *<UI>Term*. This client program runs under *Windows 95* and *98* and is fairly simple to set up. The first time you run it, you have to specify the port you want to use, the data rate and the TNC type. In addition, you will have to specify your call sign and the call sign of the server you are using. This program also uses a TNC's KISS mode. You need not worry about specifying TNC parameters; *<UI>Term* takes care of that for you.

Rethinking Mobile Data Services

Given that the primary purpose of a *HamWeb* server is to provide data to mobile amateur packet radio users, using a terminal program running on any computer (even a notebook or hand-held) is *not* the ideal answer. I have provided *<UI>Term* not because I think it is the best way to access *HamWeb*, but because it is a quick and easy way of demonstrating the server's capabilities. It is *extremely unsafe* to attempt to type on a keyboard and read a computer screen while driving—although I do know a couple of people who try to do it.

The availability of Internet-derived data in our vehicles calls for a complete rethinking of how this data is displayed and how data requests are sent to a server. While driving, most of us access information from a large number of sources. We look at dashboard gauges, listen to the radio, glance at the displays of our mobile radios or GPS receivers and watch and listen for warning lights and sounds. We do this constantly while we are driving, and we do it safely. We need to begin to think about how we can develop safe mechanisms for communicating data in a mobile environment. We are at a very early stage in this, but here are a few examples of what I'm talking about:

Suppose you establish a special e-mail account that is accessible via a Web page. When family members want to leave you a message while you are mobile, they send it to that account. You use a $6 PIC microprocessor to automatically generate a request for data from that Web page every now and then. Any messages that are in the mailbox are displayed on a $20 4-line by 20-character LCD glued to your dashboard.

Suppose you have a microprocessor-based device that periodically generates a request to a server for the latest DX PacketCluster information. The microprocessor evaluates the response and determines whether there are any countries on the list that you need. If there are, a voice-synthesizer chip (about $12) announces the prefixes and frequencies. You could wear this device on your belt as you do a pager.

Suppose hams in your area figured out a way to create a Web page that has traffic (or weather, sports, or whatever) information that is updated in a timely manner. From your car you access the Web page and have the relevant information appear on a small dashboard-mounted display. The beauty of this is that you could constantly monitor any type of information requested by others as well as yourself.

Have you ever wondered which of your friends were mobile and which repeaters they were monitoring? Suppose you could develop a system whereby mobile radios had their call signs encoded digitally and transmitted periodically in a very short data burst. As the Internet becomes more and more ubiquitous, it should be possible to construct a Web page that lists all of the folks who have their radios on in a given area and which frequency they are monitoring. When connected to a *HamWeb* server, it would then be possible to have—on your dashboard—a listing of who is on the air and on which frequencies.

One particularly interesting thing about mobile data services is that quite often the information that is of value in a mobile environment does not require high data speeds because it consists only of very small snippets of information. For many of these applications, providing alerts, performing various lookup functions and so forth, 1200 baud is perfectly adequate. There's a lot of life left in 1200-baud data transmission; we simply must be more creative about what we do with it.

So now it's your turn to exercise *your* imagination. What I've put together is not an end product—it is an "enabling technology," a building block that can be used to provide a completely new kind of mobile data service for radio amateurs. Folks anywhere in the world can establish Web pages that include content of interest to hams. It's up to the ham community to develop these Web pages and to imagine new mobile data applications that help bring life back to packet radio.

Notes

[1]As long as the data accessed is legal to transmit via Amateur Radio. The *HAMWEB* software, written by me, is available free of charge for amateur noncommercial use. You can obtain it from the ARRL at **www.arrl.org/qstfiles/** and from **ftp://ftp.tapr.org/pub/wa0ptv/**.

[2]But not *Windows 3.11* or earlier versions.

[3]A URL (uniform resource locator) provides the complete specification needed to obtain a Web page.

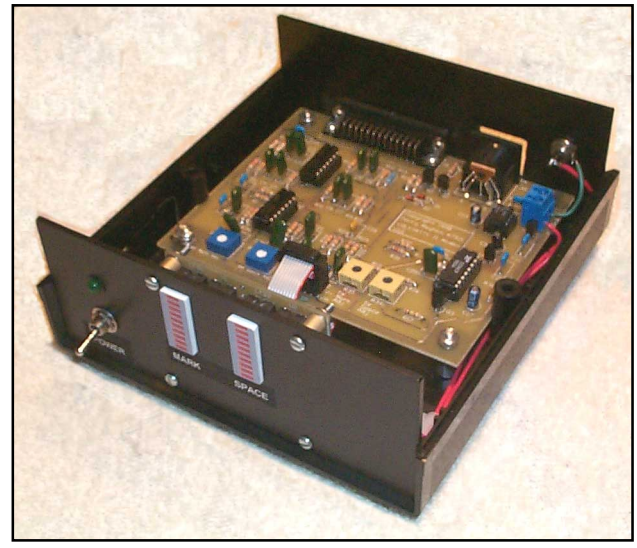
You can contact John Hansen, W2FS, at 49 Maple Ave, Fredonia, NY 14063; **john@hansen.net**. QST

See Feedback in December 1999 *QST*.

By Terry Mayhan, K7SZL

VolksRTTY II: for RTTY, AMTOR and PACTOR

Part 2—Let's construct the modem and put it on the air.



Part 1 of this article describes the circuit and its operation, presents the schematics, part lists and software sources.[1] Refer to Part 1 as we construct the modem and put the system on the air.

Construction

VolksRtty II can be built on a PC board or perfboard with point-to-point wiring—neither lead length nor component layout is critical. I developed a set of PC boards[2] for my unit: a 4×5-inch main board and a 2×2½-inch display board. All connectors (DB25 for the computer's RS-232 interface, DIN-5 for connecting to the transceiver and a terminal block for power) are mounted on the main PC board so no point-to-point wiring is required. A short ribbon cable carries the mark and space signals, unregulated power and ground from the main to the display board. The size of the display board allows it to be mounted vertically on a relatively small front panel for ease of viewing. In a departure from the PK-232 style of tuning indicator, VR2's displays are oriented vertically, with the segments at the top corresponding to maximum input.

Pay close attention to the values and tolerances of the resistors and capacitors associated with U1A through U1D—use *exactly* the values specified, with 5%-tolerance resistors and 2%-tolerance capacitors or better. These components establish the passband characteristics of the 1360-Hz band-pass filter, which greatly affects the performance of the modem.

The completed circuit boards can be installed in a suitably sized plastic[3] or metal[4] enclosure of your choice. I haven't encountered any RF-intrusion problems with this circuit, but if you intend to run high power or have occasionally experienced RF in your shack, prudence suggests a shielded enclosure.

Checkout and Alignment

Hardware Checks

Before applying power, insert U5 into its socket on the main board. Do *not* install the remaining DIP ICs or the ribbon cable to the display board just yet. Apply power to J4 and confirm that the voltages in Table 1 are present at the indicated locations. (All voltages are measured with respect to ground.)

Disconnect the power supply, install the balance of the ICs on the main board and recheck all voltages with power applied. The +8- and –5-V readings should be identical to the values previously measured, but the –8-V dc rail will normally sag a bit under load (–6.5 to –7.0 V dc). Disconnect the power supply and install the ribbon cable that connects the main and display boards together. With the 10-segment LED displays and the two LM3914s *out* of their sockets, apply power to the main board and measure

[1]Notes appear on page 41.

Table 1
Main Board DC Voltage Readings

	U5		U1		U2		U4	
Pin	*8*	*5*	*4*	*11*	*4*	*11*	*4*	*12*
DC Voltage (Only U5 installed)	+8	–8	+8	–8	+8	–8	+8	–5
DC Voltage (All ICs installed)	+8	–6.5 to –7.0	+8	–6.5 to –7.0	+8	–6.5 to –7.0	+8	–5

Table 2
HC31.CFG File Changes for VolksRTTY II

Search for	*Change to*
select port	select port com*x* (where *x* is the number of the COM port you use)
set afcenter	set afcenter 1360
set afshift	set afshift 170 Hz (or 200 Hz*)
set extconv	set extconv on

*Both shifts are commonly found on the HF bands—170 Hz is typically used for RTTY, while PACTOR more frequently uses 200 Hz. Decide which mode you anticipate using most frequently and select the corresponding shift, or even "split the difference."

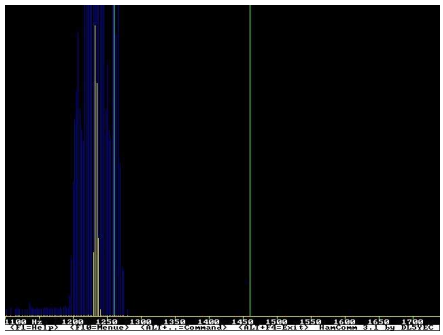


Figure 1—Tuning display showing AFSK space tone before alignment (200-Hz shift).

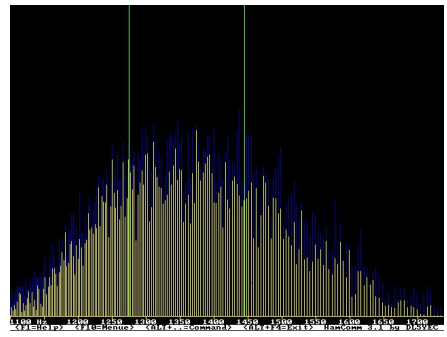


Figure 2—*HamComm* tuning display with no signal present (170-Hz shift).

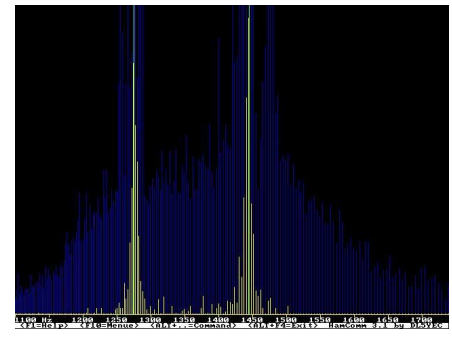


Figure 3—*HamComm* tuning display with properly tuned RTTY signal (170-Hz shift).

the voltage at pin 3 of U1 and U2 on the display board. You should see +8-V dc. Disconnect the power supply and install the indicators and ICs in the display board. Again, pay close attention to orientation. Reapply power to the main board and confirm the absence of smoke, exploding components or other signs of circuit trauma. With no receive-audio input connected to J3, both LED indicators should be dark, although you may see a brief flash when power is first applied. Disconnect the power.

Test Software

If you don't already have it on your hard drive, acquire a copy of *HamComm* V3.1[5]—this will be used during the alignment process, plus it's outstanding for general RTTY operating. Copy the compressed file to an appropriately named subdirectory on your computer's hard drive (eg, C:\HC), and execute it by typing HAMCOM31. The program will extract a number of files and place them in the same subdirectory. These include the executable for *HamComm* (HC.EXE), a configuration file (HC31.CFG) that defines *HamComm*'s operating parameters, and a very extensive documentation file (HC.DOC). Make a backup copy of HC31.CFG, then use your favorite text editor to open HC31.CFG and, at a minimum, make the changes shown in Table 2. The file is very long (about 700 lines), so I've indicated a "search for" text to help locate each parameter in the file. When you have completed the changes, save the file as plain text with the same name (HC31.CFG) and exit.

Alignment

With power removed from the main board, use a standard serial cable to connect J1 on the main board to your computer's RS-232 port. Install a short piece of solid #22 wire as a jumper between the RX-Audio (pin 1) and TX-Audio (pin 3) terminals on J3. The jumper connects the AFSK output of the modem to the received-audio input so that the modem listens to itself. Apply power.

Operating in the native DOS mode,[6] execute *HamComm* by typing HC from the subdirectory containing the *HamComm* files. Press **F7** to switch to the spectrum-analyzer display and hit the **PAGE UP** key three times to expand the display scale. You will see two fixed, green "target" tuning lines on the black background. (See Figure 1.) If you selected a 200-Hz shift, one line will be at 1260 Hz and the other at 1460 Hz.

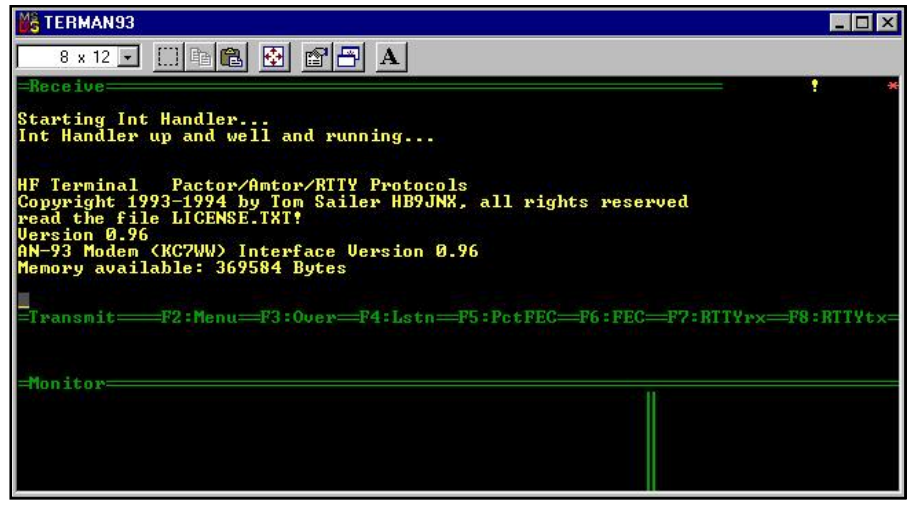


Figure 4—*Terman93* start-up screen.

Somewhere near the 1260-Hz line, you should see a bright yellow line that scintillates a bit. That's the signal from the modem's AFSK generator. Using a small screwdriver, adjust the **Transmit-Space-Adjust** control (R34) to set the space frequency of the AFSK generator to exactly coincide with the 1260-Hz target line. Observe DS2—you should see one or two segments illuminated. Now adjust the **Receive-Space-Adjust** control (R23) through its range. Notice that the illuminated segments move to the top end of the display and then retreat. The upper position corresponds to maximum signal. Carefully adjust the control to maximize the reading on display DS2. This completes the alignment of the space channel.

To align the mark channel, use a short clip lead to connect the junction of R17 and Q3 to pin 5 of U5—this switches U4, the AFSK generator, to a mark state. Observe that the yellow line has now shifted to the vicinity of the 1460-Hz target line. Adjust the **Transmit-Mark-Adjust** control (R35) so that the yellow line and the target line exactly coincide. Observe DS1; you should see one or two segments illuminated. Adjust **Receive-Mark-Adjust** control (R20) until the deflection of DS1 is at maximum. This completes the modem hardware adjustments—disconnect the power supply and remove the clip lead and jumper in J3.

Functional Test Drive

At this point, you should have a fully functional modem. Before you load T93 (*Terman93*), let's do a test drive of the modem with *HamComm*—this will provide a good opportunity to become familiar with VR2's tuning indicator since you can compare its appearance with *HamComm*'s on-screen indicators. Connect VR2 to your transceiver's receive-audio, microphone and PTT lines. Receive audio can be obtained by a parallel connection across the speaker or via a plug partially inserted into the headphone jack. Either approach allows you to listen to pitch cues as you tune in FSK signals. The best choice for a microphone-audio, PTT and ground interface is the transceiver's front-panel microphone connector. Many newer transceivers have a digital-interface port, however, they may not be compatible with the VR2 without modifications. For now, stick with a proven approach.

If you later decide to reconnect the modem to your transceiver's digital port for direct FSK operation, don't forget to program the transceiver for a 1360-Hz center frequency.

Set the transceiver to USB and disable the VOX feature. If your transceiver has selectable filters, choose one with a bandwidth between 1.8 and 2.7 kHz. Using a wider filter bandwidth than necessary eliminates the effects of passband tuning on VR2's front-end filter. Later, when you are actually operating RTTY and PACTOR, you will want to select filter bandwidths of 250 and 600 Hz, respectively. At that point, passband tuning becomes a critical parameter, and it must be centered at 1360 Hz. Tune the receiver to a clear frequency. Restart *HamComm*, press **F7** to bring up the spectrum-analyzer tuning screen and hit the **PAGE UP** key three times to expand the display.

Apply power to the modem and slowly increase the receive volume. Observe that, in response to the random noise, VR2's tuning indicators begin to dance at the bottom of the scale. As the volume is increased, the illuminated segments move up the scale until they reach a point where increasing audio levels cause no further deflection. Leave the volume control at this setting and confirm that roughly 60% of each display's segments are illuminated. Compare the *HamComm* tuning screen with Figure 4—the two should be similar. If the two differ significantly, there is probably a trouble with the wiring or components associated with U1.

Set your transceiver to the digital portion of your favorite band and tune the receiver to a reasonably strong RTTY signal. Using the spectrum-analyzer tuning indicator screen, carefully adjust the receiver tuning until the yellow mark/space lines of the RTTY signal are aligned with the green tuning lines as shown in Figure 3.

Observe VR2's LED tuning indicators. Note that as the received signal toggles between mark and space, the two indicators alternate between maximum (within one segment) and minimum. Rock the dial back and forth and note how the displacement of the LEDs changes as the signal is mistuned. Tune in the signal several times, switching your attention between *HamComm*'s tuning display and the one on VR2 until you are confident that you understand what LED pattern to look for on VR2. With the signal properly tuned, press **F3** to return *HamComm* to the RTTY screen. You should see intelligible text being printed. (If you have gotten this far successfully, VR2's front-end filter, limiter and FSK detector are working.)

Connect your transceiver to a dummy load or tune it to a clear frequency in one of the RTTY bands. Adjust your transceiver in the same manner that you would to operate on SSB (USB mode). Reduce the microphone gain to its minimum level. On your keyboard, press the **CONTROL** key with one finger and the **T** key with another. You should hear your transceiver's TR relay pull in, or see signs that the transceiver has switched from receive to transmit mode. At the same time, you should hear the distinctive "diddly, diddly, diddly . . ." of an idling RTTY signal coming from your PC speaker. Slowly increase your microphone gain while observing the plate current (drain or collector current for solid-state rigs). Increase the gain to achieve a reading equal to about one-half of that normal for CW operation. (Since RTTY is a continuous "key on the brick" mode, you don't want to run your radio at more than about one-half power, unless the instruction manual indicates otherwise.) At this half-power level, your mike gain should be around the normal level used for voice. You should not observe much plate (collector) current variation with the different mark/space tones being transmitted as *HamComm* idles. Type in a few characters (like your call sign) followed by a tap on the space bar and observe the change in sound. The transmitted characters will appear, highlighted in gray, on the lower receive window. To stop transmitting and return to the receive mode, you have two options: **CTRL-T** or **CTRL-BACKSPACE**. The former command immediately terminates the transmission, while the latter switches back to receive only after the transmit-buffer contents have been sent. For an exhaustive description of the operational features of *HamComm,* refer to the HC.DOC file provided with the evaluation copy of *HamComm*.

This completes the checkout and alignment of the VR2. As a reward for all your hard work, this would be a good time for a RTTY ragchew—or perhaps a little DX to get a feel for how your new modem performs. Have fun!

Table 3
Changes to the *Terman93* ALLMODE.INI file (words in italics indicate values that vary among stations)

Heading	*Search for*	*New Setting*
[RTTY]	ReverseTX	ReverseTX=T*
	Reverse	Reverse=T
[AMTOR]	Selcall	Selcall=*your selcall***
	TXReverse	TXReverse=T
	Reverse	Reverse=T
[PACTOR]	Mycall	Mycall=*your call*
[LISTEN]	CheapPactor	CheapPactor=T†
[AN93]	ConvAdjust	ConvAdjust=*20* (initial setting, see text)
	ComAddr	ComAddr= *correct port address* (per Table 4)††

*When you initially download the ALLMODE.INI file, it contains no entry for the ReverseTX parameter. Use a text editor to insert "ReverseTX=T" on a new line immediately under the [RTTY] heading. (If this isn't done, *Terman93* will add the parameter automatically and set its value to F, which will cause your transmit polarity to be incorrect.)

**Selcalls are created from the first letter plus the last three letters of a call sign. For example, the selcall for K7SZL is KSZL; for W1AW, it's WWAW.

†This setting apparently reduces the processing load for slow (eg, 12-MHz '286) computers. You need CheapPactor=T if your computer crashes when entering the listen mode, or it gives a LOST INTS error. It seems to make no difference for '386 and faster computers.

††One beta tester had interrupt problems. They were empirically solved by adding another parameter "ComInt=4" on a new line immediately after the ComAddr line. Values for ComInt appear in Table 4.

Installing T93

Download the compressed file TERMAN93.ZIP from the Internet at **http://www.ife.ee.ethz.ch/~sailer/ham/ham.html#hfterm**. Inside is a folder named AN93 that contains four files: ALLMODE.INI, LICENSE.TXT, MANUAL.DOC and TERMAN93.EXE.

Extract the files to an appropriate directory (say, C:\AN93) of your 12 MHz '286 or faster computer. The initial file extraction can be performed from within a *Windows* 3.1, *Win95* or *Win-NT* environment, however, you should operate *Terman93* only in native DOS mode.

T93's documentation file, MANUAL.DOC, is a model of brevity. While it does provide the essential information to interface the modem to a host running T93, it is largely silent with respect to on-the-air operation of the program. I'll describe operation somewhat here, but for additional detail visit my Web site (see Note 5).

The ALLMODE.INI file contains a number of configuration parameters that must be tailored for your particular installation before you can operate. Make a backup file, then use your favorite text editor to make the changes shown in Table 3. Again, use the "search for" text to locate a parameter, then change it as shown. When you're finished, save the revised file with the same name as plain text and exit the text editor.

Confirm that VR2 is connected to your computer, radio and a power source. Execute T93 by typing TERMAN93 at the DOS prompt in the AN93 directory. The screen shown in Figure 4 should appear. If the program immediately terminates, it means that the address and interrupt parameters for the COM port are not set correctly. If that occurs, edit ALLMODE.INI to change the address for the COM port (ComAddr parameter) and its associated interrupt vector and try again. Once you have T93 up and running, set your receiver

audio to slightly below normal listening level, and observe the asterisk in the upper right hand corner of the T93 screen. It should be moving back and forth on either side of an exclamation point, indicating that T93 is receiving input from VR2.

If you have a frequency counter with a 10-second or longer measurement period, follow the instructions in Section 1.17 of the AN-93 file MANUAL.DOC. This procedure describes how to accurately set the clock-correction parameter (ConvAdjust) in the ALLMODE.INI file. The T93 documentation indicates that the parameter must be set within 30 ppm, however, on-the-air experiments on PACTOR suggest that significantly greater errors can be tolerated with no degradation of link performance. If you don't have access to a counter, the initial ConvAdjust setting of 20 will be good enough to establish a PACTOR link. If you have trouble with the link stalling after the first half dozen words or so, adjust the correction factor empirically until the link remains synchronized.

Operating T93

Take a moment to explore the contents of T93's screen. There are four windows: receive, transmit, monitor and status (lower right-hand corner). Each is self-explanatory, with the exception of the monitor window, which is only active in AMTOR or PACTOR modes. It shows raw data sent and received in a packet form as well as a number of cryptic codes that appear to have been implemented as software debugging aids.

In preparation for your initial QSO with T93, let's review the most frequently used function keys. The emphasis here is on RTTY and PACTOR, since AMTOR activity has declined to a negligible level. Important function keys include:

F2 Menu—Provides menu access to most of T93's functions including clock correction and emergency link down. The menu is generally not used during routine operations since it invariably requires multiple keystrokes to accom plish tasks that can otherwise be performed with a single function key.

F3 Over—Turns the link back to the other station when in PACTOR ARQ mode

F4 Lstn—Puts T93 in receive mode for PACTOR and/or AMTOR.

F5 PctFEC—Selects PACTOR FEC transmit mode (used for calling CQ).

F6 FEC—Selects AMTOR FEC transmit mode (used for calling CQ).

F7 RTTYrx—Selects RTTY receive mode

F8 RTTYtx—Selects RTTY transmit mode

Consider labeling your function keys with these functions prior to your first QSO.

RTTY

RTTY operation is quite straightforward. Press **F7** to put T93 in the RTTY receive mode, and locate a clear spot for a CQ or a station you wish to call. When you are ready to transmit, press **F8**. If you don't enter any text for several seconds, T93 will send a continuous stream of RY characters. (This feature can be disabled from within ALLMODE.INI if you wish.) When you start typing, the RYs cease, and your keyboard input is sent. Unlike *HamComm*, which has provisions for an end-of-buffer TR-control character, T93 is happy to terminate a transmission in midstream if you press **F7** before the transmit buffer is empty.

Monitor the progress of transmission by watching the receive window for transmitted characters (they're blue) to confirm that all the entered text has been sent before pressing **F7** to return to the receive mode. T93 does send text files that contain predefined brag tapes, CQs and so on. When this facility is used, a "\q" text-string terminator can be used to automatically switch back to receive mode at the end of the file. Unfortunately, an apparent program bug causes it to always return to the PACTOR receive mode, so an additional keystroke (**F7**) is required to reset T93 to RTTY receive. Because of this bug and T93's limited RTTY feature set, I prefer to use *HamComm* for RTTY work.

Table 4
ComAddr/ComInt Parameter Table

Port	*ComAddr*	*ComInt*
COM1	3F8H	4
COM2	2F8H	3
COM3	3E8H	4
COM4	2E8H	3

PACTOR

Press **F4** to place T93 in the PACTOR/AMTOR receive mode and tune to the lower part of your favorite digital band until you hear a PACTOR FEC transmission.[7] FEC mode is used almost exclusively to call CQ on PACTOR. Note the call of the station and press **ALT-P** to bring up the PACTOR menu; you will find that the selection Master Shortpath is already highlighted. If the station is domestic, press **ENTER**. A second menu then appears, requesting the call of the other station. Delete the default entry, "NOCALL," before you enter the call of the station sending CQ. When call entry is complete *and the other station has stopped calling CQ*, press **ENTER**. You will hear the TR relay pull in and your transceiver will begin transmitting and receiving. During the receive periods you should hear the other station respond, and after a few exchanges *your call* should appear (blue) in the receive window. This is your cue that a link has been established—start typing. Introduce yourself and turn the link over to the other op by entering something like

> "W7XXX de K7SZL Good morning OM—handle here is Terry and QTH is Redmond, WA. Go ahead BK"

Follow the text by pressing the **F3** key to turn the contact over. Note the mixed use of upper and lower case characters—PACTOR supports both, and the backspace key even works!

To call CQ, press **F5** and your transceiver's TR relay will pull in. This places you in the PACTOR-FEC transmit mode. Enter your CQ text and monitor the progress of transmission until the contents of the buffer have been completely sent. Press **F4** to return to the PACTOR-receive mode. With luck, you will hear a reply. If so, quickly adjust your RIT to the calling station if necessary, but don't touch the keyboard. Within a few seconds, you will hear your transceiver automatically switch to transmit (in response to TR commands from your computer executing T93). When the link has been established, the call of the other station appears in the status window in the lower right-hand corner of T93's screen. The other operator will typically introduce him or herself and turn the link back to you. From that point on, simply use the **F3** key to turn the link around so that the other operator can transmit. This brief overview of T93 operations should get you started, but refer to the supplementary manual on my Web site (see Note 5) to learn the full capabilities of the program.

Conclusion

VolksRTTY II, *HamComm* and *Terman93* represent an economical approach to adding a relatively full-featured HF digital capability to your station. Excluding the PC board and enclosure, parts cost for the VR2 modem should not exceed $40. Best of all, the circuit is robust enough to be easily implemented by anyone who has successfully completed simple analog projects such as an audio filter or D-C receiver. Test-equipment requirements are limited to a VOM or DVM, although a frequency counter would be helpful.

Based on the correspondence I received following publication of the initial VolksRTTY article, I'd say many hams would find loading and configuring the software to be the most challenging element of the VR2 project. It's not that this aspect of the project is particularly complex, but rather many amateurs cannot comfortably create a subdirectory, copy, edit and save a text file under DOS.

If you experience "deer in the headlights" syndrome when faced with the DOS prompt (C:\), I recommend you obtain copies of *HamComm* and T93 before building the modem. Try installing them on your computer, and if you run into problems, contact computer-savvy friends for help. If you have none, solicit assistance from a club member or get on the local repeater and post your question—don't just struggle in silence. Computers have become an essential part of the hobby in the last 10 years or so. If you aren't using them yet, you're missing a lot. I guarantee that the first time you see your computer take control of your

radio and establish a PACTOR link using a modem you built yourself, your efforts will all seem worthwhile.

One last comment—following my previous article I was flooded with "tech support" e-mail inquiries that consumed a significant fraction of my spare time for nearly two months. Although I will try to respond to questions on this project, please download the supplementary documentation from my Web site and check out the frequently-asked-questions (FAQ) files there before you send me your inquiry. Someone else has probably encountered the same problem and the information you need may already be available.

Good luck with the project, and I hope to work you on PACTOR in the very near future.

Notes

[1]T. Mayhan, K7SZL, "VolksRTTY II: for RTTY, AMTOR and PACTOR: Part 1," *QST*, Oct 1999, pp 41-44.

[2]A limited number of VR2 parts kits are available from the author for $80 each, plus $5 for US shipping ($10 for overseas). The kit includes main and display PC boards, all board-mounted components and interconnecting ribbon cable. Order from Terry Mayhan, K7SZL, 4517 159th AVE NE, Redmond, WA 98052; **tmayhan@worldnet.att.net**; **http://home.att.net/~k7szl/**.

[3]See Bill (KD7S) Jones's Web page at **http://www.psnw.com/~kd7s/elmer101.html** for details of building custom enclosures using scraps of ABS plastic.

[4]Ron Finger, W7ZT (a beta tester for this project), suggested RadioShack's P/N 270-253A as a suitable enclosure that is readily available.

[5]An evaluation copy of *HamComm* is available from a variety of ftp and Web sites including the author's "Unofficial *HamComm* Home Page," which is located at **http://home.att.net/~k7szl/**. A registered copy of *HamComm* is available for $30 from W. F. Schroeder (DL5YEC), Augsburger Weg 63, D-33102 Paderborn, Germany.

[6]**IMPORTANT**—the evaluation copy of *HamComm* will not run properly in a DOS window under Microsoft *Windows*. You must quit *Windows* and run/restart the computer in DOS mode.

[7]In my area, PACTOR activity is usually found on 3620—3630 kHz, 14,065—14,080 kHz and 21,065—21,080 kHz. If you aren't sure what PACTOR FEC sounds like, point your browser to my Web site (see Note 5 for URL).

Terry Mayhan, K7SZL, was first licensed in 1962 and currently holds an amateur Extra class license but no microphones. He received a BSEE from the University of Washington and an MSEE from the US Naval Postgraduate School in Monterey, California. Terry has held positions as a commissioned officer in the Navy, aerospace systems engineer and in technical marketing. He is presently employed as a product manager for an electronics company that develops communications equipment for police and fire dispatch centers. You can reach Terry at 4517 159th Ave NE, Redmond, WA 98052; **tmayhan@worldnet.att.net**.

New Products

BEACONFINDER GUIDE TO LONGWAVE STATIONS IN NORTH AMERICA

◊ Many amateurs and shortwave radio listeners enjoy tuning the frequency spectrum just below the AM broadcast band—530 kHz and down. This region is filled with signals from navigation beacons, time stations, experimenters and numerous utility stations. Identifying these signals can be challenging, however, as they are not often listed in conventional frequency guides.

The *BeaconFinder* frequency guide focuses specifically on frequencies below 530 kHz. It lists the frequency, identification and location for hundreds of longwave broadcasters that can be heard in North America—including commonly logged foreign stations.

An "ID-to-frequency" cross-reference section facilitates the identification of stations by either ID or frequency.

The guide consists of over 60 pages of listings punched for three-ring binding. A companion 3.5-inch diskette (in *.rtf* format) that contains searchable station listing is also available.

Price: *BeaconFinder* guide, $11.95 postpaid; *BeaconFinder* diskette, $11.95 ($8.95 when purchased along with the guide). For more information contact Kevin Carey, PO Box 56, West Bloomfield, NY 14585.

USB OPTO-ISOLATED INPUT/OUTPUT MODULE FROM J-WORKS

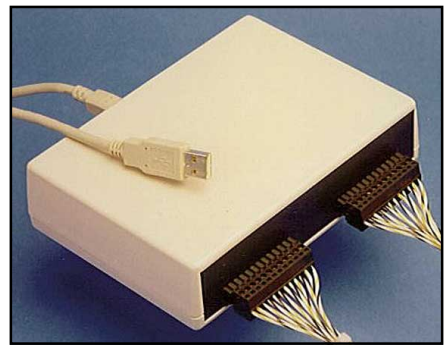
◊ J-Works Inc, a developer and manufacturer of PC and USB-based test instrumentation and home automation products, now offers their JSB-320 series USB input/output modules.

This peripheral unit connects to your PC's USB port and can provide up to 32 opto-isolated inputs and outputs. The user can control these from any programming language that supports USB communications.

The outputs are rated at 7-30 V dc 1 A. The input range is 10 to 30 V. Plug-in style terminal blocks allow easy hook-up.

Price range for the JSB-320 series modules ranges from $205 to $299. For more information contact J-Works Inc, 12328 Gladstone Ave Unit 4, Sylmar, CA 91342; tel 818-361-0787; fax 818-270-2413; **sales@j-works.com**; **http://www.j-works.com**. QST

Next New Product



Strays

FREE SWEEPSTAKES SOFTWARE

◊ The *November Sweepstakes Logging Program*, version 2.5, by N3FJP is now available for free downloading from the Web. The program has been modified to accommodate the new precedence characters (S, M, U) and write the new Cabrillo file format for submission to the ARRL. You can download the software at **http://members.aol.com/snkdavis/page1.html**.

IF THE CALL SIGN FITS...

◊ The Amateur Radio career of Issac Roach, K4QM (SK), began in the early part of this century. In fact, he participated in the 1BCG transatlantic tests in 1923. Due to work and family responsibilities, however, he allowed his license to lapse in 1930. According to his son, Lloyd, W3QT, when Issac re-joined the hobby in 1965 he was astonished at his new call sign. And after 35 years what "Roach" wouldn't be surprised to learn that he had been assigned WA3*DDT!*

MOBILE WEB

◊ Brian, K2BJ, in Syracuse, New York has created a Web site devoted to HF mobile operating. The site features a display of ham license plates from the US and Canada. Brian is seeking contributions of plate images to fill out the collection. Visit the site at **http://www.k2bj.com.**

WANTED: FORDHAM SCHEMATIC

◊ I'm looking for the schematic for a Fordham 550-MHz frequency counter. Daniel V. Mackey, KC2DCX, 70 Candlewood Gardens, Baldwinsville, NY 13027-2634; **dmackey@arrl.net**.

WANTED: AMPSPEC-3 INFO

◊ I own an Ampspec-3 HF Spectrum Display Receiver from Mauro Engineering of Shasta, California. The one I have is for use with a Commodore 64 computer. They offered a version for IBM PCs and compatibles as well. I would like to hear from anyone who has made the conversion from a Commodore to a PC-based system. Larry Van Fossen, WB7UZO, PO Box 182, Neah Bay, WA 98357; **wb7uzo@olypen.com**.

WANTED: ULTRACOM-25 MANUAL

◊ I need a service manual or even a schematic diagram for an Unimetrics Ultracom-25. Robert E. Hilton, N9SJV, 5809 Heatherview, Fort Wayne, IN 46818.

I would like to get in touch with...

◊...hams who were Nuclear Weapons Specialists in the Air Force, possibly in the missile programs, to form a net. Al Alvareztorres, AA1DO, **albert13@home.com**.

◊...anyone who knew Leo H. Hyman, licensed as W8STY/XU8 on October 12, 1945, at Hangchow Airdrome. Jay S. Hyman, W2CSS, 1032 East 2nd St, Brooklyn, NY 11230; **w2css@arrl.net**.

◊...anyone who has a schematic diagram for a Alinco SR4 or SR4D repeater controller. Mine is in need of repair and detailed information is difficult to locate. Steve Turner, PO Box 74, Quinton, NJ 08072.

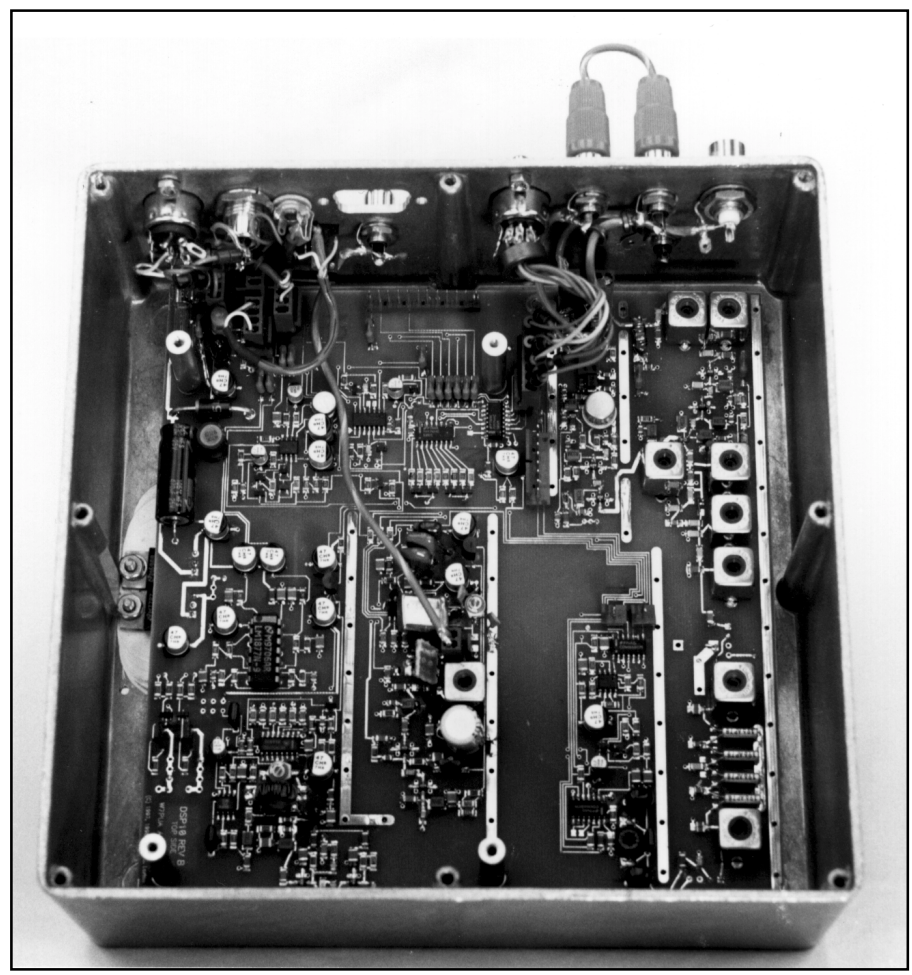
Next Stray

By Bob Larkin, W7PUA

The DSP-10: An All-Mode 2-Meter Transceiver Using a DSP IF and PC-Controlled Front Panel

Part 3—This is it! It's about time to put your new transceiver on the air!

PHOTOS BY THE AUTHOR



The transceiver's main board is visible with the DSP box removed. The RF circuitry lies along the right-hand side; the synthesizers are in the center.

Before you press that mike button or key, you should become familiar with the operation of your new transceiver and what you can expect from it. I'll cover that this month along with some ideas I have about future expansion.

Operation

By simply attaching an antenna, speaker and microphone to the transceiver, you can operate 2-meter QRP. First, connect the transceiver's DB9 connector to a PC serial port you've chosen, then apply power to the transceiver and PC. Programs load first into the DSP, then into the PC. The default PC configuration screen (see Figure 13) is that of a 2-meter transceiver with a large frequency display and a help summary. For weak-signal work, an alternate display (see Figure 14) is available.

The frequency to which the transceiver is tuned is displayed on the PC's screen and changed by using the **F9** (down) and **F10** (up) keys. Used alone, these two keys tune the transceiver in 10-Hz steps. For faster tuning, press and hold the keyboard's **SHIFT** key in combination with the **F9** or **F10** key to tune in 100-Hz steps. Other modifier keys allow tuning in steps ranging from 1 Hz to 1 MHz. You'll likely find that using a PC keyboard to tune a radio takes some getting used to. That's because most of us are accustomed to turning a knob. But the simplicity of being able to go "up 20 kHz" in two keystrokes is great!

Function keys **F7** and **F8,** respectively, increase and decrease the audio gain in 2-dB steps. Pressing the **SHIFT** key modi-

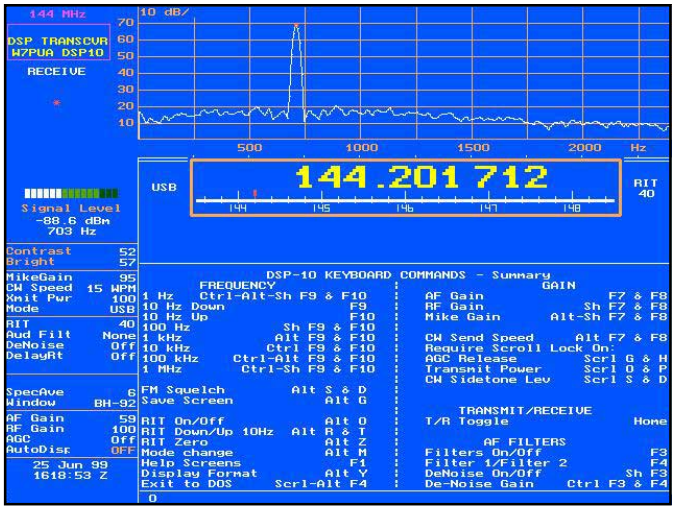


Figure 13—The default PC-configuration screen is that of a 2-meter transceiver with a large frequency display and a help summary.

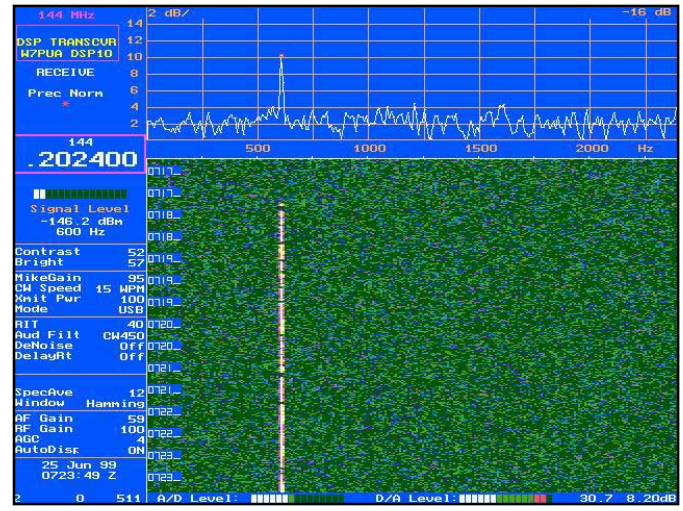


Figure 14—For weak-signal work, you can use the alternate PC-configuration screen shown here.

fies this function to adjust RF gain in 6-dB steps. Mode selection—USB, LSB, CW, or FM—is controlled by the **Alt-M** or **Alt-m** keypresses. Various other keys are used to control receiver functions such as RIT, CW filters and LMS denoise gain.

Signal strength is displayed in dBm (decibels relative to a milliwatt). When a transverter is used ahead of this transceiver, this readout is corrected to allow for the transverter's gain. A bar graph above the signal-level display acts as an S meter with 6-dB steps.

The maximum available transmitter output power is 20 mW. This is sufficient to drive any mixer used in a transverter. If your transverter is equipped with an attenuator for use with drive levels greater than 20 mW, you'll need to alter the attenuator-pad values to decrease the attenuation level. Unless you're a dedicated QRP operator, you'll *want* to add an external amplifier when operating this transceiver on 2 meters!

To transmit, push the mike button or press the PC's **Home** key. If there's a backlog of data coming from the DSP to the PC, there can be a delay (a fraction of a second) between pressing the mike's PTT switch and transmitting. Pressing the **Home** key, however, makes the changeover immediately. A relay sequencer, controlled by the PC's software, produces logic-level outputs for antenna-relay and power-amplifier control. For our simple example, we do not need this feature because we are not using an external amplifier. An on-screen display shows output power when operating SSB and deviation when using FM. You'll find that operating SSB or FM with this transceiver is quite similar to using a conventional multimode transceiver.

For CW operation, you have several keying options. A key jack mounted on the enclosure accepts a hand key. Alternatively, the PC keyboard's right-hand **Alt** key can function as a hand key. Finally, you can use the computer keyboard as a CW generator. Alphanumeric keys enter information into a buffer that is sent when in the transmit mode. During receive or transmit, data can be entered into the buffer. The buffer data is shown in a three-line display at the top of the screen. Prosigns such as **AR** and **SK** are sent by pressing the appropriate keys in combination with the **Alt** key. By enclosing a sequence of characters between pound signs (#), that character sequence can be sent repeatedly. As soon as the pound sign is encountered, the character sequence is repeated continuously until canceled by pressing the **@** key. Pressing the **Home** key switches the DSP-10 to transmit and starts the CW transmission. The next **Home** keypress toggles back to receive. CW speed is changed by using the **Alt-F7** (increase speed) and **Alt-F8** (decrease speed) keys.

When operating CW, the spectral display offers tuning information that is not otherwise available. One display line shows the current CW offset. A marker on the display identifies the frequency of the strongest signal in the passband; this can be used to set the operating frequency. The spectral display shows the entire audio spectrum, unrestricted by any narrowband filter that might be in use. In the voice modes (FM and SSB), the spectral display offers little new information except, perhaps, when on FM where repeater tone signals are easy to observe and identify.

One design goal of this transceiver was to remove operating-frequency ambiguities as much as possible. The CW mode is one area where this often can present problems. During transmit, the displayed frequency is the *actual* transmitted frequency. In receive, the displayed frequency is that required to produce an audio pitch equal to the CW offset. The CW offset is normally set to the center frequency of the audio filter, if one is used, but it can be set to any value. If RIT is in use, the transmit and receive frequencies can be separate, but the receive-frequency display will reflect this change. The sidetone sent to the speaker when the key is down is the same frequency as that of the CW offset.

If you want to use a transverter for, say, 1296 MHz, with the transceiver, there is provision to correct the display to show the actual transmitted frequency. The conversion frequency and other transverter information are obtained from a configuration file.

Band changing is accomplished from the keyboard using the **Ctrl-Alt** modifier. The key used is then the same as the letter or number used in the ARRL VHF-Contest band designators. For instance, 1296 MHz would be displayed if **Ctrl-Alt E** is pressed. This band changing is treated in the way usually referred to as a "VFO," meaning that if you switch to another band and then return to 1296, the transceiver is returned to the last 1296-MHz frequency used. If the transceiver is turned off, it is returned to the last frequency used when turned on again.

Presently there are no memories in the sense of fixed-frequency values. There are, however—in addition to the transverter bands—six VFOs dedicated to 2 meters that can include a mix of modes.

A number of seldom-used controls, such as the **CW Offset** discussed earlier, require use of the **Scroll Lock** key. This serves as an element of protection against inadvertent control changes. Another example is program termination: That requires simultaneous keypresses of **Scrl Lock-Alt-F4**.

To store the state of the transceiver at shutdown, the PC uses a configuration file (*UHFA.CFG*). This same file can be used to alter the transceiver's operational parameters. For instance, the calibration constant for the **Signal Level** display comes from this file. In order to have a known starting point, it is best to start with *no* configuration file. At shutdown, the program will write a file

that contains the default parameters. Eventually you'll find it necessary to add more parameters such as transverter gains and conversion-oscillator frequencies, but not initially.

The PC's program will *not* run in a DOS window under *Windows 95/98*. This may be somewhat annoying for those whose computers always boot up running *Windows*. You must then quit *Windows* and elect to reboot to DOS. This situation affects only casual users of this program, because those running the transceiver-control program on a regular basis will not have loaded *Windows*.

Weak-Signal Displays

One of the driving forces behind this project was a desire to produce a good weak-signal transceiver for UHF and microwave frequencies. Spectral displays useful for such purposes are included as operator-controlled options. As shown in Figure 14, a waterfall display[20] is available. The way in which the spectrum display is sliced into colors is fully controllable. Also variable is the amount of averaging before the display is updated. To allow off-line experiments with the weak-signal processing, the spectral data can be recorded in a file as it is gathered and saved to disk.

Performance

The obvious question regarding this transceiver is: "How well does it work?" For use as an IF for a UHF/microwave transverter, it is quite satisfactory. At my station, the transceiver has worked well as a 2-meter radio. However, my location is not subject to many strong local signals. As we'll see, the dynamic range of the receiver is probably the weakest point of this design. Early on, I realized that providing state-of-the-art dynamic range would add considerably to hardware complexity. This radio's design is intended to minimize hardware complexity wherever possible.

Now to the numbers. Table 2 shows the transceiver's measured performance. The receiver sensitivity is adequate for most general work; any transverter used ahead of the DSP-10 will dominate the overall noise figure. Gain added ahead of the transceiver is detrimental to dynamic range. If the transverter gain is more than 10 or 15 dB, reduce the RF gain of the DSP-10.

The input third-order intercept point is an issue when more than one strong signal is present in the passband. Two 500-µV signals will produce an intermodulation product of about 0.3 µV. This level of interference would certainly be a problem. However, most 2-meter operators do not encounter such signal levels. The image and IF rejections are very high, eliminating "birdie" problems.

Transmitter spurious outputs are better than current FCC requirements for a transceiver of this power level. If an amplifier is used with the transceiver, the LO signal at 19.665 MHz below the transmitter frequency is probably the one that you should watch for spectral-compliance problems. Presently, that signal level is –69 dB.

Using DSP to generate SSB produces results that are somewhat different from their analog counterparts. It is very easy to suppress the carrier and the opposite sideband. During transmit, however, there is a flat level of noise across the 3-kHz transmit band that is caused by A/D conversion. The total noise power is about 65 dB below peak output, so it should not be a problem on the air.

On CW, the noise level is lower than on SSB and comes from the DAC. This noise occupies roughly 5 to 8 kHz on either side of the transmitted carrier and is limited by the crystal filter.

Table 2
Measured Performance

General
Power requirements: 13.6 V, 0.72 A maximum in receive; 0.75 A maximum in transmit.
Operating voltage range: 10.6 to 16.0 V
Frequency coverage: 144-148 MHz

Receiver
Receiver noise floor, 450-Hz filter: –136.8 dBm
FM 20-dB quieting: 0.31 µV
Second-order intercept point (66- and 78-MHz inputs): +69 dBm
Third-order intercept point: –21 dBm
IF rejection (19.665 MHz): 127 dB
Image rejection (104 to 108 MHz): 125 dB
Audio power, each channel @ 13.6 V: 0.77 W into 4 Ω, 0.85 W into 8 Ω.
Audio power, each channel @ 11 V: 0.54 W into 4 Ω, 0.48 W into 8 Ω.
Audio response, SSB filter, –6 dB: 190 Hz to 3020 Hz.
Audio response, 450-Hz CW filter: 310 to 750 Hz.

Transmitter
Maximum output power (rated output is 20 mW), CW or FM: 40 mW
Harmonic suppression at full output: greater than 62 dB
Conversion oscillator feed-through (f_0 = 19.665 MHz): –69 dB
Third-order intermodulation, 700 and 1900 Hz tones, 20 mW peak power: –33 dB
Fifth-order intermodulation, 700 and 1900 Hz tones, 20 mW peak power: –42 dB
Carrier suppression: greater than 50 dB
Opposite sideband suppression: greater than 60 dB

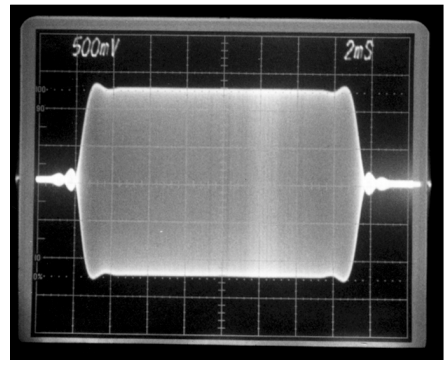


Figure 15—Keyed waveform of the transceiver in CW mode. The keying envelope has a distinctive ripple at the end of dots and dashes. This is a result of generating the CW signal as modulation of a carrier by a 500-Hz bandwidth-limited signal. This shaping essentially eliminates key clicks more than 500 Hz from the carrier

Figure 15 shows the transceiver's CW keying waveform. In spite of the rapid rise time of about one millisecond, key clicks are still concentrated within 500 Hz of the carrier frequency. Ripple can be seen on the waveform at both turn-on and turn-off. This rather ideal keying characteristic results from the band-limited keying waveform that amplitude modulates the carrier to produce CW. As you might expect, the on-the-air sound is crisp without audible key clicks.

At a peak output of 20 mW, the transmitted SSB signal third-order intermodulation products are down at least 33 dB. More importantly, the fifth and higher-order product levels drop off rapidly. Keep in mind that as this signal is amplified, it tends to degrade the intermodulation levels relative to the peak output.

Improvements

Suppose we wanted to bring the receiver up to "contest grade"—what changes would be needed? Raising the input intercept point to the +10 dBm level would require a new RF board. We would need to add a high-dynamic-range IF amplifier at 19.665 MHz and add associated switching to get it out of the transmit path. This would lower the noise figure at the first mixer so that we could reduce the gain of the RF amplifier. Next, the RF amplifier and first mixer would need beefing up. The first mixer would end up in the +17 dBm LO class, or greater, and the first-conversion oscillator would need a level increase.

At this point, the reciprocal mixing of phase noise from the first-conversion synthesizer would cover the intermodulation products. It is possible to improve the VCO somewhat to lower the phase noise. But, to reduce the noise to our "contest" level, you

would need to raise the present 5-kHz synthesizer reference frequency to perhaps 100 kHz. That would allow a wider loop filter for the synthesizer, which reduces close-in phase noise. This can be made compatible with the 5-kHz step size by one of several techniques, such as using a DDS to set the reference frequency.

Next, you would find that for signals within the crystal-filter passband, the ADC noise limits the dynamic range. The present ADC really has about 12 or 13 bits above the noise level. Around 16 to 18 bits would support the improved performance level. Alternatively, a lesser number of bits running at a higher conversion rate could be used. For SSB and CW, a narrower crystal filter could be used since the fine-tuning could now be done in the fancier synthesizer. FM operation would require a wide crystal filter, of course.

Incorporating all of these changes would significantly add to the transceiver's complexity, but for many that would be justified by the improved performance. I feel that many (most?) of us can be happy with the present level of receiver performance, realizing that we have made a reasonable set of tradeoffs. There certainly are opportunities for future projects!

Future Directions

This transceiver is ready to go for QRP 2-meter operation. For some, this might be the stopping point. But the DSP-10 should be regarded as one building block in a potentially large collection. An obvious add-on is a power amplifier for 2 meters. The transceiver is compatible with many of the single-board transverters described in *QST* over the years. This can extend operation into the UHF and microwave bands. A tuning knob can be interfaced with the PC quite easily, if desired.

One of the best parts of building in software is being able to modify or add in any way imaginable (or at least having that illusion!). The "wish list" for other additions and changes depends on an operator's particular interest. My personal list is oriented towards weak-signal operation and looks like this:

- Add the ability to measure a frequency standard by stealing an occasional second away from reception time. This measurement would include transverters in the signal path so that the overall frequency accuracy could be 10 Hz or better. Eventually it would be desirable to have the transverters synthesized from the station frequency reference.
- Add some weak-signal modes using multitone frequency-shift keying.
- Add the ability to use custom-designed audio filters with real-time downloading to the DSP. (The DSP program already has this capability.)
- Add a 12-kHz concurrent spectrum display. Wider displays could also be added by briefly stopping the transceiver and sweeping the first-conversion oscillator.

There you have some ideas of what could be done with this project. I encourage experimenters to jump in and start writing programs. In general, changes need be made only to the PC program. The DSP unit is quite general in its commands. For instance, those wanting a *Windows 98* interface could develop it in Visual Basic and never need to change the DSP programming at all.

Acknowledgements

I want to thank the many people who have helped with this project: Johan Forrer, KC7WW; Gary Oliver, WA7SHI; Andrzey (Andy) Baranski, PE1ROE and Ernest Manly, W7LHL, have all provided helpful inputs. Special thanks go to Kirk Bailey, N7CCB, for the many discussions that are reflected in the current arrangement of the transceiver.

Notes

[19]Bob Larkin, "The DSP-10: An All-Mode 2-Meter Transceiver Using a DSP IF and PC-Controlled Front Panel,"—*Part 1*, Sep 1999 *QST*, pp 33-41;—*Part 2*, Oct 1999, *QST*, pp 34-40.

[20]An example of the spectral map display is included in the article by Steve Ford, WB8IMY, "A Conversation with Mike Cook, AF9Y," *QST*, Jan 1998, pp 56-57. More information about AF9Y's spectral display program *FFTDSP* is available at his Web site **http://www.webcom.com/af9y**.

You can contact Bob Larkin, W7PUA, 2982 NW Acacia Pl, Corvallis, OR 97330; **boblark@proaxis.com**.

New Products

LEAKSEEKER 82B IN-CIRCUIT COMPONENT TESTER

◊ Locating shorted or leaky components installed on a printed circuit board typically requires the unsoldering and testing of several suspect components—often a time-consuming and tedious process. Electronic Design Specialists offers a piece of test equipment that can help locate the malfunctioning component quickly—without the unnecessary grilling of innocent suspects.

The *Leakseeker 82B* has the ability to measure variations in resistance as small as 0.001 Ω. Touch the gold-plated probe on any solder pad along the suspicious trace and the unit will calibrate itself to within a 24 mΩ window of the resistance at that point. Move the probe to the next pad and the device will indicate whether you are moving closer to or further from the short, as indicated on an 11-LED distance/direction scale, and will sound an associated higher or lower pitched tone. This initial 24-mΩ window allows you to check about 2 or 3 inches of trace. As you move further along the *Leakseeker* will automatically recalibrate to a new 24-mΩ window.

The unit tests at a current-limited 8 V, permitting it to power through good diodes to locate defective components beyond. The *Leakseeker* has an operating range between 0 and 150 Ω that allows identification of leaky components as well.

A three-wire test mode is also included that can help locate high resistance shorts and thermally defective components.

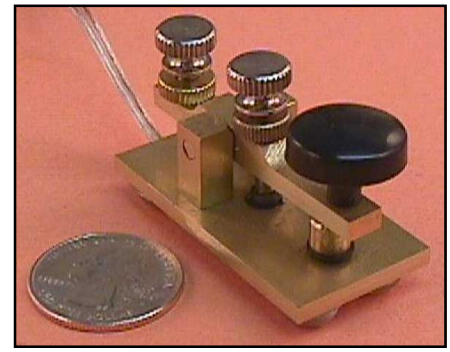
The *Leakseeker 82B* comes with a special set of gold-plated test clips and probes, a complete manual with a hands-on tutorial, a technical assistance phone line and a 60-day satisfaction or money-back guarantee.

For more information, contact Electronic Design Specialists, Inc, 4647 Appalachian St, Boca Raton, FL 33248; tel/fax 561-487-6103; **info@eds-inc.com**; **http://www.edsinc.com**.

MINIATURE "SOX" STRAIGHT KEY

◊ Morse Express adds another product to their extensive lineup of custom keys and paddles.

The "SOX" key, hand-made by Tim



Soxman, W3ZVT, measures a mere $1\frac{1}{4} \times 1 \times 2$ inches and weighs just 3 oz. The base and most of the major components are machined brass. A unique "springless" design employs magnets to provide tension.

Adjustments are made using two knurled-head screws with lock rings. Its "knob-over-base" configuration helps prevent the key from tipping forward. An attached cord terminated in a 3.5-mm plug is also included.

Price: $79.95. For more information contact Morse Express, 3140 S Peoria St, Unit K-156, Aurora, CO 80014; tel 800-238-8205; fax 303-745-6792; **info@MorseX.com**; **http://www.MorseX.com**.

Next New Product

By Ev Tupis, W2EV

An Automated Meteor-Scatter Station

Think VHF meteor-scatter work is reserved for big-gun SSB ops? Think again! The military has long used meteor-scatter propagation to transmit data between automated stations. Thanks to APRS, innovative software and ham ingenuity, working meteor pings is becoming a new digital domain!

This November—the month of the Leonids meteor shower—could be a real eye-opener for meteor-scatter ops, digital and otherwise. As the celestial fragments streak through the Earth's atmosphere, they leave behind a fleeting stream of ionized particles, many which are capable of reflecting radio waves over great distances. Every 30 years or so the Leonids shower becomes a raging meteor storm. The last time it happened, 6 meters sounded like 20 meters during a DX contest. Every November until 2003, the Leonids may "go crazy" once again. Will you be ready? Will this year's Leonids kick off your meteor-scatter career?

Meteor showers have long been exciting events for weak-signal VHF operators. The "ping jockeys" have used these short signal bursts (referred to as "pings") to complete QSOs with other enthusiasts at distances of more than 2000 km on frequencies from 50 through 432 MHz. The most common modes for meteor work include SSB and two flavors of CW: conventional and HSMS (High-Speed Meteor Scatter). With the latter, computers are often used to generate and decode extremely high-speed Morse code transmissions that can take advantage of meteor bursts that last less than a second.

The next generation of meteor-scatter ops may use a fully automated digital system based on readily available packet radio technology! Before you cast this off as "impossible," know that this is a method of long-distance communication with a proven track record. Yes, even FM-based packet, usually ignored by traditional VHF DXers, is quite capable of producing spectacular DX results.

Imagine a system that will automatically transmit your call sign and location at regular (short) intervals while listening for other similarly configured stations' call signs and locations. After receiving that information from a remote station, the system is smart enough to appropriately place a station icon on an electronic map! Why, you can even save your reception reports to disk and play

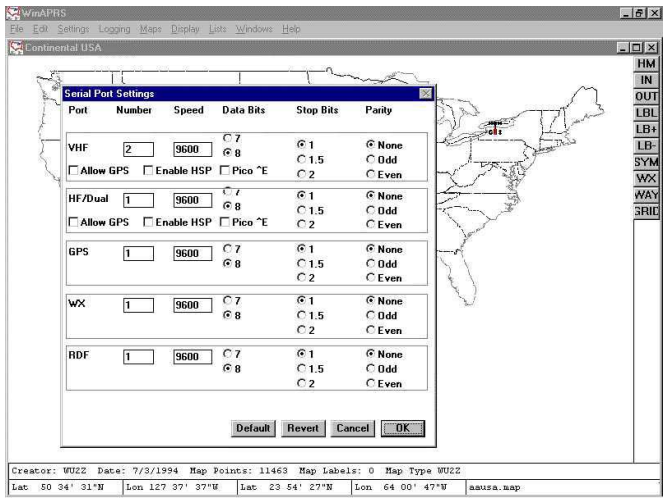


Figure 1—This is the proper setting if your TNC is connected to COM2. If any other COM port is required, change the "2" under the Number column to the appropriate COM port designator.

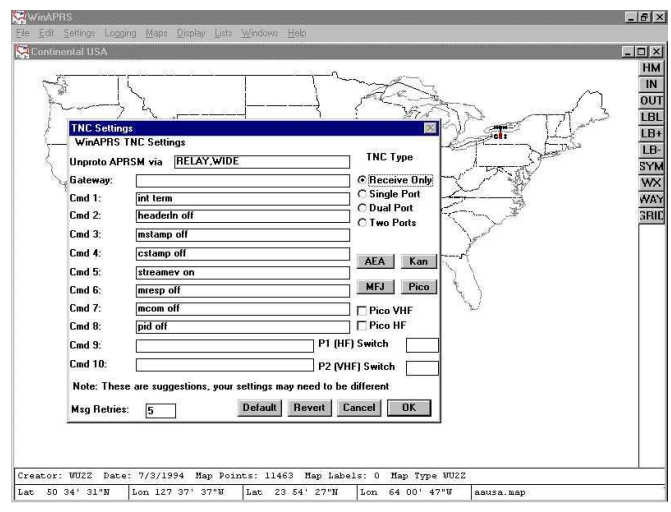


Figure 2—If you're using a Kantronics TNC (the best for this purpose), press the "Kan" button and the correct commands will be automatically entered in the area to the left. Because meteor-scatter work requires that the TNC be directly configured to transmit properly formatted packets, we place the software in "Receive Only" mode.

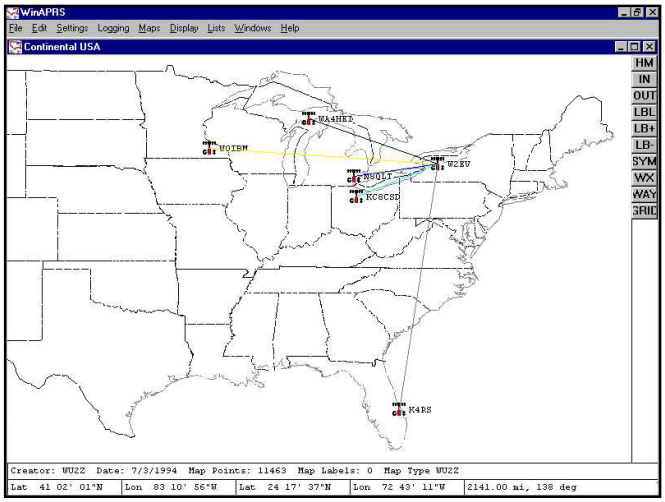


Figure 3—This illustrates all of the stations received at W2EV during one overnight session of the 1998 Leonids event. Ray-traced lines were added for clarity.

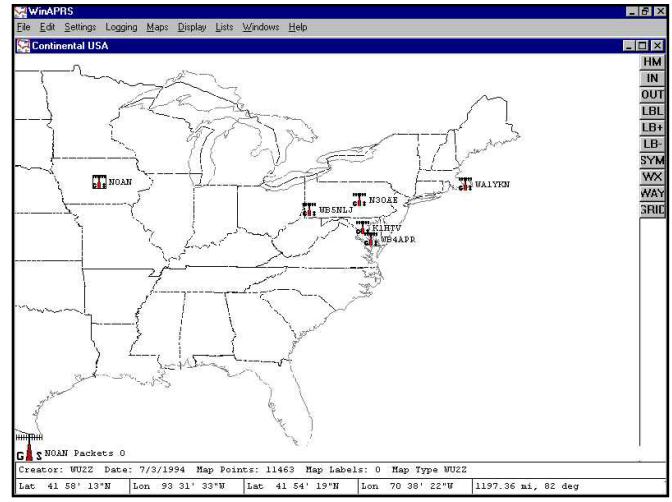


Figure 4—Here's an example from the 1995 Perseids meteor shower showing the packet stations received by N0AN. Thanks to Bob Bruninga, WB4APR, for his archives of the 1995 reception reports.

them back to "re-live" the event!

All it takes is a VHF FM transceiver, a terminal-node controller (TNC), a *Windows* computer, a copy of *WinAPRS* and a modest outdoor antenna.

When it comes to FM transceivers, more power means better results. Some participants have experienced limited success at 25 W, but most successful stations run 50 W or more (some as high as 200 W!).

Not all TNCs are alike. Ranked according to desirability (for this purpose) are the Kantronics KPC line with ROM version 6.2 or greater; the KPC line with any ROM version (because it can eventually be upgraded); and any standard TNC-2 style unit. Baycom stations won't work at all. Although there are other versions of the software, I haven't tested them and I have no experience in configuring them to work in this application.

"A modest outdoor antenna" means a small beam, if possible. Although some ops have had limited success with omnidirectional antennas, most successful 2-meter operators use small beams (4 to 14 elements) that are vertically polarized (more on the polarization issue later). If 6 meters is your cup of tea, a half-wave vertical will do just fine, although some ops choose to use horizontally polarized beams.

Because it's lower in frequency, 6 meters is capable of supporting meteor-scatter communications at lower power levels—but the same principle applies to power output: The more the merrier! Typical 6-meter ops run 20 to 150 W.

APRS software is a "natural" for chasing meteors and other propagation anomalies. APRS was designed to provide a wireless point-casting public service network for radiolocation. One station transmits position-location information that is subsequently relayed by digipeaters. Anyone in listening range picks up the information, which is then displayed on the users' computers. Many people have called APRS a "solution without a problem." These are people who haven't seen the power of a wireless amateur-based radiolocation system—especially during severe weather and search-and-rescue events.

The Principle

Configure your TNC to transmit your call sign and location every few seconds, in the hopes of catching a meteor "burn." When a distant station receives your packet, it decodes it and displays the received information on a map. It's that easy! So easy, in fact, that it may make sense to configure your station and let it run through the entire meteor event. Although we tend to focus on determining a shower's "peak," these events are usually quite broad and often last several days.

The Practice

The "trick," if there is one, is to use *WinAPRS* to decode received packets while configuring your TNC to send properly formatted packets. When transmitted, packets take the following form:

W2EV-2>CQ,QSL1-1:[FN03XD]

As you can see, the actual transmission is quite short. It includes the call sign of the originating station (W2EV-2) and the six-character Maidenhead grid square that identifies the station location (FN03XD). The CQ is a nonfunctional placeholder and QSL1-1 cues the receiving station to repeat the packet once. If the meteor burn is long enough and the DX station has adequate power, you might even hear the DX station repeat your information—an automated QSL!

The only caveat is, for the "automatic QSL" function to work, the DX station must be using a Kantronics KPC-model TNC with ROM 6.2 or greater (if the DX station doesn't meet this specification, the basic system still works, minus the "acknowledgment" packet). If the DX station is using a KPC-model TNC, you may receive the following packet from that station:

W2EV-2>CQ,AA4DXX,QSL1:[FN03XD]

The Kantronics ROM will insert the call sign of the digipeating station (AA4DXX in the above example) and decrement the QSL counter to –0 (the –0 is not sent, but is inferred by not appearing), prohibiting other stations from digipeating it again. If the DX station is not using a Kantronics KPC TNC, it will not digipeat the packet. If a digipeat doesn't occur, don't be discouraged. It may only be a matter of time before a sympathetic meteor allows you to receive the DX station while it's transmitting.

Configuring the Software

First, download *WinAPRS* from the Tuscon Amateur Packet Radio web site at **http://www.tapr.org** (the download is about 1.5 MB) and follow the instructions for loading it into your computer.

Configuring *WinAPRS* for meteor-scatter use is easy. Run the software. You will be greeted with a pop-up window titled "WinAPRS" that displays copyright information. Press <Enter>. Another popup window will appear, this one titled "TNC Selection." Make sure the radio button for "Single TNC on VHF" is selected and press <Enter> again.

You will be greeted with a map of the continental US. Complete the set up by changing the following parameters:

Select the "Settings" menu, choose "Station" and change the call sign to your own. If you are planning to operate on 2 meters, end your call sign with a –2 (ie: W2EV-2). If you are planning on joining the 6-meter experimenters, end your call sign with a –6 (ie: W2EV-6). Then press <Enter> or choose "OK."

WinAPRS assumes that your TNC is con-

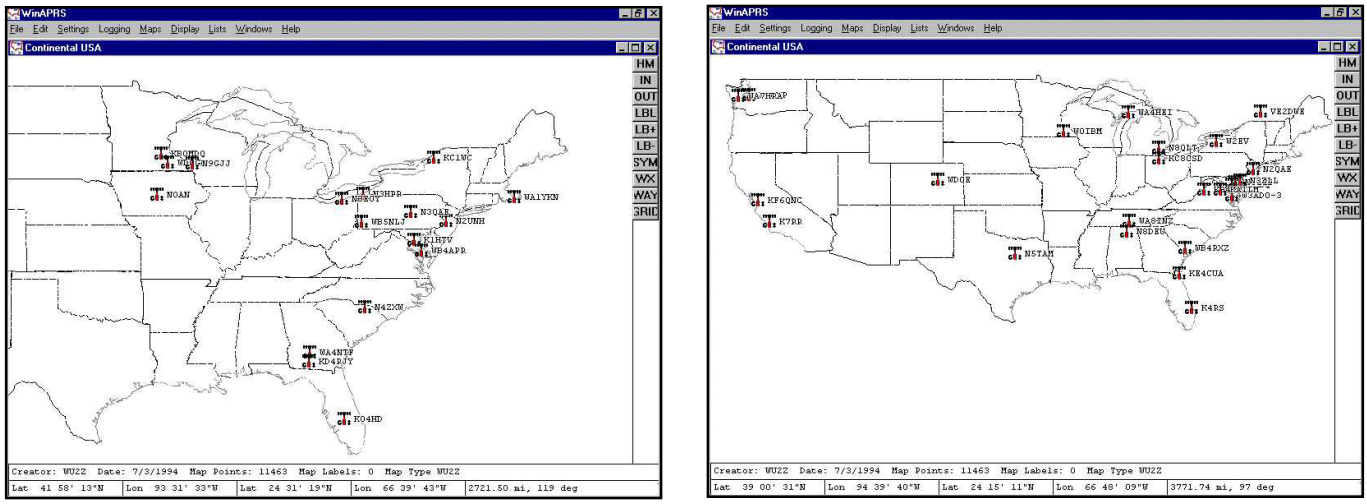


Figure 5—Participation is increasing! Compare the number of stations reporting packet-based meteor-scatter activity in 1995 (left) to those reporting activity in 1998 (right). Of course, the more activity, the greater the opportunity for success. Why not join in the fun?

nected to COM1. If that's correct, go on to the next paragraph; otherwise, from the "Settings" menu, select "Serial Port" and make sure the correct serial port is selected. *WinAPRS* defaults to COM1. If your TNC is on COM2, change the "1" to a "2" and press <Enter> or choose "OK" (**see Figure 1**).

From the "Settings" menu, select "TNC" (**see Figure 2**). Press the radio-button titled "Receive Only" and the selection button that best describes the brand of TNC you're using (ie: AEA, Kantronics, MFJ/TNC-2 or Picopacket). Don't be confused by this step. *WinAPRS* is used to decode packets, but the TNC itself is configured to transmit them. That's why we configure *WinAPRS* for "Receive Only" mode. When done, select the "OK" button.

Make sure that your TNC is "on." The final step is to select the "Settings" menu and the "Open VHF TNC" option. When you do, you may be greeted with a popup message that says, "Please set your Lat/Lon in SETTINGS/Station." Ignore that message if it appears and press "OK." Immediately, you will notice a list of commands flashing across the bottom of your window. These are commands that *WinAPRS* is sending to your TNC, configuring it for proper receive operation.

Your station is now ready to receive and decode DX packets. Before we go on, remember that *WinAPRS* is shareware. You may use it without charge, but until it is registered (and a registration fee is paid) it will not retain your customized settings after you exit the program. Each time you start the program you will need to configure it as shown above. Registration information is included in the program documentation.

Configuring the TNC

The next step is to configure your TNC to send packets that *WinAPRS* can decode properly. *Make sure your FM transceiver is turned off.* Select "Terminal Window" from the "Windows" menu. This will open a window that will allow you to communicate directly with your TNC. You are about to manually configure the TNC to send properly formatted packets. Because these settings are going directly to your TNC (and not through *WinAPRS*), you'll need to perform this step only once. Most TNCs will retain their settings after power-off.

The exact syntax of these commands may vary from one TNC manufacturer to another. I've included steps for two commonly used TNCs: the Kantronics KPC and the MFJ (a TNC-2 clone). No matter what brand of TNC you use, reset or restore it to its factory-default settings prior to continuing. Kantronics uses the RESTORE D command, MFJ uses the RESET command. After doing so, continue as outlined below.

Be sure to type these commands exactly as shown:

Kantronics KPC TNC with ROM 6.2 or above

INTFACE TERM
CD SOFTWARE
UITRACE QSL,30
LT 1 [GRIDSQ] (ie: [FN03XD], etc; put it in square brackets)
LTP 1 CQ VIA QSL1-1
BLT 1 EVERY 00:00:10

KPC models with ROM versions less than 6.2

INTFACE TERM
CD SOFTWARE
LT 1 [GRIDSQ] (ie: [FN03XD], etc; put it in square brackets)
LTP 1 CQ VIA QSL1-1
BLT 1 EVERY 00:00:10

MFJ (and other TNC-2 clones)

BTEXT [GRIDSQ] (ie: [FN03XD], etc; put it in square brackets)
UNPROTO CQ VIA QSL1-1
BEACON EVERY 1

The idea is to place your TNC in a mode where it will transmit packets often enough to have a good chance of catching a falling meteor—without clogging the channel with traffic. The BLT and BEACON EVERY parameters determine how frequently your stations transmits; in this case, every 10 seconds.

A Little Frequency History

Early on, 2-meter APRS users found a home on 145.79 MHz. As time passed, users learned that the International Space Station was planning to operate its amateur station at 145.800 MHz. The interference potential was obvious. Being good neighbors, the APRS community began to search for a new home. The Ontario/Western New York Packet Advisory Group (OWNYPAG) suggested a move to 144.39 MHz, which was quickly adopted by Canadian hams. Over time, the entire APRS community followed suit. Today, 2-meter APRS activity in North America is found on 144.39 MHz.

Just as it's important to keep all APRS activities on one frequency, it's also important to locate all meteor-scatter ops and propagation experimenters on one frequency. Because of the "vacant-yet-still-available" status of 145.79 MHz, experimenters gravitated there. The channel is clear for the time being, and meteor-scatter use tends to be short-lived, so what's the harm?

When the International Space Station becomes a reality we'll need to relocate meteor experimenters to another 2-meter frequency, and establish a nationally recognized frequency on 6 meters. If possible, frequencies that are far from the "bottom" of the band should be explored, allowing operators to enjoy packet and weak signal meteor-scatter QSOs simultaneously. This is why packet meteor-scatter systems use vertical polarization. Doing so provides at least 20 dB of isolation to stations with si-

multaneous SSB/CW activity (which uses horizontal polarization).

Searching for an "available" frequency isn't an easy task. There are countless technical and political issues to be solved. Until national frequency coordination exists, everything is done by gentlemen's agreements. All things considered, the following frequencies have been proposed for this experimental mode: 147.585 MHz and 53.530 MHz. These frequencies appear to be ideal at this time, but users should know that the future may require propagation enthusiasts to find another home.

Great Theory, but Does It Work?

In a word, "Yes." At least twice a year, APRS experimenters join with their SSB/CW counterparts in hunting meteors. Participants have had incredible success by activating FM packet stations during meteor events like the November Leonids and the granddaddy of 'em all, the August Perseids (see Figure 4). The big advantage that packet-based meteor-scatter ops have is their ability to "operate" tirelessly around the clock during meteor showers. Additionally, by definition, a DX station's icon doesn't appear on your computer map unless both call signs (and grid squares) have been fully received—no guesswork. Power-up your FM transceiver, tune it to the correct frequency and wait for a rock to fall!

Here's where Kantronics TNCs have an advantage. The CD SOFTWARE command invokes a feature that allows the KPC to perform its own carrier detection without the need for a squelch circuit (which can be turned off). As a result, Kantronics users will probably be able to decode weaker signals than ops using other TNCs. If your TNC isn't a KPC, set your transceiver squelch to "barely muted." If there are any other stations on the air in your radio horizon, their icons will appear on your screen as they transmit. You'll quickly know if you have meteor-chasing neighbors! The authors of *WinAPRS* are developing further enhancements to their product to support the needs of packet meteor-scatter and propagation enthusiasts.

Figure 3 depicts the "stations heard" display as received by my station in Western New York during one overnight period of the 1998 Leonids shower. Notice that the distances covered rival those enjoyed by traditional SSB/CW ping jockeys!

What are the best opportunities for success? In order, check out the August Perseids, the November Leonids and the January Quadrintids. Then again—you never know—by running your station continuously you may discover a previously unknown meteor event, or pick up signals during openings caused by other propagation modes.

Can it Get Any Better?

Again, in a word, "Yes." Imagine a system that can plot other propagation anomalies in near-real-time, even warning users of band openings in progress! There is an experimental propagation plotting network dubbed "PropNET" that is based on the principles outlined here, but expanded to provide an "early warning system" for VHF-and-above propagation enthusiasts.

Have you ever wished you knew the location of a contest rover so you could "put a bead on 'em?" Imagine a system where contest rover stations use Amateur Radio means to transmit their locations for everyone to see, allowing anyone within range to properly aim their antennas *before* attempting the contact. The possibilities seem endless and are limited only by our imaginations.

Take a moment to join in the meteor-scatter fun as a method of becoming familiar with the concepts presented here. And if you're presently a narrowband MS enthusiast, consider this an exceptional opportunity to enhance your operating fun. If you've always wondered about meteor-scatter communications but haven't gotten around to learning the ropes, this may be just the ticket. When using packet technology there are no complicated sequences to learn—just set up and go!

If you have Internet access, join a listserve to communicate with the growing number of ops (see Figure 5) with an interest in packet meteor-scatter operation and propagation plotting experiments. Visit the TAPR Web site and sign up for the PropNET "special interest group." You may also stay current with the goings-on by periodically pointing your web browser to **http://www.RochesterNY.org/PropNET**. There you'll find information about packet meteor-scatter operations and all sorts of packet-based propagation-chasing stuff of particular interest to VHF operators.

You now have everything you need to know to join in the fun. I look forward to seeing your APRS icon on my screen!

You can contact the author at 17050 LaDue Rd, Holley, NY 14470-9736; **evman@ix.netcom.com**. QST

New Products

POWERPORT QUICK DRAW SUB-MINI H-T POUCH

◊ Tired of getting poked in the ribs by your belt-clip-mounted sub-mini H-T? What if you could firmly secure it in an inverted position?

That's the concept behind Cutting Edge Enterprise's *Quick Draw Holster*. This glove leather pouch clips to your belt and allows you to insert the radio antenna-end down into the holder. The antenna passes through a small opening in the bottom of the pocket. A flap folds over the top to keep the radio secured. Perforations in the front of the pouch allows sound from the H-T's speaker to escape.

The *Quick Draw Holster* is available for the Yaesu VX-1R, the ICOM IC-Q7A, the Standard C508A and '108A, the Alinco DJ-C1T, 'C4T, 'C5T and other similarly sized scanners and FRS radios.

Price $19.95. For more information contact Cutting Edge Enterprises, Suite 546, Santa Cruz, CA 95060; tel 800-206-0115; fax 831-426-0115; **cee@cruzio.com**.

IMPROVED CLEARSPEECH-SPEAKER

◊ A new version of Noise Cancellation Technology's ClearSpeech-Speaker, a mobile style external speaker with built in DSP noise reduction, is now available.

The CSS-1 features increased audio output and now includes a speaker jack for connecting your own existing external speaker to its internal DSP circuitry. NCT claims that the CSS-1 will remove up to 95% of the noise on a received signal. Power requirements are specified at 9 to 24 V dc, 3 A maximum. The device measures 5.5 × 4.3 × 2.5 inches and includes a mobile bracket.

Price: $129.95. Am-Com is now the exclusive distributor of NCT ClearSpeech products to the amateur community. For additional information contact Am-Com, POB 356, Lakeside, MT 59922; tel 888-803-5823 (orders); 406-844-3252 (technical assistance); **amcom@digisys.net**; **http://www.amateurcommunications.com** (information and on-line ordering). QST

Next New Product

Strays

ATTENTION STAMP COLLECTORS

◊ WJ8C's Amateur Radio First Day Covers home page on the Web at **http://www.bright.net/~wj8c**, has been revised. The section on Amateur Radio has been updated with covers provided by ARRL Southwestern Division Director Fried Heyn, WA6WZO, as well as many others. E-mail comments or questions to Gary, WJ8C, at **wj8c@arrl.net**.

GRAND OPENING OF *ON THE SHORT WAVES* ON THE WEB

◊ You are invited to visit a new Web site devoted to the history of shortwave broadcasting and shortwave listening. It is called *On The Short Waves* and it can be found at **http://www.ontheshortwaves.com**. The site is intended to be a gathering place for people who are interested in the subject. The main focus is on shortwave broadcasting and the listening hobby that has grown up around it. However, since shortwave listening grew out of medium wave listening, the site covers that aspect as well. You'll also find information about Jerry Berg's book *On the Short Waves, 1923-1945: Broadcast Listening in the Pioneer Days of Radio*. The site is home to the Committee to Preserve Radio Verifications, too.

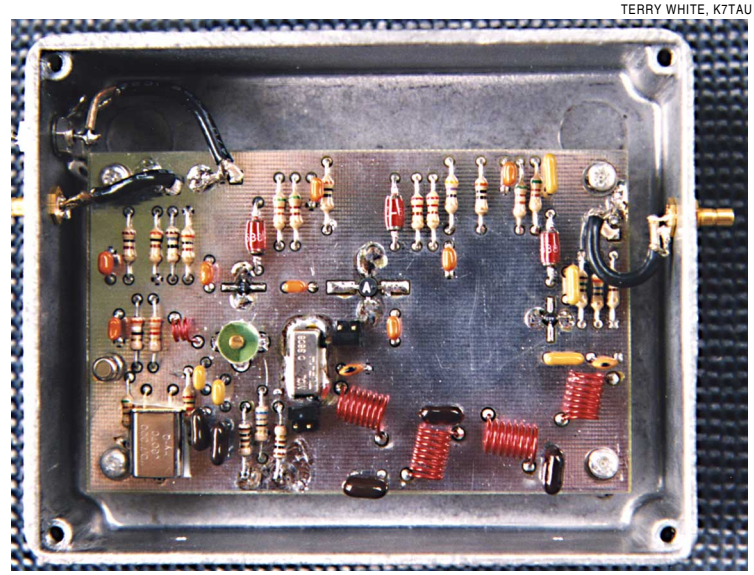
Next Stray

Wes Hayward, W7ZOI, and Terry White, K7TAU

A Tracking Signal Generator for Use with a Spectrum Analyzer

It's ideal for any application that requires a sweeping signal generator.

TERRY WHITE, K7TAU



The tracking generator PC board is housed in a die-cast aluminum box (Hammond 1590BB; see Note 4). Careful board shielding is vital to trouble-free operation.

A spectrum analyzer is a receiver-like instrument that measures signals over a wide range of frequencies and amplitude. A tracking generator is a transmitter-like source of RF that tracks and sweeps with the spectrum analyzer to which it is attached. The circuitry needed to realize this function is the same as that used in an amateur transceiver and is based upon a shared oscillator. Unlike an amateur transceiver, however, a tracking generator functions in full duplex, emitting RF as the spectrum analyzer works.

The upper portion of Figure 1 shows a partial block diagram of our spectrum analyzer described last year in *QST*.[1] Input signals within a 0- to 70-MHz range are upconverted to a 110-MHz IF, where they are filtered and processed. Swept conversion is obtained from a 110- to 180-MHz voltage-controlled oscillator (VCO.) Our spectrum analyzer VCO circuit includes an auxiliary output for use with a tracking generator—like this one.

A block diagram of our tracking generator is shown at the bottom of Figure 1. A pair of monolithic amplifiers (U1 and U2) boost the VCO sample to a level of +17 dBm, providing local oscillator (LO) injection for a high-level mixer, U4. Q1, a 110-MHz crystal-controlled oscillator provides 0 dBm RF injection for the mixer. The mixer's output is low-pass filtered and amplified by U3 to provide a 0-dBm output.

Circuit Discussion and Adjustment

Figure 2 is the tracking-generator sche-

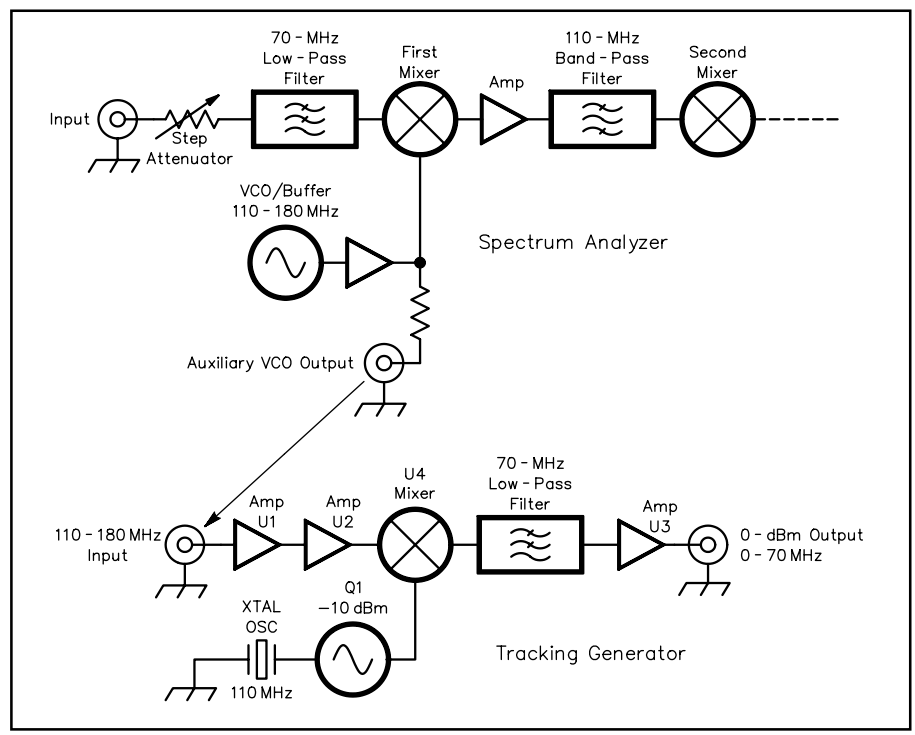


Figure 1—Block diagram showing functions within a spectrum analyzer front end and a tracking generator.

[1]Notes appear on page 52.

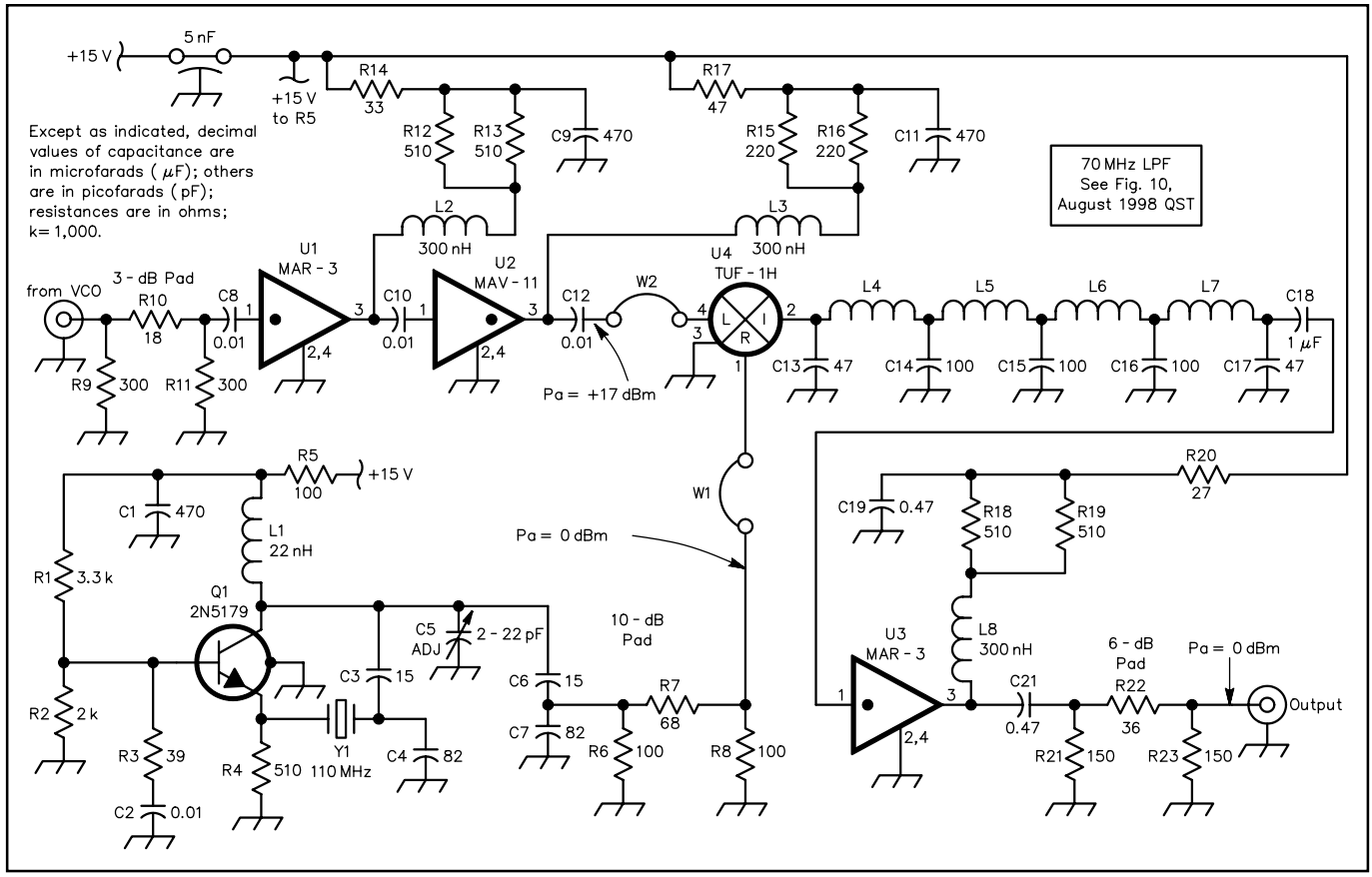


Figure 2—The tracking-generator schematic. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or film units. Equivalent parts can be substituted; n.c. indicates no connection. The low-pass filter is identical to that used in the original spectrum analyzer (see Note 1).

L1—22 nH, 2.5 turns #28 wound in the threads of a #6-32 machine screw as form; see text.
L2, L3, L8—1-μH molded RFC, any value from 100 nH to 2.7 μH will suffice.
L4-L7—8 turns #22 wound in 1/4-20 bolt threads as form. Use bare or enamel-covered wire.
Q1—2N5179 NPN VHF transistor
U1, U3—Mini-Circuits MAR-3 amplifier
U2—Mini-Circuits MAV-11 amplifier
U4—Mini-Circuits TUF 1-H mixer
Y1—Fifth-overtone crystal at first IF; see text and Note 2.

matic. Before doing anything else, determine *exactly* the center frequency of your spectrum analyzer's first IF. In our analyzer, this is the second LO frequency (usually 100 MHz) plus the second IF, 10 MHz in our analyzer. (Other spectrum-analyzer builders have used slightly different frequency combinations.) The measurement is best done by injecting a signal from a generator into the first IF, while measuring the generator signal using a frequency counter. Once the first IF is determined (using the narrowest-resolution bandwidth position), you can order an appropriate crystal.[2] By determining the proper frequency for Y1 early on, there is no need for crystal-oscillator frequency adjustment. Some tuning might be needed if a much narrower bandwidth is available.

The tracking-generator's crystal oscillator, Q1, is nearly identical to that of the spectrum analyzer's second LO. L1, the collector inductor, consists of 2.5 turns of #28 wire wound in the threads of a #6-32 machine screw (2.5 mm ID, 1.26 turns/mm), removed after winding. Temporarily remove jumpers W1 and W2. Then, using a 50-Ω-impedance power meter, measure the crystal-oscillator power output and the mixer LO injection. Confirm the output power of U3. Attenuator-pad values in all paths may be adjusted as needed.[3]

When installing the Mini-Circuits amplifiers use care, for the dot position changes with amplifier types! Careful shielding is mandatory when the generator

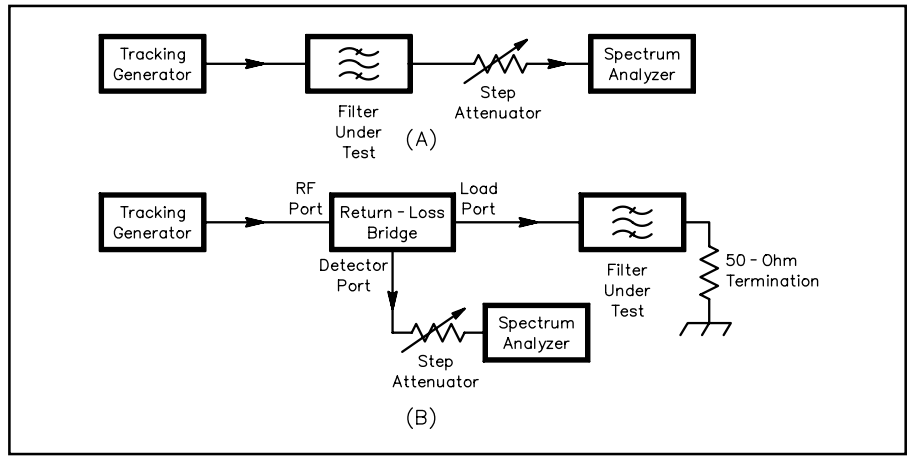
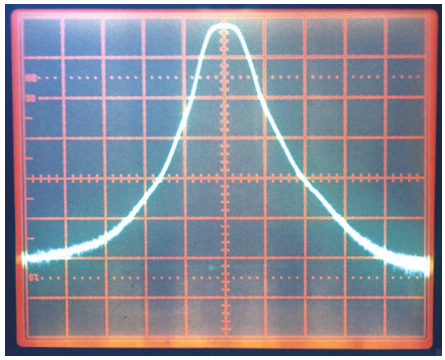
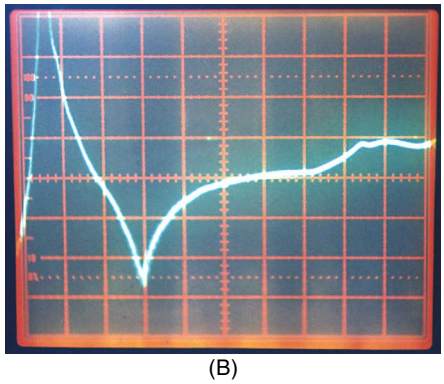


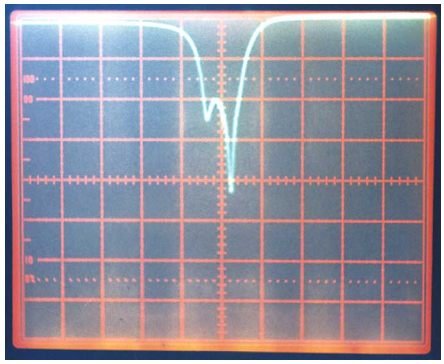
Figure 3—Application block diagrams for the spectrum-analyzer/tracking-generator combination. If a good return-loss bridge is not available, you can use a Mini-Circuits ZFSC-2-2, but with severely degraded directivity.



(A)



(B)



(C)

Figure 4—Filter measurement with the spectrum-analyzer/tracking-generator combination. Under test is a 7.15-MHz, three-pole LC bandpass filter with a 300-kHz bandwidth. At A, the nominal filter response including a 2-dB insertion loss. At B, all attenuation is removed, resulting in a peak filter response 30 dB above the reference level. This allows detail in the filter stopband to be seen. At C, the return loss at the filter input.

output frequency is the same as the analyzer input. The tracking-generator board (see the accompanying photo) fits a Hammond 1590BB die-cast box, slightly larger than the 1590B boxes used for most of the spectrum analyzer subcircuits.[4] Check our Web site for more tracking-generator and spectrum-analyzer details.[5] Also, see the Kanga USA site for board prices and availability.[6]

Applications

A tracking generator can be used in any application where a signal generator is needed and when it is useful to have the generator sweep. A spectrum-analyzer/tracking-generator combination is much more effective than using a swept oscillator with a wideband display. The combination affords enhanced dynamic range, the result of the detector's narrow bandwidth, a function performed by the spectrum analyzer.

The block diagram of Figure 3 shows how to evaluate an LC filter using the spectrum-analyzer/tracking-generator test set. At A, the scheme used to measure the usual filter response. Remove the filter from the system, replace it with a through connector or cable to calibrate the system for a reference level (top-screen) response. Install the filter and measure the response. Figure 4A shows the response of a 7-MHz bandpass filter measured with this approach. The response peak is below the top of the screen, indicating a 2-dB insertion loss. Figure 4B resembles 4A; however, the span is increased to show the response from about 5 to 50 MHz, and attenuation is removed so that the response peak is now 30 dB *above* the top of the screen. Although the response drops to –90 dBc at about 15 MHz, it comes back up. Shielding within the filter is needed to fix the degraded stopband performance.

Figure 3B shows the method used to measure the filter's input-impedance match. A return-loss bridge is employed. First, remove the filter and disconnect the 50-Ω termination, allowing the attenuator to be set for a top-screen response with an open-circuit termination at the load port. With the filter now terminated at the other end, insert it and measure the return loss. As seen in Figure 4C, it's a reasonable match (RL > 20 dB) over the filter passband.

The return-loss measurement approach is wonderful when used with an antenna. Figure 5 shows the result of checking a low, 20-meter dipole. Prior to attaching the return-loss bridge, the analyzer was tuned to place 14 MHz exactly at screen center. Measuring the antenna shows that its resonance is below the band with a return loss of about 15 dB (SWR = 1.43:1).

The reported measurements used no attenuation in the tracking-generator output, which provides an output power of 0 dBm. This power level is fine when checking an antenna or an LC filter. However, it is generally too high for the input of a receiver or amplifier. So, insert an attenuator at the tracking-generator output to establish a proper power level. The term *proper level* is, of course, relative. However, you now have the instruments needed to make such a determination for yourself. Unless you need the full 1-mW output of the tracking generator, using a fixed value of attenuation at its output forces a cleaner tracking-generator output impedance.

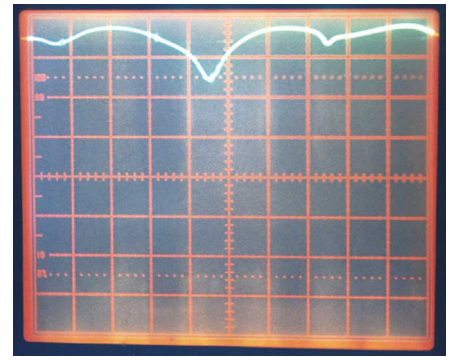


Figure 5—Input match for a low, 20-meter dipole antenna. The dip is slightly below 14 MHz indicating the need of a little trimming (or use of a Transmatch).

Concluding Thoughts

The spectrum-analyzer/tracking-generator combination is ideal for checking filters, amplifiers and antenna systems. Although this system is well suited to investigating LC filters, it lacks the stability and phase-noise qualifications for examining narrower crystal filters. This spectrum analyzer/tracking generator combination is capable of all measurements normally performed by a scalar network analyzer.

You can contact Wes Hayward, W7ZOI, at 7700 SW Danielle Ave, Beaverton, OR 97008; **w7zoi@teleport.com**. *Terry White, K7TAU, can be reached at 9480 South Gribble Rd, Canby, OR 97013,* **twhite@tqs.com**.

Notes

[1]Wes Hayward, W7ZOI, and Terry White, K7TAU, "A Spectrum Analyzer for the Radio Amateur," *QST*, Aug and Sep 1998.

[2]The fifth-overtone crystal used in our analyzer was ordered from Hy-Q International, 1438 Cox Ave, Erlanger, KY 41018-3166, **www.hyqusa.com**. The board layout accepts an HC-49/U holder. The crystal type is JG07C.

[3]Attenuator-pad component values are found in Wes Hayward, W7ZOI, and Doug DeMaw, W1FB, *Solid-State Design for the Radio Amateur* (Newington: ARRL, 1977), p 151.

[4]Hammond boxes are available from Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677; tel 800-344-4539, 218-681-6674, fax 218-681-3380; **http://www.digikey.com** and 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**.

[5]**http://www.teleport.com/~w7zoi**

[6]Kanga USA, 3521 Spring Lake Dr, Findlay, OH 45840; **www.bright.net/~kanga/kanga**. QST

By Don Gagnon, WB8HQS

How to Run a Hamfest in 63 Quick and Easy Steps

Valuable tips from a veteran with more than a decade of experience with the popular Fort Wayne (Indiana) Hamfest and Computer Expo.

Let's start at square one. Why does a group or club decide to have a hamfest? It could be several reasons, or more likely a combination of several, but usually the bottom line is to make money for the group. There are other possibilities like providing a service to regional hams, maybe getting the public involved, or just to say you did it, and did it well.

While thinking about an undertaking of this magnitude, there are several key issues that should be discussed in depth before taking the plunge.

A crowded hamfest is a happy hamfest! This scene is from the Fort Wayne Hamfest and Computer Expo.

Initial Considerations

People

Do you have enough people in your group or club to handle the workload? You need to consider the work that will be required in the months before the hamfest, plus the jobs that will need to be done the day of the event. Just because you have a large membership doesn't mean you're going to get a majority of them to help. It is not unusual to have 10% of your membership willing to get involved, and maybe another 10% that will do a specific job if they are asked to. If you're lucky, and have a good talker in your organization (like maybe a salesperson), he or she may be able to persuade more of them to action.

Timing

When should you hold the hamfest? You will need to find an "open" weekend, which has no other regional hamfests within (ideally) about 4 weeks. This *may not* be possible. You also have to watch out for holidays. For example, a Father's Day hamfest might work (since most attendees are men), but a Mother's Day event is probably not a good choice.

Finances

You'll need some "seed cash" to put on a hamfest, and some backup funds to cover a "disaster." I'm not aware of a good rule of thumb as to how much cash you should have, but it needs to be enough to prepare and distribute flyers, put a deposit on the facility you'll use, and cover any other expenses before the big day. If you sell tables before the event, then you'll have some income from that too. You need "disaster" money in case, for example, there is an ice storm on hamfest day and no one shows up. You will get no ticket income, and possibly no table sales either. What you *will* get are expenses incurred working up to the hamfest, and you'll still have to pay the rent, table rental costs and so on. Although this is unlikely, you should be financially prepared for the possibility.

Location, Location, Location!

You'll need a place to hold the hamfest that is easy to find. A local landmark is ideal, like a convention center, a county fair grounds or something similar. The worst choice is a meeting hall that requires the attendees to get off main roads and make several turns on side streets to find it. You don't want to have people getting lost! A 2-meter or 70-cm FM talk-in station will help, but the talk-in operator may quickly become overwhelmed if too many people need navigational assistance!

Now That the Decision Has Been Made...

If you have gone through these issues and feel you are in a position to put on a hamfest,

then we should get down to business. Your first step should be to form a core hamfest committee. This committee's primary purpose is to set up a schedule of what needs to be done and when, make job assignments (both within the committee and within the general membership) and make all of the "high level" decisions that arise. The committee needs to understand all of the things that will need to be done for the hamfest to be successful, and here is where a detailed schedule comes in. They also need to discuss all of the assistance the ARRL can provide. If the hamfest is an ARRL-sanctioned event, information can be submitted for publication in the *QST* "Hamfest Calendar."

Key Issues To Consider

Rule 1—Keep Your Commercial and Fleamarket Vendors Happy

Do whatever it takes to accommodate their needs and make it as easy as possible for them to participate. Perusing the fleamarket and/or commercial booths is the primary reason people attend hamfests, so your event will grow and prosper if you can make things easy for your existing vendors, and continue to add new vendors. Little things like being able to drive directly to their tables, on-site food service, help with loading or unloading, free coffee and doughnuts, or a hassle-free preregistration method are always appreciated. These are the niceties that make them want to come back.

Pricing

Early on you need to decide how much you're going to charge for tickets, tables, and electrical hookups. Most hamfests these days charge between $5 and $8 to get in, but it has always been my opinion that if you set the admission fee at $5, you'll get the computer and electronics enthusiasts to stop by as well. If you go above $5, many of them will not come. Computer hobbyists can be a significant portion of your attendance these days since computers and Amateur Radio have merged to a great extent.

Table prices usually range from $10 to $20 for a standard $2\frac{1}{2} \times 8$-foot table, depending on how many attendees you can predict will walk by their table during the event. I have found that vendors would rather pay a little more for their tables if you keep the ticket prices low to bring in more people. A larger volume of potential money-in-hand customers easily outweighs a couple of extra bucks per table. You may also have a few "special" or "premium" locations (like along a wall or very near the main entrance) where tables may cost more.

Create a Detailed Budget

Setting up a detailed hamfest budget is a must, and it must include specific dollars to be spent on each and every major category. It is much cleaner to make it totally separate from the club's general operating budget, but this may not be easy. If you can keep them separate, it will be easier to track profitability (a very important concept in running a hamfest), and then you can simply transfer the hamfest profit to the club's general operating budget once a year.

Do whatever it takes to keep your vendors happy. They're your most powerful "drawing cards."

Advertising

You need to consider what methods of advertising you will use. There are several options, depending on your budget and the size of your event. For a first time, you will likely go with something small, like signs created on a word processor and printed on 11×17-inch paper. You can then attach them to pieces of cardboard and make some wooden stakes to mount them on. These need to be put on major street corners in your town. If your hamfest is at a facility that is on a highly traveled road, then a banner on the building or in the front yard may help a lot. Of course, check your local regulations concerning flyers and handbills before you begin plastering them throughout the area.

You should get a stack of single page hamfest flyers to all the local/regional hamfests in your area throughout the year. If you have access to a mailing list of local hams, or hams that have attended another hamfest in your area, you should mail them a flyer about 3-4 weeks prior to the event. If your hamfest is ARRL sanctioned, you can get a list of all the ARRL affiliated clubs in your area, and then send them a package of 10-15 flyers and maybe even a couple of free tickets. Hams like things that are free!

For hamfests that have been running for a few years and may have a little bit bigger budget, you can try block or classified ads in the local newspaper, and radio advertising. An ad in *QST* wouldn't hurt, either. This isn't as expensive as it sounds, especially if your group is a registered not-for-profit organization.

Ticket Design

Design tickets that require the attendee to fill in their names and addresses, as opposed to the cheap theater or carnival type tickets. These can be custom designed for your event, or generic ones available at an office supply store. This type of ticket serves two useful purposes: (1) so you'll know where to send their prize if they should win one (good incentive to fill out the ticket), and (2) it allows you to enter this information into a computer database and begin building your future mailing list! Past experience shows that about 35% of the attendees do not turn in a ticket stub (and I have no idea why).

Assigning the Right People to the Right Jobs

You will need to assign several specific tasks to specific people—those who you can count on to get the job done without having to be prodded constantly. There are several key positions that will be needed:

• General chairman—This is the person who will oversee the entire operation, but he is *not* the one who should have to do most of the work. That's where *delegation* comes in. It's an easy trap to fall into, wanting to do everything yourself, but it will quickly lead to burnout.

• Table sales—This person will be solely responsible for table sales. Many smaller hamfests simply sell the tables at the door on the day of the hamfest. This works okay if you have a relatively small number of tables, but if you have more than 50 or so, preregistration is highly recommended. Using preregistration will make the table chairman's position a little busier, but the work is spread over a longer span of time. For example, the Fort Wayne Hamfest and Computer Expo has over 1100 tables, and preregistrations are required. We normally sell 50-60% of the tables a year in advance, and sell out weeks before the big weekend. A table chairman's dream is to be sold out 2 weeks early, and not have any "last minute" cancellations to deal with!

• Advertising—This position should be filled by someone who has worked with the local media, and may have the right contacts in the right places. How busy this position is depends on what type of advertising budget your hamfest has.

• Traffic—It will be this manager's job to keep traffic flowing smoothly in the parking lot (primarily during vendor setup and teardown), and inside the building, if the vendors can drive right up to their tables.

• Security—This job assignment depends on how big your event is. With a small hamfest, just having your members walking around during the event is sufficient (maybe with a badge or hat indicating they are hamfest workers), but with larger events, you will need specific people assigned to security, and someone to coordinate them. You may even want to hire one or more local law enforcement officers to be there throughout setup and the open-to-the-public hours. They may not be able to do much in a particular situation, but their

visible presence can make a big difference in the number of shoplifting problems you experience.

• Vendor check-in—This person will handle the checking in of vendors, selling vendor tickets, directing them to their table, etc. If your tables are not presold before the hamfest, then the check-in chairman or the table chairman will need to have people available at vendor check-in, prepared to sell tables.

• Forums and meetings—If you will be offering forums, VE testing, or meeting places for regional ham radio organizations, you need someone to set up and coordinate them. They will also be responsible for getting the schedule of events in the mail-out flyer.

• Worker recruiting and scheduling—This person's job will be to call all of your members and sign them up for specific jobs at specific times. Depending on how many members you have, this could be very time consuming. Again, a good talker is a necessity for this position!

The Nitty Gritty

With the people assigned and jobs distributed, you must now turn your sights to some of the smaller, but nevertheless important, issues.

Refreshments

Will you be making refreshments available during the hamfest? This can range from family members selling hot dogs, hamburgers, and soft drinks, to a professional catering service at some convention halls. Check the facility rules and plan accordingly.

The Web

If your club has a World Wide Web page, this is an excellent way to get detailed information out about your hamfest, and to keep people up to date on table availability, forum topics, VE test times, etc. An example of a club/hamfest Web site can be seen at **http://www.acarts.com**. This page was designed to provide lots of information in a logical manner, without all the fancy graphics that slow Web pages down so much.

Facility Policies

Be sure you know the facility's policies on smoking, bringing food in, hauling hand carts across carpeted areas, and so forth. Then you need to make sure your vendors are informed about these rules. Be wary of vendors playing music. If they have not licensed that music (via ASCAP or BMI), then both they *and* the hamfest can be held liable.

Insurance

It is usually a good idea to purchase a special, short-term liability insurance policy to cover your event. This is for your own protection, and many facilities require it. I would highly suggest it, for what little a one or two day policy will cost.

Policy Statements

Establish a formal refund policy concerning table sales. If a vendor who had reserved 10 tables calls you the night before and says he decided not to come, do you refund his money? What if you can "resell" his tables the next morning?

Also you should have a policy on what types of products can and cannot be sold. It's a shame to have to turn away hams wanting table space to sell ham stuff, while there are a dozen tables of crafts inside. The Fort Wayne Hamfest and Computer Expo requires that 75% of the items being sold must be radio/electronics/computer related. A policy on the display of pornography is also a good idea. Hamfests are family events and you don't want open displays of pornographic items. These policies *must* be in writing, and made available to the vendors before the day of the hamfest.

Prizes

Even though few people ever win a major prize at a hamfest during their lifetime, it is still a drawing card. You will need to decide what type of prizes you will be giving away, whether it is cash, ham gear or computer equipment. If you plan to give away ham gear, you should establish a policy dealing with what happens if a nonham wins it. We have always awarded an equivalent cash prize to keep a transmitter out of the hands of a nonham. It is often easier to just give cash, and avoid dealing with the thorny issues of equipment control altogether. If you do go for ham gear, note that most of the major equipment manufacturers, in conjunction with a dealer, will offer their equipment at a substantial discount if it is to be used as a major hamfest prize.

These are the basics to be considered and acted upon when embarking on the great adventure of holding a hamfest. Use them as guidelines in helping to make a decision on whether to start a new hamfest, or use this information to branch off into areas you hadn't thought of before for your existing event. Now let's look through our crystal ball at a simple hamfest schedule, that may help you in setting up your own custom plan.

12 Months Prior (Or Right after the Last Hamfest):

✓ Preregister tables for the following year.

✓ Hold a critique meeting for your workers to discuss what went wrong and what went right. There is *always* room for improvement.

✓ Enter your attendee's ticket stubs into your attendee database.

✓ Sign an agreement to reserve your building or location. Some places will require a lease (and a deposit) a year in advance, but some may not.

✓ Create or update the design of your one-page flyer and get it to the printer.

✓ Line up managers for key positions for next year.

10 To 11 Months Prior

✓ Update hamfest letterhead and envelopes, if you use custom stationery for your correspondence.

✓ Comb ham radio, electronics and computer magazines for vendors in your region that may be interested in coming to your hamfest. You can add them to your "prospective" list and send them a letter of introduction inviting them to attend.

✓ Get your members who attend other hamfests during the year to pick up business cards and sales circulars from vendors there, so you can add them to your prospective list.

8 To 9 Months Prior

✓ Send letters of introduction to all on your prospective list. Be sure to include a table reservation form.

✓ Develop or update documents like the floor plan/table layout, your inquiry letter (the information letter you send to those who request information), and a local hotel/motel listing, if applicable.

✓ Start work on your vendor letter. Put together a vendor letter to be sent to those who attended last year (but did not preregister) with a reservation form for the coming year. Be sure to tell them how great it was, how many people attended (and saw their tables). You can also include vendors who did not attend last year, but were there a year or two before that.

✓ Print some fill-in-the-blank postcards to send to vendors when their table orders are received and logged in. This is a cheap and easy way of confirming receipt of their order. Do *not* confirm actual table numbers or locations at this time. You want to have the flexibility to juggle locations to make things fit right up to the last month or so if necessary. Note that those who preregistered are automatically guaranteed their same tables.

6 To 7 Months Prior

✓ Send out vendor letters stressing reserving tables early, no smoking, no music playing, no pornography, etc.

✓ Review money issues with the hamfest committee (and maybe the entire membership). To be discussed are items like ticket, table or electricity prices for the hamfest a year and a half away. These need to be decided early.

✓ If you are having an ARRL sanctioned event, send a letter your section manager and the division director inviting them to attend and giving them all the necessary details. See pages 10 and 12 in a recent *QST* for lists of directors and section managers. If you wish to have an ARRL-sanctioned event, you must contact the Convention and Hamfest Branch at ARRL Headquarters to obtain an application. Send SASE to Gail Iannone, ARRL, 225 Main St, Newington, CT 06111, or e-mail **giannone@arrl.org**. With an official ARRL sanction you'll receive special benefits such as free prizes, handouts, mailing labels and other support.

Remember, however, that you must submit an application every year your hamfest is held.

✓ Begin preparing your direct mail flyers (and get price quotes from several printers).

4 To 5 Months Prior

✓ Check for any fire marshal permits or amusement licenses that you will need for your event (this varies from state to state).

✓ Send hamfest notifications to ham and electronic magazines (they often require a minimum of three months lead time).

✓ If your event is ARRL-sanctioned, you will receive a list of regional affiliated clubs from the ARRL.

✓ Confirm any special details with the facilities people such as parking arrangements, when you can get into the building, when you must vacate it, etc.

✓ Start compiling and printing information for your vendor's package (if applicable). Our club normally sends a package, which contains table numbers, driving instructions, hotel info, rules of the facility, etc.

✓ Get your direct mail flyers printed. Send a copy of your flyer to ARRL Headquarters (Attn: Gail Iannone). To receive a detailed listing in *QST*'s "Hamfest Calendar" your flyer must arrive by the first day of the second month preceding the desired issue month. For example, your information must arrive at HQ by August 1 to be listed in the October *QST*.

✓ Start putting together your forum/meeting/VE testing schedule for the flyer.

✓ Start thinking about how many tables and chairs you are going to need, and make some calls to see where you can get them.

2 To 3 Months Prior

✓ Update your Web site (if applicable).

✓ Send letters to local computer and radio-controlled model clubs telling them about your event. Their members will likely be interested in a general electronics fleamarket.

✓ Confirm VE test arrangements (if applicable).

✓ Think about your display system, (which can be anything from a signboard with handwritten information, to a computer-generated display with several monitors throughout the facility).

✓ Make sure the workers are scheduled and all needed jobs have been filled.

✓ Mail out vendor packages (if applicable).

✓ Confirm that all of the radio/TV/newspaper advertising has been arranged. Note that if you are a registered not-for-profit organization, you can request local radio stations to run "public service announcements" about your event. Be sure tell them the public service activities your club does.

✓ Design and/or update your tickets and get them printed.

✓ Make sure the major prizes are on order, if you are giving away actual equipment.

✓ Ship the club packages to regional clubs, with the flyers and possible free tickets.

1 Month Prior

✓ Update your Web site (if applicable).

✓ Send direct mail flyers.

✓ If you are going to allow preregistration for the next year, decide how and when you will accomplish this and prepare any forms that you will need.

✓ Send amateur packet bulletins to promote your hamfest. Be careful to keep the message devoid of statements relating to making money.

✓ Arrange for hamfest talk-in equipment and people.

✓ Set up on-site frequencies that will be used by workers to communicate among themselves.

✓ Print brightly colored badges to signify to vendors and attendees that your people are hamfest workers and available to assist with any questions or problems.

✓ Set up a schedule for routine announcements and prize drawings. Be prepared to post the schedule in plain view near the public address microphone, and *tape it down*—it will disappear if left to fend for itself!

The Last 2 Weeks

✓ Confirm any special needs of forum presenters, such as overhead projectors, slide projectors, chalkboard, etc.

✓ Send hamfest info to local newspapers' public service columns.

✓ Send out final packet message.

✓ Determine if you'll need any general supplies, such as a light for the talk-in station, pencils, paper, paper clips, staplers, rope for hanging banners, strong tape for hanging signs, something to use as a ticket barrel, etc.

The Last 5-7 Days

✓ For those of you who do sell tables ahead of time, print the table labels, which show table numbers, and maybe information on who has already reserved it.

✓ Put out street corner and banner signs.

✓ Make up a sign showing the physical location of all preregistered vendors. This can aid attendees in finding a desired vendor quickly.

✓ Remind your treasurer that you may need substantial amounts of change (both bills and coin) the day of the hamfest. You will need change for some or all of the following areas: ticket sales, table sales, club member consignment table, the food bar, membership table, etc.

✓ Hold a final meeting, which should include all managers, to insure each of their areas are up to date and ready, and to handle any last minute "emergencies".

Hamfest Day (Or Weekend)

✓ Be sure to have a schedule of exactly when set-up events should be happening. It should include when workers need to show up, when the vendors will be allowed in, when the show will open to the public, etc.

There will be lots of things to do, but you won't have much time to look over your "cheat sheet"! These are just a few of the more significant areas to watch:

✓ Make sure security, vendor check-in, and traffic people know where and when they need to be in position.

✓ Have your talk-in, display system, food sales, etc. ready to go by the time you open the doors to the vendors.

✓ Arrange for a very orderly ticket sales system. People don't like to have to stand in line for long to buy their ticket and start their quest.

If your managers and chairman are doing their job, the day should go smoothly. The general chairman should only have to handle questions and maybe settle small disputes, should any arise.

✓ Be sure to plan for a clean up crew once the doors close and the vendors leave. Depending on the facility's size and rules, this could take quite a while.

✓ Plan to offer a vendor preregistration time while they are setting up, so they can take care of that task before the buying public comes in and they get very busy!

The Week after the Hamfest

✓ Managers and chairmen collapse from exhaustion, and thank their spouses (if applicable) for letting them spend so much time working on it.

✓ Mail out prizes to those lucky winners who weren't there for the prize drawing.

✓ Update Web page telling how it went and include preliminary information on next year (assuming you will be having another one).

✓ Pay the remaining bills and review your balance sheet (did you make a profit?).

✓ Decide whether to do it again next year, and prepare to start all over again!

That about covers it! I hope this helps you in making a decision as to whether to hold a hamfest, and for those of you already holding an annual event, I hope this gives you some ideas for improving it as time goes on. Please keep in mind that this list only covers the highlights (my list for our ham-fest has over 200 entries in it), and there will most likely be substantially more detail than I show here in your working schedule!

You can contact the author at 2805 Nordholme Ave, Fort Wayne, IN 46805. QST

Strays

QST Congratulates...

◊ Ted Rappaport, N9NB, who was among the recipients of the Stephen O. Rice Award, and Dennis Bodson, W4PWF (ARRL Roanoke Division vice director), who received the Charles Proteus Steinmetz Award. Both awards were presented at the IEEE International Conference on Communications last June in Vancouver, British Columbia.

Next Stray

By Peter Coffee, AC6EN

Sharpening the Edge of Amateur Innovation

ARRL Technology Task Force seeks members' visions, hopes and dreams.

It's right there in the Part 97 Rules that define the Amateur Radio Service: "The amateur's proven ability to contribute to the advancement of the radio art." It's a proud statement of amateur contributions in the past, but it's also a promise of continued innovation: part of ham radio's payback for the use of the precious radio spectrum.

To fulfill that promise is not only our duty, but also our pleasure: that's what "amateur" means. We can do it better if we do it together, and that's why ARRL has chartered the Technology Task Force and the companion Technology Working Group: to invite, collect, evaluate, and share your inspirations for how we'll do ham radio in the decades to come.

Out on the Edge:
Frontiers for tomorrow's ham radio
- *Wavelength*: microwave, laser, radio astronomy
- *Modulation*: audio/video, digital modes, spread spectrum
- *Mobility*: miniaturization, hands-free operation
- *Automation*: store/forward networks, satellites
- YOUR IDEA HERE

Amateur Radio is Not the Museum of Radio

In this era of consumer-friendly communication, both worldwide and wireless, ham radio is threatened by a perception that it's a museum of old-time technology. There are many nice folks, even in hams' own families, who think of hams (if they think of us at all) as a cult in the same vein as those who restore and operate steam-powered locomotives: a Colonial Williamsburg of quaint old men with soldering irons and telegraph keys.

But even those Morse CW transmissions, one of the oldest and simplest modes in use by amateurs today, may come from a transmitter that contains technology as modern as that of any cellular telephone. Microprocessor control and internal DSP are now common in Amateur Radio equipment. Of course, Amateur Radio does a lot more than the simple telegraph key image that comes to some people's minds. Even the Morse code signals themselves may be sent and received by computer-driven keyers and text-displaying code readers. We can have roots in the past, while still having branches that reach for the sky—or beyond the sky, with space communications and radio astronomy enthusiasts now firmly established as members of the amateur radio community.

Your Role in Ham Radio's Future

No one should underestimate the challenge that lies ahead for the world's ham radio community. Like water, we need to keep moving or we will stagnate.

We can't assume that established manufacturers of ham radio equipment will continue to serve a hobbyist market: not if our core technologies grow dusty and are abandoned by other users, such as governments and commercial users. The military, public safety, transportation, and personal communication sectors are arguably outpacing the amateur community in adopting the reliability of digital modes, the convenience of store-and-forward messaging, and other key innovations in which it is our place to lead.

In an international environment of spectrum coordination, we must cultivate a constructive relationship with many levels of regulatory authority and with industry. The solo inventor can only get so far: the ARRL can make an important contribution as a coordinator and leader in getting ideas across the gap that separates possibility from practice.

The Technology Task Force is your readily accessible point of entry into this process. Chaired by ARRL First Vice President Steve Mendelsohn, W2ML, its other members are Roanoke Vice Director Dennis Bodson, W4PWF; Hudson Director Frank Fallon, N2FF; New England Director Tom Frenaye, K1KI; Southwestern Vice Director Art Goddard, W6XD; Pacific Director-elect (and current Vice Director) Jim Maxwell, W6CF; International Affairs Vice President Larry Price, W4RA; and Rocky Mountain Director Walt Stinson, W0CP.

Serving as an investigative panel for the Task Force are the members of the Technology Working Group, chaired by *CQ* Editor Rich Moseson, W2VU and also including AMSAT-NA President Keith Baker, KB1SF; computer industry analyst Peter Coffee, AC6EN; ITT Aerospace/Communications director Mike Cook, AF9Y; NLECTC communications manager Gene McGahey, NR0NR; ARRL Technical Relations Manager Paul Rinaldo, W4RI; Temple University professor Dennis Silage, K3DS, and *QEX* Editor Doug Smith, KF6DX. Ed Hare, W1RFI, the ARRL Laboratory Supervisor, is the ARRL Headquarters staff liaison to the TTF and the TWG.

You Can Help!

This is your opportunity to directly influence what the ARRL will do to promote the technology important to the future of Amateur Radio. Your ideas and work could be the key that opens new doors for ham radio! The TTF has made it easy for you to share your ideas. You can fill in a form on the ARRL Web page at **http://www.arrl.org/news/ttf/**, send email to the TTF at **ttfinput@arrl.org** or offer your ideas by mail to the ARRL Technology Task Force, c/o Ed Hare, W1RFI, 225 Main St, Newington, CT 06111. Suggestions are requested by November 30, 1999. QST

Q Vince, KR3O, asks, "Could someone be injured by touching the ground side of a coaxial-fed dipole antenna when I am transmitting at 100 W?

A Most definitely! There really is no such thing as a "ground" side to a dipole. Although one side of your dipole is connected to the shield that goes to ground at the shack end, this is a "ground" for dc only. There is plenty of RF voltage present on that side of the dipole—enough to get your attention with a painful burn.

Q Mike, K4JIF, asks, "My transceiver has a built-in antenna tuner, but it can provide a 1:1 SWR only in the middle of the 80-meter band using my G5RV antenna. I want to operate phone on the high end of the band and CW on the low end of the band, but my tuner can't seem to deal with the mismatch at the band edges. Should I use an external tuner?"

A The internal antenna tuners provided in modern rigs are quite limited in range. They will not normally tune mismatches that result in SWRs of more than 2.5 or 3 to 1.

An external antenna tuner should do the job. Although they are more expensive, the roller-inductor models are particularly versatile. Make sure to switch your internal tuner off, of course, before attempting to use an external tuner.

Another alternative would be to try different antenna designs. A broad-banded design such as a cage dipole might provide a sufficiently broad SWR bandwidth that your internal tuner could handle.

If you are going to invest in an external tuner, I'd suggest that you try it with a simple dipole fed with 450-Ω ladder line. Just cut the legs to equal lengths, as long as possible. If the dipole is a total of 62 feet in length or longer (a quarter wavelength at 3.750 MHz), I'm willing to bet that your external tuner will allow you to operate wherever you want on the band.

Q Chet, KD4IIO, asks, "I am trying to get an old version of *SuperMorse DOS* software to run under *Windows 98*, but nothing seems to work. Can you help?"

A I have heard that the interrupt handling for *DOS* applications has changed drastically from *Windows 95* to *98*. The net effect apparently is that any *DOS* software that tries to write directly to the hardware routines (which *Super Morse* does to achieve perfect timing) will not work properly under *Windows 98*.

NuMorse is a program that will run under *Windows 98* (it is a true *Windows* application). You can find it on the Web at **http://www.btinternet.com/~tony.lacy/**. There is also a *DOS* program called *SmartCW* that does run properly in a *DOS* window under *Windows 98* (this one doesn't write directly to the PC hardware). It is available at **http://www.qsl.net/aa1do/smartcw.htm**.

Q Rich, KC2FCL, asks, "I am a new amateur and I am very interested in packet radio. I know I need a transceiver, a TNC and a computer to get started. I am a little uncertain about what type of computer is required, though. Any suggestions?"

A Just about any computer can be used for packet. The primary requirements are terminal software and the ability to hook up a serial connection between the computer and the TNC. There are still some hams using Ataris and Commodores for packet radio, believe it or not. Speed is not required for packet use since the limitation is placed on the system by the TNC.

You can probably pick up an ancient Atari, Commodore or RadioShack Color Computer at a fleamarket for next to nothing. Finding terminal software, however, would be a different matter. My suggestion, instead, would be to look into a used 286 or 386 PC. I saw a 386 at a recent hamfest selling for only $75—complete with a monochrome monitor and a small hard drive. You can even find used 486 laptops for $100-$200. These would make outstanding packet radio computers. They can run *Windows* at a rudimentary level and use the *Windows* terminal software to "talk" to the TNC.

Q Tim, K4TK, asks, "Our club would like to put a 6-meter FM repeater atop a tower in town. How do I determine if our installation would be in compliance with RF safety rules?"

A Although many amateurs must perform RF safety evaluationsof their stations, there are a number of "categorical" exemptions. The FCC exempted some stations from the need to perform evaluations because the power level, frequency and station type (and configuration) is such that it is very unlikely that the station could exceed the permitted exposure levels.

Two of the exemptions may apply to your repeater operation. First, stations that have 50 W PEP or less to the antenna are categorically exempt from the requirement to do an evaluation. If you have a 50 W repeater, and even a fraction of a dB of feed line loss, you have less than 50 W to the antenna. In most cases, the FCC does not require that you evaluate a station supplying less than 50 W to the antenna.

Many repeaters are also categorically exempt, regardless of power, as long as their antennas are not mounted on buildings. If your repeater is on a tower and it is located more than 10 meters above ground, the regulations do not require that the RF exposure be evaluated.

Now, there are exceptions to this evaluation. Even stations that are categorically exempt from the need to evaluate must not exceed the exposure limits. The FCC's RF-exposure material clarifies that if a station is categorically exempt, but it has an unusual configuration that might result in excessive exposure, the amateur should evaluate the repeater anyway. A good example of this might be a 45-W repeater with an antenna located within a few feet of where people might be found.

If your repeater is not categorically exempt, by virtue of its power level or the height of the antenna on the tower, you will need to perform an evaluation. There are a number of different ways to do this. The easiest is a "worst-case" evaluation that runs your transmitter power, operating on/off times and antenna gain into a formula and determines the required distance in feet. To do this for an "uncontrolled" exposure environment (this means that it is possible that people who have no knowledge of RF exposure may be exposed by your repeater—ie, roof-top workers, etc), determine your average power by starting with your transmitter power, subtract the power lost in the feed line, multiply that result by the percentage of time the repeater *could* be transmitting in a 30-minute period. (For a repeater, this percentage is usually 100%.) Then, multiply this result by the *numerical* gain of your

antenna (the gain expressed as a number, not in dB). For 30-300 MHz, you can use the formula:

$$D = 1.047 \times \sqrt{P \times G}$$

Where D is the diagonal distance between the antenna and area of exposure, P is the power in watts and G is the numerical gain of the antenna (ie, 6 dB is G = 4).

This formula applies only to 30-300 MHz. For other frequencies, the permitted exposure level varies by frequency. Fortunately, there is an easier way. The Web site at the University of Texas, **http://n5xu.ae.utexas.edu/rfsafety/**, can calculate the required distance from your average power and antenna gain. This simple formula approach gives a worst-case evaluation, for the distance if the person being exposed is in the main beam of the antenna. In most cases, repeater antennas direct energy to the horizon, not downward, so the exposure below the antenna is almost always less than the worst-case formula would predict. The ARRL book, *RF Exposure and You* (**http://www.arrl.org/catalog/6621/**), contains additional charts and tables that give a more accurate analysis of typical repeater antennas. The FCC also permits you to choose other evaluation methods, such as antenna modeling, actual measurements and so on.

There is one other consideration that may apply to some amateur repeaters. The FCC rules do not cover just single-transmitter installations, but require that multiple-transmitter sites also comply *as a site*, with all transmitter operators on the site being jointly responsible for overall site compliance in all areas where the RF fields from their own station exceed 5% of the level permitted *for their own station*. Fortunately, for most amateur repeaters, this "5%" area covers +/– 10 feet from the antenna on the tower. The FCC also clarifies that if your station is categorically exempt from evaluation, you generally do not share joint responsibility with others on the site. This joint responsibility is a complex issue that is discussed in great detail in *RF Exposure and You*.

There are a number of useful Web sites that have more information. The ARRL info on the subject, at **http://www.arrl.org/news/rfsafety/**, contains links to the FCC material, downloadable reprints of several *QST* articles on the subject, and more.

Q Rob, WA4RX, asks, "I have a Yaesu FT-7 transceiver that seems to generate the proper output, but the receiver is behaving strangely. Sometimes it seems to die altogether. When I jostle the rear cabling and PL-259 it comes back in full force. Gently tapping the radio provides similar results. I've checked the coax and it is fine; so is the PL-259 connection. This has occurred on different antennas and cables, so I know it's not the cable system. Have you heard of such a problem before?"

A This is a common problem on older radios. There are three possible causes:

(1) Oxidation on the connectors (using a contact cleaner would help here).

(2) Fatigue of the contact "fingers" on the center receptacle of the SO-239 coaxial connector. After repeated connects/disconnects, the sides of the center part of the SO-239 are often bent outward, resulting in poor contact with the pin on the PL-259. You can sometimes take a sharp probe and bend them *slightly* inward to correct this. If the connector doesn't look too difficult to replace with a new one, you might want to consider that approach.

(3) Cold/fatigued solder joint on the inside of the radio at the SO-239 connector.

Q How do you measure the radiation pattern of an antenna?

A Of all antenna measurements, the radiation pattern is probably the most difficult and demanding. The information is very useful, however, in determining if an antenna is functioning as it was intended (if a beam, for example, is focusing the RF energy as well as predicted). See Figure 1.

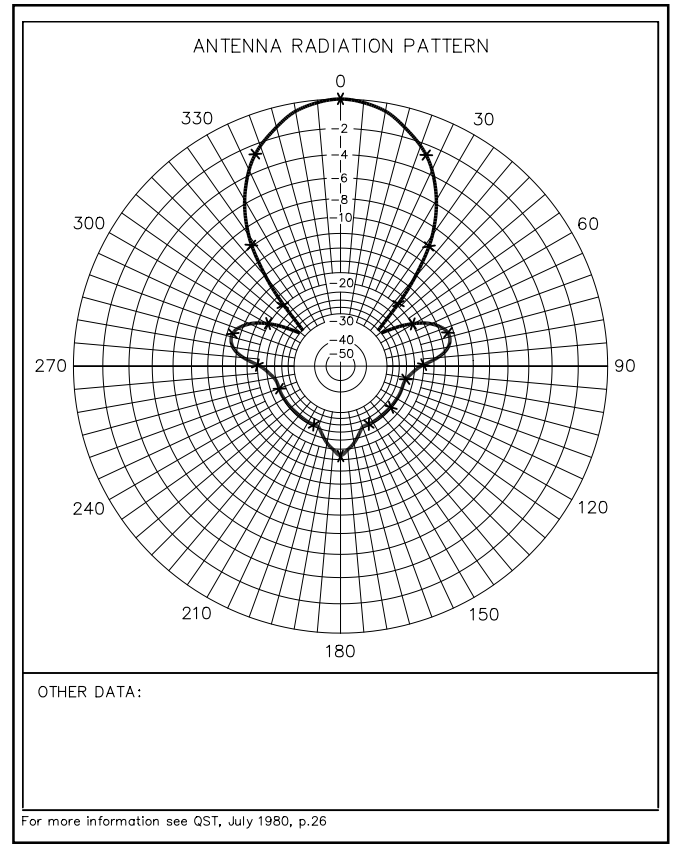


Figure 1—A sample radiation plot of a typical Yagi antenna. Notice how the RF appears to be focused primarily forward.

Any antenna radiates to some degree in all directions. Therefore, the radiation pattern of an antenna is a three-dimensional representation of phase, magnitude and polarization. In general, and in practical cases for Amateur Radio applications, the polarization is well defined and only the magnitude of radiation is important. In many cases the radiation in one particular plane is of greatest interest: the plane corresponding to that of the Earth's surface, regardless of polarization.

Because of the nature of an antenna test range set up, measurement of a radiation pattern can be successfully made only in a plane nearly parallel to the Earth's surface. With beam antennas it is usually sufficient to take two radiation pattern measurements, one in the polarization plane and one at right angles to the plane of the polarization. These radiation patterns are referred to as the principle E- and H-plane patterns respectively. The E plane, meaning parallel to the electric field, which is the polarization plane, and the H plane, meaning parallel to the magnetic field. The magnetic and electric fields are always perpendicular to each other in a plane wave as it propagates through space.

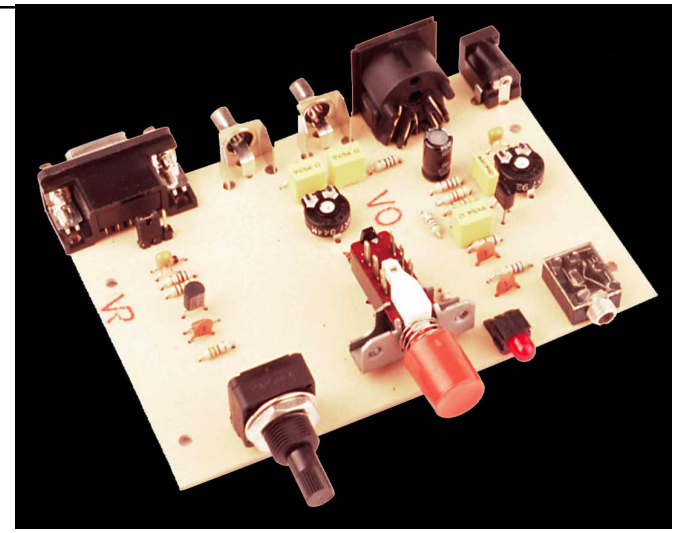
Most hams do not have the equipment to make accurate radiation pattern measurements. You must be able to rotate the antenna in the azimuth plane (horizontally) with a fair degree of accuracy. You also need a signal-strength meter calibrated over at least a 20-dB dynamic range with a readout resolution of at least 2 dB.

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. QST

By Salvador Esteban, EB3NC

PTTSound

Put your computer's soundcard to work for RTTY, PSK31, SSTV, Hellschreiber and many other modes with this versatile interface.



Computers have become essential tools in ham stations throughout the world. The majority of these computers are equipped with *soundcards*, devices that essentially function as digital-to-analog converters (and vice versa). Although soundcards were originally intended for gaming and other home applications, amateurs quickly discovered that they could use them to transmit and receive digital and analog signals without the need for an external interface (such as a multimode communications processor). Software has been created to use the soundcard's capabilities to transmit and receive modes such as CW, RTTY, AMTOR, PACTOR, PSK31, SSTV, fax and Hellschreiber, just to name a few. You'll find a large collection of Amateur Radio soundcard software on the Web at **http://www.muenster.de/~welp/sb.htm**.

Connecting a soundcard to a transceiver can often be as easy as running a couple of shielded cables between the two devices. For best performance, however, you need to provide the necessary audio levels to both the soundcard and the transceiver. Yes, you can make these adjustments in the soundcard "mixer" software, but this can be inconvenient, particularly if you use the soundcard for other applications. Independent audio-level controls for signals to and from the radio would make life much easier.

There is also the issue of using the computer to key the transceiver. Usually this requires a simple transistor switch, typically wired to a computer's serial (COM) port. When the transistor conducts, it effectively grounds the transceiver's keying line, either at the microphone jack, or at a rear-panel accessory socket.

But what do you do with your microphone when you want to operate in a digital or image mode? Many transceivers are designed in such a way that if you key the radio at the accessory jack, the microphone will be "live" as well. You have to disconnect your microphone to prevent it from contributing audio to your digital signal.

PTTSound, as I call it, is a simple interface that allows you to independently set the audio levels to and from the computer sound card. PTTSound not only includes the serial port keying interface, but also a convenient microphone input and push-to-talk switch. No more fumbling with cables whenever you want to switch between voice and digital (or image) modes! PTTSound even incorporates a microphone preamp and mike-level adjustment.

Computer Keying Circuit

Nearly all Amateur Radio soundcard software packages feature the option to key the radio via the DTR or RTS pins at the computer's serial port. You can hardwire PTTSound to the pin you desire, or use a jumper to switch between the two if necessary. When the software is in the transmit mode, the logic "high" voltage present at either pin is conducted to D1 and Q2 through a serial cable between the computer and J1, the PTTSound DB-9 connector (you could also use a DB-25 connector, if you prefer). Q2 is biased so that the logic signal will cause it to conduct and ground the transceiver keying line through switch S1. (D2 and C8 are included to protect Q2 from transient switching voltages.) The LED, DS1, will glow to indicate that you are transmitting.

Microphone Switch and Preamp

You connect your microphone directly to PTTSound. In my version I use a 1/8-inch jack for this purpose because I use a simple electret "computer style" microphone, but any microphone jack will do.

When you press S1, a DPDT latching pushbutton switch, the transceiver keying line is grounded, which places it in the transmit mode. Soundcard audio is disconnected and the mike becomes live. Once again, LED (DS1) glows to indicate that you are transmitting.

The output of Q1, the single-transistor microphone preamp, is adjusted through trimmer potentiometer R1 and routed to the rig through S1, the manual PTT switch. Once you have the level set properly for your radio, you'll rarely need to change it.

Soundcard Input and Output

Connector J2 receives the *transmit* audio signal from the Line Out (or Speaker Out) jack of your soundcard. The signal is fed to potentiometer R15, and finally to the radio through switch S1.

The *receive* audio from the transceiver is fed back to the soundcard's Line Input jack through J3, and the level is adjusted at potentiometer R16. In my design R16 is mounted on the front of the board for easy access. I find that it is handy to be able to adjust the receive audio level on the fly.

Construction and Alignment

You can build PTTSound on a piece of breadboard; the layout is not critical. For a neater, easier installation you can use a PC board.[1] The schematic diagram is shown in Figure 1.

I suggest using shielded cables for all connections between the PTTSound and the computer or radio. For connections to the soundcard you'll need two cables, each with one 1/8-inch stereo plugs on one end and two male RCA phono connectors on the other. *You must use stereo plugs*. If you use monaural plugs you might ground one of the soundcard channels and damage the soundcard. Since ham applications use monaural audio, I suggest that you use only one channel for the soundcard inputs and outputs. A 1/8-inch stereo plug consists of three connection points: *tip, ring and barrel.* In most soundcards these correspond to the left, right channels and ground, respectively. It is probably best to use the *tip* (left) channel only.

[1]A printed circuit board for PTTSound is available for $6.50, plus shipping and handling, from FAR Circuits, 18N640 Field Court, Dundee, IL 60118.

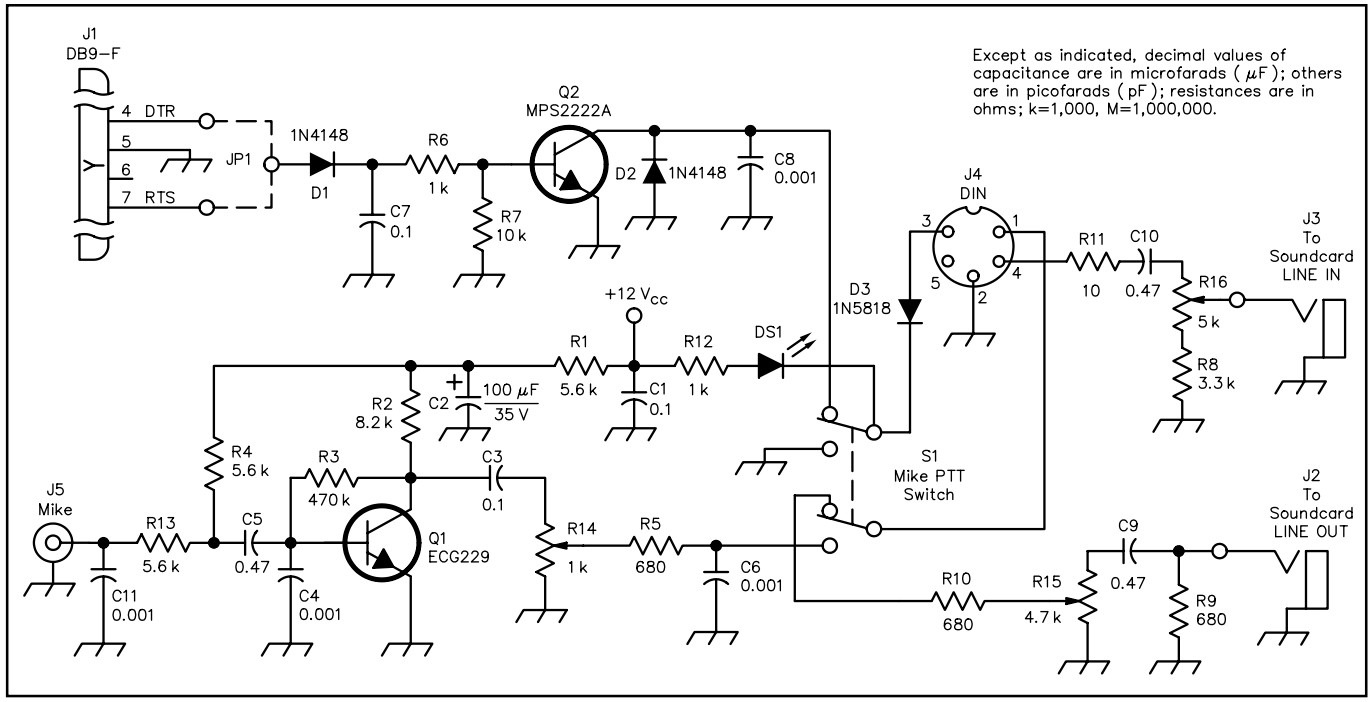
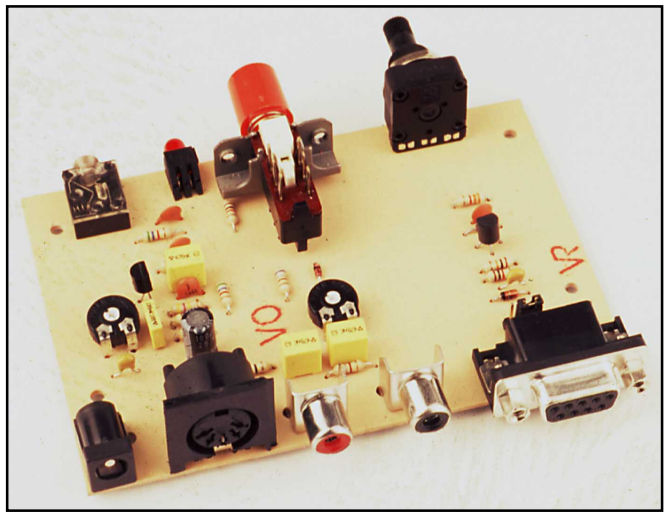


Figure 1—The PTTSound interface. RadioShack part numbers shown unless otherwise noted. Parts can also be obtained from Mouser Electronics (tel 800-346-6873), MCM Electronics (tel 800-543-4330) and other sources.

C1, C3, C7—0.1μF ceramic (272-135)
C2—100 μF 35V electrolytic (272-1028)
C4, C6, C8, C11—0.001μF ceramic (272-126)
C5, C9, C10—0.47 μF polyester (Mouser 140-PF1H474K)
D1, D2—1N4148 diode (276-1122)
D3—1N5818 diode (Mouser 625-1N5818)
DS1—LED (276-041)
J1—DB9 female jack
J2, J3—Female RCA phono jacks
J4—5-pin DIN jack
R1, R4, R13—5.6 kΩ 1/4 W
R2—8.2 kΩ 1/4 W
R3—470 kΩ 1/4 W
R5, R9, R10—680 Ω 1/4 W
R11—10 Ω 1/4 W
R6, R12—1 kΩ 1/4 W
R7—10 kΩ 1/4 W
R8—3.3 kΩ 1/4 W
R14—1 kΩ trimmer (271-280)
R15—4.7 kΩ trimmer (271-281)
R16—5 kΩ linear taper (271-1714)
S1—DPDT latching pushbutton switch (Mouser 612-MTH-22 and 612-1C-RD [cap])
Q1—ECG229 transistor (MCM ECG229)
Q2—MPS-2222A transistor (276-2009)

When you have PTTSound hooked up and ready for testing, turn on your transceiver, start your ham software (PSK31, for example) and adjust R16 for the desired receive audio level to the soundcard. Now connect your transceiver to a dummy antenna if you have one available. Place the software in the transmit mode and make sure that PTTSound is keying the radio properly (the PTTSound LED should glow). If your rig isn't keying, check the wiring or jumper at J1. Make sure your software is configured to key through the correct COM port.



Rear view of the PTT Sound board showing the input and output connectors.

Switch your ham software to the receive mode. Open your soundcard mixer or other audio level-control software. Adjust the computer audio for the level you enjoy for normal use (for games and other applications). Now, place your ham software back in the transmit mode. Watch your transceiver's RF output or ALC meter and adjust R15 for the correct level. Depending on the software and mode in question, this is usually the point where you achieve maximum RF output *without* significant ALC activity.

Finally, press S1 and make sure that your transceiver enters the transmit mode. Speak into the microphone and adjust R14 for the proper level. The microphone amplifier is designed for an audio response that emphasizes the higher frequencies, thus allowing better intelligibility. Even so, it can be modified for more bass response by changing the C3 and C5 values slightly. If you need greater microphone gain, reduce the value of R13 (but not to less than 1 kΩ).

An article about another version of this project originally appeared in the CQ Radio Amateur *Spanish Edition in August 1998.*

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http://www.teleline.es/personal/estaban1

By Ian Poole, G3YWX

Radio Waves and the Ionosphere

Although hams are required to have a passing familiarity with the physics of the ionosphere, a more intimate understanding can make or break your enjoyment of the hobby. This primer will fill in some of the blanks and start you on a fascinating journey.

Radio propagation via the ionosphere is a fascinating and important means of long-distance radio communication. Thousands of hams and commercial operators use the ionosphere every day to make contacts over vast distances. To effectively use these propagation modes to their fullest, however, we must understand the physics behind the magic. Knowing when to listen, the best frequencies to use and where signals might come from enable experienced DXers to work stations when less-experienced operators come up short. In fact, knowledge of propagation and a "feel" for conditions and what each band might produce are valuable commodities for any radio operator.

The Atmosphere

Before we look at how signals are reflected by the ionosphere we must see where these reflections take place and how the reflecting areas are formed. The atmosphere can be split into a variety of different layers according to their properties. The most commonly used names are shown in Figure 1. Here we can see that the troposphere is the part of the atmosphere closest to the ground, extending to a height of about 10 km. At altitudes between 10 and 50 km we find the stratosphere, which contains the famous ozone layer at a height of about 20 km.

For shortwave communication the ionosphere is the most important, although the troposphere plays a key role in VHF and UHF communication. The ionosphere crosses several meteorological layers and extends from about 50 to 650 km.

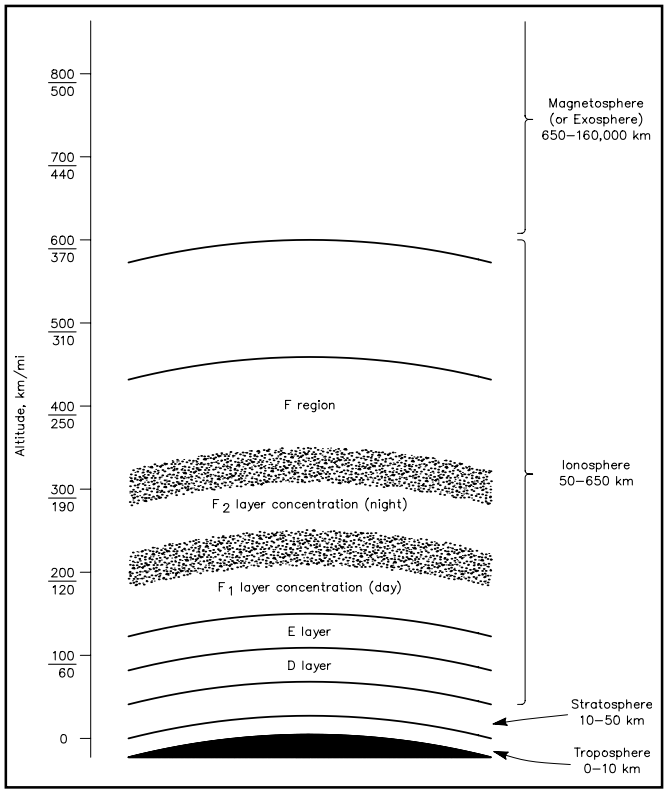

Figure 1—Areas of the atmosphere.

The Ionosphere

The ionosphere is so named because it is a region in the atmosphere where ions exist. In most areas of the atmosphere molecules are in a combined state and remain electrically neutral. In the ionosphere, however, solar radiation (mainly ultraviolet light) is so intense that when it strikes gas molecules they split—ionize—and an electron is set free. What remains is a positive ion (a molecule that is "missing" an electron) and a free electron. Although ions give their name to the region, free electrons actually affect radio waves. The number of electrons starts to increase at an altitude of about 30 km, but the electron density isn't sufficient to affect radio waves until about 60 km.

We often think of the ionosphere as having a number of distinct layers. This is convenient for many explanations, but it's not entirely accurate as the entire ionosphere contains ionized molecules (and free electrons). Instead, the layers are best thought of as peaks in ionization levels.

To quickly identify the layers, peaks or regions, we refer to them by the letters D, E and F. (There is a C layer, but its level of ionization is so low that it has no effect on radio waves.)

Layers

The D layer is the lowest, at altitudes between 50 and 80 km. It is present during the day when radiation is beaming in from the sun. Because the density of the air is still high at this altitude, however, ions and electrons recombine relatively quickly. After

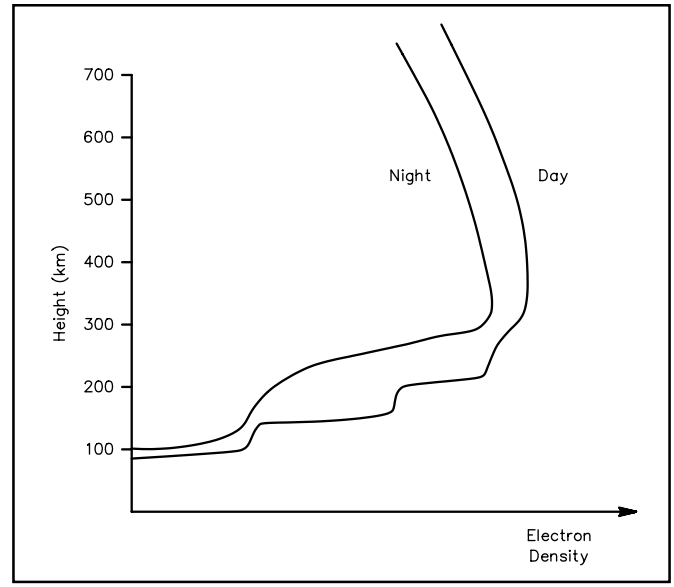

Figure 2—Typical electron distribution (day and night).

sunset, when solar radiation is blocked by the Earth, electron levels fall quickly and the D layer effectively disappears.

Above the D layer, the next ionization level is called the E layer. It can be found at altitudes between 100 and 125 km. Because electrons and ions recombine relatively quickly here, ionization levels drop quickly after sunset. Although a small amount of residual ionization persists, the E layer virtually disappears at night.

The most important layer for long-distance communication is the F layer. During the day it often splits into sub-layers we call F1 and F2, as shown in Figure 4. (At night the two layers merge back into a single F layer.) F-layer altitudes vary considerably and depend on the time of day, the season and the state of the sun. In the summer, the F1 layer may be at 300 km, with the F2 layer at 400 km or more. In the winter, these figures may be about 300 km and 200 km, respectively. At night, the F layer is generally around 250 to 300 km. These figures vary considerably, however, so consider them as approximates.

As with the D and E layers, ionization levels in the F layer decrease at night. The rate of recombination is much slower, however, because the layer is higher and air density is much lower. Because the ionization remains overnight, it can still affect radio signals

The Sun and the Ionosphere

It's not surprising that solar variations affect the ionosphere. One major factor is the number of visible sunspots. The spots appear on the surface of the sun as dark (relatively speaking) areas that can be seen when an image of the sun is projected onto a screen or a piece of paper. Sunspots affect the ionosphere because the areas around the spots emit greater amounts of the ultraviolet radiation—the main cause of ionization.

Note: *Never* look directly at the sun, even through darkened glasses. Doing so can permanently damage your sight.

The number of spots varies, roughly conforming to an 11-year period. This means that ionospheric conditions—and radio propagation—vary in sync with this cycle. At the low point of the cycle, HF bands above 20 MHz or so may not support ionospheric propagation. At or near the 11-year peak, frequencies at 50 MHz and higher may be effective.

Ground and Sky Waves

Signals in the medium and shortwave bands travel by two basic means: ground waves and sky waves.

Ground waves occur as the signal spreads out from the transmitter in all directions. Instead of traveling in a straight line (and not being heard beyond the visual horizon), radio signal tends to follow the curvature of the Earth. This occurs because currents are induced in the surface of the Earth, which slows the wavefront near the ground. As a result, the wavefront tilts downward, enabling it to follow the curvature of the Earth and travel beyond the horizon.

With some exceptions, ground-wave propagation is generally used for signals below 2 or 3 MHz. It is not used much at higher frequencies because the level of attenuation increases with frequency, and above these frequencies coverage becomes progressively less reliable. This is demonstrated by the fact that shortwave broadcast stations are only audible for short distances via ground wave. In comparison, medium-wave stations are audible over much greater distances—a typical high-power AM broadcast station may have a coverage area of a hundred miles or more. Total coverage is affected by a variety of factors, including transmitter power, the type of antenna and the terrain over which the signals are travelling.

Signals also leave the Earth's surface and travel toward the ionosphere. As we will see, some of these are returned to Earth. These signals are termed sky waves for obvious reasons.

The D Layer

The first layer a signal reaches is the D layer. This layer acts as an attenuator, especially at low frequencies. In fact, the attenuation varies as the inverse square of the frequency. That is, doubling the frequency reduces the level of attenuation by a factor of four. This is why low-frequency signals are prevented from reaching the higher layers, except at night when the D layer disappears.

Signals are attenuated as they pass through the D layer because they cause free electrons to vibrate. When this occurs, the electrons collide with other molecules, consuming a small amount of energy and dissipating a proportionately small amount of the radio signal.

We can see that the level of attenuation depends upon the number of collisions that take place. In turn, this depends on a number of other factors. One of the most obvious is the number of gas molecules that are present. More gas molecules mean more collisions and increased attenuation.

Ionization levels are also important, as is the frequency of the radio signal. As frequency increases, wavelengths become shorter and collisions between free electrons and gas molecules decrease. As a result, low-frequency signals are attenuated far more than those at higher frequencies. Even so, high-frequency signals still suffer some reduction in strength.

The E and F Layers

As with the D layer, when signals enter the E and F layers they cause free electrons to vibrate. Here the air density is much lower and there are fewer collisions. As a result, much less energy is lost and these layers affect radio signals in a different way. Rather than colliding with gas molecules and losing energy, the electrons tend to re-radiate the signal. Because the signal is traveling in an area where electron density is increasing, the farther it progresses

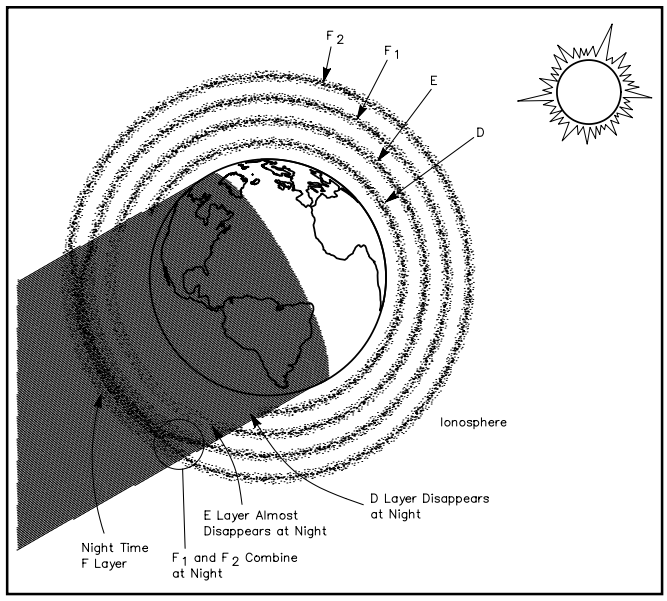

Figure 3—A simplified view of the layers of the ionosphere over the period of a day.

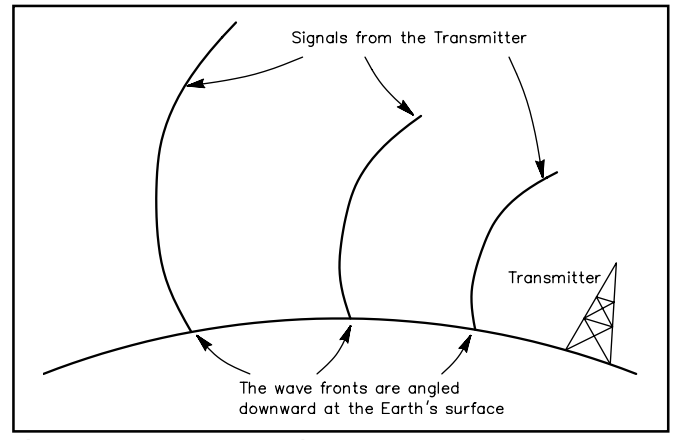

Figure 4—A ground-wave signal.

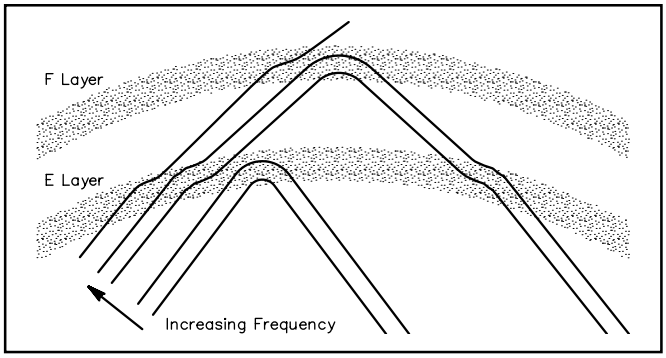

Figure 5—Refraction of a signal as it enters an ionized region.

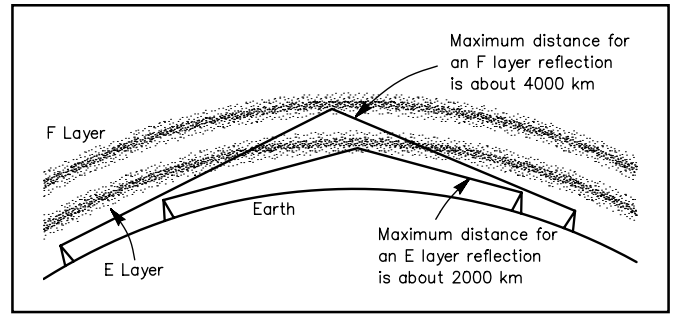

Figure 6—Signals reflected by the E and F layers.

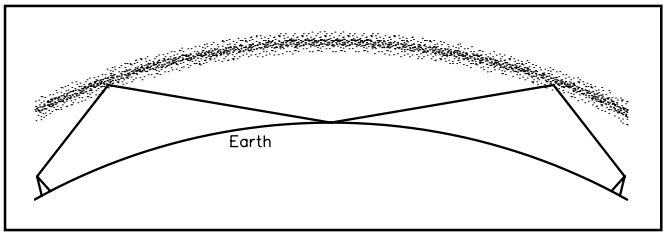

Figure 7—Multiple reflections.

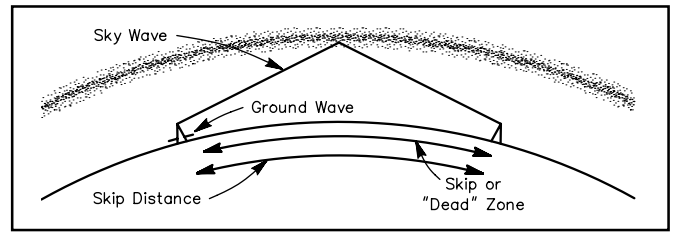

Figure 8—Skip distance and dead zone.

into the layer, the more the signal is refracted away from the area of higher electron density. At HF, this refraction is often sufficient to bend the signals back toward Earth. In effect, the layer appears to have "reflected" the signal.

These "reflections" are affected by frequency and the radio wave's angle of incidence. As frequency increases the amount of refraction decreases until a frequency is reached where the signals pass through the layer and on to the next. Eventually, a frequency is reached where signals pass through all the layers and into outer space.

Changing the Frequency

During the day, medium-wave signals propagate only via ground wave because the D layer absorbs signals that reach the ionosphere. As frequency increases, attenuation falls to a point where signals pass through the D layer and on to the E layer. Here signals are reflected and pass back through the D layer and return to Earth a considerable distance from the transmitter.

As frequency increases further, E-layer refraction becomes less efficient. Eventually, signals pass through to the F1 layer, where they may be reflected back through the D and E layers to reach Earth. Because the F1 layer is higher than the E layer, the distance traveled by signals reflected by the F layer will be greater.

As frequency increases still further, signals will eventually pass through the F1 layer to the F2 layer. Because this is the highest reflecting layer, the distance spanned by signals reflecting from it is the greatest. The maximum skip distance for the E layer is about 2000 km. For the F2 layer that increases to about 4000 km—a significant gain.

Several Hops

Considerable distances can be spanned by an E- or F-layer reflection, but that does not explain how signals can propagate to the other side of the globe. World-spanning propagation requires several reflections. Having returned to Earth from the ionosphere, the Earth's surface acts as a reflector and returns the signal back to the ionosphere, where it is reflected back to Earth yet again. In this way signals can travel around the globe (sometimes in several directions!).

The nature of the Earth's surface also has an effect. Desert areas are poor reflectors, but oceans are quite effective. This means that signals bounced off the Atlantic Ocean, for example, will be stronger than those reflected by areas such as the Sahara Desert.

Apart from losses caused by reflections at the Earth's surface, signals are attenuated each time they pass through the D layer. In fact, D-layer attenuation is particularly significant when we remember that signals have to pass through the D layer twice for each E- or F-layer "round trip."

Apart from the fact that high-frequency paths are more likely to use the F2 layer and require fewer reflections, high-frequency paths also suffer less from D-layer attenuation. This means that (all other factors being equal), a 28-MHz signal, for example, will be stronger than one on 14 MHz if propagation is supported at both frequencies.

Skip Distance and the Skip Zone

Skip distance, skip zone and dead zone are important terms associated with ionospheric propagation. The distance a signal travels along the surface of the Earth when it is reflected by the ionosphere is known as the skip distance, as shown in Figure 8.

There is also a region known as the skip zone or dead zone. Ground-wave signals will be heard only at a certain distance from the transmitter because of signal attenuation. Signals traveling to the ionosphere may not be reflected until they reach distances well beyond that where ground-wave signals fade out. The result is an area or zone where no signals can be heard. This is known as the skip zone, or dead zone. This is particularly pronounced for high-frequency signals where ground waves fade away quickly and skip distances may be a thousand miles or more.

Summary

For hams, an understanding of radio propagation is practical and fascinating. The more you find out, however, the more interesting it becomes—so beware!

Ian Poole is the author of Your Guide to Propagation, *published by the RSGB;* Short Wave Listener's Guide, *published by Newnes (an imprint of Butterworth Heinemann);* and Basic Radio Principles and Technology, *published by Newnes— all available from the ARRL.*

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By Gil McElroy, VE1PKD

Keeping Track of OSCAR: A Short History Amateur Radio's Race for Space

Making contacts through a long chain of ever-more-sophisticated Amateur Radio satellites has made satellite QSOs an everyday occurrence. But as we wait for the launch of the Phase 3D "supersat," this fascinating look at our first faltering steps into space is a dramatic illustration of just how far we've come!

Years in the making—and in the waiting!—AMSAT's Phase 3D satellite is the most sophisticated and expensive Amateur Radio satellite ever built. With transmitters and receivers spanning 21 MHz to 24 GHz, it will bring satellite communication to virtually every ham with only modest equipment. "Large expensive satellite stations will be a thing of the past," wrote Steve Ford, WB8IMY, in May 1995 *QST*.

According to recent reports, our wait for Phase 3D may soon end. While we're waiting for "launch day," though, let's take a look at the truly remarkable story of how hams came to have their own satellites.

Most of us know that science fiction writer Arthur C. Clarke, in an October 1945 article in *Wireless World* magazine titled "Extra-Terrestrial Relays, Can Rocket Stations Give World-Wide Radio Coverage?", first proposed placing an artificial satellite in geosynchronous Earth orbit. What most of us don't know, however, is that Clarke's proposal called for a manned, steam-powered satellite! At the time, vacuum tubes were the order of the day; transistors hadn't been invented. Neither had solar cells and, given the state of WW II technology, Clarke could come up with no better means of converting solar energy into usable power.

Clarke did, however, correctly envision the satellite's role in television and radio communication.[1] But in 1945, Earth-orbiting objects (other than the Moon, the usual space debris and perhaps an alien spacecraft or two!) existed only in science fiction novels. Something far more down to Earth—or at least closer to it—was needed.

On August 10 of that year, the *New York Times* reported that Westinghouse had a plan that would revolutionize broadcasting. A system of 14 airplanes continuously flying at an altitude of 30,000 feet would blanket most of the US with radio and television signals. Nicknamed "Stratovision," it never came to be.

First in Space

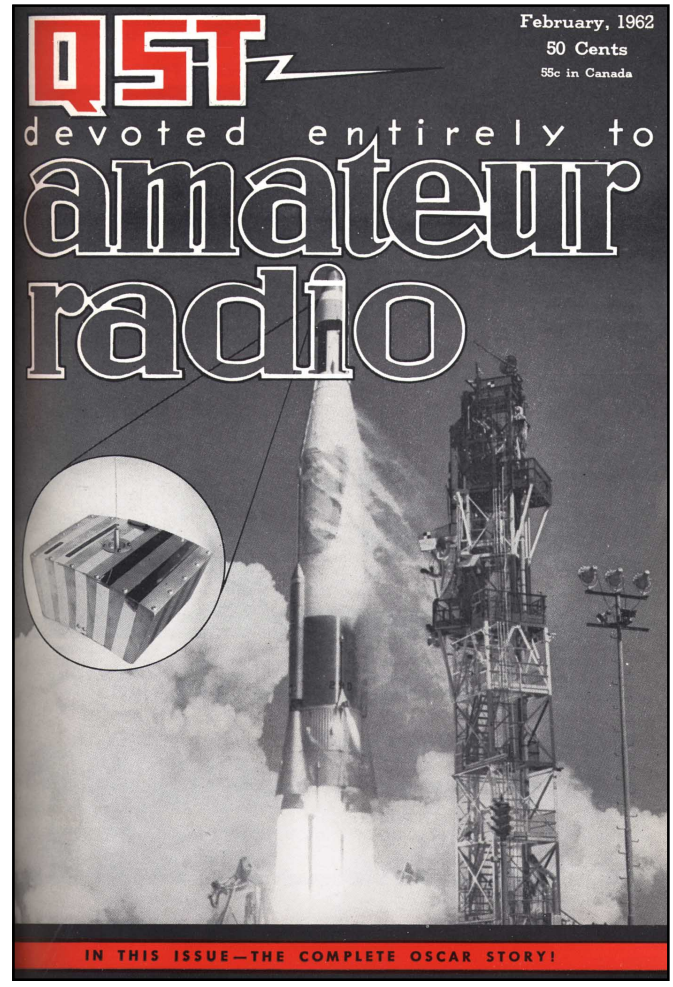
I was almost two years old when the Soviet Union launched *Sputnik I* (its full name was actually *Prosteyshiy Sputnik*, or "simplest satellite") on October 4, 1957. I was too young to understand its implications and possibilities. Others, however, weren't, and hams led the way. According to Helen Gavaghan in *Something New Under the Sun: Satellites and the Beginning of the Space Age*, *Sputnik*

> …was broadcasting at 20 and 40 MHz, frequencies that the network of American radio tracking stations set up to follow U.S. satellites...could not detect, even though every ham radio operator in the world could hear the satellite's distinctive "beep beep."[2]

It would take a week before American satellite stations could accomplish what hams were able to do from the start. Satellites weren't too much of a stretch for technologically progressive hams. After all, we'd been bouncing signals off of the Moon since 1953, only seven years after the US military had paved the way. Why should artificial satellites be a problem?

On January 31, 1958, *Explorer I*, the first US satellite, was put into orbit, and ham operators were involved right from the start. *QST* reported in the March 1958 issue that the Voice of America was offering QSL cards to amateurs who reported receiving *Explorer*'s signal. *QST* also offered a handy tip to those interested in this new technology:

> If you don't have a special converter for picking up signals from the Explorer and its successors, an f.m. tuner can be pressed into service. Simply poke a wire in near an i.f. plate lead, connect to your communications receiver set at 10.7 Mc., and tune.



The cover of the February 1962 *QST* celebrated the launch of OSCAR 1.

A year and a half later, on August 12, 1960, *Echo I* was launched. It was the first true communications satellite and the first artificial satellite that could be seen from Earth with the naked eye. *Echo I*, a large mylar ball that efficiently reflected radio waves, was a passive repeater from which signals could be bounced. Using it wasn't all that different from moonbounce, but it was a start. *Echo I* was also a better solution that one that had seriously been proposed by the Air Force—placing 500,000,000 tiny copper wires into orbit 2000 miles above the Earth to create an artificial ionosphere!

But what about a satellite of our own—one built by and for hams? The idea was first seriously proposed in an article by the late Don Stoner, W6TNS, in the April 1959 issue of *CQ* magazine. "Currently being tested," he wrote, "is a solar-powered six-to-two-meter transistor repeater that could be ballooned over the Southwest. Could anyone come up with a spare rocket for orbiting purposes?"

Fred Hicks, W6EJU, didn't have a rocket, but he did have the requisite enthusiasm and, having worked for a missile contractor and witnessing six satellite launches, some background in the field. He contacted Stoner and the dream began to be take shape. Hicks eventually became chairman of the Project OSCAR—*O*rbital *S*atellite *C*arrying *A*mateur *R*adio—Association located in California, and Stoner wrote the first major article about amateur satellites, published in the February 1961 issue of *QST*. "Be assured," he wrote, "that this is not an April Fool joke."

In the article, Stoner went on to note that the idea of an amateur satellite really took root when the US launched its first satellite with a remotely controlled transmitter and receiver. If the government could do it, why not hams? On September 10, 1960, Stoner, Hicks and an ARRL representative met with the chief of the Space Instrumentation Section at the Jet Propulsion Lab in California to craft a plan. Two phases were originally envisaged. The first was the design, construction and launch of a beacon transmitter. The second was an orbital repeater. The Amateur Radio space race was on! Stoner made an appeal in the pages of *QST*:

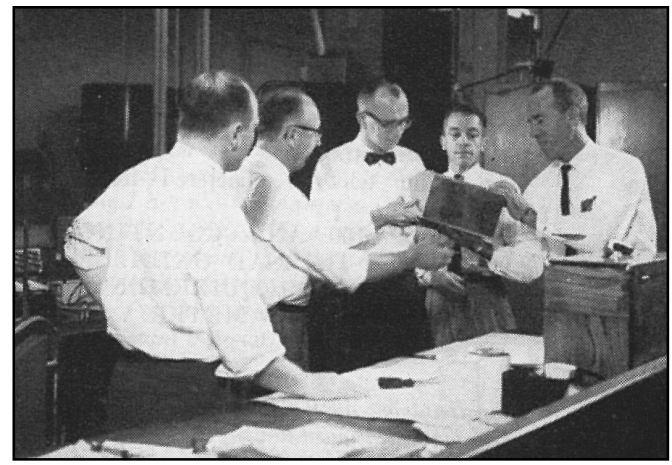
> There is no other group of 200,000-plus persons with the technical knowledge or the equipment to carry out the OSCAR program. With all available amateurs contributing to the effort, it would be possible to supply the scientific world with volumes of communication data gathered by observing and using the OSCAR satellite.[3]

In the spring of 1961, the ARRL officially endorsed Project OSCAR. In May, *QST* began running a series of articles preparing amateurs for the imminent launch of *OSCAR I*, a number of them written by Ray Soifer, K2QBW. With titles like "Space Communication and the Amateur," and "The Feasibility of Amateur Space Communication," Soifer's series spread the satellite gospel and laid the groundwork for widespread interest in amateur space communications.

The project progressed rapidly. In July, the ARRL formally requested the cooperation of the State Department in backing the amateur satellite program, noting that the Air Force would allow *OSCAR I* to be carried into space in conjunction with the launch of a *Discoverer* series satellite from Vandenberg Air Force Base in California. In September, Project OSCAR at last received the backing of the FCC and the blessing of the State Department. Amateurs had a date with space! As William Orr, W6SAI, later dramatically reported in the pages of *QST*:

> On December 12, 1961, at 2042 GMT, Discoverer XXXVI was launched into orbit, carrying into separate orbit OSCAR I guided in its flight into history by the thoughts and prayers of thousands of radio amateurs who stand on the threshold of tomorrow.

It was 60 years to the day since Marconi first heard the faint sound of a Morse "S" atop a hill in Newfoundland transmitted from the far side of the Atlantic. What hams heard of *OSCAR I* from its first transmissions on the afternoon of December 12, until it ceased transmitting on the 30th, was a Morse code "HI." The satellite completed more than 300 orbits before burning up as it reentered the atmosphere on January 3, 1962.



OSCAR 1 completes its final checkout. From left to right: Gail Gangwish; Nick Marshall, W6OLO; Don Stoner, W6TNS; Chuck Towns, K6LFH; and Fred Hicks, W6EJU.

QST reported that more than 3000 reception reports had been received by Project OSCAR, which kept track of the satellite's internal temperature by asking hams to count the number of "HI"s transmitted over a set period of time. The faster the rate, the higher the temperature. It wasn't sophisticated by today's standards, but it worked, and the technique was used to determine the failure of *OSCAR II*, launched in the summer of 1962, after transmitting for 18 days.

It would be three years before hams would again venture into space. *OSCAR III* was launched in March 1965. This was a satellite with a difference. *OSCAR III* wasn't a simple beacon. It was equipped with a transponder, or "translator" as it was then called, operating at 2 meters. It took only a little bit of doing for hams to catch on to working what was really a rapidly moving repeater.

By the satellite's ninth orbit, the first two-way amateur satellite QSO occurred between HB9RG in Switzerland and DL6EZA in Germany. Two meters became the hottest band that March as hams the world over sought the ultimate DX. Congratulations poured in to the Project OSCAR offices. *QST* ran pages of "Calls Heard" in the May issue that year, at the same time sadly noting that *OSCAR III*'s translator had failed on March 24 after 206 orbits.

Other OSCARs would follow, and AMSAT, the "Radio Amateur's Satellite Corporation," as it was announced in the June 1969 *QST*, would take a place in space as well. Many OSCARs would follow, with the latest being UoSat-OSCAR 36. Through the years their capabilities have expanded. Now ham satellites are relaying not only voices or Morse, but also high-speed digital information.

Acknowledgment

"Keeping Track of OSCAR" was the title of an article by Ralph Burhans, W8FKC, and Ray Rankins, W8CMC, that appeared in the May 1962 issue of *QST*.

Notes

[1]As reported in January 1978 *QST*, Clarke was made an honorary life member—number 2001, no less—of AMSAT in recognition of his important role in the origins of satellite communication.

[2]Gavaghan, Helen, *Something New Under the Sun: Satellites and the Beginning of the Space Age* (New York: Copernicus, 1998), p 33.

[3]Stoner, Donald L., W6TNS, "Project OSCAR—Something of the Future," *QST*, February 1961, p 146.

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By H. Ward Silver, N0AX

Test Your Knowledge!

Enjoy this "Homebrewer's Fantasia".

Let's have a quiz for those basement and spare-bedroom da Vincis out there. Put down those hot irons, sweep off the workbench and turn off the test equipment. This one's for you!

1. A "PIC" is a type of…
a. transistor array
b. microprocessor
c. coax connector
d. comb

2. Which is most likely to have a "bat handle"?
a. soldering iron
b. rack-mount enclosure
c. toggle switch
d. torque wrench

3. Which connector family is most closely associated with RS-232 interfaces?
a. DB
b. RCA
c. BNC
d. Centronics

4. What type of holes does a "fly cutter" cut?
a. circles
b. squares
c. rectangles
d. irregular

5. True or False
T-F The shield on coaxial cable prevents inductive coupling
T-F The ac line neutral connector should be connected to chassis ground
T-F A 1N4007 rectifier has a higher voltage rating than a 1N4001
T-F Motorboating is a type of feedback
T-F Class C amplifiers are linear amplifiers

6. Which solder alloy is the easiest to melt (%lead—%tin)?
a. 60—40
b. 50—50
c. 1—99
d. 37—63

7. A bipolar switching transistor's fully-saturated collector-to-emitter voltage is…
a. 0.3 V or less
b. 0 V
c. 0.7 V
d. 5 V ± 0%

8. An op-amp's ability to change its output voltage rapidly is called…
a. Beta
b. CMRR
c. slew rate
d. open-loop gain

9. What component is used to keep the plate voltage out of a tube amplifier's output matching circuit?
a. plate choke
b. neutralizing capacitor
c. bleeder resistor
d. blocking capacitor

10. Which of these is a Germanium diode?
a. 1N28
b. 1N34A
c. 1N914
d. 1N4148

11. Which type of logic element's output is TRUE when either, but not both, inputs are TRUE?
a. NAND
b. NOR
c. XOR
d. D-type flip-flop

12. Winding parallel wires on a ferrite core is called…
a. bifilar
b. trifilar
c. twisted-pair
d. scramble-wound

Bonus: A "Brown Devil" would be what type of component?

Total Your Score!

There are a total of 16 possible answers in this quiz, not including the bonus question. Give yourself one point for each correct answer.

13—16 A homebrew "Master Chef!"

6—12 You have the homebrew bug, but a little extra studying wouldn't hurt.

1—5 You need to spend time with a hot soldering iron and a good reference.

Answers
1. b—PICs—Peripheral Interface Controllers—are favorites of experimenters throughout the world.
2. c—Miniature toggle switches frequently have handles shaped like baseball bats.
3. a—The DB-25 and DB-9 connectors are found on most computing and terminal equipment.
4. a—The fly cutter is used to cut large diameter circular holes in sheet metal.
5. F, F, T, F
6. d—This mix of lead and tin melts at the lowest temperature.
7. a—The exact value depends on the circuit.
8. c—Slew rate is measured in V/µs
9. d—This component passes output RF, but not dc.
10. b—Germanium is used for its special temperature coefficient and lower forward voltage drop.
11. c—XOR stands for Exclusive-OR
12. a—Bifilar windings are used to balance winding characteristics between windings.
Bonus: Ohmite's Brown Devil power resistors are one of the oldest brands in the electronics industry.

22916 107th Ave SW
Vashon, WA 98070

Strays

NEW ZEALAND HAM HISTORY

◊ The New Zealand Association of Radio Transmitters announces the publication of *Ham Shacks, Brass Pounders and Rag Chews, A History of Amateur Radio in New Zealand*. This 300-page softcover book is available for $19.75 US postpaid from NZART Publications, PO Box 40-525, Upper Hutt 6415, New Zealand; tel +64-4-528 2170; fax +64-4-528 2173; **nzart@clear.net.nz**; **http://www .nzart.org.nz/nzart/publicat/publicat.html**. Major credit cards accepted.

Next Stray

Product Review

*Edited by **Joe Bottiglieri, AA1GW** • Assistant Technical Editor*

Patcomm PC-9000 HF Plus 6-Meter Transceiver

Reviewed by Rick Lindquist, N1RL
Senior News Editor

What was that Yogi Berra-ism? "It's deja vu all over again!" A few years back, we reviewed the Patcomm PC-9000's daddy (see "Product Review," *QST*, Feb 1998), the PC-16000. In several respects, it was a troublesome review, but the net result was a significantly improved transceiver. Shortly afterward we invited the manufacturer to let us have an advance look at their next product—the PC-9000—then in the conceptual stages. It's unfortunate that, for whatever reasons, this did not happen.

Even so, Patcomm learned some lessons from the PC-16000 experience. The PC-9000 is a compact transceiver that, overall, represents a more refired product. Let's take a look at what it has to offer, what Patcomm learned along the way, and what they still might do better next time around.

What You Get

The PC-9000 looks much more like a piece of ham radio gear than did its sire. A sturdy black, no-frills, square-edged cabinet houses the PC-9000. Weighing in at around four pounds, this basic ham bands-only transceiver covers 160 through 6 meters, SSB and CW. FM is optional. It runs 40 W on HF and 20 W on 6 meters. On the low-power setting, the PC-9000 puts out around 3 or 4 W. It's suggested retail price is $799.

The earlier PC-16000 had a feature we'd never found on any other transceiver: You could simply plug in an AT-style computer keyboard and operate conventional 45-baud RTTY or keyboard CW. The radio would decode either mode on the display. The keyboard also permitted control over several of the radio's functions. The PC-9000 also lets you plug in a keyboard—via a DIN jack on the side of the transceiver—but its functionality is a little more limited in the standard configuration. On the PC-9000, you can quickly and easily send, but not decode, CW from the keyboard without any special software or TNC. You need an optional hardware/software package to get RTTY capability, but you also gain CW decode, direct frequency entry via the keyboard, message memories, and frequency memories. (This option was not yet available at the time of this review.)

Even without the option package, the keyboard control was pretty handy—even if you're not especially interested in sending CW from the board. It lets you change bands, dial the frequency up and down using the cursor keys, change modes, or lock the dial. The *User Manual* was a bit skimpy on the benefits of keyboard operation; I discovered most of them by trial and error. The *Manual* does list some keyboard shortcuts for sending special CW characters like $\overline{AR}$, $\overline{SK}$ and $\overline{AS}$. By the way, you can still use the internal keyer while you're in keyboard mode. The display shows the 16-character type-ahead buffer; type ahead more than that and it won't be transmitted.

The keyboard feature is the highlight of the PC-9000. The only downside is that when you're in keyboard mode, the display only shows the transmitting frequency.

Like Father, Like Son?

On the clearly labeled, brushed-finish front panel we recognized the same white pushbuttons that we'd seen on the PC-16000, and the same milled aluminum control knobs. But a significant improvement is the large, dimpled main tuning knob, its primary black offset by a nice beveled edge around the perimeter of its face. The knob has a great "feel" to it, and the dimple is actually usable. The dial "drag" is not adjustable. The red-white-blue stylized Patcomm logo above the knob testifies to the radio's domestic origins.

The green, backlit display appears to be identical to the one on the PC-16000. So does the horizontally oriented S/RF meter. The meter is pretty small, even for a compact radio like this—although let's face it: How often do you see real meters anymore? This one can be hard to read, and once a signal tops S9 you're pretty much on your own. Yes, there are divisions for what appear to be 10 dB over S9 and 20 dB over S9, but you'll need a jeweler's loupe to make them out. This is quibbling, though, because hardly anyone believes S meter readings anyway. With the PC-9000 you'll often be able to say, "You're pinning my S meter," and you won't be woofin' anyone either.

A substantial bail boosts the radio up toward eye level, if needed. A hefty mobile microphone plugs into a front-panel jack. There's a 1/4-inch jack for headphones on the front panel too.

There's a down-firing speaker. The speaker itself is a small oval unit.

The display typically shows both the transmit frequency (top) and the receive frequency (bottom). Additionally, the display shows you the tuning step and the band memory number selected. This last feature is especially noteworthy since you apparently need an optional "upgrade software package" to take advantage of the memories. The unit will retain the last frequency you tuned to on each band.

From an ergonomic standpoint, the PC-9000 is easy to access and intuitive to use. Unlike some other, more compact radios, it's actually possible to get your fingers on the knobs or to press the buttons

BOTTOM LINE

The PC-9000 is a simple but functional HF and 6-meter transceiver that offers respectable performance and intuitive operation. Patcomm's unique computer keyboard connectivity adds built-in—and expandable—digital and control capabilities.

without the danger of making two adjustments for the price of one. There's no "menu" on this set. All the buttons and controls are on the front panel, so there's little guesswork involved.

Protruding off the rear apron is a large heat sink. This is the primary means of cooling the radio; there is no cooling fan in the PC-9000 (the PC-16000 didn't have one either), so fan noise is not an issue. On the other hand, the PC-9000 runs rather warm, even if you're not transmitting. Some venting on the enclosure itself might help.

The back panel is uncluttered. A couple of 3.5 mm jacks permit connecting a keyer paddle and amplifier switching contacts. (The switching transistor will handle up to 180 V dc at 2 A, which means it can easily switch a Heath SB-220 or similar old brute if you need it to.) There's also an SO-239 for the antenna connection. For the dc power connection, Patcomm employs a two-prong polarized Jones connector. The power cord is a little over 5 feet long with a blade-type automotive fuse in the positive lead.

The PC-9000 lacks a specific ground connector. More important, it lacks a separate jack for a manual key or external memory keyer. That connection is available via the microphone jack. Other features not included in the PC-9000 package include VOX and full-break-in.

I did undo the four machine screws that hold the top cover in place to get a look inside the radio. It appears to be very neatly constructed using mostly surface-mount technology.

How Well It Works

I first tried the PC-9000 out in my favorite mode—CW. Once I got the dit and dah connections reversed on my Vibroplex paddle (the paddle sense is just the opposite of my other radios and keyers), it was a cinch to push the **KEY SPD** button and dial up an appropriate keying speed. While it indicates a minimum speed of 5 WPM and a top speed of 75 WPM, we measured the range at from 5 to 50 WPM.

Tuning around, the next thing I noticed was the tuning rate. The **TUNE RATE** button lets you step through four tuning *step*—not rate—settings: 10 Hz, 100 Hz, 1 kHz, or 10 kHz. Now, 10 Hz steps are fine for CW, but the problem with the PC-9000 is the encoder rate. Turn the knob slowly through a complete rotation and you'll cover just under 1 kHz of spectrum—I found this too fine for comfortable trolling on CW.

The curious thing was when I tried to speed up a modest excursion and discovered that the faster you spin the tuning knob the slower your progress! The *User Manual* acknowledges that the software sometimes misses pulses, but this was almost like spinning your wheels. According to the manual, the encoder generates up to 120 pulses per dial revolution, but because of the missed pulses, the territory covered with each spin of the dial may vary. Indeed! I tried giving the knob eight or nine fast cranks at the lowest tuning step only to wind up just about where I'd started out.

The net result—regardless of mode—is that you'll want to up the tuning step to compensate, a solution that is not entirely satisfactory, especially if listening to a receiver step through a CW signal 100 Hz at a time makes you cringe. The top two step rates are way too coarse for anything short of transband excursions, but the **TUNE RATE** button only steps up through the choices, so to get back to finer tuning steps, you have to step through the entire series.

The inability to set a comfortable tuning rate was an issue for SSB as well as CW.

The PC-9000 tunes CW from the high side and employs a fixed 800-Hz offset. There is no readily accessible adjustment for the sidetone volume.

At first I had mixed feelings about having both transmit and receive frequencies on display at all times. But this has some real advantages—especially if you operate split frequency a lot. This way, you'll always know where you're transmitting. Press the **SPLIT** button and you can toggle between enabling tuning to change either the receive or the transmit frequency. Unfortunately, Patcomm provides no way to quickly check your transmit frequency—eg, to look for QRM or to track pileup activity.

Tuning across a band in the CW or USB/LSB mode generates slight synthesizer "chuffing" noise. It's not enough to be objectionable except on a deathly quiet band, but it's easy to hear. Much more objectionable were the birdies! I'd noticed a few fairly faint spurious signals early on—too weak to do more than budge the S meter but still strong enough to provide competition for a puny signal. The straw that broke the camel's back—and nearly my eardrums—was when I was attempting to tune in a regional CW beacon on 50.060 MHz and ran smack into a bone crushingly loud birdie there instead.

I found other loud and not-so-loud birdies on 20 meters plus huge ones at around 1.825 and 18.099 MHz. There was an S4 birdie at 50.149. A squawky-sounding birdie was roosting at 14.0243 or so. Patcomm needs to explore ways to scatter the flock here.

On a much brighter note, the SCAF (switch capacitance audio filter) provided great control over selectivity. Some kind of relative or real (ie, displayed) indication of the bandwidth setting would have been helpful. According to the manual, the PC-9000 employs two AGC loops—a comparatively "soft" one in the IF and a tighter one in the audio stage. The SCAF works in the audio stage of the receiver, but attenuation due to tighter filtering does affect the reading you see on the S meter. By the way, a front-panel AGC button lets you select fast or slow AGC settings, but does not let you disable the AGC altogether.

The PC-9000 offers true "single-signal" reception, too. We'd mentioned in the review of one extremely popular compact HF transceiver that it would—without an optional crystal IF filter—tune both "sides" of a CW signal—kind of like a direct-conversion set. The PC-9000 tunes just the desired side, regardless of the SCAF setting or signal strength, so I was impressed.

We noted one characteristic that might be SCAF-related. The PC-9000 tends to constrict audio on SSB reception. Measurements in the ARRL Lab indicated that the radio's not passing much more than about 1400 Hz of audio bandwidth when in the USB or LSB mode. The net effect is that the receiver audio on sideband is not as intelligible as it could be—even a good external speaker didn't help much. Patcomm is aware of this problem and has made changes in their current production units. Earlier production radios can be updated.

We didn't have the chance to test the PC-9000 during a major contest, but it seemed to handle nearby strong signals pretty well, and the numbers we saw in the Lab bore this out. Patcomm specified a two-tone, third-order dynamic range of 92 dB but without mentioning the bandwidth it was measured at. It came quite close to that, earning respectable numbers (see Table 1) with our ARRL Lab-standard 20 kHz spacing with the SCAF set at approximately 500 Hz.

Transmitting on CW is semi-break-in mode only, and the receiver recovers rapidly enough to suit most casual operators—although it would be nice to make this a user-settable adjustment. Keyboard CW was a joy. Just type and it sends. Stop typing and you're back in receive. The main complaint I got on CW concerned the element weighting on the internal keyer—and thus also on the keyboard. One CW veteran called it "choppy." Perhaps this could be fine-tuned in software.

On SSB, the radio garnered uniformly favorable reports of clean, crisp audio. The transmit audio level also is factory-set; there's no external microphone gain adjustment.

FM operation is pretty plain-vanilla and, without the option package, somewhat hampered by the inability to store channels and splits in memory. Additionally, the PC-9000 does not provide CTCSS tones for repeater access, and this does not appear to even be an option. You can set repeater offsets by pressing the **SPLIT** button, then dialing up the desired amount of split. There's a continuously variable manual **SQL** (squelch) control on the front panel.

Operation of the RIT was a bit dismaying. As I'd mentioned, the display typically shows the transmit and the receive frequencies. Press the RIT button and the little left-pointing arrow disappears from between the "T" and the displayed frequency. This means you can only change the receive frequency—which you can, as long as you are moving the main tuning knob (there's no

Table 1
Patcomm PC-9000, serial number 04069C0026

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive and transmit, 1.8-2.0, 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, 50-53 MHz (receive 50-54 MHz).	Receive and transmit, as specified.
Power requirement: Receive, 1.5 A; transmit, 8 A (40 W output).	Receive, 1.8 A; transmit, 11.7 A. Tested at 13.8 V.
Modes of operation: SSB, CW, FM (optional), AFSK.	As specified.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, bandwidth not specified, –128 dBm.	Noise floor (mds), 500 Hz filter: 1.8 MHz –124 dBm 3.5 MHz –126 dBm 14 MHz –122 dBm 50 MHz –117 dBm
FM sensitivity, 12 dB SINAD: Not specified.	For 12 dB SINAD: 29 MHz 2.1 μV 52 MHz 1.8 μV
Blocking dynamic range: Not specified.	Blocking dynamic range, 500 Hz filter: 3.5 MHz 96 dB 14 MHz 117 dB* 50 MHz 113 dB*
Two-tone, third-order IMD dynamic range: 92 dB.	Two-tone, third-order IMD dynamic range, 500 Hz filter: 3.5 MHz 86 dB 14 MHz 87 dB 50 MHz 86 dB
Third-order intercept: +10 dBm.	3.5 MHz +8.5 dBm 14 MHz +13.5 dBm 50 MHz +9.5 dBm
Second-order intercept: Not specified.	+36.2 dBm.
FM adjacent channel rejection: Not specified.	20 kHz channel spacing: 29 MHz, 57 dB; 52 MHz, 60 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz channel spacing: 29 MHz, 58 dB*; 52 MHz, 62 dB*; 10 MHz channel spacing: 52 MHz, 86 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: 22 μV; 50 MHz, 24 μV.
Squelch sensitivity: Not specified.	At threshold, preamp on: FM, 29 MHz, 1.4 μV; 52 MHz, 1.6 μV.
Receiver audio output: Not specified.	1.8 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6dB points, (bandwidth): CW-N (500 Hz filter): 625-1136 Hz (511 Hz); CW-W: 694-2083 Hz (1389 Hz); USB-W: 694-2083 Hz (1389 Hz); LSB-W: 685-2000 Hz (1315 Hz).
Spurious and image rejection: Not specified.	First IF rejection, 14 MHz, 63 dB; image rejection, 14 MHz, 73 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: HF: SSB, CW, FM, 40 W (high); 50 MHz: SSB, CW, FW, 20 W (high).	HF: CW, SSB, FM, typically 36 W high, 3.5 W low; 50 MHz: CW, SSB, FM: typically 18 W high, 3.4 W low.
Spurious-signal and harmonic suppression: Not specified.	HF, 45 dB; 50 MHz, 59 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: Not specified.	38 dB.
Undesired sideband suppression: Not specified.	52 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1 and Figure 4.
CW keyer speed range: Not specified.	5 to 50 WPM.
CW keying characteristics: Not specified.	See Figure 3.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 150 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 9.2 ms; FM, 9.4 ms. Unit is not suitable for externally generated AMTOR modes.
Composite transmitted noise: Not specified.	See Figure 2 and Figure 5.

Size (hwd): 2.7×8.0×7.5 inches; weight, 4.0 pounds.

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

*Measurement was noise-limited at the value indicated.

Third-order intercept points were determined using S5 reference.

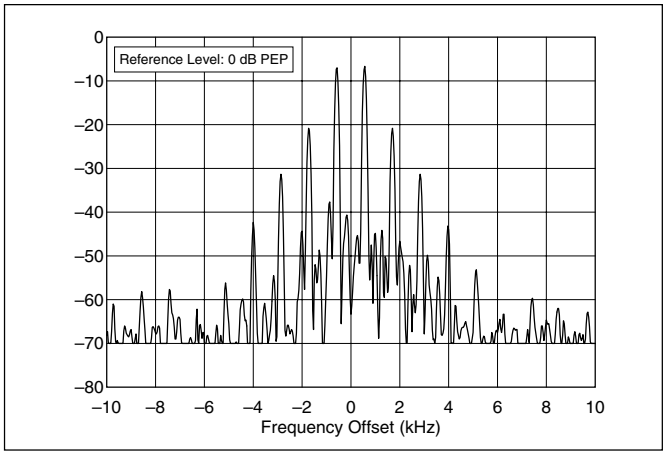

Figure 1—Worst-case HF spectral display of the PC-9000 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 22 dB below PEP output, and the worst-case fifth-order product is down approximately 33 dB. The transceiver was being operated at 40 W PEP output at 21.250 MHz.

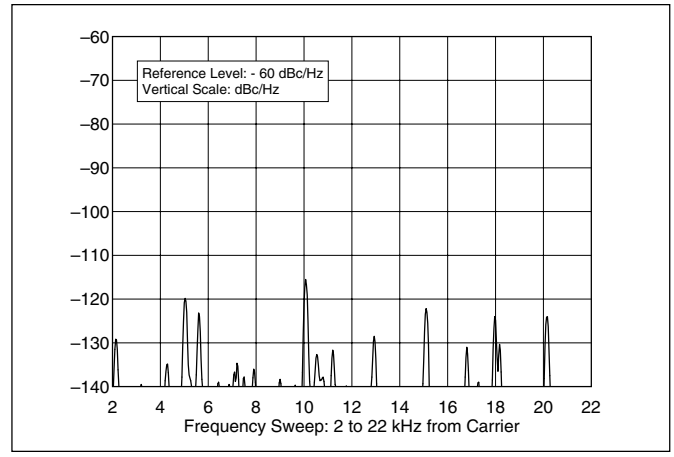

Figure 2—Worst-case HF spectral display of the PC-9000 transmitter output during composite-noise testing. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier. Note that the majority of the noise is below the base line of the graph. Power output is 40 W at 14.200 MHz.

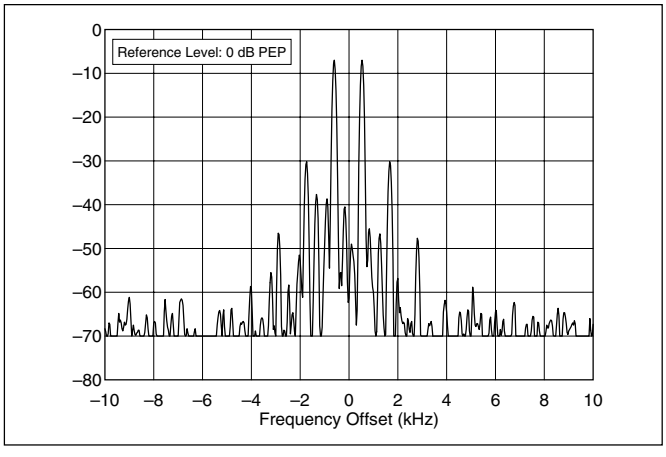

Figure 4—Worst-case VHF spectral display of the PC-9000 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 32 dB below PEP output, and the worst-case fifth-order product is down approximately 47 dB. The transceiver was being operated at 20 W PEP output at 52.200 MHz.

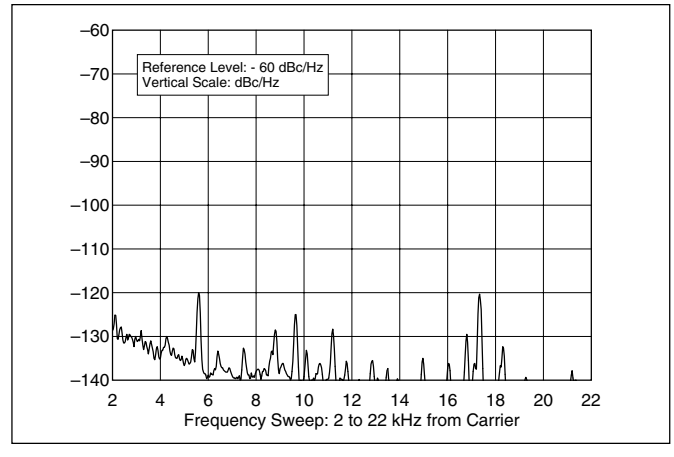

Figure 5—Worst-case VHF spectral display of the PC-9000 transmitter output during composite-noise testing. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier. The 2 kHz noise is –127 dBc/Hz, 22 kHz noise is below the base line of the graph. Power output is 20 W at 50.020 MHz.

separate RIT tuning knob). Stop tuning, though, and within about three seconds, the arrow reappears and you're out of RIT mode. I found it more convenient to set up in **SPLIT** and use that feature as an RIT.

The **BAND** button only steps in one direction—up. So, if you're on 20 meters and want to go back to 40 you have to step up through all the other bands until you reach 40 again.

By the way, the 40 W was plenty of power to work the world. Even on SSB, hardly anyone noticed the difference in signal strength when I switched from the Patcomm to another radio running 100 W.

A few words on the *User Manual*. Ours arrived in a three-ring binder and ran about 15 single-side sheets of information. It does not include a block diagram or a schematic of the PC-9000, but it does include everything you'll need to know about getting the PC-9000 up and running. There's little information about the available options it refers to, however.

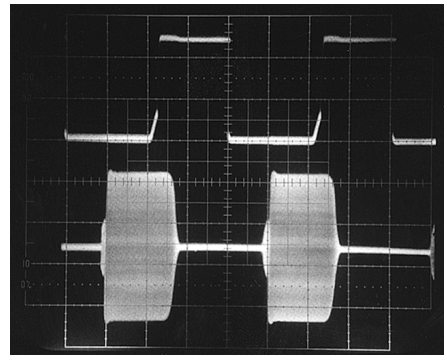

Figure 3—CW keying waveform for the PC-9000 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is approximately 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 40 W output at 14.2 MHz.

Conclusions

Overall, the PC-9000 offers substantial improvement in fit and finish over its larger, more expensive ancestor, but it has a few rough edges. Still, it's a functional transceiver with respectable Lab numbers that offers plug-and-play keyboard CW and 6-meter operation to boot. Eliminating the annoying birdies would go a long way toward making the PC-9000 a better overall value.

Manufacturer: Patcomm Corporation, 7 Flowerfield, Suite M100, St James, NY 11780; 516-862-6512; fax 516-862-6529; **patcomm1@aol.com**. Suggested retail price: PC-9000, $799. Options: FM-9K, $79; EC-9K Expanded Capability Module (adds RTTY encode and decode, CW decode and 100 memories), $179.

The High Sierra HS-1500 HF/6-Meter Mobile Antenna

Reviewed by Wayne K. Irwin, W1KI
Assistant to the ARRL VEC Manager

Amateurs have been taking their stations on the road for over 60 years. Early mobile experimenters were first authorized to operate in the old 5-meter band. Designing mobile antennas for this band was not much of a challenge—a quarter-wave whip for 60 MHz is only about 4 feet high. Suitable antennas and mounts were easy to fabricate in a home workshop. It was certainly more difficult to assemble transmitters, receivers and power supplies that would operate reliably in a mobile environment than it was to design and build an antenna system.

Shortly after World War 2, interest in mobile operation on the HF bands began to grow. These lower frequencies presented some unique antenna challenges. Mobile antennas for 160, 75 and—to a somewhat lesser extent—40 meters typically consisted of long whips, large loading coils and impedance matching networks. These demanded more substantial mechanical construction and beefier mounting arrangements. As a result, most early mobile operators tended to concentrate their efforts on a single band.

Mobile Antenna Evolution

Enter the commercial manufacturer. Ready-made HF mobile antennas of predictable performance became available in the 50s and 60s. The amateur only needed to find a way to fasten the antenna to the vehicle (frequently on the massive steel rear bumper) and to establish a good RF path to ground. Multiband mobile operation became popular. Changing bands was relatively easy—just pull off the side of the road and replace a section of the antenna with the one provided for the desired band.

With some other designs, all that was needed to switch bands was to pull over, hop out, and change the location of a tap wire on a large coil mounted near the center of the antenna. This design—appropriately dubbed the "bug-catcher"—is still a popular multiband mobile antenna system. Mobile enthusiasts whose primary interests lie in the 40-meter and lower HF bands are particularly fond of this antenna configuration. The large high-Q loading coil results in a relatively efficient radiator, although the usable bandwidth becomes narrower as the operating frequency is reduced. (Changing frequencies by more than 25 to 30 kHz on the 75-meter band, for example, usually means a trip to the antenna to change the tap position.)

Bug-catchers are not especially esthetically pleasing, but they do represent an effective antenna system for low frequency HF mobile operation. They are often among the top performers in the "Mobile Shootouts" (see *California Mobile Antennas and the Moment of Truth*, *QST*, September 1995).

What if you could change the tap point remotely? The "screwdriver" style antenna, invented by Don Johnson, W6AAQ, is essentially a variation of the bug-catcher. Jim Heath, of High Sierra Antennas, has presented the amateur community with his version of this interesting antenna.

Design Details

The screwdriver antenna uses a small dc motor (a modified cordless power screwdriver in Don's original incarnation) to change the tap location of a loading coil—similar to the moving tap on rotary inductors found in some antenna tuners. As the motor turns, the amount of coil exposed above a large diameter tube that serves as the lower portion of the antenna varies. An electrical connection is established between the top of the tube and the rotating loading coil. The exposed portion of the coil becomes an active part of the antenna. That part below the connection, and within the tube, is effectively out of the circuit.

One of the specific design details that distinguishes this antenna from similar screwdriver style antennas offered by other manufacturers is the arrangement High Sierra uses to provide contact between the top of the lower tube and the moving coil windings. Some designs use copper finger stock. In the HS-1500, the upper end of the tube is fitted with a collar that has a groove machined into the inner wall. A special stainless steel spring is installed in the groove and provides a multiple-contact mating surface with the windings of the rotating loading coil. Should this contact spring ever wear out, it can be replaced with relative ease.

The HS-1500 is tuned to the desired frequency with a remote control box. Pushing a switch in one direction causes the motor to rotate counterclockwise, exposing more of the coil above the tube and lowering the resonant frequency. Pushing it in the other direction causes the coil to rotate clockwise, retracting it into the tube and increasing the resonant frequency. An LED indicates when the coil reaches the end points of its travel. The control box is small, and can be mounted in any convenient location in the vehicle. The antenna is adjusted for the lowest SWR. No metering is included in the control box—you can use your radio's internal SWR meter or install an SWR meter in your antenna feed line.

The HS-1500 package I ordered came with the control box components—a switch, an LED, an enclosure and related hardware—as a kit. It was a simple matter to put it together. (It is also available assembled for a small additional charge.) I also purchased the HS-110A 72-inch whip, the HS-303 whip Quick Disconnect and the HS-201C Universal Mounting Bracket.

Let's Get It On

The HS-1500 is not an antenna that lends itself to a quick installation—it requires some thought and consideration. It's a fairly large assembly, as mobile designs go.

When choosing your mounting location,

Table 2
High Sierra HS-1500

Manufacturer's Specifications
Electrical

Frequency coverage: 3.5 MHz to 30 MHz and 50 MHz to 54 MHz
SWR: <2.0:1 (typically <1.5:1)
Feed impedance (nominal): 50 Ω
Power rating (maximum): 800 W PEP; 400 W average
Power requirements: 13.8 V dc (nominal) at 3 A

Mechanical

Lower mast: 2 inches in diameter, 37 inches in length
Finish: Powder-coated baked-on. Available in black, white or silver/gray.
Whip antenna (upper mast): 72 inches
Total height with 72-inch whip at 3.5 MHz, 125 inches; 30 MHz, 110 inches (typical).
Weight with 72-inch whip: 6.3 lbs

care should be taken to ensure that the top of the antenna does not exceed the maximum height allowed by state motor vehicle laws. On my car, when the antenna is extended for 75-meter operation, the tip of the whip winds up about 11 feet above the ground.

For my particular installation, I had a local metal shop fabricate a 1-inch tubular arm that bolts to my car's frame just forward of the rear bumper. It extends below the bumper and curves up to a point just behind the trunk deck, where I attached the Universal Mounting Bracket. This mounting bracket is fitted with a tapered stud that engages a tapered hole in the base of the HS-1500 and a stainless steel hose clamp that secures the top of the bracket to the lower portion of the antenna. This stud and clamp setup allows me to remove the antenna from the vehicle in just a couple of minutes.

Another available option (the HS-204C) can be used in conjunction the '201C. This adapter allows you to make use of a 2 × 2-inch receiver type trailer hitch as the vehicle mounting point. A built in fold down system lets you hinge the antenna rearward so that you can open tailgates or hatches.

The 72-inch upper stainless steel whip is somewhat flexible. Expect the tip of the antenna to occasionally hit a low tree limb, but this should not be a problem unless your travels take you down an unusually shady lane. The Quick Disconnect option makes separation of the whip from the top of the coil an easy task. With the whip removed (depending on your particular vehicle mounting location) you should have adequate clearance to enter parking garages and drive-throughs.

Once securely mounted, the lower portion of the antenna does not lean back from the force of the wind when the vehicle is in motion. Some relatively minor leaning of the upper whip will be observed at highway speeds. A fishing line guy, as is sometimes needed with other large antenna designs, should not be required.

The HS-1500 can also be installed on mobile homes, motor homes and trailers. Additional mounting accessories are available for such installations. With a suitable RF ground plane, the antenna can be employed for fixed station applications as well.

A printed brochure is available from High Sierra describing the HS 1500 and its accessories. High Sierra also has a Web site: **http://www.hsantennas.com/**. The brochure and the Web site provide useful mounting suggestions. Several example installations are included.

One Small Problem—Sort of...

After the review unit was installed, I soon discovered that the antenna would not resonate on the 10-meter band. I have some whips from other antennas in my collection, so I tried substituting a shorter one. No problems with 10 meters after that—but now the antenna would no longer resonate on 75.

A quick e-mail to High Sierra brought a prompt reply: "Did you check the RF grounding?" The manufacturer recommends a wide flat ground connection from the mount to the vehicle. I had initially used a single piece of number 14 wire. Replacing this inadequate ground wire with a piece of half-inch tinned braid solved my problem. The RF ground system is something that cannot be ignored in nearly any efficient HF mobile antenna installation—the HS-1500 is no exception!

Final Impressions

The High Sierra HS-1500 is a well-made relatively attractive HF mobile antenna that provides continuous coverage from 80 to 10 meters. Oh yes, remove the top whip and adjust the coil to its fully retracted position and it also covers 6 meters!

How does it perform? It is not unusual to hear comments such as, "Are you sure that you are mobile?" "You must be running an amplifier." "One of the best mobile signals I have heard in some time."

If you are serious about HF mobile operation, the High Sierra antenna is certainly worthy of consideration. With it, you will enjoy an installation that allows you to QSY from one end of the HF spectrum to the other—from the front seat of your car—and will provide you with a mobile signal that demands attention.

Manufacturer: High Sierra Antennas, PO Box 2389, Nevada City, CA 95959; 888-273-3415; fax 530-273-7561; **heath@hsantennas.com**; **http://www.hsantennas.com/**.

Manufacturer's list price: HS-1500 (with powder-coated finish), $295; HS-110A 72-inch stainless steel whip, $20; HS-201C Universal Mounting Bracket, $55; HS-204C Receiver Hitch Adapter, $85; HS-303 Whip Quick Disconnect, $15. Several additional accessories and package discounts are available.

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

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

ADI AR-147 VHF FM Mobile Transceiver (see: "Product Review," October 1999 *QST*). Minimum Bid: $145.

Alinco DR-M03SX 10-Meter FM Mobile Transceiver (see: "Product Review," September 1999 *QST*). Minimum Bid: $165.

AOR AR7000B Wide Range Communications Receiver (see: "Product Review," July 1999 *QST*). Minimum Bid: $795.

Hamtronics R139 Weather Satellite Receiver (see: "Product Review," June 1999 *QST*). Minimum Bid: $160.

ICOM IC-2800H Dual-Band FM Transceiver (see: "Product Review," October 1999 *QST*). Minimum Bid: $445.

ICOM IC-706MKIIG HF/VHF/UHF Transceiver with FL-100 500-Hz CW filter (see: "Product Review," July 1999 *QST*). Minimum Bid: $1015.

Kenwood VC-H1 Interactive Visual Communicator S/N 00100076 (see: "Product Review," December 1998 *QST*). Minimum Bid: $275.

Kenwood VC-H1 Interactive Visual Communicator S/N 00100078 (see: "Product Review," December 1998 *QST*). Minimum Bid: $275.

Maha-Rexon RL-501HP Dual Band 2m/70cm FM Hand-Held Transceiver (see: "Product Review," April 1999 *QST*). Minimum Bid: $165.

Yaesu FT-90R Dual-Band FM Mobile Transceiver (see: "Product Review," September 1999 *QST*). Minimum Bid: $275.

Yaesu FT-100 MF/HF/VHF/UHF All-Mode Transceiver with XF-117C 500-Hz CW filter, S/N 9D021081 (see: "Product Review," June 1999 *QST*). Minimum Bid: $995.

Yaesu FT-100 MF/HF/VHF/UHF All-Mode Transceiver with XF-117C 500-Hz CW filter, S/N 9D021145 (see: "Product Review," June 1999 *QST*). Minimum Bid: $995.

Yaesu VX-5R Tri-Band 6m/2m/70cm FM Hand-Held Transceiver (see: "Product Review," May 1999 *QST*). Minimum Bid: $155.

Sealed bids must be submitted by mail and must be postmarked on or before December 1, 1999. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

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

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

Feedback

◊ Please refer to Francesco Morgantini, IK3OIL, "A PIC 16F84-Based CW Decoder," *QST*, Aug 1999, pp 37-40. An updated program and related files (IK3OIL2.ZIP) has been posted at the ARRL's download site. Read the included README.TXT file for an explanation of the contents and use of the .ASM and .HEX files that apply to various LCDs, including the Optrex 16117A. Contact FAR Circuits for PC board or IC replacements (18N640 Field Ct, Dundee, IL 60118-9269; tel 847-836-9148 (voice and fax).

◊ In "Using the MFJ-259 SWR Analyzer to Find a Short Circuit in Coaxial Cable," Technical Correspondence, *QST*, Oct 1999, p 66, the unit of measurement for the Short Location in Equation 1 should be in *feet*, not inches.

◊ Sharp-eyed bit masters detected some "parity errors" in "Test Your Knowledge" in the October 1999 *QST*, page 52. The final three rows of the truth table in answer 3 should show Amp Key as logic zero. The correct answer to question 5 is that PTT B should be set to logic zero, lest the amp be keyed whenever the antennas are ready. The answer for question 7 is actually one-half of 33.3 MHz or 16.67 MHz. Thanks to K5RA, N1XS, and WB6IKJ and others.

◊ Please refer to Wes Hayward, W7ZOI, and Terry White, K7TAU, "A Spectrum Analyzer for the Radio Amateur—*Part 2*, *QST*, Sep 1998, p 40, Fig 16. The six 2-W input resistors for the 20-dB pad should be 620 Ω units, not 820 Ω as originally specified.—*Wes Hayward, W7ZOI (tnx EA2SN)* QST

W1AW SCHEDULE

Pacific	Mtn	Cent	East	Mon	Tue	Wed	Thu	Fri
6 AM	7 AM	8 AM	9 AM		Fast Code	Slow Code	Fast Code	Slow Code
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	Visiting Operator Time (12 PM - 1 PM closed for lunch)				
1 PM	2 PM	3 PM	4 PM	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
2 PM	3 PM	4 PM	5 PM	Code Bulletin				
3 PM	4 PM	5 PM	6 PM	Teleprinter Bulletin				
4 PM	5 PM	6 PM	7 PM	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
5 PM	6 PM	7 PM	8 PM	Code Bulletin				
6 PM	7 PM	8 PM	9 PM	Teleprinter Bulletin				
6:45 PM	7:45 PM	8:45 PM	9:45 PM	Voice Bulletin				
7 PM	8 PM	9 PM	10 PM	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
8 PM	9 PM	10 PM	11 PM	Code Bulletin				

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

♦ Morse code transmissions:

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 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 W6OWP, with K6YR as an alternate. 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.

Hints & Kinks

*Edited by **Bob Schetgen, KU7G** • Senior Assistant Technical Editor*

PSK31 AND NEWER KENWOOD RADIOS

◊ After reading the PSK31 article in *QST*,[1] I decided to give the mode a try. Being a computer system programmer/analyst /administrator by trade and a ham by hobby, the challenge of integrating computers with radios intrigues me. Here are the pitfalls I encountered when trying to connect my homebuilt P200 MMX computer system to my Kenwood TS-570D.

Fortunately, I still had the 13-pin DIN connector (for the **ACC2** jack) in the TS-570D's box. Those who do not have their original connector can obtain one from Digi-Key.[2] The Digi-Key part number is CP-1013-ND and they run $1.65 each in quantities less than 10. (Be forewarned—I have not purchased one of these connectors from Digi-Key. I'm just passing along information I found on a PSK31 e-mail reflector.)

I obtained some shielded audio cable (single center conductor) and connected my sound card to the **ACC2** jack. I attached a 1/8-inch male stereo plug to one end of the audio cable with the center conductor to the plug center pin and the shield to the plug ground ring. The other end was connected to the **ACC2** pins 3 (**AF OUT**) and 4 (**GROUND**). This cable connects the transceiver's audio output to the line-in jack of the computer sound card. A second, similar cable connects the computer line-out jack (1/8-inch stereo) to the transceiver audio input—pins 11 (**AF IN**) and 4 (**GROUND**) of the **ACC2** connector.

With that accomplished, I plugged in the cables and fired up PSK31SBW.EXE. I could receive just fine, but the audio out did not key my radio using VOX. I've since learned that pin 11 of the **ACC2** connector inserts audio into the AF path *after* the VOX circuit. No wonder the radio didn't transmit using VOX!

To get around this problem, I now feed the computer audio into the mike connector (pins 1 and 7). I built another shielded audio cable with a 1/8-inch stereo plug for the sound card line-out connection. The line-out audio is too strong for the mike input, so I use a 100:1 voltage divider to reduce the audio to microphone level. The divider shown in Figure 1 is an **L** network of 100 kΩ and 1 kΩ resistors (both 1/4 W) in the line. I obtained the schematic from a PSK31 Website (**http://www.qsl.net/wm2u/psk31.html**).

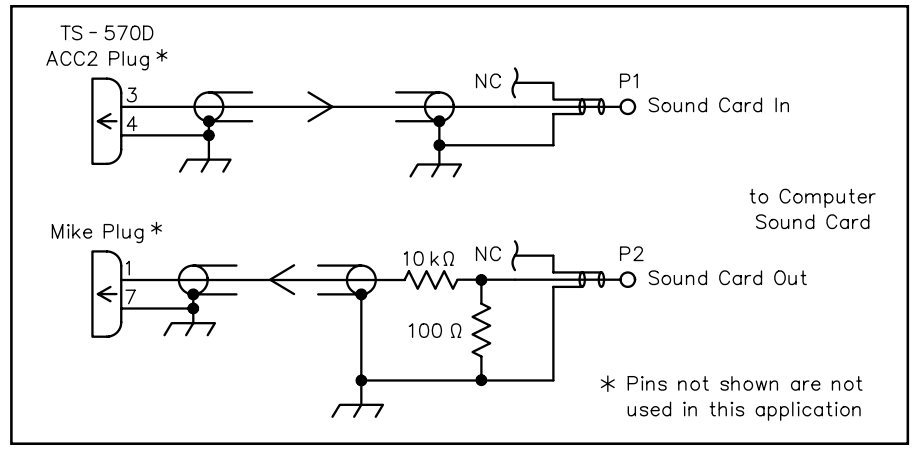

Figure 1—A voltage divider reduces computer sound-card line-out audio to microphone level for connection to a transceiver's mike connector.

My Heil headset and its associated adapter make it much easier to feed audio into the microphone connector. The Heil adapter includes a 1/8-inch female mono jack for microphone input. With that in mind, it was just a matter of building the divider into a matching plug. Unfortunately, I couldn't fit those resistors inside a 1/8-inch plug, so I went the next best route. I built the divider into a 1/4-inch male mono plug and use an adapter to complete the connection. I can now switch between the headset and the PSK31 connection by simply unplugging the headset and plugging in the line-out plug of the cable I built.

After fabricating these connectors, I fired up PSK31SBW.EXE again. Success! The audio now keys the VOX and it works great. I'm now having all sorts of fun with this new mode. Give it a try and meet me on the air sometime.—*Mitchell E. Carson, W5MEC, 4705 Branch Hollow Dr, The Colony, TX 75056-2407;* **Mitchell.Carson@dalsemi.com**

TS-570 BATTERY REPLACEMENT

◊ Since November of 1997, I have been using a Kenwood TS-570D transceiver. This is a fine radio, and I have three friends who have the same radio. Two of us have had a difficulty that is easily corrected: The lithium batteries have failed. When this happens, the radio operates while power is applied, but all programmed functions revert to their default values when power is removed. From past experience, it is difficult to realize that a lithium battery can fail, but they can. A replacement lithium battery (CR2032) is available at RadioShack.

First, disconnect all external cables while performing this procedure. Then remove the radio's upper and lower covers. Four screws secure the front panel to the side panels. Remove the upper two screws, but just loosen the two lower screws. This permits the front panel to pivot forward. The battery is mounted in a spring-loaded holder on a subpanel behind the front panel. Simply replace the battery, replace and tighten the screws and reinstall the covers. This operation is much quicker and easier than packing and shipping the radio for repair.—*Harold Kane, W2AHW, 326 NE 45th St, Pompano Beach, FL 33064;* **HAROLD-KANE@worldnet.att.net**

MORE SOLAR K.I.S.S.

◊ I would like to offer the following comments on the June 1999 Hints and Kinks column regarding "The Solar K.I.S.S." The diodes used to reduce the panel voltage will dissipate power just as a comparable resistor would. At 0.7 V and 5 A, a diode will dissipate 3.5 W (V × I). The diode has an equivalent resistance of 0.14 Ω (V/I). Of course, a 0.14-Ω resistor with 5 A through it dissipates 3.5 W ($I^2 \times R$). The solar charging circuit proposed by K5CN does not eliminate losses and is, in fact, no different than a circuit built using resistors, from a loss viewpoint. The circuit does not provide a "regulated" output as the voltage of the solar panel and the battery voltage vary with solar conditions, state of battery charge and battery load.

If maximum solar charging efficiency is

[1]S. Ford, WB8IMY, "PSK31—Has RTTY's Replacement Arrived?", *QST*, May 1999, pp 41-44.

[2]Digi-Key Corporation, 701 Brooks Ave S, PO Box 677, Thief River Falls, MN 56701-0677; tel 800-344-4539 (800-DIGI-KEY), fax 218-681-3380; **http://www.digikey.com/**.

the goal, you are better off using a solar charger/controller as described in various ARRL publications, or a commercial version of a solar controller.—*Glen Noble, WE7C, 52136 Dorance Meadow Rd, La Pine, OR 97739*; **gnoble@coinet.com**

QUICK VHF MOUNTAINTOP ANTENNA SETUP

◊ I do a lot of VHF mountaintop operation and contest roving, which require quick antenna setups and takedowns. My boom-to-mast connections require either a 7/16- or 1/2-inch wrench, and I never seemed to have the correct one handy when I needed it. Open-end wrenches have different sizes on each end, and unfortunately, 7/16 and 1/2 are not normally paired.

I recently found the solution to my problem in an auto-parts store: an Exide (#7000143 B143BPE) battery-terminal wrench. This wrench is small enough to fit into a pocket, but I made it even more convenient by drilling it in the center and attaching it to an expandable plastic wrist key ring holder. This keeps it immediately at hand and has saved a lot of time looking for it.—*Lynn Burlingame, N7CFO, 15621 SE 26th St, Bellevue, WA 98008;* **n7cfo@ix.netcom.com**

Figure 2—N7CFO's wrist-captive antenna wrench.

TOWER-SECTION ALIGNMENT

◊ Upon recently erecting a Rohn 25G tower, I was faced with a minor problem. Some of the section legs did not properly align with their mating section. Although the misalignment was not great, it was enough to make assembling the tower sections difficult.

To avoid hitting the tower legs with a hammer, I decided to use a Pony clamp.[3] A Pony clamp (see Figure 3) is an adjustable clamp used in woodworking. Simply place the clamp across the tower section legs that are too wide and tighten the clamp until the legs slide into the other section.

The advantage of this method is that the tower can be fitted on the ground. By slightly overtightening the clamps, the tower legs will remain in that position. Mark the same leg of each section to ensure the sections are assembled the same way when erecting the tower. Now when erecting the tower, each section will easily fit together. If you encounter an alignment problem during the installation, simply adjust the appropriate Pony clamp. This is much easier than using a hammer to "persuade" a tower section into place when you're 40 feet in the air and hanging off the side of a tower.—*Thomas V. Cefalo Jr, W1EX, 51 Oak St, Winchester, MA 01890;* **tom_cefalo@radiowavesinc.com**

Figure 3—A Pony clamp is familiar to woodworkers and helpful to hams installing towers. Most any moderate-length, medium-duty clamp will work to adjust tower-section fit as described by W1EX.

POLARIZED GLASSES AND LCDS

◊ KA1MIT's success with Edmund Optics' retarder film[4] reminded me of my physics course way back in college. It's been a while, but as I recall, any polarizing film could help a bit, though it will stop a percentage of the light.

Our teaching assistant asked us what would happen if two filters were used and each was rotated 45° to make 90° from the original. Naturally, we all thought that nothing would pass through the combination.

And naturally, we were wrong. A 45° rotation drops the transmitted light by a set amount (there's a bit of trigonometry involved, but I vaguely recall that the square root of 2 was part of it). A second 45° rotation drops it by the same amount. (It's the same math, after all.) So, one sheet of the cheapest clear polarizing sheet you can find should give a viewable display through polarized sunglasses—a bit dimmer, but viewable.

I've just dug out two handy sets of old clip-on sunglasses and tried the trick on an LCD clock atop my PC monitor. Yup, it works! One's green, the other's amber, so it's extra dim.—*Jim Tolson, KF9CI,* 4934 Dobson St, Skokie IL 60077; **JTolson777@aol.com**

MORE ON REWINDING 24-V RELAYS

◊ I thoroughly enjoyed reading the piece by Paul Wade, N1BWT, in Hints and Kinks in December 1997 *QST*.[5] It referred to my June 1956 article[6] on the subject of relays and brought back memories of long ago. I would like to add three comments:

1. A suggestion for dealing with relays in sealed cans: If the relay is of suitable size, use a hacksaw with very fine teeth to oh-so-carefully cut the can away. Blow out any metal chips that get inside.

2. A relay that will operate on only one polarity of coil voltage may be polarized either by a permanent magnet (rare these days), by a series diode (to protect it from reverse spikes) or a shunt diode (to protect some other component). Ignore that and make it go as you have done.

3. One of the voltages in the table of Common Relay Voltages is 115. That may very well be an ac relay with a shading coil surrounding part of the pole piece. If so, before changing the winding, measure its operating voltage using dc and use that figure in your calculation. The dc operating voltage of a 60-Hz relay may be around one-third of the RMS voltage. The shading coil may slow the pick up or drop out of the relay by 10 to 25 milliseconds. If that is important, try removing it. That may not be easy.—*Laurence B. Stein, Jr. W1BIY, 374 East St, Hingham, MA 02043*

[3]Pony is a specific brand of pipe clamp. Pipe clamps are made by installing clamp hardware on a piece of pipe. Pipe-clamp hardware and pipes are available at nearly all hardware stores

[4]M. Bogart, KA1MIT, "A New Slant on LCDs," *QST*, July 1999, p 64.

[5]P. Wade, W1GHZ, "Rewinding Relays for 12-V Operation," *QST*, Dec 1997, p 69.

[6]L. B. Stein, Jr, W1BIY, "Some Hints on Relay Operation," *QST*, Jun 1956, pp 21-25.

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.

New Products

SOLAR POWER ON CD-ROM

◊ Hams seeking information on solar and independent power generation might want to check out this CD-ROM product from *Home Power Magazine*. It's *Solar4*, the magazine's just-released CD-ROM, that contains issues 61-70 of *Home Power Magazine* in high-resolution PDF format. It also includes nearly four hours of audio workshops on solar technology, video clips, vendor info and system design tools. *Solar4* supports *Windows*, Mac and Unix systems. The *Adobe Acrobat Reader* software is also provided. Price: $29 postpaid in the US. Home Power, PO Box 520, Ashland, OR 97520; tel 800-707-6585; 530-475-0830; **http://www.homepower.com**.

Edited by **Rick Lindquist, N1RL** • Senior News Editor

Amateur Restructuring: Please QRX

"What's up with amateur license restructuring?" That question was on the minds of many amateurs as summer receded without any sign that the FCC had even reached square one in its long journey toward releasing a *Report and Order* on the subject.

"The Commission staff is diligently working on this proceeding," said an FCC staff member who did not want to be identified by name. "Given the number of steps all items go through before a decision becomes public, it is impossible for any staff member to predict the date the Commission will act."

Number of steps aside, another factor in the equation was the FCC's move last spring into its new digs at The Portals, an activity that certainly disrupted the routine work flow. Rumors aside, the FCC official added, "revealing any information about internal thinking or scheduling is a violation of the Commission's rules."

In other words, despite unfounded speculation in some quarters, there's simply no news to report on the progress of restructuring.

On August 10, 1998, the FCC proposed phasing out the Novice and Technician Plus licenses, leaving just four amateur license classes in place—Technician, General, Advanced, and Extra. The Commission invited the amateur community to express its opinions on Morse code requirements, but offered no specific recommendations of its own.

The previous month, the ARRL Board of Directors issued its own plan to restyle Amateur Radio. Among other details, the ARRL plan also called for four license classes and for "refarming" Novice/Tech Plus subbands to provide additional spectrum for higher-class operators. Under the League plan, the Technician license would remain unchanged, and the General would become the entry-level ticket for those interested in HF operation. The ARRL proposed Morse code requirements of 5 WPM for General and 12 WPM for Advanced and Extra class.

The din of the restructuring debate that these blueprints—and those proffered by others—raised last fall seems now a dim echo. To most amateurs, dealing with this sort of issue might seem simple: Just do it! But there's a lot to "it" in this case. Besides, when it comes to the FCC, observers say, the wheels can turn very slowly.

ARRL Executive Vice President David Sumner's "It Seems to Us . . ." editorial in August *QST* perhaps explained it best. "We know it's coming, but we don't know when," Sumner wrote. "We know the structure will be simplified, but we don't know how much. We're pretty certain the Morse code requirements will be lowered, but we don't know how far." And that, Sumner pointed out, is because "the FCC itself doesn't know."

The FCC staffer concurred with Sumner's assessment. "We are simply in that period of time when no information is available," he said. "This is a normal part of the Commission's quasi-judicial decision-making process and a necessary part of being objective and fair to all."

The FCC staff member said that although comments and reply comments are in—some 2200 comments were filed in the proceeding, mostly by individual amateurs—late-filed comments continue to show up. He said the FCC staff "is working on resolving this docket along with other work we have to do."

Before the long-awaited *Report and Order* sees the light of day, the Wireless Bureau staff first must digest the comments. Then, the staff will circulate its recommendations to the Commissioners. The Commissioners and their staff will mull the WTB input and accept a plan that quite likely represents a compromise.

The ultimate FCC decision will come either at the Commission's monthly meeting or it will be handled ''on circulation''—outside of an actual meeting. A *Public Notice* will be issued, and the actual *R&O* will follow—days or weeks later.

The bottom line is that Amateur Radio operators will have to be patient.

"No one wants this proceeding decided more than we do," the FCC staff member concluded. To which most amateurs would shout a resounding "Amen!"

ULS FOR AMATEUR SERVICE SLOWLY GETTING UP TO SPEED

As summer came to an end, the FCC's new Universal Licensing System had yet to resume routine processing of Amateur Radio vanity call sign applications. But it was getting much closer!

In late September, several lucky applicants who had put in their call sign requests back in the pre-ULS era benefited from some "live" testing of the ULS vanity processing system. A few not-so-lucky applicants learned, however, that the FCC had to rescind some of those vanity grants it had cranked out—and should not have—during those "test runs."

The first post-ULS vanities were run September 16. Prior to that, no vanity call signs had been granted since August 4. The ULS has been accepting vanity applications since it inaugurated the ULS for the Amateur Service August 16, however.

Some 30 vanity call sign applications dating from July were processed September 16. The FCC ran a batch of another 50 or so vanity applications on September 21. "We're taking it slow," the spokesperson said, explaining that Commission personnel did not want to process a large number of applications and then discover problems.

In fact, a few glitches did occur and have been corrected, the spokesperson said. While reviewing the applications, FCC personnel found some that should not have been granted in the first place because of various fatal errors made during the application process. "And there will be plenty more, I'm sure," the spokesperson said. The FCC cancelled those call signs and dismissed the applications. The Commission has the option of rescinding any grant within 30 days.

The FCC anticipated that full-scale vanity processing could begin by early October, barring any unforeseen major problems.

Under the ULS, applications that would have gotten an additional manual review in the past now will be automatically dismissed and returned to the applicant for correction and refiling.

The FCC says vanity applications not accompanied by payments within the 10-day deadline will be dismissed automatically. The ULS now permits on-line credit card payments. The fee for a vanity call sign application increased to $14 on September 14.

Despite its August 16 amateur opening date for the ULS, the FCC did not begin accepting new and upgrade amateur applications from Volunteer Examiner Coordinators until late August. The FCC initially conducted some small "live test" runs on new and upgrade applications before inviting VECs to transmit what was, by then, a substantial application backlog. ARRL-VEC Manager Bart Jahnke, W9JJ, said that data for 200 exam sessions—more than 550 applications in all, some dating back three weeks—were submitted for FCC processing August 26.

While most amateur applications now go on the new interactive ULS Form 605, it's still not possible to file a club station application via the ULS. For now, club station applicants must obtain an Assigned Taxpayer Identification Number (ATIN) by contacting the FCC Call Center. Call toll-free 888-CALL FCC (225-5322) and press menu item 2. Club station applicants should continue using the old paper Form 610B and write the

ATIN in the upper righthand corner of the form. Hams who are trustees for more than one club station must obtain a separate ATIN for each club.

All paper applications go to FCC, 1270 Fairfield Rd, Gettysburg, PA 17325-7245.

In the wake of comments and criticisms about the difficulty of having to configure a dial-up connection with a particular browser (*Netscape* version 4.5 or higher, and version 4.61 preferred) to file an application, the ULS Task Force says it's planning to convert to electronic filing via the Internet. But a spokesperson said that was not likely to happen for another six to nine months. In the meantime, some have opted to file on paper.

Most Web call sign servers have been reprogrammed to accept update files from the ULS and should reflect current FCC licensee data. Although it's not nearly as convenient to use as the typical Web call sign server, applicants can obtain new call sign or upgrade information from the ULS, **http://www.fcc.gov/wtb/uls**, by clicking on "License Search." To confirm license class and reveal additional data, users must click on the pulldown menu labeled "License Options" on the bottom of the screen, click on "Amateur Administration," then "Go."

Users with technical questions dealing with the mechanics of ULS registration or access, or having browser problems should contact ULS Tech Support at 202-414-1250; **ulscomm@fcc.gov**. Applicants needing to obtain an Assigned Taxpayer Identification Number or having other "administrative" questions about the ULS should contact the FCC Call Center toll-free at 888-225-5322.

W3CI TRADES FINE FOR LONG-TERM SUSPENSION

Facing a hefty fine in a malicious interference case, Amateur Extra licensee Kornwell H. Chan, W3CI, of Dresher, Pennsylvania, has cut a deal with the FCC to suspend his license for four years, effective immediately, in exchange for not having to pay up.

Earlier this year, Chan and Technician licensee Michael E. Gallagher, KB1DTA (ex-KB3DHX), of W Concord, Massachusetts, each received $7500 fines from the FCC in connection with malicious interference to the Phil-Mont Mobile Radio Club VHF and UHF repeaters. Following up on complaints from the Phil-Mont club, FCC personnel monitored interfering signals which included transmissions of classical music and a person talking with a disguised voice. In February, FCC personnel using direction-finding equipment tracked the signal to a vehicle occupied by Chan and Gallagher and equipped with amateur gear.

Chan subsequently negotiated with the FCC to give up his Extra ticket until 2003 instead of paying the $7500 fine—if there are no violations of the suspension agreement. FCC Legal Adviser for Enforcement Riley Hollingsworth, K4ZDH, told the ARRL that Chan "was cooperative and helped the Commission with information regarding the jamming." Under the agreement, Chan's license will be suspended until September 1, 2003.

In a letter, Hollingsworth reminded Chan that, during the suspension, he would have no authority to operate Amateur Radio equipment and will have to be on his best behavior.

Mir Crew Departs; R0MIR QRT

An era of Amateur Radio in space ended August 27 when the crew aboard the Russian Space Station *Mir*—including French astronaut and amateur Jean-Pierre Haignere, FX0STB—returned to Earth. While some hold a glimmer of hope that private funds will be found to keep *Mir* in orbit, the more likely scenario is that a "cleanup crew" will return to *Mir* sometime early in 2000 to complete preparations to send the spacecraft to a fiery death in the atmosphere.

Several US astronauts—including John Blaha, KC5TZQ; Jerry Linenger, KC5HBR; Mike Foale, KB5UAC, David Wolf, KC5VPF; and Andy Thomas, KD5CHF—made Amateur Radio and space history during their respective tours aboard *Mir*. Linenger was aboard during a near-disastrous fire; Foale was there when a Progress supply rocket rammed *Mir* causing serious damage. In the aftermath of those crises, both astronauts took comfort in the availability of Amateur Radio. Some of their exploits are detailed in the book *Dragonfly: NASA and the Crisis aboard Mir* by Bryan Burrough.

Several Russian crew members also were licensed and active from space, and the R0MIR call sign and packet system became fixtures on the world Amateur Radio scene. The German SAFEX repeater also provided operating enjoyment for hams around the world for several years. But the greatest thrill for hams was a chance to actually speak to one of the members of the *Mir* crew

SSTV was a relatively recent addition to the complement of amateur equipment aboard *Mir*. It was Amateur Radio slow-scan images that recorded the last day of *Mir*'s routine occupation—the spacecraft's crew waving good-bye.

Amateurs worldwide now look forward to the next great international Amateur Radio manned adventure in space: Amateur Radio on the International Space Station—*ARISS*

W8ZCF

The *Mir* crew (l-r), Haignere, Victor Afanasyev, and Sergei Avdeyev, waves good-bye.

Balloting Scheduled In Four ARRL Divisions

Members in seven ARRL divisions have nominated candidates for Director and Vice Director for terms beginning at noon January 1, 2000. The ARRL Election Committee has declared all of the candidates to be eligible. Retirements will ensure some new faces on the Board next year. Incumbent Directors Tod Olson, K0TO (Dakota), Lew Gordon, K4VX (Midwest), and Brad Wyatt, K6WR (Pacific), announced earlier that they would not seek re-election.

Balloting for Director will occur in the Great Lakes and Midwest divisions. Balloting for Vice Director will occur in the Atlantic, Great Lakes, and Pacific divisions. Candidates running unopposed have been declared elected.

In the Atlantic Division: Unopposed for a three-year term as Director is incumbent Kay Craigie, WT3P. Running for Vice Director are John Buchanan, KW3X, and Bernard E. Fuller, N3EFN.

In the Dakota Division: Unopposed for a three-year term as Director is Jay Bellows, K0QB, the current Vice Director there. Unopposed for Vice Director is Twila Greenheck, N0JPH.

In the Delta Division: Unopposed for a three-year term as Director is incumbent Rick Roderick, K5UR. No nomination has been received for the Delta Division Vice Director's slot. The ARRL Articles of Association provide that "Should the office of Vice Director be vacant, the vacancy shall be filled by appointment by the President."

In the Great Lakes Division: Running for a three-year term as Director are David Coons, WT8W; George Race, WB8BGY; and Murray Scott, KE8UM. Candidates for Vice Director are Gary Johnston, KI4LA, and Lawrence Solak, WD8MPV.

In the Midwest Division: Running for a three-year term as Director are John Seals, WR0R, and Robert Wade Walstrom, W0EJ. Unopposed for Vice Director is incumbent Bruce Frahm, K0BJ.

In the Pacific Division: Unopposed for a two-year term as Director is James A. Maxwell, W6CF, the current Vice Director. Running for Vice Director are Jettie Hill, W6RFF; John Ronan, III, K3ZJJ; and Robert Vallio, W6RGG.

In the Southeastern Division: Unopposed for a two-year term as Director is incumbent Frank M. Butler, W4RH. Unopposed for Vice Director is incumbent Evelyn Gauzens, W4WYR.

Full members of record in the Atlantic, Great Lakes, Midwest, and Pacific divisions as of September 10, 1999, were sent ballots in late September. The deadline for receipt of completed ballots is noon Friday, November 19, 1999. Any member who is entitled to a ballot and who does not receive one by November 1 should request a duplicate ballot from the Secretary, ARRL.

Specifically, he cautioned Chan that "any such incidents of retaliation for which you are directly or indirectly responsible will nullify this agreement, and will jeopardize your Amateur Radio license."

No similar deal was in the works for Gallagher. The FCC had cited Chan and Gallagher for failing to operate "in accordance with good amateur practice," failing to identify as required, transmitting music on amateur frequencies, and willfully impeding legitimate amateur communications.

FCC DESIGNATES MICHIGAN HAM'S LICENSE FOR HEARING

The FCC in August notified Andrew Penn, N8JVA, of Linden, Michigan, that it intends to designate his Amateur Radio station license for a revocation hearing before an administrative law judge. The FCC also intends to suspend Penn's Extra class operator license for the remainder of the license term, which ends February 22, 2004. The action by the FCC's Compliance and Information Bureau stems from a case it inherited from the days when it shared enforcement duties with the Wireless Telecommunications Bureau.

Penn was a Volunteer Examiner for an examination session June 3, 1997, in Oak Park, Michigan, after which, the FCC alleges, the names of four applicants who did not sit for exams were added to the list of successful applicants. Last December 14 the FCC downgraded two amateur licensees and pulled the Tech Plus ticket of Steven A. Penn, formerly KC8HUM, of Southfield. Andrew Penn is Steven Penn's father. The FCC says the name of an unidentified fourth ham was added to the list after the test session but the application never was submitted to the FCC.

The Commission says its evidence shows that the names of four applicants "were added and signatures forged, sometime after the tests were administered, by one of the four examiners." The FCC says the other three examiners knew nothing of the scheme and brought the situation to the attention of the ARRL-VEC and the FCC.

At press deadline, Andrew Penn had not indicated whether he intended to appear and present evidence at the proceeding. But the FCC also gave him the option of avoiding the hearing and terminating the investigation by submitting his Amateur Radio license for cancellation.

FCC RELAXES RULES FOR SPREAD SPECTRUM

The FCC has relaxed rules governing the use of spread spectrum techniques by radio amateurs and opened the door to the possibility of international spread spectrum communication. The *Report and Order* in WT Docket 97-12 adopted August 31 concludes a proceeding that originated with an ARRL petition in December 1995 and has been pending since 1997.

The FCC adopted rules that will allow Amateur Radio stations to transmit additional spread spectrum emission types. Once the new rules become effective November 1, hams will be able to use techniques other than frequency hopping and direct sequence spreading. In addition, the new FCC rules will permit US hams to use spread spectrum techniques to communicate with amateurs in other countries that permit SS. Spread spectrum communication has been limited to stations within FCC jurisdiction.

The new rules require that spread spectrum stations running more than 1 W incorporate automatic transmitter power control. Amateur stations using SS are restricted to a maximum power of 100 W.

The Commission also amended the rules to eliminate what it called "now-unnecessary record keeping and station identification requirements" that apply only to stations using spread spectrum. The FCC agreed to let SS stations identify themselves using conventions developed by the Amateur Radio community.

Roanoke Division Vice Director Dennis Bodson, W4PWF, who has followed the League's Spread Spectrum initiative through from start to finish was pleased with the outcome of the proceeding. "I'm very happy," he said. "The League got everything it wanted and more—all of which, I believe, will help to promote this mode on the amateur bands." Bodson served as the ARRL Board liaison with the Future Systems Committee and chaired the *Ad Hoc* Committee on Spread Spectrum, which was instrumental in developing the League's stance on Spread Spectrum.

Stations employing spread spectrum techniques will remain secondary to—and must

In Brief

• ***Help Wanted*—Assistant Contest Manager:** The ARRL seeks a licensed Amateur Radio operator for the position of Assistant Contest Manager. Duties include accurate data entry, preparing and verifying contest results for publication, and the preparing mailings and shipping packages. Familiarity with *Excel*, *Access* and *Word 97* is helpful. Applicants must posses the ability to work independently. Apply in writing to American Radio Relay League, Contest Department, 225 Main St, Newington, CT 06111. No telephone calls, please. The ARRL is an Equal Opportunity Employer.

• **W2VU named editor Of *CQ*:** *CQ VHF* Editor Richard Moseson, W2VU, has taken on additional duties as the new editor of *CQ* magazine. Moseson succeeds the late Alan M. Dorhoffer, K2EEK, at the editor's desk. An amateur since 1970 and a former ARRL Northern New Jersey Section Manager, Moseson joined CQ Communications in 1992.

• ***QST* Cover Plaque Award winners:** Dwayne L. Kincaid, WD8OYG, won the July *QST* Cover Plaque Award for his article, "The DWM-4: A Microprocessor-Controlled Multichannel Wattmeter for HF, VHF and UHF." The winner of the *QST* Cover Plaque Award for August was Jay Dyer, W8JAY, for his contribution "A Digital DXpedition to China and Mongolia." Congratulations, Dwayne and Jay!

• **Amateur Radio "community site" on-line:** Dubbed an Amateur Radio "community site," eHam.net, debuted September 2 at **http://www.eHam.net**. Bill Fisher, W4AN, one of the amateurs behind the new site, says eHam is—among other things—aimed at giving hams a place to share ideas as well as to contribute news, buy and sell, take practice exams, see equipment reviews, and get propagation information and DX spots. eHam.net includes a call sign server. A "Friends Remembered" department lets hams post reminiscences of Silent Keys. The site also includes various Amateur Radio-related links and includes news items from the ARRL and other sources.

• **No DXer of the Year for Zorro:** Yasuo "Zorro" Miyazawa, JH1AJT, did not receive the DXer of the Year Award August 28 in New Orleans, nor was anyone else named to receive the award instead. The New Orleans International DX Convention last spring had named Miyazawa as DXer of the Year for this year's event. However, the New Orleans International DX Convention Committee and Miyazawa mutually agreed to remove Miyazawa's name as this year's nomination as a result of recent controversy surrounding Miyazawa.—*Bernie McClenny/The Daily DX*

• **QRZ announces on-line practice exams:** QRZ now offers free, online practice amateur exams for all license classes at **http://www.qrz.com**. The exams include instant scoring and all images and diagrams from current VEC question pools.

• **W4RA receives Calcutta Key:** IARU President Larry Price, W4RA, received the Calcutta Key from the RSGB during the September IARU Region 1 Conference in Lillehammer, Norway. The Calcutta Key is awarded by the RSGB for "outstanding service in fostering International Friendship within Amateur Radio." The RSGB Council voted to award Price the Calcutta Key at its July 24 meeting. "Naturally I am quite thrilled at this recognition," said Price, a past president of the ARRL.

• **Myron Hexter, W9FKC, SK:** Noted veteran DXer Myron "Mike" Hexter, W9FKC, of Highland Park, Illinois, died August 4. He was 91. First licensed at age 15, Hexter was an ARRL member for 70 years and a charter member of W9DXCC. He had 378 DXCC entities confirmed. Hexter also wrote two articles for *QST* during the 1950s. W9FKC was an avid CW operator and a long-time member of the FOC. He was a founding member of a number of Chicago area amateur radio clubs.—*thanks to John Swartz, WA9AQN*

ARISS INITIAL HARDWARE FLIGHT DELAYED

The grounding of the US space shuttle fleet in late summer will delay launch of the initial station hardware for Amateur Radio on the International Space Station. But pre-launch processing of Amateur Radio equipment bound for the ISS remains on schedule. The gear had been scheduled to launch in December aboard STS-101. With the shuttle launch hiatus, it now won't go up until sometime early next year.

NASA grounded the shuttles to allow a detailed inspection of electrical wiring on the entire shuttle fleet. The inspections come in the wake of problems during the July launch of the shuttle *Columbia*, when astronauts and ground controllers struggled with power failures in computers controlling two of the orbiter's three main engines. According to news accounts, the shuttle was one short circuit away from an emergency abort.

An electrical problem later in the same mission initially caused a Space Amateur Radio EXperiment school contact to be rescheduled. A orbiter power outlet subsequently was determined to be faulty.

Inspectors found dozens of electrical defects on shuttles *Endeavour* and *Discovery*. Comprehensive inspections of *Columbia*—the oldest orbiter—and *Atlantis*—the one that will carry the initial ham gear to the ISS—were scheduled for late September, NASA said.

SAREX Principal Investigator Matt Bordelon, KC5BTL, said that STS-101 would not go up until January 22 at the very earliest and probably not until February. "We delivered our internal amateur hardware back in July, so nothing changes there," he said. The ARISS antenna hardware was due for fall delivery to be stowed aboard STS-101 for flight.

"Everything is pretty much on schedule as far as the ham radio hardware is concerned," Bordelon said. "There is no impact to our schedule. We're just moving along."

For more information on ARISS, visit **http://garc.gsfc.nasa.gov/~ariss/ariss.html**.

NASA PHOTO

The ARISS initial amateur gear in a NASA "soft stow" bag. The bag protects the gear during flight and transfer from the shuttle to the ISS.

accept all interference from—stations employing other authorized modes. The FCC declined to authorize the use of spread spectrum techniques on additional bands or frequencies.

A copy of the FCC's complete Report and Order is available at **http://www.arrl.org/announce/regulatory/wt97-12**.

BALLOTING FAVORS THIRD FLORIDA SECTION

ARRL members in nine Southern Florida counties have voted overwhelmingly in favor of creating a new ARRL West Central Florida Section. Ballots counted September 15 at ARRL Headquarters showed 920 members favoring the idea—proposed by the West Central Florida Section Committee—and 86 opposed. A county-by-county breakdown of the vote indicates that a majority of ARRL members who cast ballots in each county voted for the proposal. The counties involved are Charlotte, DeSoto, Hardee, Highlands, Hillsborough, Manatee, Pinellas, Polk and Sarasota.

ARRL Executive Vice President David Sumner, K1ZZ, says the next step is for the ARRL Board of Directors to review the entire file and to vote to approve or disapprove the proposal. No timetable has been established for completion of the Board's review. The ARRL Board has the final say on whether the new section will be created.

The petitioners were gleeful at the news. "The Committee is thrilled and elated with the vote of the membership," said Committee Chairman Paul Toth, K2SEC. The petition was filed with the ARRL last April.

ARRL By-laws provide that a new section may be created from one or more existing sections. The most recent new ARRL section created was Northern New York in 1996. At present, there are 70 ARRL sections.

HAM RADIO PROVIDED POST-EARTHQUAKE COMMUNICATION LINKS

Within the first hour of the devastating earthquake August 17 in Turkey, members of the Amateur Radio Emergency Service organized by TRAC, the Turkish Amateur Radio Society, began providing emergency communication. "The first three days following the quake all communication needs were met by radio amateurs," TRAC Secretary Yuksel Hak, TA1BY, said. Hak said telephone and other communication networks had collapsed, either due to power failures or from too much traffic.

The quake in Western Turkey lasted 48 seconds and measured 7.4 on the Richter scale. The death toll was in the tens of thousands.

Hak said the common frequencies used by ham radio also helped to tie together the incompatible radio systems used by various governmental organizations. "TV networks, daily newspapers and magazines all appreciated the support given by the hams," he said. "This proved the important role of Amateur Radio service in case of disasters."

Section Manager Election Notice

To all ARRL members in the Eastern New York, Eastern Pennsylvania, Louisiana, North Carolina, Pacific, San Diego, South Dakota and Virginia sections. 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 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 10, 1999. Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before January 2, 2000, to full members of record as of December 10, 1999, which is the closing date for nominations. Returns will be counted Feb 22, 2000. Section managers elected as a result of the above procedure will take office April 1, 2000.

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, 2000. If *no* petitions are received from a section by the specified closing date, such section will be resolicited in the April 2000 *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 Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Richard Palm, K1CE, Field Services Manager*

Rick Palm, K1CE • *Field Services Manager*

NTS Pillars K2KIR and W2MTA Reminisce

◊ In the early days of NTS there was only one cycle—the evening cycle (now known as Cycle 4). I became the acting net control station (NCS) for the Eastern Area Net on my 17th birthday, when the regularly assigned NCS was a no-show. During my college years I subbed a few times from W1MX (and met George Hart, W1NJM, for the first time when a fellow MIT Radio Club member and I visited the old ARRL HQ at 38 LaSalle Rd in West Hartford one weekend).

After graduation I settled down in Massachusetts and put together my own station so I could resume my weekly NTS schedules. When another NTS alumnus —K2SIL/8 (now K1GQ)—vacated the Wednesday night EAN NCS slot at the end of 1962, I volunteered. Net manager W2EZB said "take it."

Starting with the first Wednesday in 1963 I began a run of 12 years and two months without missing a single assignment until a combined business and pleasure trip took me to Hawaii in March of 1975. Ironically my trip included a visit with K2SIL, who was now setting contest records as KH6GPQ and operator of KH6RS!

The severest challenge to my unbroken string came in 1971 when General Electric sent me to a weeklong management course at their corporate training campus along the Hudson River. It was too far from home for me to get back for my Wednesday night slot, and the one or two traffic people I knew in the area were not in town at the time. To turn down the company course would have been political suicide. So, into the car went my Hallicrafters SR-150, an E. F. Johnson Matchbox, some rope, and a spare 80-meter dipole with open wire feed line already attached. I didn't have much hope of making the net that week, but I knew I'd never forgive myself if I didn't at least try.

When I arrived at the school on Sunday afternoon and saw the week's schedule my heart sank. Wednesday was filled with meetings and exercises right through the evening. But late Wednesday afternoon a last-minute schedule change was announced. I knew that if I skipped dinner I could possibly squeeze a little operating in at net time! Enlisting the help of a puzzled but good-natured team member, I managed to get my dipole about 15-20 feet off the ground and the open wire stuffed through a small window in my basement dorm room. With five minutes to spare I was on the air and my string of consecutive Wednesdays stayed intact. When the net ended I quickly retrieved the dipole and put everything back in my car. Within 10 minutes I was off to a scheduled mixer with GE managers, where I met the late Jim Lawson, W2PV.

Bud, K2KIR (center), with junior op Colden, flanked by Bill Myers, K1GQ (left), and Dan Clark, N2DC.

Participation in NTS has impacted my life in many ways—some (such as my lifelong fanaticism for full break-in CW) perhaps less profound than others (more than one wag has suggested that I turned down lucrative West Coast job offers because of EAN). Through NTS I met many wonderful, reliable people including Dan, N2DC (ex-W2ZRC), who in addition to being a superb NCS is the finest mentor and fairest boss this engineer-turned-manager ever worked for. And while there were a few social events I regretted missing, there have been many more positives than negatives associated with trying to maintain near-perfect attendance all these years. That weekly NCS job has kept my station continuously on the air with a decent signal and prepared for emergencies for over 36 years despite six "permanent" QTH moves plus summertime shuttling to and from vacation cabins. Early on I learned always to have backups ready to go—everything from antennas to pencil leads.

Over the years we took the NTS precepts and procedures set down by W1NJM and fine-tuned them to improve the system's overload capacity. In the 70s we developed NCS and representation techniques that many times allowed us to clear in excess of 300 messages in a single 60-minute EAN session. From the massive traffic overloads of the Simulated Emergency Tests we figured out how to make the entire system run continuously with overlapping cycles and multiple modes. Later we settled on a four-cycle framework for defining the underpinnings of the routine daily operations of today's NTS.

Because of my participation in NTS, I was introduced to the old ARRL CD (Communications Department) Parties, a few of which I actually won. These led to my getting into CW Sweepstakes and DX Tests (which generally I didn't win). My NTS assignments also got me involved in various local and regional emergency preparedness exercises, and helped me better understand the role that NTS could and should play when emergencies come along. Many local ARES organizations could greatly improve their preparedness stance solely by imitating the NTS concept of regular, scheduled system activity. And both structures could benefit from closer, more frequent links between the two.

I can still remember sitting at the kitchen table in my parents' home when I was 14 years old and reading W1NJM's description of NTS operation. It was elegance,

simplicity and, in retrospect, just plain common sense. It would seem that today's technologies have finally "outplayed" the original NTS structure, but just when we think we've put the ultimate commercial telecommunications system in place, Mother Nature has an unerring instinct for finding new ways to let good old fashioned Amateur Radio have a chance to shine. Just like the Collins 75A-4 and other great innovations, NTS is a ham radio "classic" that represented a quantum leap when originally introduced and which is, 50 years later, still pretty darned good. To George Hart and the ARRL—thanks and congratulations!—*Bud Hippisley, K2KIR*

◊ When I entered Amateur Radio in February 1952, the NTS and the New York State (NYS) CW net had been in operation for close to three years and five years, respectively. My Novice license was in-hand for one month of 80-meter operation before I joined the Marines during the Korean War. I enjoyed my early ham radio thrills at Camp Lejeune's W4LEV and as a USMC field radio operator.

After college, in 1957, with an IBM flight test job, the traffic net bug began to bite along with CW contesting and 10-meter mobile operating. My first NYS meeting with Clara Reger, W2RUF (SK), was a turning point. She took me off the net frequency and asked me why I had checked into NYS. I told her that I wanted to increase my code speed for contesting purposes! I've been on NYS ever since.

My NTS duties grew in 1960 while in Milwaukee for IBM. It was there that I met Fred Borcherdt, W9DYG, manager of the Central Area Net. He gradually drew me away from Wisconsin's CW net and SCM Bud Woida, W9KQB, and into the Ninth Region Net with Paul Metzner, W9ZYK, then into the Central Area Net and later the Transcontinental Corps with Art Swinfin, W9DO, and company. Life has never been the same since!

The following spring our family of six traveled to New Mexico and then on to Cape Canaveral, Florida. I worked with New Mexico brass pounders including Carl Franz, W5ZHN, 12th Region Net with John Sampson, W7OCX, and Pacific Area Net with Jack Kane, W7DZX, while also doing TCC work for Cecil Johnson, W6EOT. Being NCS on the NMBPN from Alamogordo could sometimes be a lonely task, and the long haul to a Washington State NCS for PAN was challenging. The summer and fall of 1961 on Florida's QFN CW net also were a lot of fun.

In 1962, Chas Willard, W2EZB, hooked me as a 2RN NCS and later EAN NCS as he moved from 2RN to managing EAN. I was EAN NCS on Thursdays until late 1964, then Saturdays until 1976, and from then until now on Sunday nights. The bridge party gang used to laugh when I would excuse myself from the table at 8:30 to go to the shack to NCS EAN on Saturday nights.

Traffic handlers attending the Western District Net (western New York) Picnic, August 7,were treated to this NTS cake furnished by Mike Connors, N2UTK. *(Thanks Ed Gutowski, KB2UQZ, Net Manager, Western District Net/Late, Public Information Coordinator)*

When our family returned to the home base in 1964, I reverted to my first love with Clara and NYS. I later became NYS manager and 2RN manager in 1974, but I've never been an Eastern Area Net manager, since Bud Hippisley, K2KIR, has held the EAN manager post since 1963, doing a great job there. In 1979, as EAS Chairman, he was the key cog in establishing the four-cycle National Traffic System we all know today.

I've been managing 2RN and serving on the Eastern Area Staff for 25 years, been Western New York Section Manager for 20 years, and Eastern Area Staff Chairman for 11 years. Thanks, Clara, for asking me why I joined NYS net!—*Bill Thompson, W2MTA*

NEBRASKA HAMS AID IN FIRE RESPONSE

Hams in Buffalo County, Nebraska, helped local authorities the evening of July 12 when a fire broke out at a lumber yard in Kearney. EC Danny Baer, KA0DBK—who is also a fireman—grabbed his emergency bag and left for the fire scene. A few minutes later, he put out a call for additional ARES volunteers. Baer assisted the Kearney Police Department by directing traffic. Other ARES members were put to work on traffic and crowd control details. The Kearney police department estimated 2000 onlookers. A Salvation Army team provided food and water to the emergency workers on the scene. "We started out on the local repeater—146.625—and soon found out that there was so much radio traffic in the area that we went to 146.520," Baer said. Five ARES members spent more than five hours at the scene. The lumber yard was destroyed along with three other businesses. Baer recommends planning ahead and training for emergencies, then remaining prepared.

NWS/ARRL SPECIAL EVENT SET FOR NOVEMBER 27

The National Weather Service and the ARRL will cosponsor a special event slated for November 27. Its purpose is to recognize the contributions that amateurs make to the NWS during times of threatening weather. The event will provide an opportunity for NWS personnel and amateurs to learn more about each other and their capabilities in severe weather situations. NWS personnel will be encouraged to use the radios (under the supervision of a control operator) and to get licensed. The event will also allow NWS offices to test back up communication in anticipation of Y2K.

November 27 is the final Saturday of the Atlantic hurricane season. The event will run from 0000 UTC to 2400 UTC. Participating stations will operate on the following bands: 80, 40, 20, 15, 10, 6, and 2 meters. Most contacts will be by SSB, but other modes like RTTY, CW and PSK31 can also be used.

The objective is for Amateur Radio operators at NWS sites to work as many other amateur stations as possible. The responsibility for setting up equipment and running the special event station at NWS sites rests with the local amateur community. Local NWS offices will provide the operators with a place to work the event, access to an area outdoors for antennas, power to run the equipment, and, of course, coffee.

Amateurs should be careful not to interfere with office operations. At most, there should only be two operators at any time during the event. Amateur operators will be responsible for logging all contacts.

The QSO exchange will consist of a location, name, and a one or two word description of the weather. A script will be transmitted at regular intervals to announce the purpose of the event and to provide QSL information.

You'll find operating instructions, a list of participating site stations and QSL information on the Web at **http://www.crh.noaa.gov/gld/radio.htm.**

Operators eligible for a QSL certificate can send a self addressed stamped envelope to the NWS office at Goodland, Kansas. The NWS will create the certificate, check the logs, and issue the certificates based on levels of achievement, as follows.

Percentage of Stations Worked	*Certificate*
2-25%	Stratus
26-50%	Cumulus
51-70%	Towering Cumulus
71-80%	Cumulonimbus
81-85%	Microburst
86-90%	Flash Flood
91-95%	Hurricane
96-100%	F5 Tornado

NWS contact: Scott Mentzer, KB0WPY; **scott.mentzer@noaa.gov**; tel: 785-899-2360. ARRL contact: Rick Palm, K1CE, **k1ce@arrl.org**; tel: 860-594-0261. QST

Strays

FREE FCC CALL SIGN ALERT SERVICE

◊ Chris Davis, KB0WWP, offers a new free service via his Web site that automatically alerts users that a pending FCC Amateur Radio transaction has occurred. It's at **http://davisfamily.nu/hamcalls/mailinst.htm**. Say you just passed your Amateur Radio examination, or applied for a vanity call sign and are waiting for that brand new call sign to pop out of the hopper at the FCC. Register and you'll be alerted by e-mail when it happens. Users also can register via e-mail to be notified, so Web access is not a necessity. To register, provide the following *six* lines of information in the body of a message to **hamcalls@davisfamily.nu**: e-mail address; last name; first name; city; two-letter USPS state abbreviation; five-digit ZIP code. E-mails will be kept private, are not used for any mailings, and will be deleted after the transaction occurs or after 60 days.

Next Stray

The ARRL Section Traffic Manager

The Section Traffic Manager (STM) holds an important leadership role within the ARRL Section. Here is a summary of the general responsibilities assigned to this integral position of the ARRL Field Organization.

The STM is appointed by the Section Manager (SM) to supervise traffic handling organization at the section level—that is, to coordinate all traffic efforts within the section, regardless of mode or National Traffic System affiliation, so that routings within the section and connections with other networks and digital traffic nodes will result in orderly and efficient traffic flow. The STM should be a person at home and familiar with traffic handling on all modes, must have at least a Technician class license, and should possess the willingness and ability to devote equal consideration and time to all section traffic matters. The STM, as all ARRL Field Organization appointees, must be a Full ARRL Member. The duties of the STM include the following:

1) Establish, administer, and promote a traffic handling program at the section level, based on, but not restricted to, National Traffic System networks.

2) Develop and implement one or more effective training programs within the section that address the needs of both traditional and digital modes of traffic handling. Ensure that Net Managers place particular emphasis on the needs of amateurs new to formal network traffic handling, as well as those who receive, send, and deliver formal traffic on a "casual" basis, via RTTY, PACTOR, and Packet based message storage and bulletin board systems.

3) Cooperate and coordinate with the Section Emergency Coordinator so that traffic nets and emergency nets in the section present a unified public service front.

4) Recommend candidates for Net Managers and Official Relay Station appointments to the SM. Issue appointments/cancellations and appropriate certificates. At the SM's discretion, the STM may directly make or cancel NM and ORS appointments.

5) Ensure that all traffic nets within the section are properly and adequately staffed, with appropriate direction to Net Managers, as required, which results in coverage of all Net Control and liaison functions. Assign liaison coverage adequate to ensure that all digital bulletin boards and message storage systems within the section are polled on a daily basis, to prevent misaddressed, lingering, or duplicated radiogram-formatted message traffic.

6) Maintain familiarity with proper traffic handling and directed net procedures applicable to all normally-used modes within the section.

7) Collect and prepare accurate monthly net reports and submit them to ARRL Headquarters, either directly or via the Section Manager.

The League is grateful to all the Section Traffic Managers for their outstanding work and leadership in the ARRL Field Organization. Thank you.

Field Organization Reports

Public Service Honor Roll
August 1999

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

821
NM1K
428
K9RTB
358
KB8ZYY
341
KB7GZU
331
WB8SIW
290
N5JZ
288
KB5WEE
286
NZ4O
276
WB2UVB
W7JMH
241
WB5ZED
233
W7TVA
221
W7GHT
220
K7BDU
218
KA2ZNZ
213
KK1A
209
W6DOB

200
N5OUJ
199
N5NAV
198
AF4HE
196
KK3F
N2LTC
193
N2WFN
192
K7VVC
N2OPJ
191
KA4UIV
189
WB4GM
188
WB5NKC
187
W4CAC
K8GA
186
KA2CQX
179
KA4FZI
178
WA4GQS
K6YR
176
W4ZJY
175
KE4OAV

173
W5ZX
AF9FA
172
W0OYH
KA5KLU
K2DN
K4IWW
171
K5DPG
WA5I
170
KU4IJ
169
N2YJZ
168
KA2GJV
AD4DO
163
KC5OZT
K4SCL
160
N8FPN
159
W7IVV
158
KB2VVB
156
K2UL
155
WX8Y
WA1TBY
152
KB2RTZ
KA8FCC

WA4DOX
151
WA4QXT
N2XOJ
N7YSS
K4RBR
150
N0KJ
WN0Y
149
W6QZ
K9FHI
KF1L
148
KC2ALG
W3YVQ
KB2KLH
147
KC2AHS
146
KB5W
145
KE4JHJ
144
WA8EYQ
KD2AJ
WB2GTG
WA1JVV
N2CCN
N1LKJ
143
KC4TLG
N8JGS
AF4GF
WX4H

142
WB2ZCM
W4EAT
141
N5JCG
N8FWA
WD4JJ
W4DGH
140
WO0A
W0LAW
N3WKE
W2RJL
WB0ZNY
W9YCV
N2UTK
W2MTA
W7ZIW
WA9VND
139
KC7ZZB
W5GKH
WA1FNM
KB5TCH
KC4ZHF
KD4GR
138
W7NWP
W7GB
137
W0GCB
KA1GWE
136
N5XGI
KJ3E
K2BTP
N2RPI

NY2V
W0WFF
KB5YAM
134
NN7H
133
K2BCL
N2WDS
WA2UKX
132
N1VXP
N2AKZ
KA4HHE
NZ1D
KF4TQX
131
KO4A
AA3SB
K6AGD
AF4NS
W7LG
W2EAG
130
W9CBE
AA4HT
129
WA0TFC
KR4MU
AD6HR
N3WAV
AG9G
N2XJ
KB2VVD
128
W3VK
NN2H
WB2QIX
WB2FGL
126
N7DRP
N2JBA
W2AKT
KA9KLZ
KG2D
125
W1ALE
124
K5IQZ
W5CDX
KC6SKK
KF4VDW
123
KE1AI

122
W8GGA
KJ9J
W1PEX
AF2K
KF6OIF
121
KD5P
W2PII
W5MEN
KI4YV
120
KO6RZ
KA7AID
KA7TTY
K7GXZ
119
K0PIZ
AA3GV
K9GBR
K4BEH
WU4C
118
K5VV
W3BBQ
W4CKS
WB2IIV
KA2DBD
K7MQF
KF4NFP
117
KM5DT
K4MTX
W9ZY
AC5Z
WA4NDA
116
K0IDS
KB0DTI
W3OKN
115
W7VSE
W4RRX
114
N3ZKP
W2JHO
WB5NKD
113
KL5T
KA9EIZ
112
KC8LYY
K4AKC
KC4PZA
AA8SN

111
WI2G
110
N8DD
WD0GUF
K5MC
K8VFZ
109
AA2SV
KF5A
108
N2VQA
KE6MIW
KB4WBY
WA4EIC
107
KG5GE
K9LGU
KA0KPY
106
KB2VYZ
WA8SSI
K5WOD
N5HK
KB2VRO
KB2ETO
WA2GUP
WA8DHB
105
W5XX
WB4UHC
K2VX
N9BNQ
104
K8QIP
K8LEN
103
KC3EOT
W4CC
102
N2ZMI
KB2WII
N9MN
101
W2CS
100
N2WXE
N2WXF
N2WXG
KE4DNO
99
N3WK
K2PB

98
K5DMC
W3CB
K0PY
W2JG
K8AI
97
N2JRS
WB2IJH
K7YOH
K5MXQ
KE4WBI
96
KA1OTN
KB2UQZ
95
N7AIK
KA4LRM
94
WB4ZNB
AA2ED
93
KC4VNO
KJ7SI
WB7VYH
AC4ZO
92
AL7N
K4YVX
KO4OL
N1IST
KC5VLW
91
KA1VEC
K8ZJU
K4AIF
89
KG0IV
WB4PAM
AA4YW
88
KE3OX
WA1QAA
KJ4N
87
W4XI
KD4HGU
85
K1SEC
N1SGK
N4JAQ
84
KE3FL

WA5FXQ
AE4NW
83
KC3Y
KC2FEM
82
K3UWO
KD5AHW
AA4BN
WB9GIU
81
K4BW
W7EP
N5LF
W0UCE
80
N4FNT
WA4GLS
W4ZBA
79
W5TIT
78
N3KB
77
KB2ETU
W2AZ
WA4EYU
76
K8IG
NR9K
75
KC8HTP
74
W7HH
K3CSX
73
N1LAH
72
KC8CMQ
KI0JO
N1VUX
KM5VA
N4MM
71
KB2VSD
N2AYK
KB0GUS
70
KB2VSR
KB2YBM
KB2YWK
KD4FGG
KC2CLD
WA5WBZ

The following stations qualified for PSHR in previous months, but were not recorded in this column: (July) KK1A 273, KB2VVD 144, K6AGD 138, KC7ZZB 120, N7DRP 118, W7VSE 115. (June) WB8SIW 327, KB8ZYY 288, KC8CMQ 255, KC8CUC 209, WX8Y 180, N8FPN 152, N8JGS 152, W7VSE 132, K8GA 131, KB2VVD 130, WA8DHB 111, K8VFZ 108, K8AI 100, WI8K 98, K8ZJU 96, K3UWO 84, AA8SN 82, AA8PI 82. (May) KB5WEE 273, KC5OZT 218, WA5I 177, KB5YAM 165, N5CAM 160, KB5TCH 128, KC5VLW 102, K5MXQ 100, AC5Z 88, KD5AHW 76.

Section Traffic Manager Reports
August 1999

The following ARRL section traffic managers reported: AL, AR, AZ, CT, CO, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KY, LA, NC, NNJ, MDC, MI, MN, MO, MS, MT, NC, NFL, NH, NLI, NTX, NV, OH, OK, OR, ORG, SB, SC, SFL, SNJ, STX, TN, VA, WI, WMA, WNY, WPA, WWA.

Section Emergency Coordinator Reports
August 1999

The following ARRL section emergency coordinators reported: CT, IN, KY, MDC, MN, MO, NLI, SD, SFL, TN, VA, VT, WMA.

Brass Pounders League
August 1999

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	716	301	868	3	1888
W7GHT	0	589	545	103	1237
WX4H	3	446	728	12	1188
KA5KLU	3	524	524	41	1092
WB5NKD	3	52	1031	3	1089
N2LTC	1	523	535	27	1086
WB5NKC	32	451	539	18	1040
KF5A	0	449	477	1	927
K7BDU	5	390	453	47	895
W1FYR	2	410	402	5	819
W1PEX	1	89	720	7	817
KB7GZU	271	81	411	2	765
W6DOB	9	323	337	42	711
W7AMM	178	84	414	21	697
KE4DNO	3	212	458	3	676
K7VVC	28	256	330	6	620
WB5ZED	26	262	211	37	536
KK3F	22	100	368	44	534
KA2ZNZ	4	247	202	76	529
W7JMH	96	136	176	115	523
N0KJ	—	—	—	—	522
KA1VEC	10	247	253	9	519

BPL for 100 or more originations plus deliveries: NZ4O 204, K5GBN 187, WB8SIW 160, AA7WG 152, N5JZ 142, K8LJG 123, KB5WEE 110.

The following station qualified for BPL in July, but the results were not reported in this column last month: KK1A 135. (June) WB8SIW 139.

Edited by **Bernie McClenny, W3UR***

Rare Countries and Everlasting Joy

By Martti J. Laine, OH2BH/P51BH

This month we have exciting news and photos about past operations by Martti Laine, OH2BH and Baldur Drobnica, DJ6SI. Martti shares his thoughts about what it takes to "open" the rarest countries—and why patience may be the highest DX virtue. Baldur discusses his May 1999 operation from Somaliland, an area in northern Somalia that declared independence in 1991. In order for Somaliland to be a separate DXCC entity it must meet one of the following criteria: become a member of the United Nations, a member of the IARU, or be assigned a call sign block by the ITU. Somaliland is not a member of either organization and does not have its own call sign block. Both 6O and T5 belong to the Somali Democratic Republic. The 6O1Z and 6O0X licenses were not issued by the Somali authorities, so this operation will not count for DXCC.—W3UR

The coveted P51BH QSL.

In this age of mega DXpeditions it is the rule for a successful operation to make more than 50,000 QSOs with eager DXers throughout the world. The DX game has become so popular that any desirable location (from a DXCC standpoint) that is available for the staging of a major operation becomes an immediate target. The global community is now very mobile, and reasonable travel destinations are within the reach of many adventurous DXers.

Rarities Come and Go

In these exciting times, however, we should not forget that there are still countries that remain closed to even the most ambitious DXpeditions. They are the countries that do not accept Amateur Radio as a legal radio service. These countries normally stay among the top-five "most wanted," and activating any one of them presents the ultimate challenge for DXers.

Many seasoned DXers will remember when Iraq (YI) was at the top of the list in the '70s, XZ at the top in the '80s and ZA was the most wanted in the '90s. Many DXers feared that these countries would be missed for a lifetime. Providence prevailed, however, and YI1BGD finally hit the airwaves. Then came ZA1A, followed by XZ1A. These operations not only reshuffled the list of most-wanted countries, they filled the gaps in many DXCC logs the world over. These countries suddenly turned out to be commonplace DX, no longer at the top of any "most wanted" list. This was the culmination of "missionary Dxpeditioning," the concept of activating and establishing Amateur Radio as a valued service in their respective societies. These efforts required decades of hard work and, in most cases, the first operation did not produce thousands of QSOs.

Wonjong Bridge connects China and North Korea in the Tumen River delta. Our four-wheel-drive truck had special permission to enter North Korea, carrying the P51BH operators to briefly activate the rarest of them all.

Mrs Iris Ying, Senior Vice President of Hong Kong Emperor Group, exchanging paperwork with the President of the North Korean Telecomm to allow the P51BH operation to proceed from the city of Rajin, DPR Korea.

Even though many barriers have come tumbling down in the world, we always seem to have a few "evergreen" DXCC rarities on our agenda. Today, three such entities are North Korea (P5), Bhutan (A51) and Yemen (7O). Amateur Radio is prohibited in all three nations and no licenses are available as such. Their concern relates to "security considerations." They often feel that unrestrained radio traffic will compromise their national security or stability. More recently, the government of Yemen has also expressed concern about having to pay telecommunications fees to the ITU if it allows international communication to take place from its territory.

These three countries are the obsessions of the DX community, but others such as Afghanistan (YA) and the Indian islands (VU4/VU7) gain rarity with the passage of time. Not too long ago some of the more desperate DXers suggested that these "rare ones" should be removed from the list since future operations seem unlikely. I believe the

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howsdx@dailydx.com

underlying reason for these requests is that some seasoned DXCC participants thought that the top of the Honor Roll was something that could be reached within a reasonably short time—preferably as short as possible. DXers can become very impatient.

DXCC Reflects the Real World

There is a relationship between DXCC and the real world. The DX Century Club program was never intended to be static. Rather, it is a dynamic reflection of the world as it is. The world is an everlasting joy, and so is DXCC. National borders keep changing. (What was once Yugoslavia is now five DXCC counters.) Wars come and go, it seems that the number of conflicts at any given time keeps growing. DXCC chronicles the shifting nature of the human world itself.

The DXCC "score" will never be complete. What you have today may be very well be gone tomorrow; missing a QSO with the next DXpedition could suddenly find you one more down the list. That's part of the excitement of the DX hunt—you need to remain alert and be ready for events as they unfold. As you read these words there are enterprising DXers preparing slots for Kosovo and East Timor (as soon as these "hot spots" cool down!).

Missionary DXpeditioning

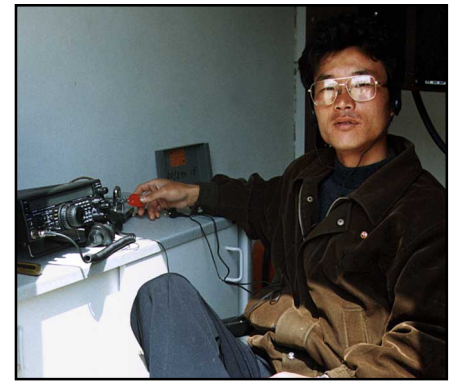
Rare countries often become available thanks to "missionary DXpeditioning." Activating the rarest of the rare poses a different challenge. Each case is unique and requires many visits and frequent communication to develop close relationships. Innovation is required, with an approach in which Amateur Radio forms only a part of the overall package while still fitting into the context of the services the DXer can offer.

Dealing with a government bureaucracy can be rather complicated, especially when security is a prime consideration. The main issues are usually matters of trust. A government has every right to ask why it should allow a DXpedition to invade its sovereign territory without receiving some benefit in return. Be it a service rendered to their society, or an activity promoting their country in a positive light, both are consistent with the spirit of Amateur Radio.

After serious efforts spanning eight years, including many visits and discussions with officials in North Korea, we were finally permitted to operate there briefly. A few P5 QSOs were made, not nearly enough to please the overall DX audience, of course. After our operation it was obvious that a number of North Korean officials were impressed with the potential benefits that Amateur Radio can provide. There were also 252 happy DXers worldwide who realized the pleasure of working one of the rarest of the rare.

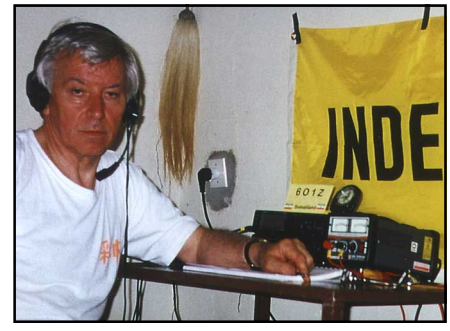
Regardless of how long it takes for DXpeditions to break the ice in rare ones such as North Korea, I remain convinced that each country on the list will eventually be available to those who deserve, as time goes by. DX is as dynamic as life, and that is why the journey is an eternal joy for those with long years in DXing who belong to the brotherhood of those who hunt.

P51BH signals emanated from this structure overlooking the city of Rajin. It housed a telecom cellular base station soon to serve the city below. Cables were run up a 120-foot tower.



Our North Korean project will be complete only when this gentleman gets on the air for the many who deserve.

The Minister of Telecommunication for Somaliland



Franz, DJ9ZB, handled all the SSB pileups as 6O1Z.

SOMALILAND

By Baldur Drobnica, DJ6SI

Somaliland? I've always wondered what it is and where it is located. After an extensive exploration on the Web, I came up with the idea of mounting a DXpedition to Somaliland. I made contact with some of my friends who finally placed me in touch with the Somaliland ambassador to Germany. To our pleasant surprise, he was enthusiastic about the possibility of an Amateur Radio operation from Somaliland. Soon thereafter Franz, DJ9ZB and I received our licenses via fax. Franz would be 6O1Z and I would be 6O0X. Weeks later we boarded a flight that took us to Hargeisa, the capital of Somaliland, by way of Paris, Dubai and Berbera.

Upon our arrival at the airport the General Director of the Ministry of Telecommunications picked us up and took us to the government hotel, a former British club. With special permission from the Ministry of Interior I was able to install an FD4 Windom antenna on a 90-foot tower. The tower was owned by the local police and was adjacent to our hotel. In the meantime Franz assembled an R-6000 vertical antenna and attached it to a water pipe 6 feet above the ground. For station equipment we used Yaesu FT-890ATC and FT-900ATC transceivers and a Daiwa power supply.

Hargeisa has no central power so we had to depend on an old German AEG generator, which only ran from 1800 to 2400 local time. In order to operate during other hours we had to pay a $4 hourly fee. Within six and a half days Franz made 8000 QSOs on SSB while I also made 8000 QSOs on CW. On May 18, after the operation closed, we celebrated Somaliland's Independence Day with the Minister of Telecommunications, the Minister of Information and the General Manager of the National Bank.

Prior to 1991 Somaliland was a British Protectorate known as British Somalia (VQ6). In 1960 the state of Somaliland was founded. About the same time Italian Somalia (I5) also became independent and the two merged to become Somalia on July 1, 1960. A civil war broke out between some of the clans in the former Italian Somalia, which caused the former British portion of the country to separate and declare independence on May 18, 1991 as the Republic of Somaliland. Somaliland has an elected president, parliament, its own currency (the Somaliland Schilling), passport, stamps, army, police and so on.

Six rival clans are at war over the remaining territory. At this time there is no single government in control over the former "Greater Somalia."

WRAP UP

That's all for this month. Keep those letters and pictures coming. Thanks this month go to DJ6SI, DJ9ZB, DL1YFF and OH2BH. Keep your ears in your headphones because you never know who will be on the other side—and from where. To those of you in the United States, I hope each of you has a good Thanksgiving. Until next month, see you in the pileups!—*Bernie, W3UR*

The World Above 50 MHz

*Emil Pocock, W3EP**

Scatter Your Way to Six-Meter DX

Six-meter DX during the peak of the solar cycle usually brings to mind conventional refraction from the F layer, much like most ionospheric communication on the lower frequencies. For such contacts to take place, the maximum usable frequency (MUF) for each refractive hop must be at least as high as the operating frequency. That is a rare occurrence at 50 MHz, especially at higher latitudes, even at the peak of the solar cycle. This makes some high-latitude paths, such as Kansas to Europe or New England to Japan, much rarer than contacts that cross only lower latitudes adjacent to the equator.

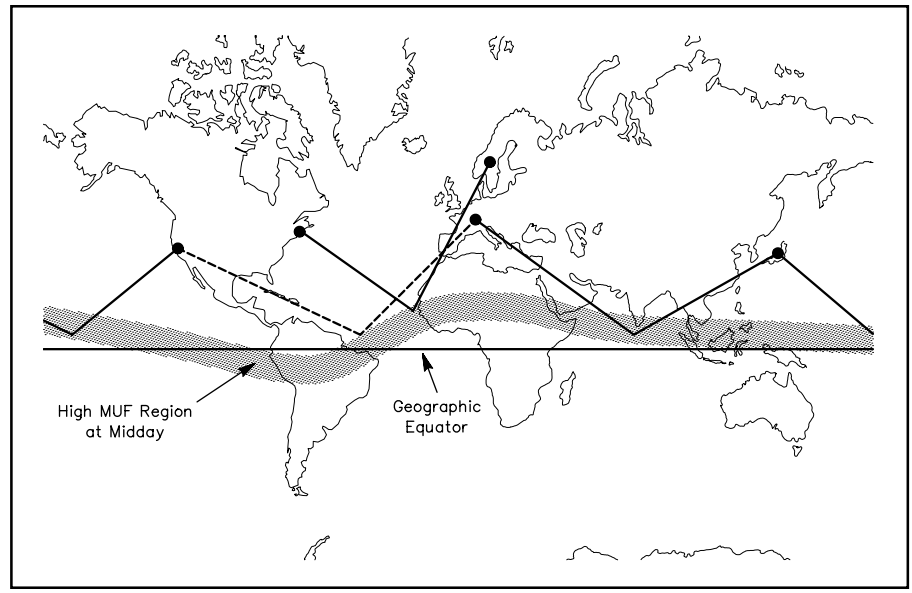


Figure 1—Surmised paths of reported 50 MHz scatter contacts (solid lines) and possible path (dotted line) during the winter. The peak times for F-layer side scatter seem to be late morning to noon, local time, at path midpoints. The responsible scattering region in each case corresponds to a high-MUF area that forms in the F layer at midday and tracks westward with the sun along a band just north of the geomagnetic equator.

Backscatter

There are other ways to make DX contacts that are not commonly available via conventional F-layer refraction. Backscatter is one of those modes. The usual explanation of backscatter involves signals that take one conventional hop and are then scattered in many directions by the turbulent surface of a distant ocean. A small portion of the scattered signal returns toward the transmitter. Two stations 100 to 2000 km apart, with both antennas pointing in the general direction of the scattering area, may hear each other via scattered signals, although the direct path is too short for a direct single-hop contact.

Backscatter is commonly observed on 50 MHz (and 28 MHz) when the MUF is just above the operating frequency. Backscatter signals are usually much weaker than those arriving at the same time via conventional means. Backscatter signals often exhibit considerable multipath distortion, sometimes described as a slight echo or hollow sound. Antennas generally must be pointed south of the direct path and toward the area of highest MUF for the most effective use of backscatter.

At other times, backscatter signals are present when the MUF within single-hop range is apparently lower than the operating frequency. Six-meter stations along the East Coast, for example, often use such backscatter as an indication that the MUF is close to 50 MHz and the band is about to open on direct paths. In such cases, the strongest backscatter signals come from due east or even south of east. It may be that a actual F-layer path is open to Africa, but the lack of stations during the previous cycle did not reveal this. It is also possible that such signals are scattered directly from the high-density F-layer that forms off Africa's west coast by noon local time, rather than by the ocean or the Earth.

Whatever the precise mechanisms, backscatter is useful for filling in contacts at distances less than a full hop, which is normally at least 3000 km at 50 MHz. It is difficult for much of the US to work into the Caribbean via a single F-layer hop, for example, but it is possible via backscatter. Many East Coast stations worked Clipperton in the Pacific Ocean during the last cycle by similar means. Point your antennas somewhat south of expected direct paths to listen for backscatter signals. Once the band is clearly open, continue to look for weak and oddly distorted backscatter signals also while pointed generally south.

This Month

November 17-18	Leonid meteor shower peaks
November 21	Good EME conditions
November 27-28	ARRL EME Contest
November 28	Excellent EME conditions

Sidescatter

Six-meter operators also commonly observe a somewhat different form of scatter that makes even much longer distances possible. Stations separated by distances greater than normal single-hop range at 50 MHz (3000 to 5000 km) can sometimes make contact via skewed paths. Signals are generally much weaker than those via backscatter and usually have a fluttery multipath-like sound. Stations running substantially more than 100 W with at least five-element Yagis have the best chances of success via this mode.

A typical skewed sidescatter path is East Coast to Europe, via the west coast of Africa. The first time I worked Scandinavia from Connecticut was via such a sidescatter path. On the morning of November 11, 1989, I was beaming due east, expecting the first contacts of the day from Africa. Sure enough, I did start the day with an easy contact: 6W1/F6CBC in Senegal at 1214 for a new country. The very next station in the log was LA3EQ, followed quickly by SM7BAE, OH2TI (all new countries as well) and half a dozen other northern Europeans. The fluttery European signals peaked at 519 to 539 with a beam heading of 80°, 30° south of the direct heading. The Scandinavians reported their antennas were pointed nearly due south. When we tried

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 860-642-4347, or fax 860-594-0259 or e-mail w3ep@arrl.org.

the direct path, signals disappeared. Within an hour, the band opened directly to Western Europe with very loud signals—but not as far north as Norway, Sweden or Finland.

The distance from the western African coast to New England is about 6000 km, coincidentally, about the same as the distance to Scandinavia. This is somewhat longer than one conventional hop near the MUF, and it suggests that scattering took place from a common region off the coast of western Africa, perhaps in the ionosphere itself. The F layer is most densely ionized over western Africa in late morning and consequently the MUF reaches its highest levels in that region. See Figure 1.

This was not an isolated event. Those in the Northeast experienced at least half a dozen similar openings during Cycle 22. The point is that the MUF was well below 50 MHz to northern Europe via the shorter, direct path, but a scatter path via western Africa was available. Signals from northern Europe were weak and easily overlooked, but they were there. Similar side-scatter contacts have been reported from California to Japan and the Pacific in early afternoon Pacific Time. In those cases, the US stations beamed west or southwest, while the Japanese beamed south and southeast.

The direct path between Japan and Europe traverses the auroral zone and rarely opens on 50 MHz, yet there is another way to make such contacts, via an even more remarkable sidescatter path. Hatsuo Yoshida, JA1VOK, relates that on occasion, when Japanese and European stations are beamed toward a common region in the Indian Ocean, very weak scatter contacts are possible between well-equipped stations. The Indian Ocean is about 7500 km from both Western Europe and central Japan, suggesting that it took two hops for both Europeans and Japanese to get into another high MUF scattering region. Perhaps that accounts for the unusually weak signals JA1VOK reported.

Other Possibilities

These examples of long-distance side scatter are not isolated events and are probably more common than so far observed. They also suggest that analogous paths in other parts of the world might be possible. The mid-Atlantic Ocean at around 20° N latitude, where the high MUF region forms after 1400, might also provide the necessary scattering region for contacts between the US West Coast and Europe. The distance from this hypothetical scattering region to both Europe and California is about 7500 km, or the same as the distances in the Europe-to-Japan case.

Other sidescatter paths might be found in the Northern Hemisphere. The best chances are for stations beaming south of the direct path around noon, local time, at path midpoint. Signals will be weak and fluttery, making CW the natural choice. Similar paths might exist in the Southern Hemisphere, in which case beam headings will be northerly. This is a relatively unusual phenomenon at 50 MHz, although 10-meter operators have reported similar conditions, when the MUF is around 28 MHz, for years. So please send me reports of any unusual scatter paths observed during this coming cycle, whether at 28 or 50 MHz. Give the usual particulars of date, time, stations and locations, signal strength and quality, and any other related observations.

What can you do on 2 meters with two 16-element Yagis in a small backyard? Joop Mutter, PA0JMV, has worked all 50 US states and just completed contacts with 100 DXCC countries on 144 MHz using this array and less than 1 kW. Note that azimuth and elevation are both controlled by *hand*—what could be simpler? Joop worked all 50 states and 36 of his countries via EME, mostly with well-timed contacts when the Moon was near the horizon. Well done!

ON THE BANDS

"The Perseids, which is always a highlight of August, was very poor this year," according to Larry Lambert, N0LL (EM09), who made just four contacts on 2 meters. Other reports were equally discouraging. Perhaps to make up for the poor meteor showing, tropospheric ducting was good across much of the eastern half of the country for many days running in August. Sporadic E declined precipitously during the month, with no more than 10 days of activity anywhere across the US and Canada. Six-meter DX also entered an expected lull between the summer sporadic-E season, the expected rise of transequatorial propagation in September/October and true F-layer DX by November. Dates and times are UTC.

Tropospheric Ducting

Excellent tropospheric ducting conditions affected 144 MHz through 10 GHz across the eastern half of the country for 10 days in August. Signals were often quite strong, allowing even modest stations to make some long-haul contacts, but the typical best distances were only in the 1000 to 1600-km range, or less than 1000 miles.

Jason Wilborn, KG4BMH (EM76), reported good 2-meter conditions on the evening of August 1-2, when he worked a handful of stations in Missouri, Iowa and Nebraska. His longest contact was with K0HA (EN10). On August 10, Jason was again working 2-meter DX just after 0000, with stations in Illinois, Iowa and Wisconsin. K9AKS (EN41) and K9YR (EN52) were his long catches that evening. Jeff Berman, K9YR, also worked KU4WW (EM54) in Alabama and AG4V (EM55) in Tennessee that evening.

The best run of days spanned August 14 through 18, when stations from northern Texas to Minnesota and eastward to New England found many of the VHF and UHF bands open for DX. Dick Hart, K0MQS (EN31) in Iowa, made more than 100 2-meter contacts in 54 grids on August 16. Dick worked nearly 1200 km southeast to Alabama and 1600 km due east to Long Island, New York. Joel Harrison, W5ZN (EM45) in Arkansas, made a series of notable 1030-km contacts with WA8WZG (EN81) in Ohio on all bands from 1.3 to 10 GHz on the same day. The distance is among the longest ever recorded on 10 GHz anywhere across the continent. Bob Leiper, W1COT (FN31), near the eastern limits of the openings in Connecticut, worked throughout Ohio, Indiana, Michigan and Illinois on 144 MHz, as far westward as N0DY (EN42) in Iowa. His longest contacts during the August 16-17 period were over a 1600-km path to W0DQY (EM48) in Missouri on both 144 and 432 MHz.

Terry Greenwood, VE3TMG (EN82) in southern Ontario, also worked as far westward and southwestward as Iowa (EN31), Missouri (EM39) and Tennessee (EM55) on 144 MHz. On 432 MHz, Terry worked westward to Illinois (EN40), Wisconsin (EN52) and Missouri (EM48) with just 30 W and a single 19-element Yagi. Dan Pruski, KA3SDP (FN00), also had a great time working throughout the Midwest on 144, 222 and 432 MHz from western Pennsylvania. Dan runs no more than about 100 W and single Yagis on each band, but managed 2-meter contacts southwestward as far as K5UR and N5FAC (both EM35) in Arkansas and northeastward to W1AIM (FN34) in Vermont on all three bands. Northern New England and adjacent Quebec rarely experience good ducting conditions, so these were some notable contacts.

The Northeast was favored again several days later. Jimmy Howard, VE2JWH (FN35), found the bands open on the evening of August 23-24 into the Midwest. On 144 MHz, he worked westward to Indiana and Illinois as far as K0WR (EM49) in Missouri. He found several VE3s on 222 MHz, and added Michigan and Illinois to his 432 tally.

Perseids Meteor Shower

The 1999 Perseids was the poorest in many years, judging by the many discouraged reporters. "Terrible is the only way to describe the meteors," in the words of Paul Kelley, N1BUG (FN55), who made no contacts on 144 MHz and made just one schedule on 222 MHz. Sam Whitley, K5SW (EM25), who usually makes 40 or so random contacts on 144 MHz, came away this year with just four, "the poorest in all my years since 1965." Bob Kocisko, K6PF (DM13), made only 1 of his 13 2-meter schedules, although most of his attempts were over 2000 km distances. Indeed, few schedules were completed by anyone, and the number of random QSOs on 144 MHz was meager in comparison to previous years.

Despite the generally sparse returns, there were some highlights. Holly Thompson, N0QJM (EN13), worked W1AIM (FN34) in Vermont for her 48th state on 144 MHz without use of EME. Welcome to that exclusive club of only about a dozen stations! The number of operators trying

222 MHz was also heartening. W7XU/0 spent 28 hours, mostly on 222 MHz schedules, but he made only two QSOs on that band for his efforts. John Fridenstine, W8PAT (EN81), completed with K0GU (DN70) over a 1900-km path, and K0GU made only one other of his ten 222-MHz schedules, that was with K7ND (CN87).

Six-Meter DX

The transatlantic sporadic-E season ended in late July, but US stations worked into Argentina and Uruguay on at least two days via transequatorial field-aligned irregularities (TE) or a TE-to-sporadic-E link. Nestor Zucchi, LW5EJU, worked more than 12 US stations on August 14, from 2125 to 2215. Most of the contacts were with W4s, but his log included N2VBK (FN02, who also found LW4DIR), K8MFO (EN90) and KC7IJ (DN44) in Idaho. On the 29th at about the same time, John Butrovich, W5UWB (EL17) in southern Texas, worked three Argentines, including LU6YAR (FF50), and three Uruguayans.

Europeans continued to work South Africa throughout the month, as they have most of the summer, probably via TE during the late afternoons. Prominent in their logs are ZS, V5, 9J, Z2, 5H and TZ stations. FR5DN (Reunion Island) also made it to Europe for the first time this year. New stations among the Europeans were ZA/N7BHC, who will be operating from Albania for at least the next 18 months, and C31HK, from the relatively rare country of Andorra.

Europeans do seem to have been getting the best of 6-meter DX so far this year. In addition to working more than 50 countries across the continent, they have been able to work into Africa, the Middle East, Asia and South America. Neil Carr, G0JHC, heard or worked 92 countries between mid-May and mid-July alone, including three new ones to boost his DXCC total to 145. His new ones were C6AGN, VP2E/W6JKV and A61AH (the first 6-meter QSO between England and the United Arab Emirates).

Arctic Auroral E

Arliss Thompson, W7XU/0 (EN13), found some auroral-E activity to the Northwest Territories and Alaska during the month. On August 19 after 0500, he worked VE8JL (DP22) and KL7NO (BP44) with good 57 signals. The distance to BP54 is nearly 4000 km. Arliss also heard the usual VE4 and VE6 beacons. On the 23rd after 0245, Arliss again found VE8JL and KL7NO. Both he and K0GU (DN70) in Colorado also heard VE8BY/b (FP53) weakly, nearly 3500 km from DN70.

Microwaves

144-GHz Distance Extended

After several months of preparation, Will Jensby, W0EOM, and Bob Johnson, KF6KVG, twice extended their 144-GHz distances to set new North American marks for the band. On August 12, the pair made a 5.4-km contact near Stanford, California, using 4× Hughes diode multipliers to get to 144 GHz on transmit. The receivers were based on Hughes harmonic mixers, previously used on 120 GHz, on loan from the University of California-Los Angles Microwave Engineering Laboratory. Their antennas were 9-inch Cassegrain fed dishes. Seem small? The dishes are actually 100 λ in diameter!

Several days later, on August 18, the pair repeated their earlier contact. Signals were at least 8 dB out of the noise, so they decided to move further apart. They then completed over an 11.7-km path, which Will believes is about the limit for the current equipment. This sets the new North American two-way record for the band. Congratulations on some pioneering work.

Three ATV Distance Marks Set in Europe

Michel Vonlanthen, HB9AFO, announced that three microwave amateur television (ATV) records were set in Europe this past summer. On 5.7 GHz, TK2SHF (JN42hf) and F/HB9RXV/p (JN33kq) recorded a one-way reception on June 15 over a distance of 216 km. At 10 GHz, EA/F1AAM/p (IM98xu) and I5/HB9AFO/p had a two-way 1320-km contact on June 17. Both stations used 12 W and 1-meter dishes. Finally at 47 GHz, HB9DLH and F1JSR got a picture one way over a 188-km path on July 30. More details are available on the Swiss ATV Web site, **http://www.cmo.ch/swisstv**.

New Microwave Club

The Roadrunners Microwave Group was organized this past summer in South Texas with 15 initial members. Their goal is to promote activity on the bands above 420 MHz. For further information, contact Tom Haddon, K5VH, President, at **k5vh@texas.net** or call 512-858-5351. Membership is not restricted by geography. This makes at least half a dozen regional microwave organizations around the country—great ways to encourage activity on the higher bands.

VHF/UHF/MICROWAVE NEWS

Two-Meter Tropospheric Ducting Record

It was inevitable that the world 144-MHz tropospheric ducting distance record of 4333 km, which has stood for four years, would be broken. How it was broken is a bit of a surprise. On August 21 at 0740, Clint Walker, W1LP/mm and captain of the *Marine Chemist Global*, completed a 4754-km contact with KH6HME (BK29go). The ship was off the coast of Mexico in DL51ce at the time, more than 100 km south of the southern end of Baja California. To the southwest were the islands of Revilla Gigedo (XF4).

Clint had been hearing the 144- and 432-MHz Hawaiian beacons off and on for more than 36 hours prior to the contact and called on CW nearly all day before contact was made. SSB signals were 52. An attempt on 432 MHz was not successful, although the beacon was making it nearly to the Mexican coast. W1LP/mm used a single nine-element Yagi and 200 W. KH6HME runs just 60 W to two seven-element Yagis. Congratulations to both operators for some alert and persistent operating.

Several Southern California stations hooked up with W1LP/mm from DL34 the day before on 144 MHz with exceedingly strong signals. The distances were in the more modest 1000- to 1300-km range, but undoubtedly new grids for the grid-starved California VHF crowd.

Will the Leonids Storm?

The Leonids meteor shower put on quite an impressive display of bright fireballs and long-duration radio bursts on the VHF bands last November 17. (See the summary in this column for February 1999.) This year is the best possibility for a minor storm, but unfortunately, North America may not be the prime position to observe the predicted display.

In 1998, the Earth encountered a band of large meteors about 12 hours prior to crossing the orbital plane of the Leonids stream. Meteor counts during this flurry reached about 250 per hour for an hour or two. The rate during the brief passage through the orbital plane itself was a more modest 100 per hour. This year, experts do not expect another outburst of large meteors, nor do they expect a great storm like those of 1833 or 1966, when the Earth crossed much closer to the center of the Leonids stream.

The consensus is that the 1999 Leonids may reach 1000 to 1500 per hour over a brief 90-minute period on November 18 around 0200Z, when the Earth crosses the Leonids orbital plane. This puts Europe and Africa in the prime positions to observe a storm. Unfortunately, the Leonids will not rise over North America until 2:00 AM Eastern Time, or about five hours later for the East Coast. Leonid rates will probably remain high, perhaps higher than any meteor shower for the past 30 years, but it is unlikely that Americans will experience the storm.

The best strategy is to start listening (or watching) after 2:00 AM local time on November 18, when the Leonids rise above the eastern horizon. There is little reason to look for Leonids earlier, because even if there is a massive display over Europe, the Leonids radiant will still be below the horizon from North America. Stick with it until 11:00 AM local time, when the Leonids set in the west. Visual observers have a much narrower four-hour or so window of opportunity, from 2:00 AM until dawn.

More detailed discussions can be found on the NASA Space Science News Web page, **http://science.nasa.gov/newhome/headlines/ast22jun99_1.htm**.

From the Clubs

At its July 17 meeting, 21 members of the North East Weak Signal Group (NEWS) voted unanimously to support the Central States VHF Society efforts to protect 144.1-144.3, 222.0-222.15 and 431.8-432.3 MHz from FM and other modes incompatible with weak-signal SSB and CW activities.

Congratulations to Dick Knadle, K2RIW, who received the Tom Kirby Award at the 25th annual Eastern VHF/UHF Conference, held in Enfield, Connecticut, on August 21.

The Central States VHF Society is again sponsoring the annual States Above 50 MHz Awards, which runs from July 1, 1999 to June 30, 2000. Only members are eligible for the first, second, and third place plaques. Details can be found at **http://www.csvhfs.org**.

The NEWS is sponsoring a Millennial Cumulative Microwave Contest for the bands at 902 MHz and higher. The contest runs for the entire year 2000. A "gaudy trophy" will be presented to the winner and plaques to the runners-up. Rules are complicated, so check the Society's Web page at **http://uhavax.hartford.edu/newsvhf**.

QST

Strays

HAM HISTORY IN BERMUDA

◊ I am researching the history of Amateur Radio in Bermuda, including an up-to-date listing of all former VP9 licensees. Since the end of World War II scores of Americans have lived on the island, and many have held VP9 licenses. I am seeking old logbooks, *Callbooks*, material realating to the Radio Society of Bermuda, QSL cards, copies of licenses, photographs, articles, correspondence, and any other memorabilia that may identify old VP9 licensees. Personal recollections or anecdotes would also be helpful. Contact James W. Carroll, Jr, VP9NA, 219 Ferndale Rd, Aberdeen, MD 21001-2402; **jcarroll@ibl.bm**.

QST congratulates...

◊...ARRL Volunteer Counsel member Jim Vano, KB0MZF, of Overland Park, Kansas. On July 23 Jim accepted an appointment to be a District Magistrate Judge for the State of Kansas.

Next Stray

Coming Conventions

*Edited by **Gail Iannone** • Convention Program Manager*

ALABAMA STATE CONVENTION

November 13, 1999, Montgomery

The Alabama State Convention (22nd Annual Hamfest and Computer Show), sponsored by the Montgomery ARC, will be held at the Garrett Coliseum at the South Alabama State Fairgrounds on Federal Dr, in the northeastern section of historic Montgomery. Doors are open for setup Friday 3 to 8 PM, Saturday 6 to 8 AM; public 9 AM to 3 PM. Features include indoor flea market (reservations required to assure table), tailgating ($5 per vehicle space), VE sessions (8 AM, bring original and copy of your current license, picture ID, and $4), forums, free parking, refreshments. Talk-in on 146.84, 147.18, 444.5, 146.92 (ragchew). Admission is $5, under 15 free. Tables are $12 in advance (by Nov 9, includes 1 admission), $15 at the door. Write to Hamfest Committee, 2141 Edinburgh Dr, Montgomery, AL 36116-1313 or phone Phil at 334-272-7980 (after 5 PM CST); **wb4ozn@worldnet.att.net**; or contact Arthur Price, KF4ILP, 1305 Dunbarton Rd, Montgomery, AL 36117-4404, 334-272-2681, **kf4ilp.arthur@worldnet.att.net**; **http://jschool.troyst.edu/~w4ap/**.

INDIANA STATE CONVENTION

November 13-14, 1999, Fort Wayne

The Indiana State Convention (27th 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, 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. 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 Doug Jones, N9NNT, Box 10342, Fort Wayne, IN 46851, 219-484-3317 or 219-484-1314; **djones2233@aol.com**; **http://www.acarts.com**.

1999
October 15-17
Pacific Division, Concord, CA*

***See October *QST* for details.**

FLORIDA STATE CONVENTION

November 20-21, 1999, Tampa

The Florida State Convention (24th Annual Suncoast Amateur Radio and Computer Convention), sponsored by the Florida Gulf Coast AR Council, will be held at the Florida State Fairgrounds, Expo Hall, located on US Hwy 301 between I-4 and M. L. King Blvd, on the E side of Tampa. Doors are open for setup Friday 3-8 PM, Saturday 6-9 AM; public Saturday 9 AM to 5 PM, Sunday 9 AM to 3 PM. Features include commerical dealers (Doug Williams, 2544 Frisco Dr, Clearwater, FL 33761, 727-725-3345; **djw@gte.net** or **wb2lez@arrl.net**), tailgating ($10 per space for the entire weekend), forums (ARRL, NTS, ARES, SKYWARN), featured guest speaker Rosalie White, WA1STO (ARRL Field and Educational Services Department Manager), VE sessions (on site Saturday 1 PM, Sunday 9:30 AM promptly; bring original license and CSCE certificate and a copy of each, 2 forms of ID, 1 with photo, and $6.45), refreshments. Talk-in on 147.165, 147.105. 147.555. Admission is $5 in advance, $7 at the door, under 12 free. Tables are $25 for the entire weekend. Make checks payable to FGCARC and mail with No 10 SASE to 1556 56th Ave N, St Petersburg, FL 33703. Contact Jean Endicott, KC4KZU, 727-525-5178; **swaps@fgcarc.org**; **http://www.fgcarc.org**.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

Hamfest Calendar

*Edited by **Gail Iannone** • Convention Program Manager*

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 13, Alabama State Convention. See "Coming Conventions."

†**Colorado (Golden)—Nov 20,** 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 (Okeechobee)—Dec 4,** 8 AM to 4 PM. *Spr:* Okeechobee ARC. Agricultural Grounds, Rte 441 N, across from the school. *TI:* 147.195. *Adm:* advance $4, door $5. Bill Gastle, N2BXH, c/o OARC, Box 368, Okeechobee, FL 34974-0368; 941-467-9974; **wgastle@okeechobee.com**.

†ARRL Hamfest

†**Florida (Port St Lucie)—Nov 13,** 8 AM to 2 PM. *Spr:* Port St Lucie ARA. St Andrew Lutheran Church, 295 NW Prima Vista Blvd; 2 miles E from Exit 63C (I-95), 2 miles W from US 1. Tailgating ($2), vendors ($5), free parking, refreshments. *TI:* 146.955. *Adm:* $2. Bill Sullivan, WA2TSM, 1238 SE Naples Lane, Port St Lucie, FL 34983-3126; 561-343-0557; **http://www.qsl.net/pslara**.

Florida (Tampa)—Nov 20-21, Florida State Convention. See "Coming Conventions."

†**Georgia (Claxton)—Dec 4;** set up Friday 6-9 PM, Saturday 7 AM; public 8 AM to 2 PM. *Spr:* Claxton ARES. Veterans Community Center, W of downtown Claxton on Hwy 280 W. Flea market, tailgating ($5), electronics, computers, ARES forum (11 AM), VE sessions (register 9 AM, test 9:30 AM; all classes, walk-ins accepted), overnight parking available with electricity, refreshments. *TI:* 147.075. *Adm:* $5, under 12 free. Tables: $5. John Perkins, W4HYU, c/o CARES, Box 456, Claxton, GA 30417; 912-739-4589; **w4hyu@juno.com**.

†**Illinois (Belleville)—Nov 6;** set up 7-8 AM; public 8 AM to 2 PM. *Spr:* Scott Composite ARS. Belleville Area College Main Campus, Carlyle Rd (Rte 161) and Green Mount Rd; I-64 E or W to 158 S to 161 W which turns to Carlyle Rd. Dealers, tailgating ($5), VE sessions (on site, must be preregistered), workshops (emergency communications and the missions of civil air patrol), refreshments. *TI:* 147.12. *Adm:* advance $3, door $4. Tables: $10. Howard "Skip" Mize, KA9VKE, 618-277-9767; **fiuinc@peaknet.net**.

†**Illinois (Litchfield)—Nov 14,** 5 PM. *Spr:* Central Illinois/St Louis Area ATV Club. Ariston Restaurant, 1/2 mile E of Exit 52 on I-55. Banquet, awards program. *TI:* 144.43. Scott Millick, K9SM, 907 Big Four Ave, Hillsboro, IL 62049; 217-532-3837; **smillick@cillnet.com**.

†**Indiana (Evansville)—Nov 27,** 8 AM to 2 PM. *Spr:* EARS. Vanderburgh 4-H Center, US Hwy 41 to Boonville-New Harmony Rd; just N of Evansville Airport. *TI:* 145.15 (107.2 Hz). *Adm:* $5. Tables: $8. Neil Rapp, WB9VPG, 1506 S Parker Dr, Evansville, IN 47714; 812-479-5741; **earsham@aol.com**; **http://members.aol.com/earsham**.

Indiana (Fort Wayne)—Nov 13-14, Indiana State Convention. See "Coming Conventions."

†**Indiana (Greenfield)—Dec 5,** 8 AM to 2 PM. *Spr:* Hancock ARC. Greenfield Central High School Pavilion, 810 N Broadway St; I-70 to Exit 104 (SR 9), S on SR 9, go through 3 lights, turn right, at next stop sign turn left on Broadway, go past next stop sign, school on right. VE sessions. *TI:* 145.33, 444.725. *Adm:* $5. Tables: $12. Tom Donaldson, N9LFU, 6214 N 400 E, Greenfield, IN 46140; 317-326-3168; **tomd@freewwweb.com**; **http://www.iei.net/~n9hqo**.

†**Louisiana (Minden)—Dec 4,** 8 AM to 3 PM. *Spr:* Minden ARA. Minden Civic Center, Main St in downtown Minden. VE sessions. *TI:* 147.3. *Adm:* advance $3, door $4. Lowell "Dusty" Collins, KB5WFE, 231 Garrett Dr, Dubberly, LA 71024, 318-371-0636, **dusty1@microgear.net; http://www.microgear.net/gwinford/mara.htm.**

†**Louisiana (Monroe)—Nov 5-6;** set up Friday 2-5 PM; public Friday 5-7 PM (social cookout on site), Saturday 8 AM to 3:30 PM. *Spr:* Twin City Ham Club. Barak Shrine Temple, 6620 Frontage Rd; from I-20 take Exit 120 (Garrett Rd), turn S on Garrett Rd to the first traffic light S of I-20, turn left at light onto Frontage Rd, Shrine Temple is about 1 mile W along Frontage Rd on the right. Dealers, limited number of travel trailers/RV hookups available ($16 per night), VE sessions. *TI:* 146.85. *Adm:* advance $5 (includes Friday cookout), door $3. Tables: $10 (electricity $10 additional). Jim Rasch, K5JMR, 1901 Richard Dr, Monroe, LA 71201; 318-372-8164; **tchc@qsl.net**; **http://www.qsl.net/tchc**.

†**Massachusetts (Newtonville)—Nov 20;** sellers check in 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. Ham Radio and Electronics Auction, free parking (in municipal lot a block away on the other side of Walnut St on Austin St), refreshments. *TI:* 146.64. *Adm:* $2. Eliot Mayer, W1MJ, 24 Hamilton Rd, Belmont, MA 02478, 617-484-1089, **w1mj@amsat.org**; **http://ourworld.compuserve.com/homepages/emayer/auction.htm**.

†**Mississippi (Ocean Springs)—Nov 19-20;** Friday 5-9 PM, Saturday 8 AM to 2 PM. *Spr:* West Jackson County ARC. St Martin Community Center; take Exit 50, S from I-10, follow Hwy 609 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, $6.45), self-contained overnight RV parking, ample free parking. *TI:* 145.11. *Adm:* $2 per adult, $4 entire family. Tables: $5 (8-ft, advanced deposits are required for table reservations). Phil Hunsberger, W9NZ, 1207 Lancelot Ln, Ocean Springs, MS 39564, 228-872-1499; or Stan Hecker, N5SP, 228-875-0222.

New Hampshire (Manchester)—Nov 6. Paul Gifford, K1LL, 603-432-1538.

New Jersey (Fair Lawn)—Nov 26. John Garis, N2VKY, 201-444-0885. (Auction)

†**New Mexico (Socorro)—Nov 13,** 8 AM to 4 PM. *Sprs:* Socorro ARA, TARA, City of Socorro. NM Tech Gymnasium, Tech Campus. *TI:* 146.68 (100 Hz). *Adm:* Free. Tables: $5. Al Braun, AC5BX, 720 California St, Socorro, NM 87801; 505-835-3456; **ac5bx@juno.com**; **http://www.ees.nmt.edu/sara/homepage.html**.

†**New York (Farmingdale)—Nov 14;** set up 7 AM; public 9 AM to 4 PM. *Spr:* Radio Central ARC. Polytechnic University, Rte 110; Long Island Expressway (I-495) to Rte 110 (Exit 49) southbound, continue for 3 miles, College is located in front of Republic Airport on the E side. Vendors. *TI:* 145.15. *Adm:* $8, under 12 free accompanied by adult. Tables: $20 (8-ft, electricity $5 additional). Neil Heft, KC2KY, c/o RCARC, Box 680, Miller Place, NY 11764, 516-737-0019, **nheft@ibm.net**; or JoAnn Colletti, N2IME, 516-399-1877; **rcarc@rcarc.org**; **http://www.li.net/~n2mdq**.

†**New York (Patchouge)—Nov 28,** 9 AM to 2 PM. *Spr:* Mid Island ARC. Knights of Columbus, 9 Railroad Ave; LI Expressway to Exit 63 S (Ocean Ave, Rte 83), continue S to Main St, make right turn, take first left, parking on left. VE sessions (noon), free tune-up clinic. *TI:* 447.025 (91.5 Hz), 145.31 (118.8 Hz). *Adm:* $5. Tables: advance $15, door $20. Mike Grant, N2OX, 17 Whiskey Rd, Coram, NY 11727, 516-736-9126; **globalcm@erols.com**; **http://www.qsl.net/mid-islandarc/hamfest.html**.

†**North Carolina (Benson)—Nov 21**. *Spr:* Johnston ARS. American Legion Complex, US 301 N, near the intersection of I-95 and I-40. Indoor dealers, outside tailgating, VE sessions. *TI:* 147.27. *Adm:* advance $4, door $5. Tables: $8. Paul Dunn, KD4BJD, 101 Carolyn Dr, Benson, NC 27504; 919-894-3100; **http://www.jars.net**.

†**North Carolina (Hickory)—Oct 23,** 8 AM to 5 PM. *Sprs:* Catawba County RACES, Centralina ARC, Catawba Valley Community College. CVCC Campus/Gym, US Hwy 70 E; ½ mile S of Exit 126/I-40, turn left at stoplight, CVCC Campus is on right, across from Sam's and Walmart. Computer and AR dealers, SKYWARN seminar, VE sessions. *TI:* 145.17. *Adm:* advance $4, door $5. Tables: $5 (plus admission). Paul Deyo, N1PD, 1577 Fox Dairy Rd, Newton, NC 28658; 828-465-2345; **n1pd@twave.net**; **http://users.twave.net/carc**.

†**Ohio (Georgetown)—Nov 20,** 8 AM to 3 PM. *Spr:* Grant ARC. Adams and Brown Community Action Building, 200 S Green St. Handicapped accessible. *TI:* 146.73. *Adm:* $2. Tables: Free (first two). Dorothy Silman, KB8TQU, 502 Waynoka Dr, Sordinia, OH 45171, 937-446-2234, **huggee@bright.net**; or Gordon Neal, W8YGW, 513-379-1659, **w8ygw@juno.com**; **http://www.qsl.net/~n1djs**.

Oklahoma (Enid)—Nov 6. Tom Worth, N5LWT, 580-233-8473.

†**Pennsylvania (Carlisle)—Oct 31**, 8 AM to 3 PM. *Spr:* South Mountain Repeater Assn. Carlisle Fairgrounds, I-81, Exit 14, N on Hanover St, follow Fairgrounds signs to Gate 3; or PA Turnpike, Exit 16, Rte 11, S to Fairgrounds. Tailgating ($5, 7 AM), nearby camping, free parking. *TI:* 145.43. *Adm:* Free. Tables: $5. William Smyser, KA3LUT, c/o SMRA, Box 45, Mt Holly Springs, PA 17013, 717-605-2052; **smraham@aol.com**.

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

Edited by ***George Fremin III, K5TR****

Winston-Salem, NC: Forsyth Amateur Radio Club, W4NC, 1500 to 2200Z **Nov 6**, celebrating the sesquicentennial of City of Winston and Forsyth County, NC. 14.235 14.035 7.235 7.035. Certificate. Rick Cochran, WO8L, 121 Warbler Rd, Pfafftown, NC, 27040.

Whitefish Point, MI: Stu Rockafellow Amateur Radio Soceity, N8F, 1100Z **Nov 6** to 2100Z **Nov 7**, commemorating the sinking of the *Edmund Fitzgerald* (operating from the Great Lakes Shipwreck Museum). 7.270 14.270 28.370. Certificate. Ben Creech, K8LHR, 416 Sunset St, Plymouth, MI 48170.

Colorado Springs, CO: Rocky Mountain Navy Amateur Radio Club, K0USN, 1500 to 2400Z **Nov 11**, remembering America's veterans. 14.250 21.350 28.450. Certificate. RMNARC, 510 West Polk St, Colorado Springs, CO, 80907.

Albuquerque, NM: Albuquerque Amateur Radio Club, N5VA, 1600Z **Nov 11** to 0400Z **Nov12**, honoring all veterans on Veterans Day. 14.287 21.325 18.130 7.245. Certificate. V.A. Medical Center, 1501 San Pedro Dr, 117D, Albuquerque, NM, 87108.

Arlington Heights, IL: Armored Force Amateur Radio Net, KA9NLX, 1400Z **Nov 11** to 2000Z **Nov 14**, to remember all veterans of all wars including the Cold War. 7.030 7.283 14.325 21.375. Certificate. John Paskevicz, 1423 North Ridge Ave, Arlington Heights, IL, 60004.

Nutley, NJ: Robert D.Grant United Labor Amateur Radio Association, WA2VJA, 1200 to 2400Z **Nov 11**, "CQ Veterans Day" honoring the men and woman of our Armed Forces. 28.450 52.525. Certificate. RDGULARA, PO Box 716 Nutley, NJ 07110-0716.

Brownsville, TX: CHARRO ARC, W5CRC, 1500 to 2300Z **Nov 13**, to celebrate the return of the snowbirds to South Texas. 28.455 21.355 14.255 7.255. Certificate. CHARRO ARC, 3554 Boca Chica, Brownsville, TX, 78521.

Brainerd, MN: Brainerd Area Amateur Radio Club, W0UJ, 1400 to 2400Z **Nov 13**, celebrating the departure of the snowbirds from Central Minnesota. 28.455 21.355 14.255 50.130. Certificate. BAARC, Box 801, Brainerd, MN, 56401.

Edmond, OK: Edmond Amateur Radio Society, KC5ORP, 1400 to 2200Z **Nov 13**, celebrating Statehood Day from the state capitol building. 50.189 28.389 21.289 14.289. Certificate. Edmond Amateur Radio Society, PO Box 48, Edmond, OK, 73083.

Waimea, HI: Kauai Amateur Radio Club, KH6E, 1900Z **Nov 20** to 1600Z **Nov 21**, to celebrate the arrival of the HMS Bark *Endeavour* of the island of Kauai. 7.080 7.220 14.250 21.350 28.450. Certificate. Kauai Amateur Radio Club Special Event Station, 6605 Alahele St, Kapaa, HI, 96746.

Goodland, KS: National Weather Service, N0A, 0000 to 2400Z **Nov 27**, operating from the National Weather Service office. 7.110 14.285 21.340 28.440. Certificate. NWS Special Event, 920 Armory Rd, Goodland, KS 67735.

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to 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

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Johnson City, TX 78636
k5tr@arrl.org

At the Foundation

*Edited by **Mary E. Lau, N7IAL** • Secretary, ARRL Foundation Inc*

With Many Heartfelt Thanks!

As you're doing the last of outdoor chores and getting ready for cooler evenings of great DXing, you may be giving private thanks for the joy that ham radio has brought you through the years. A favorite sked or fun-filled sprint on a new-to-you mode reignites the excitement that hamming reliably offers. For many, the joy inspires a public affirmation of appreciation for a person or program integral to their enjoyment of the hobby. If you're feeling thankful, won't you consider adding your name to the "honor roll" for which *we're* most thankful?

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Program
Robert J. Howe, in loving memory of Robert Howe, N2IDR
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James V. Barlett, W5TMR

As received and acknowledged during the months of **March** through **August.**

Silent Keys

By Kathy Capodicasa, N1GZO

It is with deep regret that we record the passing of these amateurs:

W1ELR, Clifford J. Fleury, White River Junction, VT
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KA1ILR, Richard H. Burnham, Abington, MA
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W2ODN, Efrain Bestard, Melbourne Beach, FL
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W2OOY, Adelbert A. Gray, Corinth, NY
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N2TPH, Ida C. Voss, Plano, TX
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*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

75, 50 and 25 Years Ago

November 1924

◊ The cover photo shows the remarkable new "One Control Superheterodyne," with the cover article providing "Complete constructional details of the most important superheterodyne development of recent years." The editorial looks forward to "The Winter Season" and the DX contacts it will bring. Another editorial topic is the Third Washington Radio Conference, which had not yet taken place as the issue went to press. Now that amateurs have shown that the shorter wavelengths work as well as or better than the longer wavelengths, the editorial dryly observes, "But say, isn't it funny how the cupidity of commercial interests is always being attracted by amateur development?"

James McLaughlin presents the cover story, "The One-Control Superheterodyne." "Communication with New Zealand" reports that "6BCP and 6CGW shatter all DX records when they work Z4AA; former wins the A.R.R.L. boomerang"! The article "The 'Bowdoin' Returns" reports that the vessel's Arctic voyage is over, and that she and radio operator Don Mix, 1TS, are safely back home. Don writes about "My Radio Experiences in the Far North" in the companion article. James Turnbull discusses "Parallel Operation of Power Tubes." H. F. Mason, ex 7BK, describes "Anntennas [sic] for Short Waves." A compilation of good transmitter circuits is presented in the article "Practical Short Wave Transmitters." A "Stray" notes that a recent newspaper item reported, "An SOS call from some ship … was picked up … tonight, but the wavelengths were so long that only fragments of it could be deciphered."

November 1949

◊ The cover photo shows W1HDQ's latest "secret weapon," a two-band antenna for 220 and 420 Mc. The antenna is described in Ed's "The World Above 50 Mc." column. The editorial discusses the need for getting "new blood" into Amateur Radio.

Oswald Villard, W6QYT, and Donald Weaver, W6VQL, tell about "The 'Selectoject," a variable-frequency audio filter, oscillator and rejection filter. M. E. Hiehle, W2SO, describes how to accomplish "Break-In with One Antenna." *QST*'s Don Mix, W1TS, addresses "Harmonic Reduction in a 500-Watt All-Band Rig." "The Regenerative Wavemeter," a dual-purpose tool for TVI reduction, is described by HQ's George Grammer, W1DF. Sam Harris, W8UKS, tells about "The 'City Slicker' Array for 144 Mc.", a stack of four folded dipoles for hams with little antenna space. By Goodman, W1DX, describes "A 75- and 20-Meter Single Sideband Exciter."

John DuBois, W3BXE, tells about visiting St Pierre in "The Story of FP8AA," the first DXpedition to that island. John describes operating from the hotel's wine cellar (to be near the hotel's only ac source, an inverter that usually produced about 80 V output), using eight cases of French Champagne as the operating table. The column "On the Air with Single Sideband" reports the first amateur two-way transatlantic SSB contact between W2TGO and DL4PA, a US Army major [in those days, DL4 call signs indicated US military personnel in West Germany—Ed.].

November 1974

◊ The cover photo shows the geometric patterns created by looking through VE4AS's delta-loop OSCAR antenna for 432 and 144 MHz. The editorial, "*QST* Advertising," discusses the League's policy on accepting advertising for *QST*, a policy designed to help League members.

Allan Simpson, VE4AS, tells about "A Two-Band Delta-Loop Array for OSCAR…On One Boom," the antenna pictured on the cover. Bert Kelley, K4EEU, describes building "Digital Clocks for the Amateur Station." In "More Basics on Solid-State Transmitter Design," *QST*'s Doug DeMaw, W1CER, describes his miniature 10-watt 160-meter rig. V. R. Frank, WB6KAP; R. B. Fenwick, WB6FDV; and O. G. Villard, W6QYT, discuss "Communicating at VHF via Artificial Radio Aurora." The artificial aurora used for the contacts was created by powerful ground-based HF Department of Defense transmitters. "Antenna Performance Measurement," by Dick Turrin, W2IMU, describes a methodology for accurate antenna measurements. "The Winceburg Incident" tells how hams provided communication following the tornado that devastated Winceburg, Arkansas. "The Kingman Reef DXpedition," by Robert Ferrero, K6AHV; Rusty Epps, W6OAT; Peter Grabosky, WB6OOL; and James Rafferty, WA9UCE (as told to John Troster, W6ISQ), describes "the first [DXpedition] in history to literally have been broadcast step-by-step by amateur radio." The story ends, as so many DXpedition stories do, with "What an adventure! Where to next?"—*Al Brogdon, W1AB* QST

Contest Corral

Edited by **George Fremin III, K5TR***

Feedback

In the **1998 ARRL 10-Meter Contest, K4NA** and **N1TM** should have listed as QRP instead of high power. **K3TJ** was incorrectly listed as low power instead of high power. The operator of **OT8T** should be listed as **DL2CC**. The call sign of **NQ7Q** in the WY section was reported incorrectly as NQ7R. An anomaly was detected in the log-checking program that affected several entries. **VR98BG's** score should be corrected to 705,808 points, 1419 QSOs, 124 multipliers, which would move him form fifth to third place in the CW Only High Power Top Ten. **N2ST** should show 86,432 points on 294 QSOs and 73 multipliers. **N5AW** should be credited with 242,816 points on 540 QSOs and 112 multipliers. **W5MN** submitted a check log for CW QSOs properly, but was credited with those QSOs during the log checking process. After removing those QSOs for scoring, **K5DX** moves into first place W/VE Phone Only Low Power, and W5MN drops to eighth place. Due to a coding discrepancy between summary sheets and the database, the following stations were listed as Single Operator instead of Multi-Operator stations: **KB5U, K2TW, W2GG, W3LJ, KD4HLV, NT4D, N5KB, K7BG, K7QQ, W9YYG, N0NI, K0KG, N0WE, VE3HG, F5POU, G8D, GW8GT, IK2ZVU, LT3C, and PY5FT**. This correction makes the following adjustments to the Top Ten Boxes: K5NZ moves into tenth place W/VE Mixed Mode High Power; N8BJQ moves into tenth place W/VE CW Only Low Power; **N0NI** moves into seventh place W/VE Multi-operator; **LU5VV** moves into tenth place DX Mixed Modem Low Power; **VK4EMM** moves into tenth place DX Mixed Mode High Power, and **LT3C** moves into fourth place DX Multi-operator. **WB8YYY's** score after correction should show 7,462 points with 61 QSOs and 41 multipliers in the MDC section.

In the **1999 ARRL RTTY Round Up**, **KG9X** should have been listed as low power instead of high power. The call sign of **W8EB** was listed as W6EB in the MI section. **K4GMH**, with a score of 128,649 on 1159 QSOs and 111 multipliers as Single Op High Power in the Virginia section, should finish in 8th place overall in that category. **W6JOX** was incorrectly listed in the SFL section. He should have been shown in the SF section.

In the **1999 ARRL International DX CW Contest WA8GHZ** submitted a log marked as a Single Band 160 Meter entry, which was actually an all band entry. This makes **K4TEA** the winner of the W/VE 160 Meter Single Band Category. **N3RS** should have been reported as a Multi-Two entry instead of a Multi-Multi. This makes them the second place finisher in that category. **K9SD** should be listed as a Multi-Single instead of a Multi-Multi, Illinois Section.

KB2UZB should have been listed in the **1999 ARRL January VHF Sweepstakes** from the ENY section with 16,875 points based on 353 QSOs and 45 multipliers.

W1AW Qualifying Runs are 10 PM EST Tuesday, November 9, and 7 PM EST Monday, November 22. The **West Coast Qualifying Run** will be at 9 PM PDT on Wednesday, November 3. Check the W1AW schedule for details.

November

6-8

ARRL November Sweepstakes, CW. See October *QST*, page 88.

Sixth Annual North American Collegiate ARC Championship, CW, 2100Z Nov 6 to 0300Z Nov 8 (phone is 2100Z Nov 20 to 0300Z Nov 22). 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: Robert Barron, PO Box 180703, Austin, TX 78718-0703; **ka5wss@tapr.org**; 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 6, 0600Z-1000Z and 1400Z-1800Z; Phone Nov 7 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 countries 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, 1999 to: Uwe Greggersen, DL8KCG, Hurst. 9, D-51645 Gummersbach, Germany; **http://www.iparc.com/Contests/contests.html**.

11

Fall All-Band VHF Sprint, sponsored by The Rochester VHF Group, 7 PM to 12 AM (local time) Nov 11, on all VHF/UHF bands. Single op all band. Exchange grid squares. Score 1 point/QSO on 50 and 144 MHz; 2 points/QSO on 222 and 432 MHz; 4 points/QSO on 902 and 1296 MHz; 8 points/QSO on 2304 MHz and above. Multipilers are 4-digit maidenhead grid squares. Final score is total QSO points × total grids. Awards. Send logs within three weeks after the contest to: Rochester VHF Group, PO Box 92122, Rochester, NY 14692; **vhfgroupers@greeceny.com**; **http://vhfgroup.rochesterny.org/**.

13-14

Worked All Europe Contest, RTTY, from 0000Z Nov 13 to 2400Z Nov 14. 80 40 20 15 10 meters. Single-op all band, Multi-op, 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 12 until 2300Z Nov 14. 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; multi ops 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. See **http://jzap.com/je1cka/jidx/** for more information. Electronic entries accepted. Awards. Send logs postmarked by Dec 31 to: JIDX Contest, c/o *Five-Nine*, PO Box 59, Kamata, Tokyo, 144 Japan; **jidx-log@dumpty.nal.go.jp**; **http://jzap.com/je1cka/jidx/**.

OK/OM DX Contest, 0000Z Nov 13 to 2400Z Nov 14. CW and SSB, 160-10 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. 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. Karel Karmasin, OK2FD, Gen. Svobody 636, 674 01 Trebic, Czech Republic; **http://crk.mlp.cz/ENG/DXCONTE.HTM**.

19-22

Six-Meter Annual Winter DX Contest, sponsored by Six Club, 6 meters only 2300Z Nov 19 to 0300Z Nov 22, Exchange grid squares, count 1 point for each QSO. Final score is total QSO points × total grid squares. Awards. Send logs by Dec 20 to: Six Club, PO Box 307, Hatfield, AR 71945; **sixclub@6mt.com**; **http://6mt.com/contest.htm**.

LI/NJ-QRP Doghouse Operation Sprint, sponsored by the Long Island QRP and New Jersey QRP clubs, 1700-2100Z Nov 20. Single op QRP, CW only. 160 80 40 20 15 10 meters. Work stations once on each band, exchanging RST, telephone area code and first name. Count 2 points/QSO. Final score is (QSO points × power multiplier) + bonus points. Power multiplier: less than 1 W output power × 10; 1 to 5 W × 7. Bonus points: Battery/solar operation from home—100; Portable field location, battery/solar operation with temporary antennas outside of home—100 points. Awards. Submit logs within 30 days to Kevin F. Glynn, 429-73rd St, Brooklyn, NY 11209; **kfglynn@prodigy.net**.

ARRL November Sweepstakes, Phone. See October *QST*, page 88.

Sixth Annual North American Collegiate ARC Championship, phone. See Nov 6-8 listing.

LZ DX Contest, CW only. Sponsored by the Bulgarian Federation of Radio Amateurs, 1200Z Nov 20 to 2100Z Nov 21. 80 40 20 15 10 meters. Categories: A—single op multi band; B—Single op single band; C—Multi op; D—SWL. All stations must stay on a band for 10 minutes 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/#rules1**.

27-28

CQ WW DX Contest, CW. See October, *QST*, page 87.

*RR1, Box 322
Johnson City, TX 78636
k5tr@arrl.org

By **Dan Henderson, N1ND**
Contest Manager

1999 ARRL International DX Contest Phone Results

It is still winter according to the calendar, with just a hint of spring to lull us into a false sense of security. But the first weekend of March is always "hot and heavy" on the airwaves for the annual ARRL International DX Phone Contest. From diehard contesters to casual operators looking to finish off their DXCC awards, thousands of amateurs take to the airwaves for this stellar "DX-a-thon." A total of 1981 logs were received for the DX Phone contest, bringing the total logs both weekends to 4240—a record number of entries for the ARRL DX Contest. Several thousand more call signs are found in logs from hams from around the world who participate but did not submit entries.

Band conditions seemed, in general, good. For example, 10 meters was active toward Central and South America and the Caribbean. W5WW, operating in HR6, racked up over 2200 QSOs on that popular band on low power while W6NL, operating HC8L made almost 3600 on 10 meters. Both the Single Op Low and High power W/VE stations topped 500 QSOs on 10. Hurrah for sunspots!

K1AR produced a recording-setting performance in the W/VE Single Op High Power Category. John's 4,961,502 score breaks the old mark set at the station of KM1H by KQ2M in 1992 by just 29,106 points. That's only a couple of multipliers or QSOs over the course of a contest.

Another man on a mission was N5TJ in the W/VE Single Op Low Power category. His score of 2,232,608 is not a misprint! He almost doubled the next nearest score in this category. Jeff worked DXCC on three bands while shattering the old category mark set by K7RI in 1991 by over half a million points. Jeff's score would have also made the Top Ten high power box.

There were many outstanding QRP efforts turned in as well, but no overall record breaker. Congratulations to W0AH who led the charge of the QRP contingent with a score of 316,968. Another terrific effort was also turned in by K1ZM who led the W/VE Single Op Assisted category with a score of 3,476,538. No single-band records were challenged, but congratulations to AA1BU, K1FZ, N5DO, K4ZW, W0UN (W0UA, op) and NA5B for being the leaders of their respective single-band categories.

The W/VE Multi-Op categories all produced exciting efforts, but again no scoring records were set in any of the three categories. W4MR's team lead the way among the Multi-Single stations, edging out the ops at K8AZ 2,917,653 to 2,809,758. The Multi-Two competition was paced by N2TX's 5,791,968 points followed by N2NT's who bested them in multipliers but fell short on the QSO totals. In the battle of the big gun multi-multi stations, W3LPL scored an impressive victory with a four-band DXCC. They only missed a five-band DXCC by 10 mults on 80 meters.

On the DX side, Central America and the Caribbean were places to be if you wanted to score. KK9A, operating VP5J, took home top honors in the Single Op Low Power category. In the process, John set a new category scoring mark, becoming the first "6 million point man" with a score of 6,011,520. Also becoming a "6 million point man" was WP3R with DL2CC as the op in the Single Op Assisted category. Only 26,994 points behind was P43P at P40B in second place.

With Dave, W6NL, at the controls, the Single Op High Power entry of HC8L cruised home with a comfortable win, outdistancing YT1AD at HU4A by about a million points. The DX QRP entries were paced

Top 10

W/VE Phone

Single Operator QRP

W0AH	316,968
KY5N	265,716
N7VY	260,982
VE3KZ	249,900
N1TM	248,031
N6WS	232,716
N1CWR	211,770
W6CN	198,762
N6AZR	164,592
W8QZA/6	141,255

Single Operator Assisted

K1ZM	3,476,538
K3WW	3,020,778
K2WK	2,781,540
KS1L	2,746,545
KI1G	2,470,698
K2XA	2,466,471
W2RE	2,366,313
K5KG	2,325,465
W1GD	2,043,885
K1VR	1,929,840

DX Phone

Single Operator QRP

LU1VK	190,548
F5BEG	129,564
HA2SX	115,881
JR4DAH	64,938
JA2DLM	50,838
JM1NKT	45,990
JA5GPJ	45,474
F6BEE	35,046
JA2JSF	33,660
OK1DKS	30,600

Single Operator Assisted

WP3R (DL2CC, op)	6,009,636
P40B (P43P, op)	5,982,642
EA9IE	2,324,070
PS2E (PY2EX, op)	1,873,056
ZP40Z	1,338,204
CP6EB	809,178
OH1EH	569,106
GW0ARK	295,509
JA1YNE	242,901
JH4NMT	213,120

Top Five—Single Band

W/VE

160

AA1BU	7,320
K5RX	3,915
W2VO	2,325
N0JK	912
K3SWZ	504

80

K1FZ	105,588
K1LZ	49,887
K4ESE	24,603
K7ZZZ (K7ZM, op)	21,672
W4MS	21,054

40

N5DO	67,851
NC4NC	43,026
N4MXT	39,744
W4JKC	22,401
K4LQ	18,975

20

K4ZW	380,484
VA3MG	337,755
WA2QNW	228,816
N0NR	182,484
N4DL	175,284

15

W0UN (W0UA, op)	641,058
W7WA	593,712
KV0Q	554,400
W5WMU	539,625
K6HNZ	496,296

10

NA5B	302,610
KA6BIM	287,595
W6AFA	260,988
K5AM	252,153
N4BP	235,935

DX

160

CO8JY	9,486
EA1DVY	4,500
S54E	1,443

80

OT9T (ON4UN, op)	117,750
S50K (at S50A)	73,206
TM6P (F5MZN, op)	70,305
EA3FQV	56,496
CT3HF	41,715

40

IQ4A (I4VEQ, op)	158,895
S53M (S55OO, op)	139,776
EA4KD	105,576
YV4FZM	105,138
LU4D (LU4DXU, op)	101,124

20

ZX5J (PP5JR, op)	461,700
LT1F (LU1FKR, op)	330,990
V44NK	318,420
5N0/OK1AUT	298,758
DJ7AA	279,990
HU1A (YU7DR, op)	535,458
TG9/IK2NCJ	465,510
9J2A (JA0JHA, op)	359,100
9Y4VU	356,874
TI7/N4MO	300,150

10

LU6ETB	535,071
LU4FM	483,741
CX8CP	471,174
PQ5W	457,722
P40KD (N6KD, op)	435,456

EA3AR hasn't let a car accident eight years ago stop him from enjoying his contesting hobby.

Thirteen year old Dustin KD7BSW running Europe on 15 meters from his Dad's (K7ZUM) station.

IK1GPG Max and Betty IK1QFM letting off some steam in their well appointed shack—complete with crocheted call-sign curtains from her 84-year-old grandmother. They operated as IR1A.

by LU1VK's 190,548 points. Congratulations also to the Single Band DX Winners: CO8JY, OT9T (ON4UN, op), IQ4A (I4VEQ, op), ZX5J (PP5JR, op), HU1A (YU7DR, op), and LU6ETB.

Really tight competition was evident in all of the Multi-Op DX categories. After slugging it out, none broke a scoring record but four stations broke the 7-million-point barrier in the Multi-Single Category. V31DX finally emerged on top, with VP5B, PJ9G and 8P9Z in hot pursuit.

In the Multi-Two category, 6D2X and HK0F each posted over 11,000 QSOs for the contest period. When the smoke from the amplifiers cleared, the winners were 6D2X with 12,739,584 points to the HK0F total of 11,231,892. Finally, the Multi-Multi DX winner was J37VG.

The log checkers were busy with this contest. Electronic logs were checked thoroughly, which resulted in stations losing QSOs and multipliers for busted contacts. You can request a copy of the checked version of your station log by sending an e-mail message to **UBNreport@arrl.org** and including as the subject of your message your call sign and the words "DX Phone UBN Request." The UBN report is a computer analysis of your entry. It shows calls that are unique (only found in your log), busted calls, and QSOs where you do not appear in the other station's log. Please bear in mind that these reports have to be prepared manually, so it may take several weeks after you submit your request before the Contest Branch staff can "cut and paste" your report and e-mail it back to you.

The Affiliated Club Competition was, as usual, hotly contested. The River City Contesters led the way in the Local Category with nine members submitting scores that totaled 16,798,080 points. In the Medium Category, the Society of Midwest Contesters held off all challengers and scored 53,876,034 from 46 entries. In the Unlimited Category, the Yankee Clipper Contest Club had a huge turnout of operators and racked up 282,469,428 points to the Frankford Radio Club's 225,763,743.

The eyes of the DX contest world will now turn to the weekend of February 19-20,

W/VE Phone

Single Op Low Power

	Score	Total	160	80	40	20	15	10
N5TJ	2,232,608	1812/428	19/14	57/41	177/59	372/103	668/109	519/102
W4/AH6JN	1,142,736	1064/358	15/15	72/43	89/52	344/90	240/77	304/81
WA7BNM	1,029,210	1183/290	0/0	43/25	93/38	202/69	533/87	312/71
WD5K	1,024,650	1035/330	0/0	40/26	53/28	285/100	332/87	325/85
W2TZ	938,736	954/328	12/12	58/34	108/54	263/83	253/80	260/65
NA2U	932,034	953/326	5/5	58/33	94/48	250/78	306/81	240/81
WS1A	759,228	838/302	4/4	48/31	76/43	255/81	291/83	164/60
AC0W	724,800	800/302	15/11	40/25	63/42	221/84	277/84	184/56
KC8FS	716,703	799/299	0/0	51/37	83/46	254/83	246/77	165/56
W1CTN	622,488	701/296	17/12	63/39	83/48	173/67	216/70	149/60

Single Op High Power

	Score	Total	160	80	40	20	15	10
K1AR	4,961,502	3262/507	29/23	200/68	350/85	1166/125	1017/112	500/94
KC1XX (K1DG, op)	4,076,190	2790/487	29/26	215/67	229/74	882/115	1083/117	352/88
VE3EJ	3,536,739	2503/471	25/21	98/57	167/66	671/117	1232/123	310/87
W9RE	2,921,184	2254/432	28/21	102/55	215/66	647/115	1004/103	258/72
VO1MP	2,635,470	2270/387	0/0	196/68	220/63	854/98	763/90	237/68
W3BGN	2,498,214	1978/421	25/22	181/70	111/54	759/104	558/91	344/80
W4AN (N1RR, op)	2,450,709	1959/417	20/16	130/58	226/66	553/96	667/104	363/77
K3ZO	2,297,100	1900/403	20/15	143/56	227/73	669/103	609/93	232/63
W7AT	2,155,056	2224/323	10/7	127/29	396/52	426/88	843/94	422/53
W7NN	2,040,420	2194/310	6/3	51/21	161/43	457/92	1048/97	471/54

Multi-Op Single Transmitter

	Score	Total	160	80	40	20	15	10
W4MR	2,917,653	1949/499	40/29	115/61	177/72	628/129	616/111	373/97
K8AZ	2,809,758	1862/503	32/24	112/66	159/73	750/140	606/113	203/87
K0DU	2,659,500	2250/394	16/13	54/33	547/55	356/101	874/109	403/83
N4RV	2,486,484	1794/462	37/29	142/65	126/63	354/99	802/111	333/95
K1TO	2,455,794	1727/474	32/27	104/56	196/71	513/118	402/96	480/106

Multi-Op Two Transmitters

	Score	Total	160	80	40	20	15	10
N2TX	5,791,968	3549/544	11/11	282/79	257/82	1294/141	1213/124	492/107
N2NT	5,244,360	3014/580	42/38	246/80	233/89	978/142	985/121	530/110
K9AA (at W9JA)	4,928,406	3031/542	25/23	107/60	365/87	1038/140	1009/122	487/110
K6RC	4,594,779	3473/441	12/9	149/44	583/63	505/103	1444/103	780/96
N3AD	3,856,410	2430/529	37/33	153/73	187/77	714/130	945/118	394/98

Multi-Op Unlimited

	Score	Total	160	80	40	20	15	10
W3LPL	11,564,760	5669/680	83/48	486/90	714/110	1851/161	1639/143	896/128
N2RM	10,011,300	5134/650	75/44	467/92	525/98	1356/149	1893/146	818/121
KB1SO	7,018,161	4097/571	34/34	247/75	496/93	1489/141	1188/121	643/107
K1KI	6,981,345	3885/599	56/40	268/83	355/89	1253/145	1485/130	468/112
N3RS	6,681,198	3914/569	26/26	242/79	327/81	1113/141	1576/128	630/114

DX Phone

Single Op Low Power

	Score	Total	160	80	40	20	15	10
VP5J (KK9A, op)	6,011,520	6262/320	131/36	367/52	455/57	2059/59	1374/60	1876/56
V26P)W5AJ, op)	5,015,184	5128/326	161/39	242/53	514/57	1167/59	1524/59	1520/59
VP5A (KQ3V, op)	4,965,873	5189/319	189/40	408/54	497/55	1590/59	991/58	1514/53
HR6/W5WW	4,958.523	5349/309	108/33	357/48	509/55	1163/58	986/59	2226/56
FG5BG	4,488,968	5142/291	49/17	250/47	426/53	1025/58	1508/58	1884/58
XE2DV	2,614,248	2964/294	135/38	151/43	233/47	477/58	832/55	1136/53
YW1A	1,916,055	2565/249	0/0	149/41	360/49	1050/56	406/52	600/51
VP2V/K1DW	1,779,510	2579/230	0/0	117/32	151/33	324/49	855/58	1132/58
4M5E (YV5NWG, op)	1,482,624	2496/198	0/0	5/1	55/23	872/57	722/59	842/55
CT1EAT	1,130,976	1848/204	0/0	86/28	271/35	296/38	596/53	599/50

Single Op High Power

	Score	Total	160	80	40	20	15	10
HC8L (W6NL, op)	7,897,329	7953/331	187/44	466/55	670/58	1370/58	1671/58	3589/58
HU4A (YT1AD, op)	6,939,270	6590/351	162/53	626/58	762/59	1714/61	1062/60	2264/60
KH7R (KH6ND, op)	6,247,908	6806/306	54/18	498/56	910/59	1200/57	1713/58	2431/58
V31JP (K8JP, op)	6,115,824	6534/312	68/25	587/58	450/56	1433/57	1535/58	2461/58
V47KP	5,589,738	5698/327	275/43	414/53	549/57	1355/58	2030/58	1075/58
ZF2DR (K5RQ, op)	4,890,600	5700/286	60/25	193/42	293/50	1788/58	1743/57	1623/54
J3A (K1XX, op)	4,731,714	5694/277	30/16	107/30	653/57	1841/58	1376/58	1687/58
NH7A	4,513,500	5015/300	51/16	219/49	832/59	1091/59	861/58	1961/59
OA4SS	3,225,171	3967/271	0/0	199/43	444/54	939/58	988/59	1397/57
T30R (OK1RI, op)	2,636,976	3208/274	34/16	189/43	417/52	495/51	528/55	1545/57

Multi-Op Single Transmitter

	Score	Total	160	80	40	20	15	10
V31DX	7,907,760	7845/336	281/47	369/54	957/59	1389/58	1967/59	2882/59
VP5B	7,579,650	7475/338	308/49	661/57	691/57	2399/59	1495/58	1921/58
PJ9G	7,535,775	7729/329	135/40	422/54	748/58	1959/58	1674/58	2791/57
8P9Z	7,383,738	7369/334	235/45	646/55	745/58	2004/58	1961/59	1778/59
ZF2NT	5,974,290	6090/327	249/47	408/54	400/56	1605/58	1748/59	1680/53

Multi-Op Two Transmitters

	Score	Total	160	80	40	20	15	10
6D2X	12,739,584	12064/352	430/56	971/58	1795/58	2622/59	3365/61	2881/60
HK0F	11,231,892	11277/332	150/41	805/57	1586/59	1843/58	3077/58	3816/59
WP2Z	9,731,916	9771/332	259/43	741/56	1088/58	2423/59	2597/58	2663/58
XA5T	7,428,525	7619/325	207/47	730/56	1298/58	1359/58	2179/58	1846/48
VP2VW	5,975,760	7114/280	3/ 3	229/44	948/57	1740/59	2283/58	1911/59

Multi-Op Unlimited

	Score	Total	160	80	40	20	15	10
J37VG	5,413,530	5821/310	47/21	641/58	688/57	1295/58	1180/58	1970/58
9A1A	3,355,983	3981/281	83/20	630/44	811/53	979/60	899/60	579/44
CO9BCC	2,636,820	3084/285	51/22	224/51	452/54	561/57	1051/57	745/44
RW2F	2,384,712	3011/264	29/14	277/34	484/55	1079/59	780/ 57	362/45
PJ8A	1,319,772	2018/218	0/0	140/29	147/29	354/50	697/56	680/54

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)		
N1TM	248,031	A	N1CWR	211,770	A	VE3KZ	249,900	A	W0AH	316,968	A	N7VY	260,982	A
N9GG	14,580	A	NE4E	106,398	A	N8XA	94,764	A	KY5N	265,716	A	N6WS	232,716	A
K1QM	5,439	A	N4EUK	1,380	A	ND8MS	29,928	A	WA0JYC	96,186	A	W6CN	198,762	A
W2JEK	4,080	A							WB0HZL	69,690	A	N6AZR	164,592	A
									WA0VBW	64,272	A	W8QZA/6	141,255	A
W2TZ	938,736	B	W4/AH6JN	1,142,736	B	K4IE	371,712	B	N5TJ	2,232,608	B	WA7BNM	1,029,210	B
NA2U	932,034	B	KC8FS	716,703	B	K9QVB	281,394	B	WD5K	1,024,650	B	N6RV	404,376	B
WS1A	759,228	B	WA4IMC	503,538	B	KE8PX	274,668	B	AC0W	724,800	B	K4XU	334,614	B
W1CTN	622,488	B	NY4T	345,912	B	K8LY	264,810	B	N5AW	594,864	B	KI7Y	306,720	B
N1DG	578,823	B	K4OGG	335,340	B	W9GG	260,988	B	W5CWQ	451,308	B	KU6J	291,657	B
K1AR	4,961,502	C	W4AN (N1RR, op)	2,450,709	C	VE3EJ	3,536,739	C	W0GG	988,236	C	W7AT	2,155,056	C
KC1XX (K1DG, op)	4,076,190	C	K4AB	1,969,230	C	W9RE	2,921,184	C	N5ZK (W5ASP, op)	753,480	C	W7NN	2,040,420	C
VO1MP	2,635,470	C	WC4E	1,719,630	C	VE3AT	987,705	C	VE5MX	707,850	C	K6GX	1,661,604	C
W3BGN	2,498,214	C	K4JNY	1,287,957	C	KT8X	829,587	C	W6PU	675,441	C	N7TT	1,414,512	C
K3ZO	2,297,100	C	NX9T	1,021,800	C	K9ZO	772,464	C	N5TY	653,022	C	W7GG	1,253,664	C

1999 International DX Contest Phone Plaque Winners

W/VE Phone

Category	*Winner*	*Sponsor*
All Band	K1AR	Frankford Radio Club
3.5 MHz	K1FZ	Norm Brooks K6FO
7 MHz	N5DO	John Minke N6JM
14 MHz	K4ZW	William Beyer Jr. N2WB
21 MHz	W0UN (W0UA, op)	*Worldradio*, Rick McCusker WF6O
Low Power	N5TJ	Dauberville DX Assn.
QRP	W0AH	Michigan QRP Club
Multi-Single	W4MR	Steve Adams K4RF
Multi-Two	N2TX	*Worldradio* Staff ARC, WR6WR
Multi-Multi	W3LPL	Western NY DX Assn

DX Phone

Single Op

World All Band	HC8L (W6NL, op)	North Jersey DX Assn
Asia	JA1ELY	Tim Coad, NU6S
Europe	OK1RF	Jerry Griffin, M.D. K6MD
North America	HU4A	Chod Harris, VP2ML
Oceania	KH7R (KH6ND, op)	W7EW in honor of W7IYW
1.8 MHz	CO8JY	ZL2BT Memorial, by Fred Race W8FR
3.5 MHz	OT9T (ON4UN, op)	K1ZM Communications
14 MHz	ZX5J (PP5JR, op)	Central California DX Club
21 MHz	HU1A	Long Island DX Assn
Low Power	VP5J (KK9A, op)	Larry Reader KE2VB
QRP	LU1VK	Southern AZ DX Assn
Assisted	WP3R (DL2CC, op)	Willamette Valley DX Club

Multi-Single

Category	*Winner*	*Sponsor*
World	V31DX	Carl Cook AI6V/P49V
Asia	JA7YAA	Yankee Clipper Contest Club
North America	V31DX	Nick Lash K9KLR
Oceania	WH6H	AH9B/V73B

Multi-Two

World	6D2X	Dave and Barbara Leeson W6NL & K6BL
North America	6D2X	Muskegum Valley RA
Oceania	DX3T	Armond Noble N6WR

Multi-Multi

World	VP2VW	Wayne Yoshida, KH6WZ
Europe	9A1A	Operators at K1TTT

Special Plaques

W/VE Combined	N2NT	*National Contest Journal*
W/VE Low Power Combined	VO1MP	Rochester DX Assn
W/VE 40 Meters Combined	KM2P	In Memory of Jim Rafferety, N6RJ, by Pace Engineering
World Combined	KH7R (KH6ND,op)	Mike Manafo, K3UOC
Japan Combined	JA8RWU	JA7WME, JE3RJS, JH7AFR
Great Lakes Division Phone	KT8X	Livonia ARC
Japan All Band Phone	JA1ELY	Communication RC, JH7YJF
Japan Low Power Phone	JA8RWU	Western Washington DX Club
Seventh Call Area Phone	W7AT	Willamette Valley DX Club
World Multi-Combined	6D2X	W2PV Memorial—Schenectady ARA

2000 and March 4-5, 2000 for the last ARRL International DX contest weekends of the 20th Century. As you prepare for the upcoming contests, please review the rule changes that affect log files. The ARRL will be phasing in during the next year the ***Cabrillo*** file format (see the General Rules for All ARRL Contests in this issue). File formats that have previously been accepted will still be acceptable for the year 2000 contest, but beginning with the 2000 November Sweepstakes the only acceptable file format will be Cabrillo. Finally, please remember that if you log using a computer you are now required to submit the electronic data file to the Contest Branch with your entry.

Affiliated Club Competition

Unlimited Category	*Score*	*Entries*
Yankee Clipper Contest Club	282,469,428	265
Frankford Radio Club	225,763,743	162
Potomac Valley Radio Club	109,744,347	103
Medium Category		
Society of Midwest Contesters	53,876,034	46
North Coast Contesters	35,647,644	18
Northern California Contest Club	30,492,003	36
Tennessee Contest Group	22,947,987	28
North Texas Contest Club	18,531,573	21
Minnesota Wireless Assn	18,290,628	21
South East Contest Club	13,131,273	13
Central Texas DX and Contest Club	13,035,534	9
Order of Boiled Owls of New York	12,542,508	10
Florida Contest Group	11,954,823	26
Western Washington DX Club	9,619,224	28
Rochester (NY) DX Assn	9,379,086	25
Florida Contest Club	9,327,735	12
Southern California DX Club	8,404,110	14
Central Arizona DX Assn	6,525,192	22
Mad River Radio Club	6,416,724	14
Willamette Valley DX Club	6,257,280	11
Southwest Ohio DX Assn	5,818,284	5
Grand Mesa Contesters	4,927,305	7
Southern California Contest Club	4,659,822	12
Mile High DX Assn	4,486,812	4
Salt City DX Assn	4,154,466	12
Western New York DX Assn	3,902,436	14
Carolina DX Assn	2,973,066	7
Kansas City DX Club	2,700,963	7
California Central Coast DX Club	2,603,475	11
Northern Arizona DX Assn	1,977,723	9
Oklahoma DX Assn	1,942,887	6
Texas DX Society	1,699,983	8
Eastern Iowa DX Assn	1,624,377	6
Kentucky Contest Group	1,090,380	7
Mother Lode DX/Contest Club	974,637	9
Northern California DX Club	967,482	4
Mississippi Valley DX/Contest Club	561,099	3
Southeastern DX Club	448,650	3
Northrop Grumman Radio Club	402,753	4
Woodbridge Wireless	394,242	4
Central Michigan ARC	87,939	3
South Jersey Radio Assn	34,788	4
Local Category		
River City Contesters	16,798,080	9
Hudson Valley Contesters and DXers	12,414,048	9
Magnolia DX Assn	2,174,055	3
Great Falls Area ARC	1,985,439	7
Utah Contest Club	1,646,280	4
Harvard Wireless	1,572,813	3
Redwood Empire DX Assn	1,410,120	3
Loudoun ARG	1,269,699	3
Sterling Park ARC	1,124,904	10
American Red Cross Emergency	991,431	6
CT RI Contest Group	622,455	5
West Park Radiops	580,122	10
Northern New York Contest Club	550,587	5
Western Illinois ARC	325,935	3
Yegua Valley Contest Club	186,138	3
Worldradio Staff ARC	171,582	3
Garden State ARA	158,802	5
Hamfesters Radio Club	133,986	5
Metro DX Club	43,302	4

Soapbox

We took the advice of W6NL and set up an operating schedule of 6/6/4/4/4 hours for each day of the contest. This system was great because it gives each member of the multi-single team a chance to work every opening at some point during the contest (ZF2NT)… It was fun to do the contest from this remote spot, but I wish I had the same antennas I use at home (T30R, OK1RI, op)… On Sunday I only could work one hour because of a wedding and birthday party my wife said I would attend. Next year I will be strong and say "yes" to her again! (4M5E, YV5NWG, op)… Perhaps on 40 meters contesters should listen on their transmitting frequencies more often. They would be surprised what they might hear from KH6/KL7 (KH6/WB6FZH)… First time in the competition and I enjoyed it very much, especially the great band opening on 10 meters on the first day (IK4QJM),… Many thanks to all who came back to my "CQ contest" calls and the support from my Team Antigua (ZP5OZ)… It was great fun working all those old radio mates and giving new chaps ZL (ZL1CDX)… I had just installed new logging software and turned on the radio. Surprise! I didn't know there was a contest on. I had better read the Amateur Radio newspapers and magazines more closely! (DL8AAE)… The hardest part was to resist the temptation to turn the linear on and go for the High Power category (G3VAO).

Scores

Scores are listed by DXCC Countries and ARRL/RAC Sections. Within each Country or Section, scores are listed in descending order, by power categories, followed by multi-operators. Line scores list call sign, score, QSOs, multipliers, hours of operation, power (A = QRP, B = Low Power, C = High Power) and band.

Phone
W/VE
Single Operator
1
Connecticut
N1TM 248,031 381 217 48 A
W1CTN 622,488 701 296 33 B
W0MHK 559,752 664 281 48 B
K1RO 223,758 401 186 9 B
W1EQ 172,692 351 164 48 B
W1XF 169,320 332 170 48 B
N1QDA 54,279 163 111 48 B
N1IXF 12,852 84 51 48 B
KQ2M 1,554,432 1472 352 21 C
WA2VUM 217,872 408 178 27 C
K5FUV/1 51,993 159 109 26 C
KA1DSQ 42,354 181 78 48 C
WA1FCN 84,744 321 88 48 B 15
K1DII 41,808 208 67 10 C 10

Eastern Massachusetts
K1QM 5,439 49 37 48 A
N1DG 578,823 641 301 48 B
N1PGA 563,160 722 260 48 B
K1HT 430,776 579 248 20 B
W1GOU 165,900 316 175 48 B
W1VIV 165,900 350 158 14 B
N1DS 158,652 339 156 48 B
K1WCC 84,750 226 125 48 B
N1KRT 78,234 221 118 48 B
N1EDM 74,370 185 134 48 B
WT1O 17,568 96 61 48 B
K1PLX 8,883 63 47 48 B
W1MMM 7,884 73 36 16 B
N1IPR 1,932 28 23 3 B
W1RY 588,612 724 271 48 C
W1KRS 570,492 689 276 48 C
N1HOQ 364,764 538 226 48 C
KA1UQ 247,050 450 183 48 C
W1AX 217,485 405 179 48 C
K1TWF 201,600 336 200 48 C
W1OHM 159,903 327 163 48 C
K1SM 125,367 319 131 48 C
K1TEX 59,976 168 119 48 C
AA1BU 7,320 61 40 48 C 160
K1LZ 49,887 241 69 48 C 80
WG1Z 60,009 241 83 48 B 20
W1ZZ 85,722 314 91 16 B 10
N1TPY 1,404 26 18 3 B 10

Maine
W1CEK 32,160 134 80 48 C
K1FZ 105,588 419 84 48 C 80
NY1E 24,522 134 61 48 C 10
KA1AIF 10,767 97 37 15 B 10

New Hampshire
WS1A 759,228 838 302 48 B
NM1W 356,211 501 237 48 B
WA1S 60,822 186 109 4 B
KC1XX (K1DG, op)
4,076,190 2790 487 48 C
WC1M 679,251 881 257 48 C
K1BD 369,954 527 234 48 C
W1UR 352,044 508 231 18 C
KC1F 334,572 569 196 7 C
K1BV 229,398 442 173 14 C
WB1GEX 155,811 311 167 11 C

Rhode Island
KS1J 535,035 673 265 48 B
K1VSJ 247,194 443 186 13 B
W1WFZ 314,925 475 221 48 C
AB1BX 54,000 180 100 48 C
WA1QXR 29,694 101 98 48 C
WA1MKS 52,785 207 85 48 C 20
AA1KM 9,372 71 44 48 C 20
W1RFQ 6,348 46 46 48 C 10

Vermont
AA1SU 130,248 324 134 48 B
N0ICI 121,365 279 145 32 B
W1ZK 591,753 697 283 48 C
W1NVT (W1SJ, op)
305,256 553 184 48 C
W1ZS 14,652 407 12 48 C
K3UOC 54,000 225 80 48 B 20

Western Massachusetts
KX1X 182,688 352 173 48 B
AE1B 172,617 353 163 48 B
K1TS 101,346 266 127 8 B
N1SR 15,840 88 60 48 B
KM3T 5,700 50 38 1 B
K1AR 4,961,502 3262 507 48 C
W1KT 965,142 879 366 48 C
KM2P 3 1 1 48 C 40
N1FUS 14,382 102 47 48 B 10

2
Eastern New York
K2SIG 422,055 565 249 48 B
W2ENY 241,233 421 191 48 B
W2YK 48,480 160 101 48 B
N2MTG 26,862 121 74 48 B
WT2JG 24,168 106 76 15 B
N1EU 548,520 653 280 48 C
K2KJ 93,960 216 145 11 C
KD2NE 11,094 86 43 48 C
KF2O 867 17 17 48 C
N2LH 59,856 232 86 14 C 20
WX2N 17,820 110 54 48 B 15
KA2NZO 18,408 118 52 17 B 10
W1NXB 2,208 32 23 11 B 10

NYC-Long Island
WB2ZTH (+K8OQL)
245,841 361 227 18 B
KA2JEM 77,958 213 122 48 B
W2BZH 60,006 274 73 48 B
N2TO 37,638 153 82 6 B
WA2CNV 245,856 416 197 48 C
K2AW 232,965 465 167 48 C
WB2AYQ 205,668 348 197 48 C
N2UN 200,934 366 183 48 C
WB2AMU 3,960 44 30 48 B 40
KA2VVO 768 16 16 48 C 10

Northern New Jersey
W2JEK 4,080 40 34 5 A
NA2U 932,034 953 326 48 B
N2TTT 153,564 268 191 48 B
W2CVW 98,328 241 136 48 B
K2SZ 50,058 162 103 48 B
N2XR 33,024 128 86 48 B
KG2MV 17,100 100 57 6 B
N2LT 1,080,288 1023 352 48 C
W2EN 886,332 932 317 48 C
N7UN 619,488 717 288 48 C
W2HCA 292,110 455 214 13 C
W2UDT 218,886 382 191 48 C
NC1A 217,668 374 194 48 C
KC2Q 103,248 239 144 48 C
K2SAU 20,400 100 68 48 C
WA2QNW 228,816 681 112 48 C 20
AE2JL 12,900 100 43 48 B 15
N2LDU 24,603 139 59 48 C 10
WA2ASQ 11,466 91 42 48 B 10
WA2BKN/T 8,520 71 40 18 B 10

Northern New York
NG2C 32,076 132 81 12 B
N2JNZ/T 3,612 43 28 12 A 10

Southern New Jersey
K1JT 232,800 400 194 48 B
W5KI 37,440 130 96 6 B
KA2YKN 25,461 123 69 14 B
N2SCJ 3,600 40 30 48 B
W2FGY 2,772 33 28 3 B
W2BE 255,171 419 203 48 C
AD3Y 8,742 62 47 48 C
KA2KFO 6,480 60 36 48 C
KS2B 240 10 8 48 C
WN2DX 1,890 30 21 48 C 20
K2BQW 65,175 275 79 48 B 15
WA2DUE 75 5 5 48 C 10

Western New York
W2TZ 938,736 954 328 48 B
N2RMZ 251,370 441 190 48 B
K2CS 248,523 443 187 29 B
W2GR 247,779 399 207 48 B
K2GKM 104,544 264 132 48 B
N2CK 86,784 226 128 48 B
N2LQQ 61,632 192 107 48 B
AA2AD 30,492 121 84 20 B
WB2AIV 23,976 111 72 13 B
W2FUI 9,660 70 46 21 B
W6XR 1,652,796 1481 372 32 C
W2LU 712,812 764 311 48 C
N2MF 442,548 647 228 48 C
NA2A 266,910 434 205 48 C
K2FR 243,288 436 186 48 C
WR2V 208,692 372 187 48 C
KW2J 191,511 369 173 21 C
WF2Y 160,272 318 168 48 C
WA2ABN 71,190 210 113 48 C
KC3HN 36,720 136 90 48 C
W2RW 33,495 145 77 4 C
W2EZ 13,725 75 61 48 C
W2VO 2,325 31 25 48 C 160
W1TY 52,419 173 101 48 C 20
WB2DVU 46,434 218 71 16 B 15
WA2RZJ 42,387 199 71 48 B 15
WB2OSM 40,392 187 72 48 C 15
N2CU 26,280 146 60 48 B 15
WB2ELW (K2CF, op)
13,905 103 45 8 C 10
N2OPW 6,240 65 32 48 B 10

3
Delaware
N9GG 14,580 81 60 48 A
NY3C 64,824 296 73 9 B 15

Eastern Pennsylvania
W3BGN 2,498,214 1978 421 48 C
N3MLV 824,175 825 333 48 C
W3IZ 438,960 620 236 48 C
KC3TL 405,612 593 228 48 C
AA3TT 402,624 576 233 48 C
N3JCL 297,888 428 232 48 C
N3KR 244,209 401 203 48 C
WE3E 235,875 425 185 48 C
AD3Z 231,264 352 219 48 C
W3BYX 220,968 372 198 48 C
N3TA 87,516 221 132 18 C
W3JRY 70,092 198 118 48 C
W3BEN 61,488 183 112 48 C
W3KM 58,926 161 122 48 C
K3SV 19,800 100 66 48 C
NM3O 7,200 60 40 48 C
K3SWZ 504 14 12 48 B 160
KB3AGZ 44,100 196 75 42 B 20
W3EHZ 35,979 179 67 48 B 20
K3BVQ 15,660 116 45 14 B 20

Maryland-DC
W3DQ 321,480 456 235 48 B
KE3VV 226,512 363 208 33 B
NV3V 169,560 314 180 48 B
N3UMA 114,210 235 162 48 B
N3WK 25,080 110 76 48 B
N3SEO 8,178 58 47 5 B
WA3YSW 5,031 43 39 7 B
K3ZO 2,297,100 1900 403 39 C
W3USS (K3ZJ, op)
1,537,380 1460 351 48 C
W3MR 793,050 850 311 48 C
W3EKT 549,990 630 291 48 C
AJ3M 350,268 578 202 48 C
N3GBP 154,878 311 166 48 C
W3YD 116,946 267 146 48 C
W3FQE 35,742 161 74 48 C
KF3BE 34,710 130 89 48 C
WA3EEE 20,340 113 60 48 B 20
K3YJP 504 14 12 48 B 20
W3CP 32,550 155 70 48 B 15
KT3RR 31,752 168 63 13 A 10
W2BZR/3 30,927 169 61 48 B 10
N3TGB 3,087 49 21 14 B 10

Western Pennsylvania
WA3EQJ 21,243 97 73 14 B
N3WAV 5,160 43 40 9 B
N3UGR 288,990 494 195 48 C
K3TG 72,504 212 114 17 C
AD8J 17,748 116 51 8 C 40
KM3J 13,677 97 47 13 C 40
WW3S 128,826 421 102 48 B 15
W3NO 44,082 186 79 48 B 10
WB0IWG 9,450 75 42 48 A 10

4
Alabama
W4DWS 218,538 342 213 48 B
KU4YJ 76,356 202 126 17 B
KE4KWE 70,644 203 116 48 B
W4AUB 61,056 192 106 48 B
WB4AWM 46,710 173 90 48 B
K6JC 20,085 103 65 48 B
KT4XA 18,090 90 67 48 B
K4NVJ 5,244 46 38 5 B
K4AB 1,969,230 1601 410 48 C
K4GW 660,393 789 279 48 C
AG4W 647,766 742 291 48 C
NM4T 61,605 185 111 48 C
K4JYO 201,069 677 99 48 C 10
KF4WCG 2,160 36 20 10 B 10

Georgia
K4OGG 335,340 486 230 48 B
K2UFT 34,776 126 92 48 B
WA4ORG 32,130 126 85 48 B
W4AN (N1RR, op)
2,450,709 1959 417 48 C
WA4TII 690,486 733 314 48 C
K4BAI 592,074 762 259 48 C
K5GOE/4 385,140 490 262 27 C
KR4TG 321,216 448 239 48 C
W4MS 21,054 121 58 48 C 80
KA9UQT 24,708 142 58 48 B 10

Kentucky
K4IE 371,712 512 242 48 B
W4LC 204,435 385 177 43 B
N4XM 30,324 133 76 6 C
KS7O 261,600 800 109 28 C 15
KD4CSW 936 26 12 7 B 10

North Carolina
NE4E 106,398 257 138 21 A
AE4ZQ 102,144 256 133 48 B
WD4CNZ 86,241 323 89 48 B
KK4LH 18,414 93 66 48 B
K5LZT 5,400 45 40 2 B
NX9T 1,021,800 1048 325 26 C
N4UH 636,894 863 246 34 C
KS4XG 365,904 504 242 48 C
NW6S 277,848 408 227 14 C
N4CW 244,818 406 201 13 C
W4YDY 95,985 237 135 48 C
KB4MIL 66,150 210 105 48 C
KA8FSM 36,432 132 92 48 C
K4WES 2,511 31 27 48 C
K4ESE 24,603 139 59 48 C 80
N4TL 396 12 11 48 C 80
NC4NC 43,026 202 71 48 C 40
W2AY 100,395 345 97 48 C 20
AA0KO/4 26,880 140 64 48 B 20
KF4VMT 5,781 47 41 4 B 10

Northern Florida
WA4IMC 503,538 631 266 48 B
WA4ET 158,886 291 182 48 B
N4KE 82,212 221 124 48 B
W4BH 69,840 194 120 48 B
W4SDE 45,090 167 90 48 B
W4YA 3,348 36 31 3 B
WC4E 1,719,630 1485 386 24 C
K8WK 764,712 817 312 38 C
W7QF 139,365 285 163 18 C
KX4WW 38,760 152 85 48 C
N4EK 26,334 133 66 48 C 20
KC4JE 6,090 58 35 7 B 20
K4VUD 243,900 813 100 48 C 15
N4PN 193,440 620 104 48 C 10
W1LR 6,300 70 30 48 C 10

South Carolina
KT4FP 136,155 313 145 15 B
KS4YX 75,516 217 116 14 B
W3VT 419,094 597 234 48 C
N4GJ 207,570 370 187 48 C
KT4JK 28,638 111 86 48 C
W4JKC 22,401 131 57 10 C 40

Southern Florida
W4/AH6JN
1,142,736 1064 358 48 B
WA4EMU 156,156 308 169 16 B
W9FGH/4 27,966 118 79 10 B
K1PT 920,040 935 328 48 C
N8PR 502,428 596 281 48 C
WB2QLP 382,284 518 246 48 C
W2WIH 301,032 444 226 20 C
K1DCB 181,908 372 163 48 C
N4TO 92,718 202 153 48 C
W4JAT 6,405 61 35 48 C
K4LQ 18,975 115 55 48 C 40
N4DL 175,284 541 108 48 B 20
NA4CW 123,120 456 90 48 B 15
N4BP 235,935 735 107 21 C 10
AJ4Y 74,460 292 85 18 B 10
W4GD 27,885 143 65 8 C 10
KF4KSN 13,668 134 34 17 B 10
KR4YL 6,930 77 30 48 B 10
W8RTU/4 675 15 15 48 B 10

Tennessee
N1CWR 211,770 362 195 48 A
NY4T 345,912 497 232 48 B
W4JH 53,928 168 107 48 B
W4NI 12,948 83 52 48 B
WB9BSH 11,388 73 52 48 B
K4JNY 1,287,957 1259 341 48 C
N4DW 80,136 252 106 48 C
W4OGG 1,482 26 19 3 C
K4WX 66,066 286 77 48 C 10
WO4O 24,138 149 54 48 B 10

Virginia
N4EUK 1,380 23 20 5 A
W4YE 253,953 417 203 48 B
N3TG 198,462 341 194 48 B
KU4FP 138,945 295 157 48 B
W4SD 119,250 250 159 48 B
K4UVT 106,272 246 144 48 B
N6MW 68,445 169 135 48 B
N4ZNH 62,475 175 119 33 B
KS4II 2,856 34 28 6 B
K3OSX 913,260 982 310 48 C
W4JVN 630,564 748 281 48 C
N4MM 372,945 529 235 48 C
W2YE 250,848 402 208 48 C
K5VG 39,087 129 101 48 C
KF4FXT 31,500 140 75 48 C
KS4JB 13,608 84 54 8 C
AF4MO 8,160 68 40 48 C
AA4KD 7,380 60 41 48 C
K4UK 2,430 30 27 24 C
N4MXT 39,744 184 72 48 C 40
WK4Y 16,317 111 49 48 B 40
K4WY 5,280 55 32 4 B 40
K4ZW 380,484 1084 117 48 C 20
WA4MA 2,700 36 25 4 B 20
AI2C 95,985 395 81 48 C 10
KD4MTW 5,883 53 37 17 B 10
KC4ATU 1,140 20 19 3 A 10

5
Arkansas
KG5RM 50,367 163 103 48 B
W5HUQ 12,834 93 46 48 C
KC5QBG 13,407 109 41 48 B 10

Louisiana
N5OKV 143,148 316 151 48 B
KM5QG 61,425 195 105 48 B
KD5CAS 40,755 143 95 11 B
WA5KBH 3,996 37 36 7 B
WM9M 4,140 46 30 48 C 40
W5WMU 539,625 1439 125 48 C 15
W5CTV 1,395 31 15 48 B 10

Mississippi
N5QDE 378,444 517 244 48 C
W5OXA 61,182 206 99 48 C
KC5ZJA 37,026 187 66 20 B 10

New Mexico
W5GZ 232,290 435 178 48 B
W6PU 675,441 897 251 35 C
W5PDO (W5IL, op)
34,194 139 82 13 C
W5JRP 16,854 106 53 48 C 20
K5AM 252,153 849 99 48 C 10

North Texas
KY5N 265,716 484 183 48 A
N5TJ 2,326,608 1812 428 42 B
WD5K 1,024,650 1035 330 48 B
N5AW 594,864 729 272 48 B
W5CWQ 451,308 572 263 48 B
KF5YZ 231,081 391 197 48 B
AC5GH 178,500 350 170 42 B
WK5K 79,125 211 125 48 B
WN5D 23,088 104 74 48 B
N5TY 653,022 783 278 48 C
W5RDX 70,092 198 118 48 C
K5RX 3,915 45 29 10 C 160
W5FO 111,201 367 101 48 C 20
W5RNF 41,220 229 60 19 B 10
KN5L 12,126 94 43 48 B 10
WA5VKS 11,235 107 35 11 B 10
K6AZA 1,836 34 18 48 C 10
KD5FUM 1,104 23 16 48 C 10
N5ZIS 969 19 17 48 B 10

Oklahoma
N5RXF 246,186 423 194 48 B
K0CIE 71,910 235 102 27 B
WB5GMK 153,765 255 201 48 C
K2BA 76,713 281 91 48 C 20
NA5B (W5AO, op)
302,610 917 110 48 C 10
W5OSU 19,350 129 50 22 B 10

South Texas
WA5IYX 361,884 569 212 36 B
KE5LQ 343,860 521 220 48 B
K5OE 326,040 494 220 48 B
W5QCL 86,751 243 119 22 B
N5AF 51,324 182 94 18 B
KM5CF 44,352 176 84 19 B
N5LYG 24,153 97 83 48 B
K4NR 23,247 123 63 3 B
N5ZK (W5ASP, op)
753,480 1092 230 48 C
W5MN 596,250 795 250 20 C
NN5ZZ (N5LZ, op)
483,975 675 239 48 C
N5DD 165,780 307 180 48 C
W5GCX 70,983 239 99 48 C
KK5RW 5,328 48 37 11 B 20
K5IUA 96,822 326 99 48 C 10

West Texas
WB4UIC 1,458 27 18 4 B
N5DO 67,851 359 63 48 C 40
NZ5M 1,080 20 18 10 B 20
W5ZO 97,128 426 76 48 C 10

6
East Bay
K6XV 37,665 155 81 48 B
KE6QR 18,228 98 62 8 B
K6JAT 99,450 255 130 48 C
KF6BIR 36,330 173 70 48 C
W6FSJ 1,995 35 19 48 C
KG6HM 11,880 110 36 13 B 10

Los Angeles
WA7BNM 1,029,210 1183 290 32 B
N6RV 404,376 664 203 48 B
KQ6QW 215,007 481 149 48 B
WB6NFU 152,427 341 149 48 B
KC6WYX 101,232 304 111 20 B
W6FFH 30,429 161 63 16 B
WA6BIL 14,076 92 51 48 B
K0DI/6 342,804 583 196 48 C
N6IC 142,002 322 147 48 C
K6SE 115,260 340 113 13 C
N6AA 20,367 93 73 48 C
W6RCL 10,455 85 41 48 C
AI6Z 1,296 24 18 48 C 80
KU6T 5,124 61 28 48 B 40
K6CEO 1,323 21 21 48 B 20
N6TCZ 48 4 4 48 B 20
W6EUF 156,006 642 81 48 B 15
K6RO 138,402 466 99 48 B 15
W6AFA 260,988 956 91 48 C 10
W6GRV 19,398 122 53 9 C 10
KQ6TI 7,776 81 32 48 B 10

Orange
KG6O 152,100 338 150 31 B
W6SA 151,632 351 144 48 B
KQ6VQ 60,264 216 93 48 B
K6HRT 37,572 202 62 48 B
K6MCP 35,280 140 84 15 B
W6NT 24,570 117 70 48 B
K6ACZ 163,305 285 191 48 C
AA6PW 114,810 430 89 48 C
KF6XA 36,696 139 88 17 C
AC6WD 84,240 312 90 48 B 15
KD6TRH 2,448 48 17 48 B 10

Santa Barbara
N6WS 232,716 473 164 48 A
N6AZR 164,592 381 144 48 A
WA6FGV 192,717 437 147 48 B
W6VM 155,376 312 166 12 B
W6UM 549,900 650 282 48 C
WA5VGI 242,970 455 178 48 C
N6HK 27,744 136 68 12 C 15
KD6PQF 12,078 122 33 16 B 10
KF6NNX 399 19 7 5 B 10

Santa Clara Valley
W6PLJ 188,331 439 143 48 B
K6GX 1,661,604 1834 302 35 C
K6GT 543,150 850 213 48 C
W6ISO 261,888 496 176 48 C
AJ6V 164,640 392 140 47 C
N6TP 121,296 304 133 8 C
K6III 7,500 50 50 48 C
N6FM 3,996 37 36 48 C
N6IV 36 4 3 48 B 20
K6HNZ 496,296 1464 113 48 C 15
N6NF 810 18 15 1 B 15
N2ALE 1,200 25 16 48 C 10

San Diego
W6CN 198,762 422 157 48 A
W8QZA/6 141,255 365 129 48 A
W6JVA 86,106 254 113 15 B
AA6EE 78,477 259 101 48 B
N6SMW 22,968 132 58 48 B
AK6R 194,892 436 149 48 C
KD6QK 22,110 110 67 48 C
WA6PY 828 23 12 5 B 20
KE6AGB 45,201 247 61 48 B 10

San Francisco
AD6EN 48,357 199 81 48 B
W6ESJ 17,649 111 53 47 B 15

San Joaquin Valley
K6MI 9,600 80 40 48 A
KI6PG 48,204 206 78 16 B
N6TNX 56,274 166 113 48 C
KA6BIM 287,595 913 105 48 C 10
N6IFW 7,830 87 30 48 C 10

Sacramento Valley
KU6J 291,657 509 191 48 B
N6JM 165,900 350 158 48 B
W6RFF 130,284 329 132 48 B
ND6S 117,936 364 108 48 B
N6GG 83,055 245 113 48 B
WF6O 62,100 225 92 48 B
KI6T 557,655 791 235 26 C
W6QEU 315,360 584 180 48 C
K6DB 97,875 225 145 10 C
WR6WR 97,650 310 105 48 C
K6FO 83,820 254 110 48 C
K6RN 64,800 270 80 48 C
KF6OBS 11,832 116 34 48 C
W6YQQ 3,036 44 23 48 C 40
K6KAY 107,184 464 77 48 B 10
K6BPB 828 23 12 2 B 10

7
Arizona
N7VY 260,982 486 179 48 A
N7IR 61,596 236 87 48 A
N7UJJ 100,440 270 124 13 B
KC5AC 18,312 109 56 11 B
WW7DX 8,820 60 49 5 B
NF7E 307,338 566 181 48 C
K6TIM 247,863 407 203 48 C
K6AIA 186,876 358 174 48 C
W7YS 106,950 310 115 48 C
K7TR 97,284 268 121 48 C
W7ZMD 15,150 101 50 48 C
KI7LS 1,320 22 20 5 C
W8AEF 14,637 119 41 48 C 80
N7UR 6,324 62 34 48 C 40
NU7AA 450 15 10 2 B 40
K7RDG (S58J, op)
215,340 740 97 48 C 15
W7AYY 57,117 241 79 48 C 15
W7IC 53,130 230 77 48 C 15
W7UPF 31,752 168 63 32 C 15
WN7J 41,856 218 64 48 B 10
W7USA 33,453 189 59 18 B 10
N7KO 23,856 142 56 7 B 10
WA7VHF 1,596 38 14 8 B 10

Idaho
W7LAR 84,480 256 110 48 B
KW7N 83,328 248 112 48 B
KJ7TH 493,809 683 241 48 C
NA7ID (K7ZO, op)
259,686 687 126 48 C
W7RNF 82,485 235 117 48 C

Montana
KS7T 349,200 600 194 48 C
KC7UP 194,052 412 157 48 C
W7WK 182,040 370 164 10 C
KK7DP 5,400 60 30 10 C 40
K7LUH 56,943 333 57 48 C 10
KK7QJ 10,296 104 33 12 B 10
K7JVT 7,221 83 29 48 B 10

Nevada
KC7DB 218,085 469 155 24 B
KM7TM 381,483 639 199 31 C
N7CQQ 167,322 353 158 48 C
W7EB 169,692 716 79 48 C 15

Oregon
K4XU 334,614 514 217 48 B
KI7Y 306,720 568 180 48 B
K5ZM 194,016 376 172 48 B
KR7X 48,807 187 87 48 B
W7AT 2,155,056 2224 323 48 C
W7GG 1,253,664 1451 288 48 C
WG7A 175,671 393 149 48 C

K7ZZZ (K7ZM, op)
21,672 86 84 48 C 80

K7EM 6,993 63 37 48 C 40
K7ZZ 220,857 809 91 48 C 15
W7FP 96,264 382 84 48 C 15
WJ7S 44,133 313 47 48 B 10

Utah

N7VM 78,255 235 111 9 B
KB7PNI 6,510 70 31 11 B
NS7K 87,153 209 139 48 C
W8EQA/7 107,730 399 90 48 C 15

Western Washington

NW7DX 34,254 173 66 48 A
N7FL 215,556 506 142 48 B
N7MOK 52,200 200 87 17 B
W7/JR1NKN 5,814 114 17 48 B
N6TPT 3,870 43 30 3 B
W7NN 2,040,420 2194 310 48 C
N7TT 1,414,512 1672 282 48 C
K7GDN 478,179 793 201 32 C
N7RO 324,450 721 150 48 C
W7QN 230,850 450 171 48 C
AB7RW 125,970 323 130 48 C
N6HR 89,100 198 150 48 C
WA2OCG 25,296 124 68 48 C
N7QNM 2,430 45 18 48 C
W7WA 593,712 1736 114 48 C 15
N7CKP 288 12 8 48 B 15
W7AKR 612 17 12 1 B 10

Wyoming

N7JT 3,276 39 28 48 C

8

Michigan

WS8M 174,348 334 174 22 B
N8WK 118,011 283 139 48 B
N8NX 72,570 205 118 48 B
AA8SN 62,271 187 111 48 B
KB8QO 42,834 242 59 18 B
KE8FO 33,768 134 84 48 B
N8VEN 25,185 115 73 10 B
W8FEM 14,760 82 60 48 B
N8WTH 7,998 62 43 9 B
WB8L 504 14 12 3 B
KT8X 829,587 1093 253 48 C
KE8GG 530,406 746 237 48 C
K8CV 102,108 254 134 48 C
WA8OLD 24,300 108 75 30 C
W8UD 105,600 400 88 48 C 15
WD8S 47,286 213 74 47 B 15
KC8IUL 714 17 14 7 B 15
N8LIQ 11,544 104 37 13 B 10
WA8YLZ 120 8 5 2 B 10

Ohio

N8XA 94,764 212 149 48 A
ND8MS 29,928 116 86 48 A
KE8PX 274,668 487 188 32 B
K8LY 264,810 455 194 48 B
W8UPH 240,975 459 175 36 B
N8FWA 144,381 323 149 48 B
KA8ZPE 134,808 274 164 48 B
KI8CS 114,660 260 147 48 B
KA8WQL 108,630 255 142 48 B
KC8HWV 75,000 205 125 48 B
N8SSE 59,730 181 110 48 B
KA8PTT 51,072 152 112 48 B
W8IDM 49,833 147 113 48 B
N8TXI 14,952 89 56 10 B
NC8V 196,416 372 176 48 C
KU8E 148,404 298 166 48 C
WD8JLM 145,530 294 165 48 C
NS8O 127,680 280 152 48 C
K5ZG 99,792 231 144 48 C
K8MR 58,800 196 100 5 C
W8VE 56,610 170 111 48 C
K8VUS 56,286 177 106 19 C
W8KH 24,840 115 72 48 C
W8NPF 24,747 113 73 48 C
W8SJU 41,391 189 73 48 C 20
WA8RCN 23,868 156 51 15 B 10
AF8C 22,848 136 56 8 B 10
N8AGU 6,075 45 45 3 C 10
KA8NRC 6,048 56 36 14 A 10
N8IRS 12 2 2 48 B 10

West Virginia

KC8FS 716,703 799 299 48 B
K5IID 310,728 484 214 40 B
K3JT 857,076 946 302 48 C
N4ZR 663,264 784 282 48 C
K2UOP 656,892 771 284 48 C
WA3HQK 49,131 159 103 48 C
K8KFJ 36,480 128 95 48 C
N8II 189,072 624 101 48 C 10
N4SEA/T 23,040 128 60 48 B 10
KB8QPY 720 20 12 9 B 10

9

Illinois

K9QVB 281,394 486 193 48 B
W9GG 260,988 478 182 48 B
K9YA 127,428 287 148 48 B
AA9DM 126,720 264 160 48 B
K9JE 116,343 279 139 48 B
WA9AW 109,326 266 137 48 B
W9LYN 46,035 155 99 48 B
AA9QT 45,276 154 98 18 B
KA9FAJ 39,468 143 92 48 B
W9BZP 34,692 196 59 48 B
W9YS 31,824 136 78 48 B
K9KJ 30,552 134 76 48 B
NA9DM 24,885 105 79 48 B
KG9JP 20,520 95 72 24 B
KB9CYL 14,850 90 55 48 B
KB9OJB 12,324 79 52 6 B
W9HL 10,251 67 51 13 B
W9DY/M 7,812 62 42 3 B
AK9Y 4,284 42 34 48 B
W0KT 3,960 40 33 48 B
K9ZO 772,464 836 308 48 C
N9LCR 271,830 410 221 48 C
KG9AV 155,142 338 153 48 C
WD9DDO 60,873 197 103 13 C
WA9CCQ 38,889 149 87 48 C
N9WKW 18,564 91 68 48 C
N9XBG 15,624 84 62 48 C
W9BNR 20,352 128 53 24 C 20
N9DT 27,744 136 68 48 B 15
KE9EX 6,720 56 40 48 B 15
WB9Z 207,162 677 102 48 C 10
KB9PPT 21,450 143 50 29 B 10

Indiana

N4TZ 167,634 417 134 48 B
NX9B 97,857 249 131 29 B
N9TU 95,832 242 132 48 B
KJ9C 65,709 149 147 48 B
W9RE 2,921,184 2254 432 48 C
K9SH 163,800 300 182 48 C
KC9FC 130,416 304 143 48 C
K9IG 71,940 218 110 5 C
WB9LRK 19,089 101 63 48 C
W9AU 59,052 266 74 48 B 10
KA9CBJ 300 10 10 48 C 10

Wisconsin

KB9RNO 90,174 226 133 24 B
KB9KEG 86,940 230 126 48 B
W9DAD 10,500 70 50 5 B
N9UA 557,034 706 263 27 C
W9BCV 138,942 279 166 48 C
NK9I 101,556 217 156 48 C
W9RN 46,530 165 94 8 C
K9QC 37,908 156 81 48 C
KA9FOX 18,762 106 59 48 C 40
W9GXR 15,000 100 50 48 C 40
K9CAN 100,998 362 93 48 C 20
WI9H 54,825 215 85 48 B 20
KF9VJ 7,068 62 38 48 C 15
W9GIL 51,030 243 70 48 C 10
W9NWY 2,400 50 16 48 C 10

0

Colorado

W0AH 316,968 562 188 48 A
WA0JYC 96,186 391 82 30 A
WB0HZL 69,690 202 115 48 A
N0KE 31,833 131 81 48 A
KI0II 12,180 70 58 3 A
AA0MZ 239,040 415 192 32 B
K0RI 126,846 261 162 48 B
K0EZW 13,860 77 60 12 B
W0GG 988,236 1132 291 48 C
K0GAS 221,616 486 152 21 C
N0RUV 93,960 261 120 24 C
W0CBH 45,600 190 80 48 C
W0AJ 5,100 50 34 48 C
N0NR 182,484 548 111 48 C 20
W0UN (W0UA, op)
641,058 1766 121 48 C 15
KV0Q 554,400 1680 110 48 C 15
KD0NB 69,678 294 79 48 B 15
W0ETT 22,032 144 51 48 B 15
KC0EGB 1,638 26 21 2 B 15
W0MU 106,656 404 88 48 C 10
N7DR 74,052 374 66 48 C 10

Iowa

WN0G 107,586 278 129 48 B
K0CF 91,176 232 131 18 B
AB0HF 144 48 1 8 B
W0PPF 107,325 265 135 31 C
WA0DCB 44,226 162 91 48 C
WB0B 4,752 44 36 5 C
NE0P 14,688 96 51 48 B 15
KC0AYG 540 18 10 7 A 10

Kansas

KB0MZG 111,795 257 145 44 B
W0WPL 50,544 156 108 48 B
KB0WPY 29,337 127 77 48 B
K0BJ 7,020 65 36 2 B
KF0XV 5,250 50 35 48 B
K1LR 262,287 453 193 48 C
WB0YJT 88,623 229 129 14 C
N0JK 912 19 16 8 B 160
W0TM 66,033 253 87 48 C 20
W7KEU 14,352 92 52 25 B 15
KK0SS 155,682 558 93 48 C 10
K0LLS 1,938 34 19 14 B 10

Minnesota

WA0VBW 64,272 208 103 24 A
N0UR 21,210 101 70 6 A
AC0W 724,800 800 302 48 B
KC0CN 207,480 364 190 34 B
KU0J 22,470 107 70 12 B
K0TT 258,354 463 186 48 C
W0ML 232,776 424 183 48 C
N0IJ 44,928 156 96 48 C
N0MSB 26,001 107 81 48 C
K0DMR 11,076 71 52 46 C

Missouri

K0KY 104,328 276 126 22 B
K2HT 83,640 205 136 48 B
KI0HQ 206,820 383 180 23 C
K0DAT 98,640 240 137 48 C
W0TT 60,495 185 109 9 C

North Dakota

KB0IXX 73,080 210 116 48 B

Nebraska

KK0DX 90,099 213 141 48 B
AB0FX 36,936 152 81 18 B
KC0ECJ 10,437 71 49 10 B
W0UVC 126,558 237 178 24 C
N0OFR 11,481 89 43 48 B 10
KC7KDZ 6,237 63 33 6 B 10

South Dakota

KD0EE 113,487 209 181 48 C

VE

Maritime

VE1JS 320,331 571 187 48 B
VE1RX 198,135 629 105 48 C 15

New Brunswick

VE9FX 441,477 747 197 48 C
VE9MY 145,290 290 167 48 C

Newfoundland-Labrador

VO1HE 12,744 72 59 48 B
VO1MP 2,635,470 2270 387 48 C
VO1WET1,107,450 1605 230 48 C
VO1RE 741 19 13 48 B 80

Quebec

VE2AWR 292,740 476 205 27 B
VE2GWL 91,866 251 122 48 B
VE2AYU 651,183 767 283 48 C

Ontario

VE3KZ 249,900 425 196 48 A
VE3BUC 149,280 311 160 48 B
VA3SWG 133,245 315 141 48 B
VE3WZ 74,694 211 118 48 B
VA3IX 66,462 209 106 48 B
VE3SKX 48,510 165 98 12 B
VE3GNU 5,832 54 36 6 B
VE3EJ 3,536,739 2503 471 48 C
VE3AT 987,705 1401 235 48 C
VE3XN 740,700 823 300 29 C
VE3RM 72,150 185 130 48 C
VA3POS 13,395 95 47 13 B 80
VA3MG 337,755 979 115 48 C 20
VE3XDT 4,059 41 33 48 B 20
VE3STT 39,879 211 63 13 B 10
VE3IRE 19,650 131 50 15 B 10
VA3JFF 1,482 26 19 48 A 10

Manitoba

VE4YU 89,652 241 124 48 B
VE4RP 32,640 136 80 48 C

Saskatchewan

VE5SF 312,480 560 186 48 B
VE5CPU 120,258 306 131 48 B
VE5MX 707,850 858 275 48 C

Alberta

VE6BF 66,096 204 108 48 A
VE6JO 1,932 28 23 48 C
VE6DBH 8,640 60 48 48 B 20
VE6FU 1,794 26 23 48 B 20
VE6JY 338,256 972 116 48 C 15

British Columbia

VE7JMN 236,205 435 181 48 B
VE7HA 10,878 98 37 48 B
VE7LRB 1,560 40 13 48 B
VE7AGJ 245,175 467 175 48 C
VE7XO 164,424 442 124 48 C
VE7FJE 47,517 337 47 48 B 15
VE7VDX 11,970 114 35 48 B 10

Northwest Territories/Yukon

VY1AC 12,900 100 43 10 B

Single Operator Assisted

1

KS1L 2,746,545 2095 437 48 C
KI1G 2,470,698 1902 433 48 C
K1VR 1,929,840 1462 440 48 C
K2RD 1,556,778 1334 389 48 C
K5MA 1,431,840 1256 380 29 C
W1RZF 1,329,405 1151 385 48 C
K5ZD 1,169,370 1065 366 16 C
AA1V 1,148,124 964 397 48 C
KA1CLX 1,051,446 979 358 25 C
W1CU 996,930 1007 330 48 C
N1DD 918,840 806 380 48 C
KZ1M 847,224 861 328 15 C
K1MY 805,896 861 312 48 C
N1NQD 760,362 706 359 48 C
K1VV 722,985 785 307 20 C
W1ZT 686,280 760 301 22 C
NZ1Q 666,288 661 336 48 C
W1NG 644,160 610 352 48 C
KK1DX 640,584 651 328 48 C
K1MO 591,507 687 287 48 C
KE1KD 546,255 597 305 48 C
W1QK 518,400 640 270 48 C
K1OZ 454,500 606 250 48 C
K1ST 400,932 518 258 48 B
K1JE 400,542 554 241 48 B
KE1IH 398,040 535 248 48 C
NQ1K 388,077 467 277 48 C
K1RV 380,250 507 250 48 B
K1AE 325,221 403 269 48 C
W1BIH 323,190 405 266 48 C
KD1KI 285,633 447 213 48 C
WO1N 278,760 404 230 21 B
K1TW 275,268 452 203 48 C
N4XR 266,175 325 273 13 C
W1HR 237,762 357 222 48 C
N1RLI 236,328 344 229 48 C
W1UK 160,854 323 166 48 C
NC1N 158,925 325 163 48 B
WV1M 147,888 312 158 48 C
W1JR 129,285 255 169 48 C
K1RM 102,144 266 128 48 C
WA1ZYX 99,960 238 140 8 B
K2AJY 96,390 189 170 48 C
N1ZZN 89,244 222 134 48 B
K1IR 84,672 196 144 48 C
K1SF 72,705 185 131 48 C
KV1J 70,329 197 119 5 C
KA1GJ 69,723 183 127 48 C
K1XM 31,842 122 87 48 C
N1KWJ 25,758 106 81 48 C

2

K1ZM 3,476,538 2327 498 48 C
K2WK 2,781,540 1836 505 48 C
K2XA 2,466,471 1753 469 48 C
W2RE 2,366,313 1711 461 48 C
K5KG 2,325,465 1667 465 48 C
W1GD 2,043,885 1531 445 48 C
N2ED 1,302,480 1080 402 48 C
K2TR 1,142,358 922 413 48 C
W2TV 1,092,147 917 397 48 C
N2FF 1,078,110 990 363 48 C
W2GDJ 811,800 825 328 48 C
K2DM 805,860 740 363 48 C
N2VW 718,746 763 314 48 C
W2YC 678,528 608 372 48 C
K2BX 557,112 668 278 48 C
K2SX 442,722 581 254 48 C
N2MG 424,482 526 269 48 C
K2XF 415,233 507 273 48 C
N2MR 408,609 547 249 48 C
WJ2D 393,162 506 259 48 C
N1JP 296,916 436 227 48 C
K2EP 261,096 473 184 48 C
K2MP 214,272 384 186 48 C
N2SS 200,448 348 192 48 C
K2ONP 194,580 345 188 12 C
NA2NA 167,904 318 176 48 C
K2ZP 155,430 330 157 48 C
N2BIM 147,258 243 202 48 C
WK2H 120,768 296 136 48 C
K2WJ 70,500 188 125 48 C
NG2P 65,826 207 106 32 C
KD2TT 52,704 144 122 5 B
W2FU 32,256 112 96 48 C
KN2T 5,100 50 34 28 C
KQ2O 4,059 41 33 48 C

3

K3WW 3,020,778 1959 514 48 C
AA3B 1,750,320 1320 442 39 C
AA3JU 1,210,560 1040 388 48 C
W3FV 1,153,278 1017 378 48 C
W3MM 1,128,006 891 422 48 C
K3CT 1,109,853 971 381 48 C
K3ND 1,087,392 964 376 48 C
K3CP 1,069,362 966 369 48 C
K3AR 1,046,826 933 374 48 C
K3DI 998,010 853 390 48 C
NN3Q 981,360 870 376 48 C
N3ZA 927,843 791 391 48 C
KE3VN 906,150 863 350 48 C
KB3TS 853,650 813 350 48 C
W3UJ 631,620 726 290 48 B
W3OV 620,004 671 308 48 C
K3OO 547,938 657 278 48 C
WB3CIW 546,678 726 251 48 C
K3IXD 453,654 542 279 48 C
K3BSA 394,218 543 242 48 C
KU3X 252,762 409 206 48 C
W8FJ 160,728 296 181 48 C
N3AM 159,840 288 185 48 C
W3KV 143,766 326 147 48 C
WR3L 142,896 458 104 48 C
K3SA 73,332 194 126 48 B
WT3P 27,489 119 77 48 B
KD3TB 26,325 117 75 7 C

4

N4ZC 1,145,703 1013 377 48 C
AD4TR 604,032 704 286 48 C
K4UVH 561,756 676 277 48 C
K4LM 500,760 520 321 48 C
N1CC 384,000 500 256 48 B
K3KO 339,840 472 240 48 C
N2FY 334,719 483 231 48 C
WD4JNS 303,072 451 224 24 B
N3RC 132,651 289 153 48 C
KA4RRU 101,430 245 138 48 C
W4ATL 71,052 191 124 8 B
KR4QI 7,695 57 45 48 C

5

KR5V 1,297,392 1432 302 48 C
N5JR 1,189,440 1120 354 48 C
K5NA 365,850 450 271 48 C
W5GAI 206,703 357 193 14 B
KB5TX 120,888 292 138 48 B

6

AD6GY 169,533 351 161 24 B
W6TK 121,245 295 137 48 C
K6LA 45,144 171 88 44 C
K6ASK 24,150 115 70 15 B
NF6R 12,936 88 49 48 C
W6ISQ 6,720 56 40 48 C

7

K7RI 1,442,925 1815 265 48 C
W7OM 689,040 990 232 48 C
K7ABV 375,000 625 200 48 C
K7GJ 333,504 576 193 48 C
W7CT 293,733 473 207 48 C
W7MD 237,600 396 200 48 C
KE7NS 192,525 425 151 48 B
K7BG 111,720 190 196 12 C
W7HS 109,500 250 146 48 c
K8EI 56,700 189 100 25 C
WO7T 56,070 178 105 48 C
KC7MIQ 5,133 59 29 6 B

8

N8TR 1,439,943 1069 449 48 C
KB8TI 1,098,972 1068 343 48 C
K8LN 750,960 745 336 48 C
KB3AUG 564,408 603 312 48 C
K8DJC 485,160 622 260 48 C
W8KEN 243,276 388 209 48 C
K8IR 58,644 181 108 48 B
KB8YBE 21,945 95 77 14 B
KG8DH 18,414 93 66 48 C

9

W9OP 634,500 750 282 48 C
W9GIG 265,500 354 250 48 C
WO9S 118,854 279 142 48 C
W9LNQ 19,200 80 80 48 B
N9PQU 14,220 79 60 48 C

0

KT0R 751,725 771 325 48 C
N0AT 612,360 630 324 48 C
N5IN 371,856 508 244 48 C
KA0TKU 305,640 360 283 35 C
KF0GV 276,507 399 231 48 C
K0IL 225,099 397 189 26 B
KI0MB 147,390 289 170 48 B
VE9WH 134,268 268 167 48 C
VE3XL 23,940 105 76 48 C

Multioperator Single Transmitter

1

AA1ON (+W1RH)
2,277,558 1654 459 48 C
K1GW (+W6PH)
1,417,602 1237 382 48 C
K2TE (+K1HI)
1,288,056 1148 374 48 C
KA1ZD (+K1ZZ)
1,246,020 1093 380 48 C
K1NU (+K1OA)
1,203,840 1216 330 48 C
K1MV (+W1SDR,KT1O,N1AO)
1,153,440 1080 356 48 C
W1BK (+W1NR)
1,037,316 932 371 48 C
K1ZO (+N1KWF,WA1ZYX,W9YRH)
998,130 970 343 48 C
N1TB (+N1UJV)
932,064 1064 292 48 C
N1AU (+WC1D)
710,946 762 311 48 C
WA1RR (KB1LN,KD1NW,N1HRA, KA1VMG, ops)
511,560 580 294 48 C
AA1JD (+NC1M,AA1LH,K1FFX)
428,505 539 265 48 C
W1AA (+K1TH,N1ZZN,N1BSO)
398,736 568 234 48 C
NC1I (+N1DPM,W1QA)
249,570 470 177 48 C
W1AF (KO1O,K1XQ,N2MSE,N3OQB, ops) 125,268 286 146 48 C
W1SRG (+N1XYR,KE4GI)
107,442 254 141 48 C
W1CC (+N1BSO)
23,112 107 72 48 C

2

W2RD (+W2XT,N2VM,N2UYV)
1,672,272 1264 441 48 C
N2SA (+WA2JQK,N2IX)
1,091,520 960 379 48 C
K2OWE (+KG2MY)
934,983 873 357 48 C
AB2DE (+N2KPB,KC2AVE,KC2DZY, N2ZAS,KB2IZB)
615,225 631 325 48 C
N2LBR (+WA1KKM)
470,475 615 255 48 C
N1XL (+K2GH)
334,371 491 227 48 B
WB2KHO (+N2LDV)
215,340 388 185 48 C
KG2FH (+KB2YZX)
84,645 209 135 48 B
AA2MU (+ops)
70,347 179 131 48 C
W2HC (W2GW,KD2IN,W2JSF,KB2OQM, W2UL, ops)
46,410 182 85 48 B
AD2P (+N2HMM)
15,744 82 64 4 B

3

NE3F (+K3ATO)
2,125,320 1592 445 48 C
W3MF (+K3PH)
1,627,647 1253 433 48 C
N1WR (+N3WZR,N3AFT)
883,365 895 329 48 C
W3HVQ (+N3TRP)
542,538 591 306 48 C
K3IVO (+K3HH,K3HOI,KF3FT,W3IP, W3NLB,WA3TID,KB0PQQ)
473,025 595 265 48 C
KE2HG (+KB2DDM)
314,352 444 236 48 C

4

W4MR (+AA4GA,K4MA,W4WA,AA4NC)
2,917,653 1949 499 48 C
N4RV (+KT4W)
2,486,484 1794 462 48 C
K1TO (+WD4AHZ,KG4BWE)
2,455,794 1727 474 48 C
AE4RO (+AE4SW)
1,376,136 1108 414 48 C
W4PRO (+ON4AUC,KO4MR,WB4GCS)
1,090,824 1057 344 48 C

5

N5CQ (+KG5IG,KM5FA,NA4M,W5TD, N3BB,N5CQ)
2,174,601 1781 407 48 C
N5TW (+W5TD,NA4M,AC5AA)
1,808,235 1405 429 48 C
K5OY (+N5ZS,AB5SE)
1,299,942 1197 362 48 C
AA5NT (+KD5FLK,N5EE)
1,240,704 1077 384 48 C
K5MDX (+WQ5L,W5UE,N5FG,K5NY, KC5LK,AA5CI)
894,873 991 301 48 C
W5WP (NZ5V,K4DG, ops)
547,962 674 271 48 C
N7DF (+ops)
181,920 379 160 48 C

6

W6EEN (+K6XC,W6AQ,W6ORD)
2,025,495 1957 345 48 C
NR6R (+N6KI,N6UWW,W5NYV,K6GO, KE6EKW,KF6UID)
798,720 1040 256 48 C
W6YRA (WA6AYI,WA7WYE,AC6YV, KE6SDB,KU6T, ops)
180,393 383 157 48 C
KQ6MU (+KF6KTM)
9,480 79 40 12 B

7

KC7V (+ops)
2,423,673 2263 357 48 C
NM7I (+K7ON)
404,169 677 199 48 B
KO7X (+NY4I)
312,639 529 197 48 C
K7ZUM (+KD7BSW)
233,037 567 137 48 C

8

K8AZ (+K8BL,K8NZ,N8AA,ND8L, W8KIC,WB8K,WT8C)
2,809,758 1862 503 48 C
W9LT (+K8OQL)
2,092,845 1681 415 48 C
N8NR (+N8BJQ,N9AG,K9NW,KB8LOE)
1,895,274 1483 426 48 C
W8SP (+WG8T,W8OP)
110,760 284 130 17 B
KC8ELY (N8MMF,N8ZDW,N8NJE, ops)
14,025 85 55 48 B

9

K9SD (+KI9A,KW0A,KA0GGI)
2,010,825 1655 405 48 C
WN9O (+W9IU)
1,408,752 1087 432 48 C
KD9ST (+K9SD,KA9SQR,KA9SQS, KB9BAT)
900,480 938 320 48 C
N9JF (+KB9JIZ)
273,306 451 202 48 B

0

K0DU (+K0UK,K0CL,N0ZA)
2,659,500 2250 394 40 C
W0CP (+KK0T,WJ1R/UA6HZ)
2,280,822 2006 379 48 C
W0SD (+W0DB,WD0T,KB0PPA)
1,657,260 1485 372 48 C
KR0B (+N0BKL,KS0T,KJ0B,KB0KQA, N0RA) 931,590 941 330 48 C
K0GQ (+K0OU,KB0RTH)
554,610 695 266 48 C
KE0A (+N0FW)
535,830 674 265 48 C
VA3RU (+VA3UZ)
864,144 1059 272 48 C
VE6AO (VE6KC,VE6NJK,VE6JF, VE6RSX,VE6TC,VE6UUG,VE6WSI, ops) 296,136 457 216 48 C

Multioperator Two Transmitters

N2TX (+KE2TR,AA2MF,N9KAU/2, KD2TT,K2AJ)
5,791,968 3549 544 48 C
N2NT (+W2GD)
5,244,360 3014 580 48 C
K9AA (at W9JA) (+K4JA,K9GY,K9JY, N9AW,N9FH,WE9V)
4,928,406 3031 542 48 C
K6RC (+K6OM,N6IG,W6UT)
4,594,779 3473 441 48 C
N3AD (+K3IPK)
3,856,410 2430 529 48 C
KB1H (+AA1CE,NB1U,N1LYA,KB1DFB, N1XS,N1BU,K1EB)
2,840,112 1936 489 48 C
W3GNQ (+N3NT,W3RFC,WI2T,WR3Z, W3ZZ) 2,800,848 1978 472 48 C
N2MM (+WA3RHW,K2UT)
2,534,925 1825 463 48 C
K2KV (+WM2V,N2GA,KS2G,K2DO, KA2D) 2,434,326 1874 433 48 C
K6SG (+K6NO)
1,940,796 1914 338 48 C
N6ED (+KQ6ZC)
1,889,082 1863 338 48 C
W8ZA (+K3DNE,WD3A)
1,591,731 1371 387 48 C
N6ZS (+N6SNO)
1,342,536 1352 331 48 C
N5YA (+KM5UB,N5KB,WN6HYX, WB2LMA,W5KNE,WA5EAH,KC5NYE, KB5SSV,K5WO)
1,222,086 1154 353 48 C
K4TCG (+W4PA,W9WI,K4OOO,K4RO, KE4OAR,W1ADE,K1KY)
1,144,080 1135 336 48 C
W1AW (N1ND,AA1GW,K5FUV,WA1STO, N1RL,K8CH, ops)
790,938 906 291 30 C
K4WZ (+KS4CG,AF4EP,K4QFF,AD4QB, WA4ZJJ)
620,310 713 290 48 C
VE5WI (+VE5FA,VE5FN)
590,205 803 245 48 C
W4WS (N4VHK,WB4MSG, ops)
432,222 574 251 48 B
N1JJ (+W0GJ,N0MLJ,N0MAJ,W0PRJ, KL7YL) 397,782 539 246 48 C

Multioperator Unlimited Transmitters

W3LPL(+ES2RR,K1HTV,K1RZ,N2IC, W2GG,AI3M,K3MM,K3MQH,K3NA, KE3Q,K3RA,KD4D,N5OKR,K8CC)
11,564,760 5669 680 48 C
N2RM (+AB2E,K2BM,KB3AFT,N2AA, N2NC,N2NU,N5NJ,W2RQ,WM2H)
10,011,300 5134 650 48 C
KB1SO (+W1GQ,K1ZR,N1SNB, KW1DX,K1SI)
7,018,161 4097 571 48 C
K1KI (+W1NT,N2YHK,KM1P,W1RM, N1IXF,K1CC)
6,981,345 3885 599 48 C
N3RS (+N3RD,N3ED,K3WU)
6,681,198 3914 569 48 C
K9NS (AA9D,K9DX,K9GSS,K9HMB, K9PW,K9RS,KS9W,W9RM,ops)
6,655,500 3825 580 48 C
W3PP (+AA1K,WB4FDT,NX3A,N3KW, NW3Y,W3KQ,K3FT)
6,119,484 3682 554 48 C
KO6N (+N6RO,K3EST,N6BV,K6AW, KM6F,WG6B,AE0M,N6BZA)
6,114,420 4355 468 48 C
W1FJ (+W1KM,NB1B,N1KO,W1NA, WA1QGC,NY1L)
6,096,150 3534 575 48 C
K1TTT (+WA1ZAM,KB1W,K2WR,KI6EZ, W1TO,K1MK,NJ1F,WT2Q)
5,423,550 3287 550 48 C
W4MYA (+N4DEN,KB4DI,N4ZJ,W4DAA, W4DR,W4HJ,W4HZ)
5,046,408 3064 549 48 C
K1RX (+W1FV,KR1G,WA1S)
5,002,692 3043 548 48 C
KV1W (+W1CSM,N6RFM,K1MBO, KE1FO)
4,456,296 2808 529 48 C
W3EA (+K3OX,N3RU,N3MKZ,W3CF, WT3Q)
4,090,824 2568 531 48 C
K3ANS (+W2CG,WF3H,K3YD, KC2ZA,K2NJ)
3,204,330 2074 515 48 C
W3EEE (+N3BNA)
2,819,124 2079 452 48 C
K3II (+K3TEJ,K3PP,K3VA)
2,505,564 1762 474 48 C
W0AIH (+WR0DK,N9THC,N9ISN, K0JA,K0JE,WW0DX,W0PIG,WA0RBW, KB9AZZ,K9WIE,K0TG)
2,465,136 1802 456 48 C
KY2J (+NA2N)
2,234,928 1616 461 48 C
K3LR (+W3GH,K8GL,N3RA,K3UA,N9RV, N6WLX,K8DX,KA3JWJ,K8KM,XE2AC, W3YQ,W3RTY)
2,071,845 1545 447 48 C
K6PUD (+N6DE,KQ6OB,KF6QXN, N6FFC,N6IV,K6EP,AA6W,K5PI,AA6EG)
1,745,436 1889 308 48 C
K2WB (+KD2KS)
1,119,375 995 375 48 C

DX

Single Operator

Africa

Nigeria

5N3CPR 13,230 98 45 48 B
5N0/OK1AUT
298,758 1717 58 48 C 20

Zambia

9J2FR 485,352 1284 126 48 C
9J2A (JA0JHA, op)
359,100 2100 57 48 C 15

Morocco

CN8NK 81,150 541 50 48 C 15

Madeira Islands

CT3KN 126,000 420 100 48 C
CT3DL 22,644 148 51 48 C
CT3HF 41,715 309 45 48 B 80

Canary Islands

EA8/OL6X (OK1DIG, op)
30,504 248 41 48 B 10
EA8AEI 16,308 151 36 48 C 10

Ceuta & Melilla

EA9IB 37,674 299 42 48 B 10

South Africa

ZS6AJS 19,581 107 61 48 B
ZS6SA 30,033 213 47 48 C 20

Asia

Israel

4Z5FW 10,080 80 42 48 B
4Z5JQ 3,654 42 29 5 B
4X1ZA 12,474 126 33 48 C
4X1VF 5,376 56 32 48 C

Kuwait

9K2HN 99,387 409 81 48 C

West Malaysia

9M2TO 1,305 29 15 48 C

China

BD4DW 2,925 75 13 48 B 10

Kyrgyzstan

EX8MZ 12,285 105 39 48 C 20
EX8MDA 1,200 25 16 48 C 15

South Korea

HL5YI 210 14 5 48 B 15

Thailand

HS1CKC 4,836 62 26 16 B 20
E21EIC 1,056 22 16 6 B 20

Japan

JR4DAH 64,938 274 79 48 A
JA2DLM 50,838 229 74 48 A
JM1NKT 45,990 210 73 48 A
JA5GPJ 45,471 286 53 17 A
JA2JSF 33,660 187 60 48 A
JA3LFK 4,944 103 16 48 A
JA4AKN 3,468 68 17 48 A
JH3DMQ 3,306 58 19 48 A
JJ4IYG 36 4 3 48 A
JA8RWU 1,090,530 1731 210 48 B
JH4UYB 387,360 807 160 48 B
JE1LFX 310,905 735 141 48 B
JR7WAB 244,728 618 132 48 B
JJ1VRO 236,376 588 134 48 B
JL1ARF 235,494 534 147 48 B
JF1SQC 187,128 552 113 48 B
JS1OYN 127,602 417 102 48 B
JH8KYU/1 115,599 341 113 48 B
7L4IOU 99,465 349 95 28 B
JR2LIS 54,036 228 79 48 B
JA5EO 46,980 261 60 48 B
JA0BMS/1 41,808 208 67 48 B
JA1GYO 33,366 166 67 48 B
JA2OJ 30,798 174 59 48 B
JA1BUI 28,539 151 63 48 B
JA1XUY 22,032 136 54 48 B
JR7LVK 21,168 147 48 48 B
JA2BQX 20,304 141 48 48 B
JH6FTJ 20,163 143 47 48 B
JH5OXF 20,100 134 50 48 B
JE3USO 18,468 114 54 48 B
JR1MRG 17,835 145 41 48 B
7K4GUR 17,700 118 50 48 B
JR7GDU 17,550 130 45 29 B
JA1AB 17,466 142 41 48 B
JH9DNK 17,040 142 40 48 B
JP1SPV 15,750 125 42 48 B
JA1KK 12,900 100 43 48 B
JA4EQB 11,832 116 34 48 B
JA2GHP 11,187 113 33 48 B
JR4PMX/1 10,710 105 34 3 B
JA3ARM 7,392 77 32 48 B
JH7IMX 6,603 71 31 7 B
JP1PZE/1 6,000 80 25 16 B
JA1BPN 4,599 73 21 48 B
JH1RMH 2,907 57 17 48 B
JH1RDU 2,760 46 20 48 B
JA7ARW 2,550 50 17 4 B
JA1YEW (N3NQL, op)
2,277 33 23 6 B
JL3RDC 2,208 46 16 48 B
JA9EJG 2,142 42 17 6 B
JA5GSG 1,794 46 13 48 B
JA1STY 1,215 27 15 48 B
JH1PXY 1,131 29 13 48 B
JK1ASO 750 25 10 48 B
JJ2IER 162 18 3 48 B
JA1ELY 1,279,944 1839 232 48 C
JH7DNO 1,237,380 2012 205 48 C
JH7AFR 1,051,218 1701 206 48 C
JR3NZC 530,406 1119 158 48 C
JA2BNN 387,240 922 140 48 C
JA7BEW 190,704 548 116 48 C
JF2FIU 154,080 535 96 48 C
JA2FSM 130,728 419 104 48 C
JA2ZJW (JH2CMI, op)
114,192 488 78 48 C
JA2AXB 112,800 376 100 48 C
JR1LEV 65,124 268 81 48 C
JH7WKQ 46,053 301 51 5 C
JR3WXA 23,400 156 50 48 C
JH6OPP 15,600 130 40 17 C
7J1ABD 9,804 76 43 48 C
JE1SPY 360 20 6 48 B 80
JH5FXP 65,190 410 53 48 C 40
JR7VHZ 42,450 283 50 15 C 40
JA7DRM 26,964 214 42 48 C 40
JA3CE 1,560 40 13 48 C 40
JG1OWV 1,044 29 12 48 B 40
JE1NYV 924 28 11 48 B 40
JA0GZ 357 17 7 48 B 40
JA0GEY 180 10 6 48 B 40
JF2FKJ 120 10 4 48 B 40
JA3WFQ 60 5 4 48 B 40
JE1GZP 2,040 34 20 48 B 20
JH3PRR 170,829 999 57 16 C 15
JA7FTR 166,152 989 56 48 C 15
JS2LGN 165,648 986 56 48 C 15
7M4BEN 150,660 930 54 20 C 15
JR1MQT 111,456 688 54 48 C 15
JA9PPC 104,490 645 54 7 C 15
JH4JNG 93,600 600 52 48 C 15
JA7BJS 87,450 583 50 48 C 15
JE1BDC 70,200 450 52 48 B 15
JH7QXJ 52,311 371 47 12 C 15
JH8SLS 46,575 345 45 48 C 15
JL3VUL/3 39,690 294 45 48 B 15
JR4GPA 18,585 177 35 48 B 15
JA1AJK 14,478 127 38 48 C 15
JR3CVO 7,482 86 29 48 B 15
JA8TEZ 6,660 74 30 48 B 15
JA3SOK 5,016 76 22 6 C 15
JE4QGF 4,950 75 22 7 B 15
JA4BAA 3,705 65 19 48 B 15
JA6ZLI 2,856 56 17 48 C 15
JK8HOS 2,451 43 19 48 B 15
JJ1JRH 1,584 44 12 48 B 15
JI8GZS 1,134 27 14 48 B 15
JA3BBG 1,008 28 12 48 B 15
JK8FRL 891 27 11 48 B 15
JE1QHT 891 27 11 5 B 15
JN2QYN/2 780 20 13 3 B 15
JH1BUB 750 25 10 48 B 15
JA5CUE 696 29 8 48 B 15
JM4MXS 399 19 7 48 C 15
JA7ADT 384 16 8 48 B 15
JJ0FDT 378 14 9 5 B 15
JK1BII 378 18 7 48 B 15
JA1XPU 345 23 5 7 B 15
JA2CWU 336 14 8 48 C 15
JF7GDF 306 17 6 48 B 15
JL2HUJ/1 225 15 5 48 B 15
JG1GCO 180 12 5 48 B 15
JH2WHS 135 9 5 48 B 15
JM4MBL 63 7 3 2 B 15
JN4DCI 45 5 3 48 B 15
JR1BSV 36 4 3 48 B 15
JR3KAH 3 1 1 48 A 15
JI2UNR 125,280 870 48 48 C 10
JE2HCJ 90,099 639 47 48 C 10
JH7GN 74,520 621 40 48 C 10
JH9VSF 45,000 375 40 48 B 10
JG2TKH 44,280 369 40 48 C 10
JG3KIV 22,080 320 23 48 C 10
JF2VAX 19,764 244 27 11 B 10
JH1AZO 16,044 191 28 48 C 10
JH1UUT 10,350 150 23 48 C 10
JA1EEG 8,736 112 26 48 B 10
JH2AVO 7,452 108 23 6 B 10
JQ6NAW 5,580 93 20 48 C 10
JG1TDK 5,457 107 17 48 B 10
JA6EFT 5,400 100 18 48 B 10
7N2UQC 2,880 64 15 48 B 10
JG3NKP/1 2,880 60 16 10 B 10
JD1BIA 2,562 61 14 48 B 10
JO1TLP 1,404 36 13 48 B 10
JA1HG 1,320 40 11 48 B 10
JE7DOT 1,296 36 12 48 B 10
JA1AAT 1,170 39 10 48 B 10
JJ6TWQ 1,020 34 10 48 B 10
JA1VHH 504 21 8 48 B 10
JH1TUX 273 13 7 48 B 10
JF1VXB 144 12 4 48 B 10
JF5FGY 132 11 4 48 B 10
JA6QDU 108 12 3 48 B 10
7K2PBB 36 4 3 48 B 10

Turkey

TA3J 264 11 8 2 B 80

Asiatic Russia

RW9QA 576 16 12 48 B
UA0ZBK 826,218 1398 197 48 C
RA0FJU 571,896 1128 169 48 C
RA0SA 45 5 3 48 C 80
RZ9UA 158,946 898 59 48 C 20
UA9CDV 67,887 397 57 48 C 20
RK9CZO (RX9CAZ, op)
59,400 360 55 48 C 20
RK9KWB 5,427 67 27 48 C 20
UA0SJ 2,310 35 22 48 B 20
UA9BS 432 12 12 48 B 20
RA9AC 105 7 5 48 C 20
UA0FDX 99,954 617 54 48 B 15
UA0CW 66,444 452 49 48 C 15
RA0FF 11,988 222 18 48 C 10

Kazakhstan

UP6F (UN7FZ, op)
3,612 43 28 48 B
UP4L (UN7LZ, op)
44,874 277 54 48 B 20
UN7AB 4,680 60 26 48 C 15

Hong Kong

VR2BG 25,956 412 21 6 C 10

Europe

ITU HQ

4U1ITU (K2KQ, op)
565,524 1366 138 48 C

Croatia

9A3SC 4,320 45 32 48 B
9A2L (9A2VJ, op)
184,128 548 112 48 C
9A6KOI 11,970 133 30 48 B 40
9A5Y (9A3NM, op)
222,480 1236 60 48 C 15
9A4RU 20,826 178 39 48 C 15
9A4D 89,148 646 46 48 B 10
9A2RD 37,515 305 41 48 B 10
9A3RE 11,397 131 29 48 B 10
9A6ACY 4,725 63 25 48 B 10

Portugal

CT1EAT 1,130,976 1848 204 48 B
CT1CLR 53,664 208 86 48 B
CT1GVN 49,941 179 93 48 B
CT1AUO 411,300 914 150 48 C
CT1BNW 85,239 287 99 48 C
CT1AOZ 22,140 180 41 48 B 80
CT1BWW 41,040 304 45 48 B 40
CT1ERY 167,640 1016 55 48 C 20
CT4NC 3,120 52 20 48 B 20
CT8T (CT1ESV, op)
292,935 1655 59 48 C 15
CT1AHU 61,758 438 47 48 C 10
CT1ELF 24,750 150 55 48 B 10
CT2GQN 19,152 168 38 48 B 10

Fed. Rep. of Germany

DL8TWA 10,680 89 40 48 A
DL8SDC 54,000 225 80 48 B
DK7FP 35,712 186 64 48 B
DK7ZH 20,448 142 48 48 B
DF5PP 15,900 106 50 48 B
DH2RAL 10,947 89 41 48 B
DF6LQ 6,384 56 38 48 B
DL7KSR 2,415 35 23 48 B
DL3KDC 684 19 12 48 B
DL5ANS 594 18 11 48 B
DL8PC 672,246 1266 177 48 C
DL2DX 594,594 1287 154 48 C
DJ6QT 455,220 1124 135 48 C
DJ3HJ 310,185 915 113 48 C
DJ2MX 121,257 499 81 48 C
DJ9AL 44,121 191 77 48 C
DL8AAE 31,506 178 59 48 C
DJ2YE 360 12 10 48 C 40
DJ7AA 279,990 1530 61 48 C 20
DL8UD 61,776 429 48 48 C 20
DJ9DZ 5,346 66 27 48 C 20
DF9ZP 211,692 1196 59 48 C 15
DK2OY 123,750 750 55 48 C 15
DL1LH 31,584 224 47 48 B 15
DJ0BX 8,532 79 36 48 B 15
DL7XR 5,070 65 26 48 B 15
DL9ZWG 2,772 42 22 48 C 15
DL4ML 3 1 1 48 C 15
DK3KD 10,530 130 27 48 C 10

Spain

EA3GHZ 183,498 514 119 48 B
EA1FAD 70,965 285 83 48 B
EA3AM 69,828 253 92 48 B
EA5FID 55,080 204 90 48 B
EA4AKJ 54,036 228 79 48 B
EA3OP 48,279 209 77 48 B
EA1CJH 32,856 148 74 48 B
EA1JE 32,637 253 43 48 B
EA1IF 21,708 134 54 48 B
EA5FFC 20,790 126 55 48 B
EA7GXX 18,792 116 54 48 B
EA5BX 18,354 133 46 48 B
EA3EVR 12,432 112 37 48 B
EA7AFM 11,868 92 43 48 B
EA1AAA 8,448 64 44 48 B
EA4DX 543,348 1053 172 48 C
EA7CRL 350,880 680 172 48 C
EA3NB 90,537 293 103 48 C
EA4TX 81,216 423 64 48 C
EA4GT 72,135 229 105 48 C
EA3GBU 47,040 280 56 48 C
EA4AAK 26,082 138 63 48 C
EA3FAJ 20,088 108 62 48 C
EA3GHQ 3,969 49 27 48 C
EA1DVY 4,500 75 20 48 B 160
EA3FQV 56,496 428 44 48 C 80
EA7GTF 13,464 136 33 48 B 80
EA3ELM 7,209 89 27 48 C 80
EA4KD 105,576 664 53 48 C 40
EA1AAW 6,642 82 27 48 B 20
EA3AAW 360 12 10 48 B 20
EA3BHB 129,564 732 59 48 C 15
EA7FTR 128,421 751 57 48 B 15
EA3QP 95,424 568 56 48 B 15
EA3BCP 36,162 287 42 48 C 15
EA4ATI 27,600 200 46 48 B 15
EA2BEY 22,176 176 42 48 B 15
EA3KT 21,156 164 43 48 B 15
EA3MR 15,096 136 37 48 B 15
EA1GL 14,100 94 50 48 B 15
EA1AHA 3,600 48 25 6 B 15
EC3AJQ 3,234 49 22 48 B 15
EC4BB 18 3 2 48 A 15
EA7KW 147,582 911 54 48 C 10
EA7BA 108,936 712 51 48 C 10
EA3AR 80,928 562 48 48 C 10
EA4ET 56,196 446 42 48 C 10
EA7DBO 34,314 266 43 48 C 10
EA1AUT 14,070 134 35 48 B 10
EA3ESJ 5,133 59 29 48 B 10

Balearic Islands

EA6LP 304,137 719 141 48 C

Ireland

EI5DI 32,190 145 74 48 B

Moldova

ER5DX 2,052 36 19 48 B

Estonia

ES7GPQ 41,451 337 41 48 B 10

Belarus

EU1SA 6,438 58 37 48 B
EU1AZ 20,862 183 38 48 C 15
EW2EO 2,706 41 22 48 B 15

France

F5BEG 129,564 354 122 48 A
F6BEE 35,046 177 66 48 A
F5BMK 316,992 1016 104 48 B
F8BPN 88,350 310 95 48 B
F8BCZ 66,216 248 89 48 B
F6FTB 47,628 196 81 48 B
F6DRP 46,299 253 61 48 B
F6EDW 35,778 178 67 48 B
F5CWU 25,344 132 64 48 B
F5AOV 20,898 129 54 48 B
F6FNA 12,150 81 50 48 B
F5HWB 10,125 75 45 48 B
F5JBF 864 24 12 48 B
F5RZJ 767,010 1382 185 48 C
TM5A 618,825 1115 185 48 C
F5IN 128,960 620 104 48 C
F6BBD 87,963 269 109 48 C
TM6P (F5MZN, op)
70,305 545 43 48 C 80
TM1W 229,923 1299 59 48 C 15
F5ASD 19,065 155 41 48 B 15
F5TVG 8,208 72 38 48 B 15

England

G0TDX 27,156 146 62 48 A
G3VAO 240,312 589 136 48 B
G4NXG/M 73,575 225 109 48 B
G0VBD 60,648 266 76 48 B
M4T (G0VQR, op)
11,610 90 43 48 B
G3FNM 18,810 110 57 48 C
G4BUO 278,574 1601 58 14 C 15
G0AEV 43,602 338 43 48 C 10
G3MXH 38,934 309 42 48 C 10
G4AHJ 2,820 47 20 8 B 10

Northern Ireland

GI0KVQ 19,080 159 40 48 B 15

Scotland

GM3BCL 121,644 372 109 48 C
GM7V (GM4YXI, op)
145,350 850 57 48 C 15

Wales

GW4BLE 264,060 1467 60 47 C 15

Hungary

HA2SX 115,881 361 107 48 A
HA8IC 18,630 115 54 48 B
HA6NL 54,282 218 83 48 C
HG3DX 156,465 855 61 48 C 15
HG1W (HA1YA, op)
61,116 463 44 48 C 10

Switzerland

HB9DDS 9,180 85 36 10 A

Italy

IK3SSJ 93,000 310 100 48 B
IK4QJM 89,670 305 98 48 B
IS0IGV 74,529 273 91 48 B
IZ1AWD 37,590 179 70 48 B
IK2SVF 36,675 163 75 48 B
I4VEQ 26,448 152 58 48 B
IV3SKB 22,692 124 61 48 B
IZ1BIJ 20,532 118 58 48 B
IK2WZQ 20,160 112 60 48 B
IK7RVY 7,626 82 31 48 B
IR0F (IK0ZME, op)
4,830 46 35 48 B
IK7WPD 4,650 50 31 48 B
IK7WUE 4,032 56 24 48 B
IK0STM 3,042 39 26 48 B
IK1SLE 904,176 1794 168 48 C
IT9PZM 616,590 1054 195 48 C
I2SVA 361,260 892 135 48 C
IK4WMB 201,828 484 139 48 C
IK6JNH 183,438 474 129 48 C
IK2ANI 177,210 537 110 48 C
IK8TLZ 132,870 430 103 48 C
IV3IPS 121,263 487 83 48 C
I4ABF 41,625 185 75 48 C
IK8UND 11,988 111 36 48 C
I3MDU 2,997 37 27 48 C
IV3KSE 2,838 43 22 48 C
I4CSP 936 24 13 48 B 80
IQ4A (I4VEQ, op)
158,895 963 55 48 C 40
IR4R (IK4ALM, op)
67,326 458 49 48 C 40
IT9STX 253,080 1406 60 48 C 20
IR0MFP 164,160 960 57 48 C 20
IU2C 125,972 724 58 48 C 20
IT9RZR 55,728 387 48 48 B 20
IT9ICS 29,868 262 38 48 B 20
II8C (IK8AFN, op)
21,120 220 32 48 C 20
IK0JMS 8,100 100 27 3 C 20
IY4W 259,128 1464 59 48 C 15
II2Y (IK2OWX, op)
143,640 840 57 48 C 15
IQ5Z (IZ5AXA, op)
105,270 605 58 48 C 15
IK1HSS 85,635 519 55 48 C 15
IV3UHL 85,008 506 56 48 B 15
IO8O 65,031 409 53 48 B 15
IK5ZTW 42,336 294 48 48 B 15
IT9WPO 38,016 264 48 48 C 15
IK8TEO 29,970 222 45 48 C 15
IT9EQQ 85,950 573 50 48 C 10
IT9EQO 79,800 532 50 48 C 10
IK4AUY 47,343 367 43 48 C 10
IK2UCK 44,034 358 41 48 C 10
IK6PMF 27,300 260 35 48 C 10
IK2YSA 23,004 213 36 48 C 10
I7FMN 12,600 140 30 48 B 10
IK2UVR 5,472 76 24 48 B 10
IV3HAX 276 46 2 48 C 10

Sardinia

IS0LLJ 26,550 150 59 48 B
IS0SLR 10,530 90 39 48 B
IS0NHT 47,268 303 52 48 C 15

Norway

LA2JR 11,070 82 45 48 B
LG5LG (OZ5JR, op)
1,938 34 19 48 B
LA1PHA 1,404 26 18 48 B
LA9HW 35,742 259 46 48 C 15

Luxembourg

LX1JH 32,802 154 71 48 B
LX1KC 401,166 874 153 48 C

Lithuania

LY2CX 9,108 66 46 48 B
LY3BH 341,226 801 142 48 C
LY5W (LY1DR, op)
106,590 323 110 48 C
LY1FAG 84,564 348 81 48 C
LY2OX 60,225 275 73 48 C
LY1DT 37,758 203 62 48 C
LY2HM 1,530 34 15 48 C 80
LY2BTA 92,748 524 59 48 C 15
LY3BA 27,552 224 41 48 B 15
LY2GF 15,444 132 39 48 C 15

Bulgaria

LZ2JE 19,584 128 51 48 B
LZ2NB 13,332 101 44 48 B
LZ6A (LZ4BC, op)
89,100 300 99 48 C
LZ1BJ 7,350 70 35 48 C
LZ1PM 2,475 55 15 48 B 80
LZ1DP 990 30 11 48 B 10

Austria

OE8SKQ 1,261,980 2052 205 48 C
OE9MON 45,720 381 40 48 B 10

Finland

OH2LYP 7,560 63 40 48 B
OH6RE 52,170 235 74 48 C
OH8LQ 139,653 789 59 48 C 20
OH6AC (OH6CS, op)
131,022 753 58 48 C 15
OH1KSD 6,045 65 31 48 B 15
OH1MM 324 12 9 48 B 15

Czech Republic

OK1DKS 30,600 150 68 48 A
OK1RF 2,063,196 2676 257 48 C
OK2FD 760,914 1342 189 48 C
OL5T (OK1FLM, op)
70,152 296 79 48 C
OL5Y (OK1FU, op)
27,423 277 33 48 C 80
OK1DG 64,845 393 55 48 C 15
OK2SAT 22,560 160 47 48 C 15
OK1DSZ 21,666 157 46 48 B 15
OK2XA 9,828 84 39 48 B 15
OK1DRQ 3,762 57 22 48 B 15
OK2RZ (OK1FUA, op)
33,744 296 38 48 C 10
OK2BJT 23,484 206 38 48 C 10
OK1XC 3,906 62 21 48 B 10

Slovakia

OM3YK 23,427 137 57 48 B
OM4DN 7,440 80 31 48 B
OM5RW 152,019 889 57 48 C 15
OM4KK 12,987 111 39 48 B 15
OM7YC 2,772 44 21 48 B 15

Belgium

ON4MA 409,092 934 146 48 B
ON4AWH 54,366 221 82 48 B
OT9T (ON4UN, op)
117,750 785 50 48 B 80
OT9A (ON4ASB, op)
178,770 1010 59 48 C 15
ON4XG 11,700 100 39 48 B 15

Denmark

OZ1ACB 41,400 184 75 48 B
OZ9Y 400,680 1113 120 48 C
OZ5EV 94,242 278 113 48 C
OZ6OG 1,782 27 22 48 C

Netherlands

PA0IJM 81,675 275 99 48 B

PA0RBS 19,350 129 50 48 B
PA3AAV 12,804 97 44 48 B
PA7KW 21,924 116 63 48 C
PA3EWP 121,296 722 56 48 C 20
PI4COM 120,624 718 56 48 C 20
PI4TUE (PA3EZL, op)
175,914 1011 58 48 C 15
PA5ET 159,372 932 57 48 C 15
PA0KDM 390 13 10 48 B 15

Slovenia
S51DX 815,040 1415 192 48 C
S55A 290,304 672 144 48 C
S54E 1,443 37 13 48 C 160
S50K (at S50A)
73,206 581 42 48 C 80
S53M (S55OO, op)
139,776 895 52 48 C 40
S50S 234,540 1303 60 48 C 20
S57U 30,381 247 41 48 B 20
S50R 208,620 1159 60 48 C 15
S53ZO (S51TA, op)
156,807 917 57 48 C 15
S57MSU 11,058 97 38 48 B 15
S59D 8,019 81 33 48 B 15
S51AY 59,928 454 44 48 C 10
S50D (S51D, op)
38,499 313 41 48 C 10
S52OT 18,090 201 30 48 B 10
S57NMQ 15,456 161 32 48 B 10

Sweden
SK0MT (SM5CCT, op)
3,024 42 24 48 A
SM7BJW 34,230 163 70 48 B
SM2EKM 200,070 585 114 48 C
SM4SET 57,240 265 72 48 C
SM2DMU 117,528 664 59 48 C 20
SK3LH (SM3WMV, op)
5,481 63 29 48 B 15
SM0KV 270 10 9 48 C 15

Poland
SP6DVP 80,340 260 103 48 B
SP7LZD 28,512 144 66 48 B
SP3XR 10,320 80 43 48 B
SP7A 3,969 49 27 48 B
SP1MVG 2,346 34 23 48 B
SP5FKW 1,716 26 22 48 B
SP7LHX 972 27 12 48 B
SP5LCC 480 40 4 48 B
SP6YAQ (SP6HEQ, op)
53,439 379 47 48 C 40
SP3GHK 1,134 27 14 48 B 20
SP6IEQ 312 13 8 48 B 20
SP5GRM 183,549 1037 59 48 C 15
SQ6Z (SP3DWQ, op)
180,264 1036 58 48 C 15
SP6IXF 88,704 528 56 48 C 15
SP6CZ 63,336 406 52 48 C 15
SP9BBH 23,970 170 47 48 B 15
SP4TVO 1,428 34 14 48 B 15
SP3KFH 17,712 164 36 48 C 10
SP6LV 15,000 125 40 48 B 10
SP2AHD 3,528 56 21 24 B 10

Greece
SV1CIB 80,652 286 94 48 B
SV7/UY0MF 7,854 119 22 48 B
SV2AEL 36,285 295 41 48 B 10

Bosnia-Herzegovina
T94KW 3,168 44 24 48 A
T97M 248,400 690 120 48 C
T94DO 22,440 220 34 48 B 10

European Russia
RN1AO 67,650 275 82 48 B
UA3BL 65,985 265 83 48 B
RW4AA 319,236 719 148 31 C
UA6AN 3,906 42 31 48 C
RX3AEX 1,638 26 21 48 C
RA3DNC 429 13 11 48 C
RA4NW 120 8 5 48 C 80
RZ1AZ 1,440 30 16 48 C 20
RV1AW 138,852 798 58 48 C 15
RA6LAE 14,319 129 37 48 B 15
UA3LHL 6,555 95 23 48 B 15
RA3XO 5,952 62 32 48 C 15
UA4ACP 37,752 242 52 48 B 10

Ukraine
UT5UAG 32,184 149 72 48 B
UU4JO 3,825 51 25 48 B
UT1II 111,300 371 100 48 C
UR8MA 9,756 542 18 48 C
UR5WA 80,700 538 50 48 C 20
US5L 11,520 120 32 48 C 20
UT5UDX 10,509 113 31 48 C 20
US5ZE 12 2 2 48 B 20
UU2JZ 32,853 233 47 48 C 15
UT1IA 21,294 169 42 48 C 15
UT7QF 17,901 153 39 48 C 15
UX1KR 7,872 82 32 48 C 15
UR7IWW 7,482 86 29 48 C 15
US5EE (UA1FA, op)
1,050 25 14 48 C 15
UY5QZ 264 11 8 48 B 15
UR7VA 80,064 556 48 48 C 10
UT0D 28,356 278 34 48 C 10
UT7ND 6,210 90 23 48 C 10
UT1FA 2,580 43 20 48 C 10
UX2DQ 48 4 4 48 C 10
UR0DXX 48 4 4 48 C 10

Latvia
YL3BZ 1,581 31 17 48 B 15

Romania
YO3APJ 30,192 148 68 48 B
YO4FRF 81,249 511 53 48 C 20
YO6SD 432 16 9 48 B 15
YO5BIM 2,907 51 19 48 B 10

Yugoslavia
YU5KTK 88,500 295 100 48 B
YU7SF 3,036 44 23 48 B
YT4AY 60,912 432 47 48 C 40
YU1JW 216,825 1225 59 48 C 20
YT7A 203,727 1151 59 48 C 20
YT7KF 133,380 780 57 48 C 20
YZ9A (YU1AU, op)
131,196 754 58 48 C 15
4N1N (YU1BX, op)
10,944 96 38 48 B 15
YZ1U 40,470 355 38 48 C 10
YU7KM 7,722 99 26 48 B 10

Macedonia
Z31JA 9,855 73 45 48 C
Z32AF 300 20 5 48 C 80
Z31GX 45,450 303 50 48 C 15

North America

Barbados
8P9JL 101,010 370 91 48 B
8P2K (8P6SH, op)
1,772,928 2432 243 48 C

Cuba
CO8JY 9,486 93 34 48 B 160
CO8DM 23,112 214 36 48 C 20

Guadeloupe
FG5BG 4,488,966 5142 291 48 B

Panama
HO3A 65,856 224 98 48 B

Honduras
HR6/W5WW
4,958,523 5349 309 48 B

Grenada
J3A (K1XX, op)
4,731,714 5694 277 48 C

Alaska
NL7Y 24,192 144 56 11 A
WL7KY 252,117 771 109 48 C
N3HXQ/KL7
157,491 921 57 48 C 15

Virgin Islands
NP2DJ 22,500 125 60 48 B
KP2BH 188,268 1082 58 48 B 15

Puerto Rico
WP4LNY 26,190 194 45 48 B
KP3O 14,880 155 32 4 B 20
KP4FP 231,000 1375 56 48 C 10
WP4MYD 65,484 428 51 48 B 10

St.Maarten, Saba, St.Eustatius
PJ8/W3EH 159,030 930 57 48 B 10

Guatemala
TG9/IK2NCJ
465,510 2630 59 48 C 15

Costa Rica
TI1Z (TI4ZM, op)
191,748 1102 58 48 B 20
TI7/N4MO 300,150 1725 58 48 B 15

Antigua & Barbuda
V26P (W5AJ, op)
5,015,184 5128 326 48 B

Belize
V31JP (K8JP, op)
6,115,824 6534 312 42 C
V31MX 213,324 1226 58 48 B 20

St.Kitts & Nevis
V47KP 5,589,738 5698 327 48 C
V44NK 318,420 1740 61 48 C 20

British Virgin Islands
VP2V/K1DW
1,779,510 2579 230 48 B
VP2VF 365,682 2066 59 48 B 10

Turks & Caicos Islands
VP5J (KK9A, op)
6,011,520 6262 320 48 B
VP5A (KQ3V, op)
4,965,873 5189 319 48 B

Mexico
XE2DV 2,614,248 2964 294 48 B
XE1BEF 674,520 1460 154 48 B
XE1RGL 34,365 145 79 48 B
XE2DN 1,548,288 2016 256 48 C
XE2AUB 281,589 1771 53 48 B 10
XE1RCF 126,420 860 49 48 B 10
XE2HWH 29,172 221 44 48 C 10

El Salvador
HU4A (YT1AD, op)
6,939,270 6590 351 48 C
HU1A (YU7DR, op)
535,458 2926 61 48 C 15

Cayman Islands
ZF2DR (K5RQ, op)
4,890,600 5700 286 48 C

Oceania

Fiji
3D2TC 57,330 273 70 11 B

East Malaysia
9M6AAC (9M6US, op)
51,480 260 66 30 C

Philippines
DU7MHA 6,384 76 28 5 B
DU1SAN 3,990 70 19 48 B
DU1LER 4,746 113 14 48 B 10

New Caledonia
FK8VHN 482,517 999 161 48 B

Mariana Islands
NH0E 47,082 266 59 48 B
WH0ABA 101,136 688 49 48 C 10

Hawaii
KH6/WB6FZH
5,814 57 34 8 A
KH6/F5IDM
301,104 738 136 25 B
WH6O 50,298 202 83 23 B
NH6YK 3,825 51 25 2 B
KH7R (KH6ND, op)
6,247,908 6806 306 48 C
NH7A 4,513,500 5015 300 48 C
KH6/KG0ZI
136,728 844 54 48 C 10
WH6CYK 59,502 422 47 48 B 10

American Samoa
AH8A 397,062 2322 57 48 C 10

West Kiribati
T30R (OK1RI, op)
2,636,976 3208 274 48 C

Marshall Islands
V73UX 993,330 1698 195 48 C

Australia
VK2APK 359,640 740 162 48 B
VK4EJ 315,447 869 121 48 B
VK5GN 516,216 1096 157 48 C
VK3IO 31,506 178 59 48 C 40
VK2ARJ 278,046 1626 57 48 C 10
VK4EMM 271,890 1590 57 48 C 10
VK2UZ 23,940 190 42 48 C 10
VK4ICU 1,392 29 16 48 C 10

Indonesia
YB2UU 44,838 282 53 48 B
YB1KOR 15,456 92 56 48 B
YB1AQS 174,510 554 105 48 C

New Zealand
ZL1ANJ 1,725,543 2367 243 48 C
ZL1CDX 139,590 846 55 48 B 10
ZL2UDY 1,035 23 15 2 B 10

South America

Trinidad & Tobago
9Y4VU 356,874 2051 58 48 C 15

Chile
CE8NKR 1,728 24 24 48 B
XQ5SM 106,191 621 57 32 C 15
CE8EIO 332,406 1878 59 48 C 10

Bolivia
CP1FF 62,481 353 59 48 C

Uruguay
CX9AU 231,363 627 123 48 B
CX8CP 471,174 2662 59 48 C 10

Ecuador
HD2RG 286,110 867 110 48 C
HC2GT 160,227 937 57 48 B 20
HC1HC 275,760 1532 60 48 C 15

Galapagos Islands
HC8L (W6NL, op)
7,897,329 7953 331 48 C

Colombia
HK3SGP 318,366 769 138 48 B
HK4QIM 160,080 920 58 48 C 15
HK6PSG 53,856 408 44 48 B 10

Argentina
LU1VK 190,548 474 134 48 A
LU1HN 14,193 83 57 48 A
LU9HO 875,247 1747 167 48 B
LU2FT 615,285 1243 165 48 B
L44D (LU4DA, op)
558,372 1178 158 48 B
LU2HF 512,820 1295 132 48 B
AY5E (LU5DV, op)
505,620 1060 159 48 B
LU5EVK 14,040 78 60 48 B
LU5VV 792,075 1475 179 48 C
LU7DW 76,950 190 135 48 C
LU4D (LU4DXU, op)
101,124 636 53 48 C 40
LT1F (LU1FKR, op)
330,990 1870 59 48 C 20
LR0H (LU9HS, op)
269,700 1550 58 48 C 20
LU7HN 110,715 671 55 48 B 20
LW7DX 97,440 580 56 48 B 20
LU2JCW 25,284 196 43 48 B 20
L50V 124,410 715 58 48 B 15
LU6ETB 535,071 3023 59 48 C 10
LU4FM 483,741 2733 59 48 C 10
LU2FA 401,967 2271 59 48 C 10
LU5FC 350,991 1983 59 48 B 10
LV4V (LU4VZ, op)
298,599 1687 59 48 B 10
LU4DX 253,518 1457 58 48 B 10
LU5FB (LU8FQN, op)
238,203 1393 57 48 C 10
LU9HOA 191,400 1100 58 48 B 10
LU4FCZ 178,002 1023 58 48 B 10
LW8DXJ 167,910 965 58 48 B 10
LU8VCC 138,339 809 57 48 B 10
LW1EGO 133,815 811 55 48 B 10
LW7EIC 100,278 619 54 48 B 10
LU2HBV 88,605 537 55 48 B 10
LW7EGO 79,035 479 55 48 B 10
LU7VCH 50,544 324 52 48 A 10
LR7H (LU7HVH, op)
34,968 248 47 48 C 10

Peru
OA4SS 3,225,171 3967 271 48 C

Aruba
P40KD (N6KD, op)
435,456 2592 56 48 C 10

Brazil
PY2MNL 1,001,376 1952 171 48 B
PY2YU 997,353 1759 189 48 B
PY2DJ 151,200 420 120 48 B
PY2KQ 84,234 278 101 48 B
PY2OZF 66,912 272 82 48 B
PY1ADV 16,218 106 51 48 B
PY2TI 363 11 11 48 B
PT7BZ 2,090,592 2562 272 48 C
PR2R (PY2KP, op)
214,272 558 128 48 C
PR7FMT 30,102 173 58 48 C
PR7AR 21,945 133 55 48 C
ZV8O 22,317 173 43 48 C 40
PY1VU 9,540 106 30 48 C 40
ZX5J (PP5JR, op)
461,700 2565 60 48 C 20
PY1LI 104,520 670 52 48 C 20
PP5UA 248,331 1403 59 48 C 15
PY2NY 82,593 483 57 48 B 15
PT1A 76,560 464 55 48 C 15
PY1KN 31,605 245 43 48 B 15
PY3FBI 7,812 84 31 48 B 15
PQ5W 457,722 2586 59 48 C 10
PY4OY 180,600 1075 56 48 C 10
PP5UB 167,040 960 58 48 C 10
PY2TST 130,644 764 57 48 B 10
PY2ELG 93,885 569 55 48 B 10
PY3RK 93,786 539 58 9 B 10
PU2MRY 74,385 435 57 48 B 10
PY3FDX 63,018 389 54 48 B 10
PY3HSP 44,274 314 47 48 B 10
ZV2VT 38,514 262 49 48 B 10
PY3CGP 17,316 148 39 48 B 10
PY1SX 9,288 86 36 48 B 10
PU7EEL 5,490 61 30 48 C 10
PU2XLO 2,574 39 22 48 B 10
PU7ENW 192 8 8 48 C 10
PV8ZDC 168 8 7 3 B 10

Falkland Islands
VP8ON 37,908 234 54 48 C

Venezuela
YW1A (YV1AVO, op)
1,916,055 2565 249 48 B
4M5E (YV5NWG, op)
1,482,624 2496 198 48 B
YV7QP 64,272 208 103 48 B
YV4FZM 105,138 649 54 48 C 40
YW3B (YV3BKC, op)
161,022 1142 47 48 B 20
YV6DBW 109,872 654 56 48 C 15

Single Operator Assisted

Africa
EA9IE 2,324,070 3255 238 48 C

Asia
JA1YNE (JP1OGL, op)
242,901 591 137 48 C
JH4NMT 213,120 555 128 48 C
JQ1NGT 153,252 594 86 48 C
JI2QKJ 85,680 560 51 15 C
JK2VOC 7,047 81 29 48 B
7N2UTO 1,080 30 12 48 B

Europe
OH1EH 569,106 1171 162 48 C
GW0ARK 295,509 719 137 48 C
OM8FF 165,678 521 106 48 C
RX3ARI 130,296 488 89 48 C
DK7ZT 45,540 253 60 48 C
PA5KT 38,586 218 59 48 C
IT9STG 19,239 121 53 48 C
G0MTN 15,105 95 53 48 B
OK1DXW 12,642 86 49 48 C
DJ9MH 12,348 98 42 48 C
DK3GI 10,320 86 40 48 C

North America
WP3R (DL2CC, op)
6,009,636 6052 331 48 C

South America
P40B 5,982,642 6351 314 48 C
PS2E (PY2EX, op)
1,873,056 2864 218 48 C
ZP40Z 1,338,204 2492 179 48 C
CP6EB 809,178 1718 157 48 C

Multioperator Single Transmitter

Africa
3V8BB (I5JHW,I5NSR, ops)
1,276,236 2106 202 48 B

Asia
JA7YAA (+7M1JAS,JG7PSJ,JH0NZN, JE7HLZ) 927,618 1501 206 48 C
JI2ZEY (JA2BY,JA2BIV,JA2BIL, JM2CCL,JQ2BBC, ops)
504,036 1077 156 48 C
RK9CWW (RA9CMO,RA9CKQ, ops)
192,474 629 102 48 B
RK9JWV (+ops)
32,361 161 67 48 C

Europe
TM1C (+ops)
3,778,929 4389 287 48 C
IR4T (I4UFH,I4JMY,I4YSS,IK4IEE, IK2QEI,IK2SGC,IK4MHB,IK4UPB, ops)
3,205,950 3886 275 48 C
HG1S (HA1TJ,HA1DAE,HA1DAC, HA1DAI, ops)
2,276,946 3189 238 48 C
HB9AUS (+HB9SFD,HB9EEX,HB9CXZ, HB9FBO,HB9ZHA,HB9BYT,HB9FAW, HB9DOM,HB9OBQ)
1,615,860 2292 235 48 C
IR1A (IK1GPG,IK1QFM, ops)
1,536,375 2125 241 48 C
OT9U (ON4ASG,ON4CEZ,ON7LX, ON7TK, ops)
1,088,127 1719 211 48 C
EA3RKG (+ops)
849,138 1459 194 48 C
DK0NB (DL4NAC,DL7NFK,DL9NDS, ops)
847,629 1777 159 48 C
G3TBK (+G0GDU,G4LQL)
770,253 1373 187 48 C
IQ1Z (+ops)
486,066 994 163 48 C
RK3AWL (RX3DCX,RV3FF,RV3BA, ops)
468,930 1015 154 48 C
OZ5ESB (OZ1CWP,OZ1INN, ops)
394,830 1070 123 48 C
IO2L (I2OKW,I2BJS,IK2ZVU, ops)
288,000 768 125 48 C
GM3GBZ/P (GM4AFF,GM4WZY, GM0VIT,MM0BDA,GM0BTK,GM0JZV, GM0RRU, ops)
257,985 585 147 48 C
YU7AL (4N7RGH,YZ7EM, ops)
235,170 585 134 48 B
SK3IK (+Packet Cluster)
228,981 601 127 48 C
G1Y (G0UDT, M0AYQ, G0LPX, G7LXK, ops)
190,008 546 116 48 C
IK8WTM (+I8OCA)
183,018 517 118 48 C
G0NYD (+G0UGS)
144,771 451 107 48 B
OL2A (+OK2PDK,OK2PEM,OK2HBY)
121,536 422 96 48 C
RW4LYL (RA4LW,RW4LE,UA4LU, ops)
106,428 362 98 48 C
RZ1AWQ (UA1ACC,R1A-1400,RA1ARZ, ops)
104,139 399 87 48 C
RZ1AWO (UA1ACC,RIA-1400,RA1ARZ, ops)
104,139 399 87 48 C
IQ7R (+ops)
98,910 314 105 48 B
OK2KDS (OK2VWB,OK2HIJ,OK2-22266, ops)
54,027 207 87 48 B
F5KQN (+ops)
51,156 196 87 48 C
US8U (+UT5UUF,UT5UDG,UY2UZ, UT5UUT,UT5UPN)
34,542 202 57 48 B
DL0BKR (+DJ3PY,DH2PK,DJ1ER, DH1PRA,DL6EN,DK1WV,DL8PL)
29,394 142 69 15 B
RK1OWZ (RA1OJ,UA1OMZ, ops)
16,848 108 52 48 C
SM4VPZ (+SM4AIO)
13,635 101 45 48 B
OM9AZ (OM8CA,OM8TA, ops)
11,664 72 54 48 B 15
SK7BQ (+SM7CWI,SM7BQX,SM7BHM, SM7GXR) 9,792 96 34 48 B 20
UU5J (UU2JQ,UU0JX, ops)
3,843 61 21 48 C 15
DL0YY (DL6FCB,DH6ZA,DL3FCG, ops)
3,780 60 21 5 B 15

North America
V31DX (+W2NA,KI6IM,KM6K,AB6WM)
7,907,760 7845 336 48 C
VP5B (K4ISV,K4CN, ops)
7,579,650 7475 338 48 C
8P9Z (K3KG,K4FJ, ops)
7,383,738 7369 334 48 C
ZF2NT (+ZF2YB/KI6Y)
5,974,290 6090 327 48 C
FM5BH (+FM5FJ,FM5DS,FM5DN)
5,142,852 5772 297 48 C
WP3A (+WP4B,WP3C,WP4NHM)
4,070,640 4846 280 48 C
KG4OX (+KG4AIJ)
4,057,614 4554 297 48 C
VP9ID (+N2KJM)
3,907,404 4188 311 48 C
VP2V/K3MD (N3PUR,K3MD, ops)
2,795,622 3401 274 48 C
XE2EBE (N6RT,AD6DO,AA6DP, ops)
2,524,788 2796 301 48 C
XE2/N7MB (N7MB,NA7DB,N7RK, ops)
1,950,000 2500 260 48 C

Oceania
WH6H (+AD6E)
2,797,440 3760 248 48 C
VK4UC (+NO7F)
1,701,504 2532 224 48 C

South America
PJ9G (K2NG,K2TW, ops)
7,535,775 7729 325 48 C
LU1NF (LU8NA,LU1NAF, ops)
1,575,840 2345 224 48 C
PY1NEZ (+PY1NEW)
188,640 524 120 48 B

Multioperator Two Transmitters

Asia
JA1ZLO (7K1OCH,7L1ETP,7L3CQP, 7N3PZJ,JM3CRK,JH8CHX,JO2HKQ, ops) 328,104 744 147 36 C
JR7ZIT (+JK1BEY,JQ1UKK)
82,524 299 92 48 B

Europe
9A7A (9A7V,9A8A,9A2ME,9A3OS, 9A3TR,9A4PA,9A4RX,9A6DM, ops)
2,301,120 3196 240 48 C
DL3TD (+DL1AUZ,DL5ANT,DK8YY)
2,136,303 2883 247 48 C
DL4MCF (+DL1ZIH,DL4MEH)
1,658,880 2560 216 48 C
EA5DFV (+EA5ON,EC5CPL)
1,449,849 2129 227 48 C
EI9GJ (EI6GF,EI7F,EI9HQ,EI2FG, EI9FDB,K5RT, ops)
1,047,696 1898 184 48 B
IQ3A (IV3TAN,IV3YYK, ops)
823,797 2347 117 48 C
RW6AWT (RA6CO,RN6BN,RU6AB, UA6AAY, ops)
431,640 872 165 48 C

North America
6D2X (K5TSQ,W5VX,N5YK,K5TR,K9PG, ops) 12,739,58412064 352 48 C
HK0F (W4DC,AA3KX,K5OF,N2PP, WB4ZNH,WZ8P,WN4FVU, ops)
11,231,89211277 332 48 C
WP2Z (KE2VB,N2TK,N2BA,VE5RA, ops)
9,731,916 9771 332 48 C
XA5T (+XE2KB,WA5SAJ,W5SB,KG5U, N5RP,K5NZ)
7,428,525 7619 325 48 C
VP2VW (+W4NF,W4RM,W4CE,W4DAV)
5,975,760 7114 280 48 C

Oceania
DX3T (DU3AR,DU3HC,DU3KQA, DY3XEX, ops)
2,223 57 13 10 B

South America
LU1FC (LU1FNH,LU1FEL,LU5FSM, LU6FXT, ops)
1,152,711 2247 171 48 C
CE0AA (+ops)
913,560 1655 184 48 C
PY3MHZ (PY3AFS,PY3BZA,PY3MRZ, PY3PAZ,PY3TMR, ops)
295,581 689 143 48 B

Multioperator Unlimited Transmitters

Asia
JH7PKU (+JH7PKU/AA3JA,JA9SSY/ K3FA,JF2IWL,JH7DXZ,JN3PYQ,JO1BMV)
604,776 892 226 48 C
JA1YPA (JA1ATK,JA1PEJ,JH1KRC, JI3ERV, ops)
222,534 634 117 48 C
JN1YUU (+ops)
4,248 59 24 48 B
JT1KAA (JT1CJ,JT1DA, ops)
2,610 30 29 48 C

Europe
9A1A (9A5W,9A3GW,9A2R,9A7R,S51R, 9A6A,9A2EU,9A7DLA,9A9A, ops)
3,355,983 3981 281 48 B
RW2F (LY4AA,RA2FA,RA2FBC,RN2FA, UA2FB,UA2FF,UA2FJ,UA2FM,UA2FZ, ops) 2,384,712 3011 264 48 C
LY7A (LY3IT,LY3RJ,LY2NLL,LY-B-26, ops) 213,312 704 101 48 C
EJ3RCW (+EI4FBB,EI3RCW,EI7IG)
79,920 333 80 12 C

North America
J37VG (+J3/K1EP)
5,413,530 5821 310 48 C
CO9BCC (CO2WF,CM2KL,CO2II,CO2JA, CO2GK,CO2KC,CL2OT, ops)
2,636,820 3084 285 48 B
PJ8A (+W8EB,ND5S)
1,319,772 2018 218 48 C

Check Logs:

3D2DD, AB6E, CU3AV, DH5MM, DL2TG, DL5NA, DU0CT, EA1BPC, EA3AAW, EA3BJM, EA3FLR, EA4EAP, EA5AL, EA5DCL, EA5FNE, EA5GRC, EC2AFA, EW3LN, EW6WR, I4AVG, IK2VUC, IK3XTY, IT9EYK, IV3HAX, JM1IX, JR7NKN, K4AGT, K7AA, KA1RLI, N1YDJ, N3XOF, N6QPF, OK1IE, PA3DCU, PA3DUS, PA3HGF, PJ8/W3EM, RA0JCV, RX3ZZ, SM5ARG, SP-0189-601, SP9ELM, SP9HQZ, SP9RVD, UA3XDO, UA9JDP, UP5P, UR7M, UU0JC, UX0F, VP2ERN, WA2FVL, XR3Z

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 their 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 Call 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.
3.4 1 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.)
3.5 All transmitters and receivers must be located within a 500-meter diameter circle, excluding antennas.
3.5.1 This prohibits the use of remote receiving installations.
3.5.2 Exceptions:
3.5.2.1 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.
3.5.2.2 Multioperator and Single Operator Assisted stations may use spotting nets.
3.6 Cross-band contacts are not permitted.
3.7 Contacts made through repeaters, digipeaters, or gateways are not permitted.
3.7.1 This applies to all forms of active relays or repeaters.
3.7.2 Satellite contacts, where allowed, are not subject to this rule.
3.8 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.
3.9 Entrants who qualify for unsponsored plaques may purchase them from the ARRL Contest Branch.
3.10 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.

4. ARRL Standard File Format: For Electronic Submission of Contest Entries.
4.1 **Any log which is computer generated must submit an electronic version of the log and summary files.**
4.2 All files must be in standard ASCII text.
4.3 The log data file name shall consist of the call sign and the extension ".LOG" for example, W1AW.LOG
4.4 The summary sheet file name shall consist of the call sign and the extension ".SUM" for example, W1AW.SUM
4.5 Electronic entries should be sent via Internet to the appropriate contest address:
4.5.1 10GHZ@arrl.org
4.5.2 10meter@arrl.org
4.5.3 160meter@arrl.org
4.5.4 AugustUHF@arrl.org
4.5.5 DXCW@arrl.org
4.5.6 DXPhone@arrl.org
4.5.7 EMEContest@arrl.org
4.5.8 Fieldday@arrl.org
4.5.9 IARUHF@iaru.org
4.5.10 JanuaryVHF@arrl.org
4.5.11 JuneVHF@arrl.org
4.5.12 RTTYRU@arrl.org
4.5.13 SeptemberVHF@arrl.org
4.5.14 SSCW@arrl.org
4.5.15 SSPhone@arrl.org
4.5.16 **StraightKey@arrl.org**
4.5.17 Send log and summary files as attachments, not as e-mail text.
4.6 They may be sent by mail to: ARRL Contest Branch, 225 Main St., Newington, CT 06111.
4.6.1 **Use an MS-DOS formatted disk, 3.5-inch (720-KB or 1.44-MB).**
4.6.1.1 **Diskette labels must clearly indicate the call sign used, contest name, entry class, and date of the contest: i.e. W1AW 10 Meter CW Only 1999**
4.6.1.2 **Include one entry only on each diskette. CW and Phone weekends count as two separate contests and must be sent separately.**
4.6.1.3 All diskettes become the property of the ARRL and are not returnable.
4.7 They may be sent by Anonymous FTP to **ftp.arrl.org/logs/**
4.7.1 If you use a non-Web-browser FTP client, FTP to **ftp.arrl.org** and change directory to /logs, with the command cd /logs.
4.8 The log file format must consist of one line of data per QSO, without headers, footers, page breaks or other non-ASCII characters. The Cabrillo file format (see sidebar) is the new ARRL standard format for electronic submissions.
4.8.1 All data for each QSO must appear on a single line, aligned by columns, and must include in the following order:
4.8.1.1 Frequency;
4.8.1.1.1 For HF: Integer frequency in KHz (i.e. 14030); if exact frequency is not known, then use 28000, 21000, 14000, 7000, 3500, or 1800.
4.8.1.1.2 For VHF/UHF; Single Character band representations as follows: 50 MHz = A, 144 MHz = B, 222 MHz = C, 432 MHz = D, 902 MHz = 9, 1296 MHz = E, 2304 MHz = F, 3456 MHz = G, 5760 MHz = H, 10 GHz = I, 24 GHz = J, 47 GHz = K, 76 GHz = M, 119 GHz = N, 142 GHz = P, 241 GHz = R, 300 GHz = S, and Light = L.
4.8.1.2 Mode: designator:
4.8.1.2.1. CW, PH, FM or RY (digital)
date: formatted as YYYY-MM-DD;
4.8.1.3. Time: 4-digit UTC without colons (*nnnn*);
4.8.1.4. Call sign of station operating;
4.8.1.5. Complete exchange sent;
4.8.1.6. Complete exchange received: (callsign, exchange received).
4.8.2 Starting in November, 2000, the new Cabrillo File Format will be required for all ARRL contests . Until that time, file formats which previously met ARRL standard file format submission guidelines are acceptable.
4.8.2.1 Complete format information on the Cabrillo Format is available at: http://www.kkn.net/~trey/cabrillo/
4.9 Multi-operator Two Transmitter category logs must indicate which transmitter made each QSO.
4.9.1 In contests that require rest periods, the "times on" and "times off" must be in a separate column.
4.9.2 A summary sheet is required with all logs, either an official ARRL summary sheet or a close facsimile with a signed contest participation disclaimer. The disclaimer is a statement of acceptance of the conditions of entry.
4.9.2.1 Electronic entries should include a summary file instead of a paper summary sheet. **Electronic summary sheets are assumed to be signed when submitted**.
4.9.2.2 All summary sheets must include all pertinent information from, or requested on, the official summary sheet for the particular contest.

5. **Paper logs:**
5.1 Entrants must use ARRL contest forms, or reasonable facsimiles.
5.2 Contest forms and rules are available:

5.2.1 At the Contest Branch Home pages:
http://www.arrl.org/contests/

5.2.2 By email to **info@arrl.org**

5.2.2.1 Include the following in the message body (the subject line is ignored):

help
index
quit

5.2.2.2 The index will list all available forms and rules.

5.3 Paper entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

6. Reporting:

6.1 **Entries must be sent to ARRL within 30 days after each contest weekend. For paper entries, this is determined by the postmark. For email, it is determined by the date the email is sent.**

6.2 Logs not sent by the contest deadline will be classified as checklogs; no extensions, no exceptions.

6.3 Entries received at ARRL more than 30 days after the contest deadline may not be included in *QST* listings.

6.4 All stations are requested to send their entries as early as possible .

6.5 Entries for the CW and Phone portions of the November Sweepstakes and the International DX Contests are considered separate contests and must be mailed or emailed separately. (Electronic summary and log files should be attached to the same email message.)

6.6 Only one entry per envelope / email is allowed

6.7 To be complete, entries must consist of the log and summary sheet.

6.8 All operators of multi-operator stations must be listed.

6.9 Entries sent by regular mail should be addressed to: *Contest Name*, ARRL Contest Branch, 225 Main St., Newington, CT 06111. Whether on diskette or paper, each should include a paper summary sheet and signed disclaimer statement.

6.10 After all entries have been initially entered into the database, a list of "Logs Received" for each contest will be posted at the Contest Branch homepage: http://www.arrl.org/contest. Participants should check the information on this list and contact the Contest Branch Manager (n1nd@arrl.org) if they find corrections.

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 1998 phone SS prohibits submission of an

The Cabrillo File Format

What is the most time-consuming part of the log checking process? It isn't analyzing data or verifying results. It's formatting the submitted logs for checking.

The old ARRL file format, while including all of the necessary information for the process, left the door wide-open for any number of interpretations as to how the information should be included in the output file. This led to over 50 different file formats, each of which technically met the requirements laid out in the rules. Hundreds of hours were being spent by staff and volunteers reformatting log files into something that the checking software could interpret.

Thanks to the hard work of many volunteers, and with the cooperation of the major logging software developers, the ARRL is proud to announce the adoption and implementation of a new standard file format: *Cabrillo*. This new format is being introduced into the ARRL Contest program starting with the 1999 November Sweepstakes. The major software developers have agreed to incorporate this new file format with their products. **Previously compatible file formats will be accepted for the coming year (from the 1999 November Sweepstakes through 2000 September VHF QSO Party).** Starting with the November Sweepstakes 2000, Cabrillo will be the only accepted electronic file format for ARRL contests.

In the new Cabrillo format, each piece of information is stored in a specific place in each record. Each piece of information appears in specified columns.

Data	*Columns*
Frequency	06—10
Mode	12—13
Date	15—24
Time (UTC)	26—29
Call signs	31—40
QSO number	42—45
Precedent	47
Check	49—50
Section	52—54
Call sign received	56—65
Number received	67—70
Precedent received	72
Check received	74—75
Section received	77—79

A sample of a Sweepstakes QSO template is shown below:

```
                              --------info sent------- -------info rcvd--------
QSO: freq  mo date       time call       nr   p ck sec call       nr   p ck sec
QSO: ***** ** yyyy-mm-dd nnnn ********** nnnn a nn aaa ********** nnnn a nn aaa
QSO: 21042 CW 1997-11-01 2102 N5KO          3 B 74 STX K9ZO          2 A 69 IL
0000000001111111111222222222233333333334444444444555555555566666666667777777777
1234567890123456789012345678901234567890123456789012345678901234567890123456789
```

For other ARRL Contests, the following Cabrillo template would be used:

```
                              --------info sent------- -------info rcvd--------
QSO: freq  mo date       time call          rst exch   call          rst exch   t
QSO: ***** ** yyyy-mm-dd nnnn ************* nnn ****** ************* nnn ****** n
QSO:  3799 PH 1999-03-06 0711 HC8N          59  700    W1AW          59  CT     0
0000000001111111111222222222233333333334444444444555555555566666666667777777777888
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

For more information on the Cabrillo file format, please refer to the General Rules, or visit **http://www.kkn.net/~trey/cabrillo/** on the Web, or contact the Contest Desk at **n1nd@arrl.org** Also, contact your software developer about obtaining the update files for your registered software. Remember, Cabrillo will be the required electronic file format starting in the Fall of 2000.

entry for the 1999 phone SS, but 1999 CW SS participation is allowable.

7.5 Call signs of all disqualified participants 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 of question, 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.

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. (If, however, they have not been a member for a year's time, they must have attended a 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 of 175 miles and members operating 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 of 175 miles and members operating 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 20 miles of the club's center

8.4.3.4 There is no attendance requirement.

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 fall into 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.

8.9.1. 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

General Rules:

1. See General Rules for All ARRL Contests.
2. Cross-mode contacts are not permitted.

1. **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.

1.1. **Single Operator:** One person performs all transmitting, receiving, spotting, and logging functions as well as equipment and antenna adjustments.

1.1.1 Use of spotting assistance or nets (operating arrangements involving other individuals, DX-alerting nets, PacketCluster, etc.) is not permitted.

1.1.2 Single-Operator stations are allowed only one transmitted signal at any given time.

1.2 Single Operators may be divided into sub-categories based on power output:

1.2.1. **QRP:** 5-W PEP output or less.

1.2.2. **Low Power:** 150-W PEP output or less.

1.2.3. **High Power:** More than 150-W PEP output.

1.3 **Single Operator Assisted:** One person performs all transmitting, receiving, and logging functions as well as equipment and antenna adjustments.

1.3.1 Use of spotting assistance or nets (operating arrangements involving other individuals, DX-alerting nets, packet, etc.) not physically located at the station is permitted.

1.3.2 Single Operator Assisted stations are allowed only one transmitted signal at any given time, not including transmissions on a spotting net.

1.4 **Multioperator:** More than one person performs transmitting, receiving and logging functions, etc. Multioperator stations may be divided into sub-categories:

1.4.1 **Multioperator, Single Transmitter:** Stations are allowed only one transmitted signal at any given time.

1.4.1.1 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.

1.4.1.2 Includes those that receive assistance with logging or relief operators, etc.

1.4.1.3 Limited to 6 band changes (maximum) in any clock hour.

1.4.1.3.1 The clock hour is from zero through 59 minutes.

1.4.1.3.2 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.

1.4.1.4 Violation of the 6 band changes rule or improper logging will result in an entry reclassification to the Multioperator Multitransmitter class.

1.5 **Multioperator, Two Transmitter:**

1.5.1 A maximum of two transmitted signals at any given time, on different bands.

1.5.2 Each transmitter is limited to 6 band changes (maximum) in any clock hour.

1.5.2.1 The clock hour is from zero through 59 minutes.

1.5.2.2 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.

1.5.2.3 A violation of the 6 band changes rule or improper logging will result in an entry reclassification to the Multioperator Multitransmitter class.

1.5.3 Both transmitters may work any and all stations; the second transmitter is not limited to working new multipliers only.

1.5.4 Each of the two transmitters must keep a separate, chronological log for the entire contest period.

1.6 **Multioperator, Multitransmitter:**

1.6.1 A maximum of one transmitted signal per band at any given time.

1.6.2 Multioperator, Multitrans-mitter stations must keep a separate, chronological log for each band for the entire contest period.

1999 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 3-5, 1999). 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).

4. Contest Exchange:

4.1 W/VE: Signal report and ARRL/RAC Section.

4.2 DX: Signal report. Country name is obvious from the prefix. Send ITU Region if maritime or aeronautical 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 plus VE8/VY1 (maximum of 79) and DXCC countries (W/VE participants only).

5.3 Final Score: Multiply QSO points by multiplier. Example: NUØX works 357 stations, including 13 DX stations, and has a multiplier of 67. His score would be 753 QSO points [(344 x 2) + (13 x 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 conformance 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 which are generated using a computer must submit an ASCII text file of the log information in ARRL file format. Paper logs in lieu of the electronic file are not acceptable substitutes. Hand written paper logs are still acceptable.

8.2 All entries for this contest must be emailed or postmarked by January 5, 2000.

8.3 E-mail entries only to: 160meter@arrl.org. Submissions require a summary sheet with all required information (including exchange sent, category entered, power, and ARRL/RAC section) and log file in ARRL file format sent as attachments to the email (see General Rules for specific file format).

8.4 Electronic files not in ARRL file format may be designated as checklogs not eligible for awards.

8.5 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 a reasonable facsimile.

8.6.1 Forms are available for downloading at the Contest Branch home 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.

8.8 General queries should be directed to the Contest Branch at **N1ND@arrl.org** or by calling 860-594-0232.

1999 ARRL10-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 11-12, 1999).

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).

4. Contest Exchange:

4.1 W/VE stations (including KH6/KL7) send signal report and state or province (District of Columbia stations send signal report and DC).

4.1.1 Novice and Technician Plus stations sign /N or /T on CW. Indicate callsign on your summary sheet as /N or /T if used.

4.2 DX stations (including KH2, KP4, etc) transmit signal report and serial number starting with 001.

4.3 Maritime or aeronautical 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 Plus stations signing /N or /T (28.1 to 28.3 MHz only).

5.2 Multipliers: (per mode, phone and CW).

5.2.1 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, VYØ), NF (VO1), LB (VO2)], YT (VY1), PE (VY2).

5.2.3 DXCC countries (except the US and Canada).

5.2.4 ITU regions (maritime and aeronautical mobiles only).

5.3 Final Score: Multiply QSO points by total multipliers (the sum of states/VE provinces/DXCC countries/ITU regions per mode). Example: NUØX works 2245 stations including 1305 phone QSOs, 930 non-Novice CW QSOs, 10 Novices CW QSOs, for a total of 6410 QSO points. He works 49 states, 10 Canadian call areas, 23 DXCC countries and a maritime mobile station in Region 2 on phone and 30 states, 8 Canadian call areas, and 19 DXCC countries 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 Your call sign must indicate your DXCC country (K6LL in Arizona need not send K6LL/7, but K6GSS in Hawaii must send K6GSS/KH6).

6.3 All entrants may transmit only one signal on the air at any given time.

6.4 The frequencies from 28.3 through 28.35 MHz are designated as a non-contest window. Stations may not call CQ contest in this window.

6.5 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 The top scoring Novice/Technician Plus station (in each category) in each ARRL Section.

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 logs which are generated using a computer must submit an ASCII text file of the log information in ARRL file format. Paper logs in lieu of the electronic file are not acceptable substitutes. Hand written paper logs are still acceptable.

8.2 All entries for this contest must be emailed or postmarked by January 12, 2000.

8.3 E-mail entries only to: 10meter@arrl.org. Submissions require a summary sheet with all required information (including exchange sent, category entered, power, and ARRL/RAC section) and log file in ARRL file format sent as attachments to the email (see General Rules for specific file format).

8.4 Electronic files not in acceptable ARRL file format may be designated as checklogs.

8.5 Paper entries should be mailed to 10 Meter Contest, ARRL, 225 Main St, Newington, CT 06111.

8.6 Paper entries must be submitted on current ARRL entry forms or on a reasonable facsimile.

8.6.1 Forms are available for downloading at the Contest Branch home 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 10M.RLS
SEND 10M.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.

8.8 General queries should be directed to the Contest Branch at **N1ND@arrl.org**, or by calling (860) 594-0232

Comfortable Code Speeds

Want to try CW in the 10-Meter Contest, but shy away because it seems like everyone is sending at 35 WPM? There is a solution for operators who want to run CW at less than 20 WPM. During the contest we encourage slow-speed CW operation between 28.050 and 28.080 MHz, and between 28.100 and 28.130 MHz. Look for contacts in these segments and you'll be able to participate at comfortable code speeds.

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 be 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 MHz 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 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 MH—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, PacketCluster, etc.) is not permitted.

2.1.4 Single Operator stations are allowed only one transmitted signal at any given time.

2.1.5 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, QRP Portable:** (not for home stations or fixed stations)

2.2.1 10 W PEP output or less.

2.2.2 Portable power source.

2.2.3 Portable equipment and antennas.

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.) QST

Strays

SSA 75 AWARD

◊ Föreningen Sveriges Sändareamatörer (SSA), the Swedish member society of the IARU and NRAU, has announced the establishment of the SSA 75 Award to celebrate the 75th anniversary of the society.

The objective is to work Swedish stations between January 1 and December 31 2000. To qualify for the SSA 75 award you must achieve a total of 75 points, which can be made up of the following:

- Contacts with Swedish stations — 1 point
- Contacts with Swedish club stations — 2 points
- Contacts with District Anniversay stations — 5 points
- Contact with the HQ Anniversary Station (SI75A) — 10 points

Each station counts once on each band. QRP, single band and single mode endorsements are available. Send a log extract showing qualifying contacts, along with $5 US to: SSA75 Award Manager, Bengt Hogkvist, Harenegatan 11 A, SE-531 34 Lidköping, Sweden

Section News

*Edited by **Steve Ewald, WV1X** • Assistant Field Services Manager*

The ARRL Field Organization Forum

Field Organization Abbreviations	
ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
DXFR	DX Field Representative
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall Carlson, WB0JJX, e-mail: wb0jjx@arrl.org—How many times have you heard the expression, "You get out of it, what you put into it." Well ham radio and ham radio clubs are no exception. You do get out of them what you put in. This time of year many clubs are electing new leadership for the upcoming year. Too often, it's like pulling teeth to try get people to volunteer to serve as an officer in their local club. It's all too easy to sit back and let someone else take the lead. This usually leads to a handful of regulars who rotate the club leadership jobs between them. In the end this can and often does cause a club to stagnate. So when your local nominating committee comes calling and ask you to run for a leadership position. Say yes. After all...You do get out of it what you put into it. Traffic (Aug): DTN QNI 151 QTC 27 in 22 sess; DEPN QNI 31 QTC 2 in 5 sess; KCARC QNI 53 QTC 2 in 5 sess, K3JL 39. 73, Randall.

EASTERN PENNSYLVANIA: SM, Allen R. Breiner, W3TI—SEC: Eric Olena, WB3FPL. ACC: Steve Maslin, N3ORG. OOC: Alan Maslin, W3DZI. PIC/BM: E. Max Peters, KI6NJ. STM: Harry Thomas, W3KOD. STM: Cully Phillips, N3HTZ. SGL: Allen Breiner, W3ZRQ. ASMs: WY3K K3TX N3KYZ WA8FQY. An LGL appointment was made to KB3ATA. SGL, W3ZRQ, published a bulletin for LGL's relating recent case histories. He suggests know the law and covenants in your area before installing a pole, tower or just raising an antenna. KB8DNZ was appointed OES and an ORS for KB3BBR. WB8PPA upgraded to Advance class. ACC, N3ORH, is now a Microsoft Certified Systems Engineer. These Del-Lehi ARC members were kept active with three public service events, Annual Easton Hospital 5K race, Lehigh River Relay Run and Derriere in Delaware: WX3TAZ W3PYF W3JD N3QZT K2YIY N3YRP KD3TI KA3ONZ KE3AW N3WXO WD5BRP N8VUO N3LVA N8QIM. Members of the Southern Pennsylvania ARC supplied communications and security for Lancaster Museum of Art and Academy of Music: W3PWH N3LOM WB3FQY N8XPA N3XPB. If N3YSI invites you to a Bar-B-Que take a fire extinguisher with you. His first one in August was a real "burner" when the propane tank caught on fire. Propane being a heavy gas moved along the porch deck and ignited everything in its path including a new Butternut antenna (still in the box), 134 feet of open wire ladder feed line up to the attic window, plus the Bar-B-Que chicken. Our National Traffic System is celebrating its Fiftieth Birthday. Organized in 1949 by George Hart, a very good friend of your SM and former citizen of Easton, PA, with the call W3NF, later as the League's National Emergency Coordinator received the call W1NJM. I seldom blow my horn, but I started in Amateur Radio during the days of the NTS as a net control station on the CW nets. I wish to take this opportunity to congratulate every net and traffic handler for their dedication, time volunteered and continuous efforts in keeping the NTS alive. The Traffiker is an all-together different breed of amateur. Our section nets listed here operate daily. Pennsylvania Phone Net 3958 kHz, 5:30 PM, Eastern PA Emergency Phone & Traffic Net 3917 kHz, 6 PM. PA Training & Traffic Net, 3610 kHz, 6:30 PM. Eastern PA 3610 kHz, 7 PM. The Eastern Pennsylvania Information Net was formed in 1996 for contacting your SM and other key section officials. It meets every first and third Sunday morning on 3987 kHz at 9:30 AM. Everyone is invited to participate. As we enter the holiday season, may we wish all a Safe and Happy Thanksgiving. Tfc: W3KOD 291, N3DRM 266, N3EFW 224, W3IVS 102, N3YSI 95, W3HK 82, W3UAQ 60, N3AT 58, W3IPX 53, N3HR 48, NR9K 42, WA8EHD 35, AD3X 18, KD3BBR 17, KA3LVP 14, N8IRN 10, W3TI 10, W8TWV 9, N8JSO 8, W3ZQN 8, N3AS 7, W3DP 7, W3NNL 7, K3ARR 6, N3KYZ 4, WA3CKA 1. Nets: EPA 128, EPAEP&T 123, HBSN 77, PFN 55, PTTN 48, SEPTN 22, MARCTN 20, LCARES 16, EPAS 5, D4ARES 2, MCOES 1.

MARYLAND/DC: SM, Bill Howard, WB3V (**wb3v@erols.com**)—GARR EC K3WJ reports 12 members; 4 Western Maryland ARES Net sessions. The net meets on 147.105. Licensing classes at Garrett Community College have been going well. FRED EC N8AAY reports 10 members; 4 Frederick County ARES net sessions. Working with Carroll County, and Multiple Sclerosis Society on the "tour de vine" Bike event. MONT EC K3XO reports 50 members, an increase of 4 since last report period; 5 sessions of the Montgomery County ARES Net on 146.955. ANAR EC N3QXW reports 40 ARES members, an increase of 1; 5 net sessions of the ANAR ARES Net which meets on 146.805 with liaison to MEPN, MSN, BTN, WVN. Brian attended a meeting at the EOC in Millersville, and several members assisted with communications for the Strider's 10 K Race in Annapolis. CHAR EC W3TOM reports 22 members, an increase of 1; 3 net sessions of the Charles County RACES/ARES Traffic and Training Net. This net meets on the primary frequency of 443.700. It is simulcast on 145.390 and 146.850. Tom reports planning for the Charles County Fair. Amateur Radio's ARES/RACES activities will be spotlighted to the public during this four day event. An NTS traffic center will be featured in addition to live Amateur Radio operations on HF,UHF, & Packet Radio. Recruitment of new Amateurs with a Fall Amateur Radio Class sign-up sheet, handouts for the general public, and an effort to meet and introduce existing Amateurs to our ARES group should make for a busy County Fair. The Fall ARES/RACES training schedule is in the bag. STMA reports the STMA ARES net was meeting three times a week practicing for SET '99. KJ3E reports no problem checking into the local net, on emergency power, even though power was off in his area. 73 - Bill and with the nets: NET/NM/QND/QTC/QNI: MSN/KC3Y/31/53/320, MEPN/N3WKE/29/36/448, MDD/WJ3K/62/270/738, MDD TOP BRASS//KJ3E/270/AA3GV/142/K3JL/148, BTN/AA3LN/NO REPORT/, SMN/KE3OX/3/7/13, June MEPN/KE30X/30/60/630, June SMN/KE3OX/0/0/0, Traffic: KK3F 534, KJ3E 187, KO4A 98, AA3SB 82, N3WKE 77, WB4FDT 76, AA3GV 67, W3YVQ 67, KC3Y 64, K3CSX 55, N3KGM 50, KE3OX 48, W3CB 43, N3ZKP 29, N3WK 20, N3EGF 17, WA1QAA 14, KE3FL 12, W3YD 11, W3VK 11, WA3WRT 5, WA3GYW 2. June KE3OX 48, July WB4FDT 84. PSHR: KK3F 196, W3YVQ 148, N3WKE 140, KJ3E 136, KO4A 131, AA3SB 131, W3VK 128, AA3GV 119, N3ZKP 114, N3WK 99, W3CB 98, KE3OX 88, WA1QAA 88, KE3FL 84, KC3Y 83, K3CSX 74, June KE3OX 100.

NORTHERN NEW YORK: SM, Les Schmarder, WA2AEA—Web: **http://www.northnet.org/nnyham**. ASMs: KD2AJ, WB2KLD, N2ZMS, WA2RLW. ACC: WZ2T. BM: KA2JXI. OOC: N2MX. PIC: N2SZK. SEC: KF2GC. STM: N2ZGN. TC: N2JKG. Nov weekends are traditionally loaded with contest activity, with an occasional meeting sprinkled in. This year ARRL and NWS will cosponsor an event on Nov 27. This will be a demo on the linkability of NWS offices via the overlay comm system of Amateur Radio; a potential necessity during a Y2K scenario, not to mention a good PR builder for hams with a national org with which ARRL does have a formal MOU. Please keep in mind that NWS areas often overlap ARRL sections, and ECs should consider touching base with both NWS and adjacent sections. Page 73, Oct 99 *QST*, has Website URL on this event. Check this to see how things develop thru Nov. 73, Les - WA2AEA.

SOUTHERN NEW JERSEY: SM: Jean Priestley, KA2YKN (@K2AA) e-mail: **ka2ykn@arrl.org.** ASM: W2BE K2WB W2OB N2OO. SEC: N2SRO. STM: WB2UVB. ACC: KB2ADL. SGL: W2CAM. OOC: K2PSC. PIC: N2YAJ. TC: W2EKB. TS: W2PAU. W2BE WB2MNF KD4HZW WB3IJB N2QNX N2XFM WA2NBL AA2BN. I'm happy to welcome 2 new staff members. As new SEC, I know Mike Mollet, N2SRO, will be a value to the Section. Bob Anderson, N2NGW, our new EC in Cape May County is experienced and an asset to his county. He's at **BRAT@prousa.net**. Mike's at firewalker@uscom.com. NEEDED: an EC for Atlantic, Cumberland and Salem counties. I urge all to register with the FCC for the Universal Licensing System. Don't wait until you have to renew. Info is in Sept *QST*. If you have an idea you feel should be presented to the ARRL about a contest or ways of doing things, please bring it to the ARRL. They take all ideas and suggestions and review them completely. Your "dues" make it your "club" and you are free to express your opinions. Word came to me of a Second Annual Bayside Hamfest mid Aug 2000. Sounds good! Traffic Aug 1999. WB2UVB 258 K2UL-4 82, KB2RTZ 79, AA2SV 70, K2UL 43, KA2CQX 25, N2WFN 22, W2AZ 17, KB2VYZ 12, N2VQA 11, N2WXF 8, KB2VSD 5, N2ZMI 4, N2AYK 3, KB2ETU 3, KB2VSR, KB2YMB, KB2YWK, KD4FQG, KC2CLD 1 ea.

WESTERN NEW YORK: SM, William Thompson, W2MTA—After this December, WNY Section reports should go to the new Section Manager, W2LC, plus ORS and net reports to STM KA2GJV. e-mail address W2LC, Scott Bauer, at w2lc@ix.netcom.com. It's been an honor serving as your ARRL Section Manager since October 1980, and STM, plus prior as NYS NM from 1968 to 1974. W2MTA plans to continue as NTS Official with Second Region Net, and Chairman of NTS Eastern Area Staff. CLUB OFFICERS: KLARA KB2WXV KG2HA KV2W N2VEB; MOARC KG2DI KC2DKV KB2WEO KC2BHM; Orleans N2LVW K2ZUT KB2RMO KA2BCF; STARS KB2YJ KD2QV KB2ESM N2TEZ WA2TVT; WNYDXA WB2RAJ KB2NMV WB2YQH. NOTICE: All WNY ECs and NMs are encouraged to file 1999 Simulated Emergency Test reports for efforts this year. It's no big trick! NMs use SET Report Form B in addition to your usual reporting method (please send a copy to ARRL HQ). ARES nets operating during SET, also use Form B. ECs please use SET Report Form A to report your ARES 1999 SET exercise to ARRL Headquarters. If you did not receive the SET forms, let me know. Have real fun during the Simulated ET!

Net	*QNI*	*QSP*	*QND*
Early Bird-FM	432	000	22
NYSRACES 3993.5	078	010	05
NYSCN-CW 3677	020	005	05
*NYS/M-CW 3677	230	088	31
CHN-SSB 3925	182	043	31
*WDN/M-FM	686	077	31
*NY PHONE 3925	240	344	30
*NYPON 3925	302	119	31
ESS-CW 3590	348	090	31
NYSPTEN 3925	357	044	31
*OCTEN/E-FM	1474	176	31

Net	*QNI*	*QSP*	*QND*
*STAR-FM	00	025	30
*WDN/E-FM	616	094	31
*NYS/E-CW 3677	393	194	31
TIGARDS-FM	023	004	05
BRVSN-FM	306	010	31
STTHN-FM	045	013	09
*CNYTN-FM	370	066	31
*OCTEN/L-FM	666	201	31
*WDN/L-FM	642	067	31
NYS/L-CW 3677	279	206	31
THIN-FM	018	000	31

[# NTS net] [* Public Service Honor Roll] Traffic (Aug.): N2LTC*1086, KA2ZNZ*529, W2MTA*428, KA2GJV*361, KF1L*279, WB2IJH*247, NN2H*175, K2BCL*153, W2FR*151, WI2G*1331, W2PII*125, WB2QIX*96, KG2D*78, N2UTK*57, NY2V*66, KA2DBD*56, AF2K*56, KB2VVD*54, N2JRS*50, N2CCN*44, KB2UQZ*40, K2DN*32, KC2FEM*30, WA2UKX*28, N2WDS*27, AA2ED*22, KC2EOT*22, KB2ETO*21, WA2GUP*21, W2RH 12, KB2WII*7. DATALINK (Aug.): K2DN R2/S0, KA2GJV R49/.S10, N2LTC R303/S210, NY2V R2/S9. BPL (Aug.): KA2ZNZ, N2LTC. Have a happy Thanksgiving, 73 W2MTA.

WESTERN PENNSYLVANIA: SM, Bill Edgar, N3LLR—ASM: N3MSE. ACC: open. ASM-ARES: WB3KGT. SEC: N3SRJ. ASM-Packet: KE3ED. ASM-Youth & Education: KE3EE. PIC: W3CG. STM: N3WAV. TC/OOC: WR4W. DEC-SO: KD3OH. DEC-N1: N3QCR. DEC-N2: KA3UVC. DEC-S1: KA3HUK. DEC-Rapid Response: N3HJY. The WPA Section Simulated Emergency Test has been scheduled for Saturday, November 13th. If you are not a member of the Amateur Radio Emergency Service, and you'd like to participate, please send me your name, and I'll refer you to the closest ARES group. This annual exercise is designed to test the emergency communications capacity of hams. This is the time to find out what works well and what can be improved upon. Please join in with us! Are you looking for club topics in the upcoming months? Atlantic Division Director Kay Craigie had a wonderful idea that she mentioned at several hamfests in our section. Why not devote a meeting to the Universal Licensing System (ULS) that has been instituted by the FCC. Knowing that there are club members that do not have Web access, your club might look at bringing a computer with Internet access to your club meeting. With this program, your club could help those without Web access to register with the ULS program, and also show those who do have Web access how the registration process works. Hams need to know that license upgrades and renewals will require that you have registered with the ULS program. Best wishes to you and your family for a Happy Thanksgiving!

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. ACC: N9KP. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. DEC-Central: N9FNP. Montgomery Co. ARES EC WA9RUM reports the ARES group was involved in a disaster drill August 4. The scenario was a tornado touch down over a three mile line. Even the hospital was hit. Three ARES teams were in the field and one team at each hospital. The EC was net control and did the logging for that part of the exercise. Several new operators were assisting, so they were assigned to teams with experienced operators as team leaders. The two hospitals, Litchfield and Hillsboro were very impressed with our communications. Operators for the exercise were EC WA9RUM, AEC N9SNE, AEC N9MPG, AEC AC9P, WA9SXK, KF4MAQ, KB9LRU, KB9TZQ, N9VOF, KB9STN, N9WWG, KB9UJR, N9PVM, AND KB9QBP. The North Shore RC is now on the Web at **www.ns9rc.org**. The site includes information on the club, Amateur Radio in general, and links to related sites. The Rockford ARA assisted with the Windsor Heights Community Church youth group walk-a-thon, the State Street Mile, and they are making plans to provide communications for the Rockvale Balloon Rally and begin a new round of Amateur Radio classes at Rock Valley College. The Sangamon Valley RC now has their own domain on the Web at **www.w9dua.net.** The LaSalle County Emergency Packet Node KA9JNV is now operating under the callsign K9PHW. Frequency remains the same at 145.550. The Six Meter Club of Chicago is organizing a Technician course this fall and also is making plans to offer on-air code practice sessions on 146.37 over the K9ONA repeater. Eleven members of SMCC

Continued on page 116

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- 40 memories + CALL channel
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- Wide receive cov. 130-180 MHz

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VHF/UHF Solid State Amplifiers

Contemporary design, quality and a 1 year warranty on parts and labor. 1 year on the RF Final transistors. Most amplifiers have GaAsFET receive pre-amps and high SWR shutdown protection

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40' Tubular Tower

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55' Tubular Tower
Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

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Call For Low Price!

DJ-S41T/DJ-S11T

440 Tiny HT 2Mtr Tiny HT

- 340 mw
- 21 memories
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- Encode built-in
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- Less than 5" high and 2 1/4" wide (DJ-S41T)

(DJ-S41T shown)

DX-70TH HF Transceiver

- 100W 160-10 Mtrs • 100W 6M. Gencov. Rx
- Full QSK, 100 Mems. • Compact, Remotable
- Dual VFO, 12VDC • 6.2 lbs.

Now In Stock! New Low Price!

COMET

SMA-501 Dual Band

Dual band "Miracle Baby" style antenna, with a male SMA connector.

Shown on the popular FT-50R by Yaesu. The antenna is only 1.75 inches tall, and exhibits surprising performance.

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CA-UHV

40M-70cm Mobile Antenna

40/*20/*17/15/10/6/2M/70cm
* optional coils

A 6M/2M/70cm whip that accepts 1,2 or 3 HF coils for up to 6 band operation. Simply screw on any combination of HF coils you choose.

Standard PL-259 connector allows easy mounting. Convenient fold-over hinge for entering garages, parking structures, etc...

HF/VHF/UHF on a single antenna!! Contact any Ham Radio Outlet store for duplexer/ triplexer options.

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NEW!

MSG Series

2M/70cm Mobile Antennas with spring-loaded whip to absorb impacts. Fold-over hinge included as well.

MSG-1000C
Length: 39 inches
Max Pwr: 150W
Conn: PL-259

MSG-1100C
Length: 43 inches
Max Pwr: 150w
Conn: PL-259

NEW!

MH-510

NEW!

6/2M/70cm HT Antenna w/SMA Connector
The first aftermarket gain antenna for the YAESU VX-5 and the ICOM T8A.

A dramatic improvement over the stock antenna. 20.75 inches of TRIBAND performance.

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TH-D7A 2M/440

- 2M/440 Dual Band
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- APRS Compatible
- DX Packet Cluster Monitor
- 200 Mems., CTCSS
- VC-H1 Messaging Control

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TS-870S HF Transceiver

- DSP in I.F. Stage! • 100W, 12V DC
- Dual mode noise reduction
- Digital Filtering (no opt. filters req.)
- Built-in RS232,Windows software incl.

TS-50S/TS60S HF Trans. • 6M

- TS-50S - World's smallest HF trans.
- 100W out, (90W TS-60S, 50MHz only)
- SSB, CW, AM, FM, • 12V Gen. Cov. RX,
- 6.4 lbs., 7.16 x 2.4 x 9.32"
- 105 db dynamic range, 100 Mems.
- Opt. ext. ant. tuners available (TS-50S only)

Call For Special Low Price!

VC-H1

Visual Communicator

Compatible w/all FM VHF/UHF • Transceivers + HF SSB Send/Rec Digital Images • (32 seconds) for download Store pictures in memory • 1.8" Color TFT LCD Display • Built-in speaker + mic • Download to PC • (with special software)

Call For Low Intro. Price!

TH-G71A 2m/440

- 2m/440 Dual Band HT
- 200 Mems • PC Programmable
- 6w 2m, 5.5w UHF @13.8 VDC
- Alphanumeric Display
- CTCSS Built It • Backlit Keypad

Call For Low Price!

5w High Power Also Avail.

TH-22AT

- Ultra Compact
- 2M HT, 5W optional
- 40 memories
- Encode Built-In

TM-261A 2M Mobile

- 50W + Mid and Low • Mil-Spec
- 61 Memory Chanels
- Alpha Numeric Function
- Dual Menu, DTMF Memory
- Backlit mic & built-in encode

Call Now For Special Low Price!

TM-V7A 2M/440Mhz

- 50W/35W • 280 Mems • Visual Scan
- Alpha Numeric • Enc/Dec & Duplexer Built-in
- Computer Programmable • 9600 Baud Ready
- Cool-blue Reversible LCD • Backlit Mic

Call Now For Low Price!

TS-570DG/TS-570SG DSP Enhanced

- 100w HF, (100w on 6M TS-570SG only)
- QSK, CW Auto Tune • Autotuner incl 6M
- DSP • Large LCD Display • Elect. Keyer
- RCP2 Radio Control Program Compatible

Call Now For Your Low Price!

Limited Time!

FREE 2M/440 Duplexer

TM742AD 2M/440Mhz

- Optional 3rd band available • Back-lit mic
- Up to 303 memories • 101 per band
- PL Encode Built in • Detachable front panel

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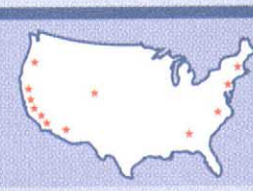
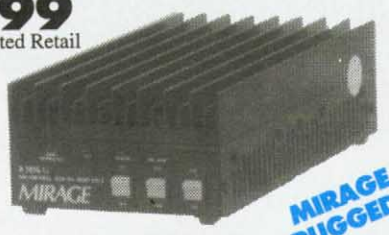


MIRAGE ...160 Watts on 2 Meters!

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 . . .

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.

RC-1B, $45, Remote Control. On/Off, pre-amp On/Off, selects SSB/FM. With 18-ft cable.

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

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/10 W 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/2 watts in; 160 watts out/3½ W in. For 0.25 to 5 watt handhelds.

100 Watts for 2 Meter HTs

B-310-G
$199
Suggested Retail

Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*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 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+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*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

MIRAGE RUGGED!

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

- ***45 Watts on 2 Meters/35W 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.

70cm 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).

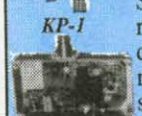
Remote Control Head for Amps

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

Repeater Amps

11 models -- continuous duty all modeFM/SSB/CW repeater amps for 6, 2, 1 1/4 Meters, 70cm, 450 MHz ATV.

Low noise GaAsFET preamps



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 160 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

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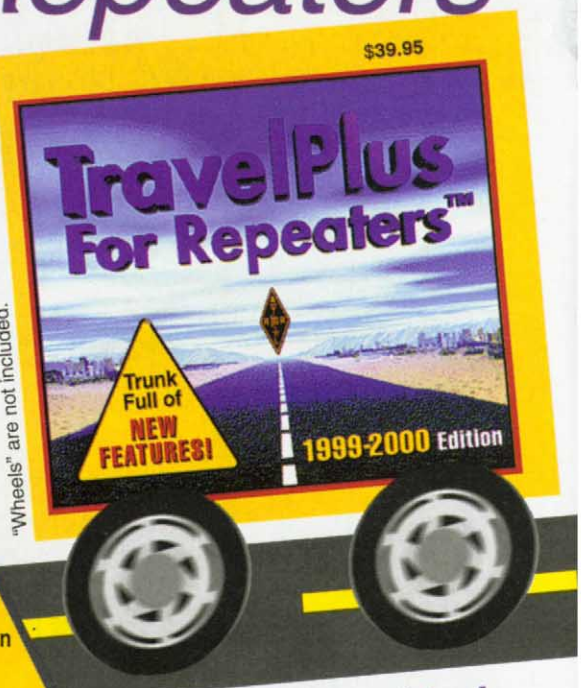

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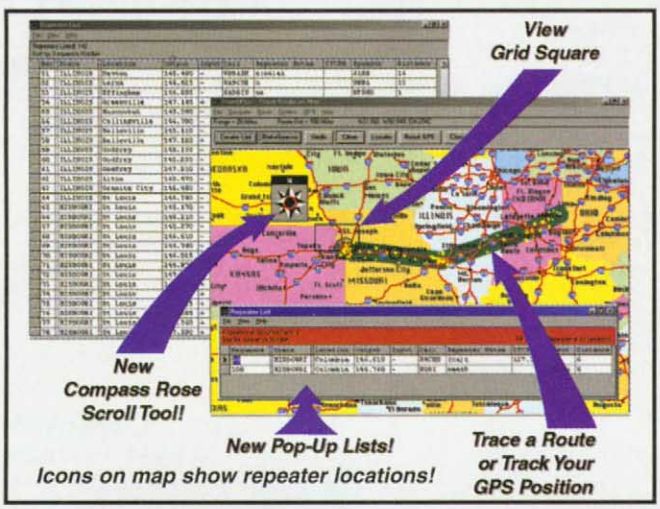

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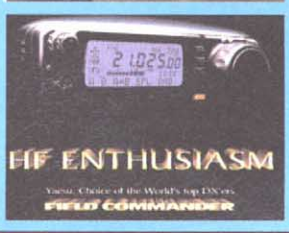

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assisted with the annual Brookfest event. Additional volunteers provided communications for the Party in the Park at LaGrange. The Kishwaukee ARC has purchased a new amplifier for their repeater, and has allocated funds to purchase tables for their hamfest. Metro ARC president W9MNF is assembling a scrapbook of the club. He would like to include QSL cards from all MAC members. Congratulations to the Schaumburg ARC. They have been officially recognized by the ARRL as a Special Service Club (SSC). If your affiliated club is also working to strengthen amateur radio, consider becoming an SSC. Contact ARRL HQ or our Affiliated Club Coordinator, N9KP, for details. August traffic: K9CNP 263, W9HLX 158, WB9TVD 35, NC9T 20, WA9RUM 7, W9FIF 7. ISN Report for August QNI 221 QTC 124 Sessions 30. D9RN Cycle 1&2 Sessions 43, QTC 156, IL QNI 43, QTR 663 min, Average 3.6, Rate 0.24, Percent Section Rep. 100%. Ninth region report, traffic 287, sessions 62, time 440 min, average 4.62, rate .652, percent rep 98% ILN K9CNP, NS9F, KF9ME. W9VEY Memorial Net de K9AXS 7 with 263 check-ins.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: AA9HN. OOC: KA9RNY. SGL: WA9VQO. TC: W9MWY. BM: KA9QWC. ACC: N9RG. Sympathy extended to the families and friends of Silent Keys: 7/26, Kenneth A. Tyson, W9YME, South Bend; 8/5, Keith W. Phillips, AA9KQ, Evansville; 8/15, Samuel M. Angel, K9DRD, Evansville; 8/29, Gregory D. Necessary, N9ZTT, Ridgeville. They will be missed. The DeKalb Co. ARES provided communications for the WBNI Bike-A-Thon participating were KA8WFA, WB9NOO, N9NMW and N9VXV. The EARS at Evansville will be having their 7th annual Winter Hamfest, Nov.27. Don't forget the IN State Convention at the Fort Wayne Hamfest Nov 13 & 14. Congrats to Jack Reynolds, AA9BO, who received the WAS award from the FIST society also to Clifford McGuyer, W9CM, for being an ARRL member for 60 yrs. I just can't believe summer is almost over as I write this. We have had some very hot wx and before long probably wishing we had some. Hope all enjoyed their summer and now preparing for winter. Hope it's not cold. It is with regret I except the resignation of our STM Gale Crozier, AA9HN. He has done a remarkable job and will miss him. I am looking for someone to fill the position. If you are interested and qualify please contact me. Thank you Gale. Send your reports to me until notified otherwise. NMs ITN/W9ZY,QIN/N9PF, WN/AB9AA.

Net	*Freq*	*Time/Daily/UTC*	*QNI*	*QTC*	*QTR*	*Sess*
ITN	3910	1330/2130/2300	2685	508	1616	93
QIN	3656	1430/0000	82	71	387	25
ICN	3705	2315	47	24	146	18
IWN	3910	1310	2282	–	310	31
IWN VHF Bloomington		475	–	465	31	
IWN VHF Kokomo		670	–	155	31	
IWN VHF Northeast		1024	–	620	31	
Hoosier VHF nets (12 nets)			472	26	485	51

D9RN held 43 sessions total QTC 156. IN represented 37 sessions by K9GBR, WB9QPA and W9UEM. 9RN held 62 sessions total QTC 287. IN represented by KO9D, K9PUI, WB9UYU, N9PF, WA9QCF, AA9HN and W9FC. Tfc: W9FC 312, KJ9J 127, W9ZY 118, KO9D 102, WB9QPA 85, K9GBR 80, K9PUI 67, AB9AA 64, W9UEM 59, N9ZZD 55, W9JUJ 49, K9RPZ 28, KB9NPU 26, KA9EIV 25, N9PS 25, N9WNH 24, KA9QWC 18, W9EHY 17, WA9QCF 14, AA9HN 10, KA9DIG 8, W9KT 7, W9BRW 6, K8LEN 6, W9RTH 4, K9DIY 4, K9CUN 3, N9JAI 3, WB9NCE 3, K9OUP 1.

WISCONSIN: SM: Don Michalski, W9IXG—SEC: WB9RQR. STM: K9LGU. ACC: KF9ZU. SGL: AD9X. OOC: W9RCW. PIC: K9ZZ. TC: K9GDF. ASM: K9UTQ, W9RCW, W9CBE. BM: WB9NRK. Bruce Micales, WA2DEU, provided support during hurricane Bret in Corpus Christi, TX. Thanks, Bruce! Congratulations to Nels Harvey, WA9JOB, for being elected to a two-year term as a Director of the Board of National Frequency Coordination Council. Our best wishes and thanks to Dan Bolander, WB9TYT, for his work as W.A.R. frequency coordinator. Dan and Judy will be moving to Florida. Ozaukee Radio Club is now using their repeater for CW practice! Great idea and we hope others follow suit so our new Technicians get inspired to upgrade. Tri-County ARC supported two very successful summer events- Cambridge Community Hope and Tour de Fort with several neighboring clubs helping. Keep this in mind for your area events- tap other clubs for assistance! Be sure to get your new hams involved in these special events. Pair the new ham with someone who has experience. BSSS needs a new scanner to produce photos on the paper. Please help out with a donation to this worthy ham newspaper! The Wisconsin nets want you! Check into them! It is with deep regret that I inform you that Joseph Halasz, N9TUS, passed away. He was a member of CWRA. Y2K communication preparations are underway. Support your emergency management organization. There are several EC positions available! Contact SEC Stan, WB9RQR, **skaplan@mcw .edu**, if interested. Test your DF skills- get your club to sponsor a fox hunt! It is lots of fun, too! Hear a new call on the repeater? Don't let them stray; make their day and say "Hey..." 73, Don, W9IXG **w9ixg@arrl.org**. Tfc: K9JPS 1043, W9IHW 728, K9RTB 721, K9GU 675, W9YPY 540, W9CBE 201, AF9FA 139, W9YCV 103, N9CK 83, W9UW 76, AG9G 76, K9LGU 73, KE9VU 68, KA9KLZ 39, WZ7V 35, W9BHL 35, KA9FVX 34, AA9BB 30, K9FHI 29, K9HDF 29, N9JIY 25, AD9X 24, KG9B 24, KA9BHK 23, WB9ICH 21, W9PVD 7, K9UTQ 4.

DAKOTA DIVISION

MINNESOTA: SM, Randy "Max" Wendel, N0FKU—Time slipped by and this news column due date caught me off guard so I don't have much to pass along this month. I just finished making 7 quarts of fresh homegrown salsa and my fingertips are burning from the habanero pepper oils. Approaching this news due date I bought a new pickup so you can about guess where my time and efforts have gone...can't possibly find enough after-market options to add to the truck you know! Of course, the first project was to install the dual-bander. Not sure about HF in it yet, however! I'd like to remind you of our ARRL Section Nets (see below freqs/times). I'd like to hear from our ARRL affiliated clubs out there in all major cities. Winter is coming so why not take some time to check them out! I hope many of you took part in the Hiram Percy Maxim/130 event over Labor Day week in September. I didn't get much chance to operate, but managed to make about 75 contacts in a few hours on the air. Also as a reminder, if you have e-mail, you can sign up for the ARRL e-mail forwarding system and have your e-mail address as @arrl.net with your

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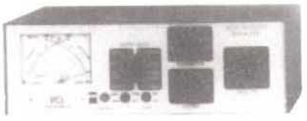

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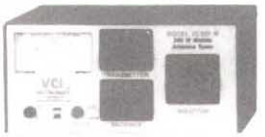

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

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PM-30, $79.95, for 1.8 to 60 MHz. Displays forward and reflected power and SWR simultaneously on dual movement Cross-Needle Meter. True *shielded* directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction includes scratch-proof case/front panel. 5.3x5.75x3.5 inches. SO-239 connectors.
For 144/220/440 MHz, 30/300 Watt ranges. PM-30UV, $89.95, has SO-239 connectors. PM-30UVN, $89.95, has N connectors. PM-30UVB, $89.95, has BNC connectors.

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DL-650M, $64.95. Handles 100 watts continuous, 1500 Watts for 10 seconds to 650 MHz. Ceramic resistor. SWR < 1.3. SO-239 connector. **DL-650MN, $69.95** has N connector.

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Net	*Freq*	*Time*	*QNI/QTC/Sess*	*Mgr*
MSPN/E	3870	5:15 P	701/73/31	W0WVO
MSPN/N	3860	12 P	417/111/30	WA0TFC
MSSN	3710	6 P	N/A	vacant
MSN/1	3605	6:30 P	218/87/31	W0HPD
MSN/2	3605	10 P	124/48/31	K0PIZ
PAW	3925	9A-5P	1438/69/63	KA0IZA

Tfc: SARS/PSHRS: KB0AII, WA0TFC, W0HPD, WO0A, W0GRW, K0PIZ, W0GCB, KB0AIJ, W3FAF, KN9U, K0PSH, K0WPK, W7HH, KA0IZA, K0OGI, N0JP, KD4NYC.

NORTH DAKOTA: SM, Bill Kurtti, WC0M—If you have an announcement or news column, let me know and it will appear here. Sorry to report that N0ZMV from Cavalier is a Silent Key. Mertie and I attended to ARRL convention at Watertown then the Dickinson Picnic. The crowd was up a little from last year and has evolved into a weekend campout from a Sunday only affair. To add a some unwanted excitement to the picnic, a large hail storm just missed the picnic site and did damage to the north side of town along with a lot of damage to crops and property in the western half of or state. KC0CRU and crew from launched a balloon from Northwood that rose to 85000 ft their next launch will include an electronic payload APRS GPS for tracking along with a Amateur Repeater. Congratulations to N0FAZ on being awarded the Welded Screwdriver Technical Award by the CDARC for his 15 years of technical service to the club building repeaters and other devices. Sess/QNI/QTC Mgr: Goose River, 1895 kc 8:30 AM Sun 5 /50 /0 KE0XT; DATA 3937 kc 6:30 PM daily 29/411/14 KE0XT. WX Nets 3937 kc 8:30 AM 12:30 PM 26/685/29 KE0XT.

SOUTH DAKOTA: SM, Roland Cory, W0YMB—QCWA Dakota Chapter 102 will operate their annual special event station on Feb 12-13. Mark this weekend on your calendar and obtain their nice certificate. A group of Black Hills hams gathered at Hill City on Sept 4 to help Frankie, W0MZI, celebrate her 80th birthday. Checkins to South Dakota nets were way down over the summer months according to STM W6IVV. Pierre RC held a Y2K drill with the Red Cross to demonstrate the ability of Amateur Radio to handle communications in case of an emergency. They are also working on getting a vanity club call sign. Pierre ARC has a Web site. It is **www.capjournal**. Click on community Web site and Pierre ARC. Traffic count for August was 678.

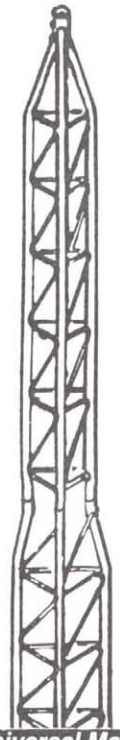
DELTA DIVISION

ARKANSAS: SM, Roger Gray, N5QS, e-mail **n5qs@arrl.org** — The heat finally broke and the hamfests have started. I just returned from the Mena hamfest and had a great time and visited with a lot of old friends. The crowd was good early and we saw a large selection of flea market stuff and there were more dealers than in past year. All in all it was a good hamfest. While there, I attended the Arkansas Repeater Council meeting and want to announce the new home page that can be found at **http://sun1.hu.edu/~hamradio/arc/**. It is presently under construction as I am writing this. You can find a printable application form, and hopefully there will be contact information and other news available there at the time you read this. I wanted to attend the hamfest at Mt Home but could not make both. I hope the conflict in dates allows me to be both places next year. I am looking forward to the CAREN hamfest next weekend. Section traffic and net reports (Aug 99): Tfc: K7ZQR 105, K5BOC 74, AB5AU 25, W9YCE 12, KA5MGL 10, KO5E 10, N5SAN 9, W5HDN 8, W5RXU 7, W5LZQ 3, ARN 83, APN 32, AMN 22, OZK 10.

LOUISIANA: SM, Lionel A "Al" Oubre, K5DPG, e-mail **k5dpg@arrl.org** Web Page **www.aisp.net/k5dpg** ASM: KB5CX. K5MC. ACC: KA5IJU. BM: K5ARH. TC: KE5FZ. SEC: N5MYH. OOC: WB5CXJ. PRC: KB5QVI. STM: KG5GE. NM LTN: WB5ZED. NM LCW W4DLZ. As this is being written, there are two active storms, Floyd & Gert, in the Atlantic and bearing down on the coast. Hopefully, neither of them will make their way to Louisiana. We are still a long way from the end of hurricane season. Remember that the frequencies, if needed in LA, MS, or STX for emergency operations, are: Official Traffic: 3873 night 7285 day; Health & Welfare: 3935 night 7290 day. If you must operate on these parts of the bands, give these designated frequencies + and - 3 kHz. As we approach fall, our activities turn to more inside endeavors. This is a good time to catch up on your reading of back issues of *QST* and check into either local nets or the state nets. Remember that public service activities help justify keeping our frequencies. New Officers for the Delta DXA are: Pres W5KB, VP K1DW, Sec W5ZE, Tr W5JYK. Coming Hamfests: Monroe November 5-6, Minden December 4, Hammond January 15, Rayne March 11-12. Go out and support our area hamfest events. Louisiana section nets: LTN 6:30 PM, 3910 kHz, nightly, WB5ZED mgr; LCW 6:45 PM, 3673 kHz, nightly W4DLZ mgr. Reports for July 1999: LTN QNI 283 QTC 92 in 31 sessions. LCW QNI 137 QTC 17 in 31 sessions. DRN5 LA Rep 100 % by WB5ZED, K5IQZ, K5WOD, W5BKM, W5CDX, WA5LHL, K5DPG. PSHR: WA5WBZ 70, K5WOD 106, K5MC 110, KG5GE 107, K5IQZ 124, W5CDX 124, K5DPG 171, WB5ZED 211. Tfc: K5WOD 10, WA5WBZ 14, KG5GE 28, K5MC 87, K5DPG 88, W5CDX 147, K5IQZ 188, WB5ZED 536 BPL 7th.

MISSISSIPPI: SM, Malcolm Keown, W5XX—DEC: K5IMT, N5XGI. EC: KK5BY, KD5CKP, W5DGK, W5DJW, K5DMC, KB5DZJ, KM5GT, N5HTQ, WD5IMP, WB5OCD, KC5SPR, WA5TEF, KC5TVI, KC5TYL, KB5WJJ, N5XGI, N5XXX, KB5ZEA, N5ZNT. The Neshoba ARC and Neshoba ARES provided communications support for the Dixie Triathalon. Those participating were AC5OH, KA5RTF, N5VWV, WB5YGI, K5MLW, AC5PC, KC5FTG, KD5HKH, N5SPD, W5DSJ, KC5FMQ, KB5BJT, KC5TGY, N5IPJ, W5ERU, W5DGK, KB5NJL, K5TMW, and KB5MNP. Congratulations to KB5W for earning the PSHR Commendation Certificate, KC5SPR for completing the EC Training and Certification Course, and N5QDE for making DXCC on RTTY. OO Rpt: K5XQ. EC Rpt: KD5CKP, W5DGK, WB5OCD, KC5SPR. Net Reports: sessions/QNI/QTC. MSPN 31/2552/57, MTN 31/183/88, MSN 31/1060/5, PBRA 31/1017/21, Jackson Co ARES 31/649/36, MSSN 22/77/0, MBHN 5/26/0, Stone Co ARES 5/58/0, Hancock Co ARES 3/116/3, MAEN 5/90/0, George Co ARES 3/14/2, Lowndes Co 5/78/0, JARCEN 5/

ATTENTION !!!



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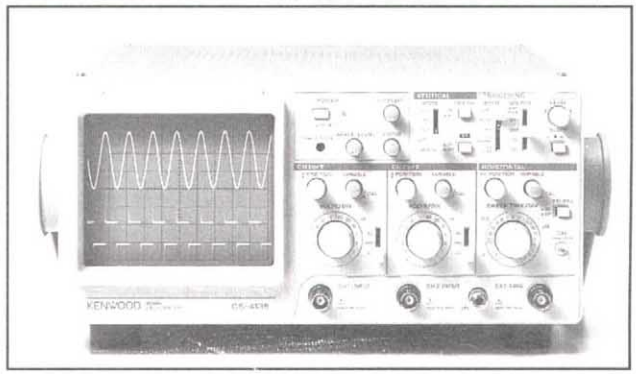

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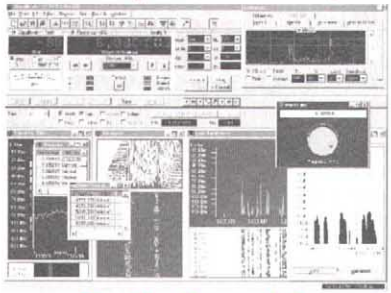

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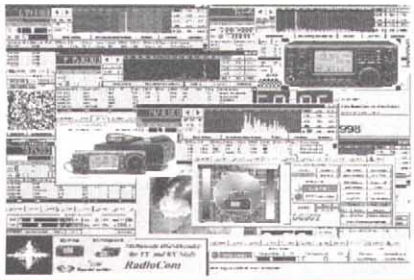

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150/0. PSHR: KB5W 146, N5JCG 141, N5XGI 136, KD5P 121, K5VV 118, KM5DT 117, W5XX 105, K5DMC 98. Traffic: KB5W 367, KD5P 169, N5XGI 76, N5JCG 40, K5DMC 35, W5XX 16, K5VV 13, KM5DT 8.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ACC: WA4GLS. ASM: WB4DYJ. PIC: W4TYU. SEC: WD4JJ. STM: WA4HKU. OOC: AD4LO. TC: KB4LVJ. I apologize for inadvertently omitting WD4JJ, SEC, and W4TYU, PIC, from the above acknowledgement list for some months in the past. Both of those individuals are a very important part of the Section's program. RCARS operated a special events station at the CAP Complex July 17, commemorating the "Scopes Monkey Trial," that earned Dayton, TN, worldwide publicity earlier this century. Thanks to Zero Beat for publicizing the NTS schedule for this section. WAVES announces the appointment of Lowell, WD4DJW, as AEC. Lowell's 30 years experience in emergency work will serve well in his acting liaison to AMC & local governmental agencies. Charlie Ann Curle, WG4G, was recently honored by the Hamilton County School Board by naming the library in which she worked so long the "Charlie Ann Curle Library." I like very much the MARC News idea, "Biography of the Month." It's good to know about other radio amateurs. SPARKS has announced the Memphis Area ARCs are joining hands to sponsor the hamfest named DIXIEFEST, to be held sometime in February 2000. It's scheduled to be held in the Shelby County building at the fairgrounds. Let's all put that event on our calendar and plan to make it most successful. RACK VE testing team still getting lots of action and lots of successful candidates. SMARC is very disaster conscious and is very active in obtaining hardware and operational personnel to make its area safer when the weather gets bad. I was advised by the TN Motor Vehicle Division that the general public will be getting new license tags in 2000. The Amateur Radio emergency tags will not be available until 2000. I was advised that nothing should be done until sometime in 2000 because those too-early applications may get lost. Since all license tags are staggered, those coming due in January 2001 should make application in October 2000 and others about 3 months ahead of the due date. Anyone wishing an application form should contact me with your mailing address and I shall see that you get one. Net sess/QTC/QNI: TCWN 26/19/129; TEMPN 22/53/673; TEPN 26/116/1901; TSCWN 11/0/14; TMPN 31/18/208. FTC: NZ4O 422, N4PU 123, WA4HKU 43, W4SYE 25, KA5KDB 14, KI4YV 13, WA4GLS 13, WD4JJ 8, W4PSN 5, W4HZD 4.

GREAT LAKES DIVISION

KENTUCKY: SM, Bill Uschan, K4MIS—ASM: Tom Lykins, K4LID. SEC. Ron Dodson, KA4MAP. STM. John Farler, K4AVX. PIC: Steve McCallum, W2ZBY. ACC: Todd Schrader, KF4WFZ. TC: Scotty Thompson, KI4AT. SGL: Bill Burger, WB4KY. BM: Ernie Pridemore, KC4IVG. This summer has been an exciting one and it isn't over quite yet. I am looking forward to Hazard Hamfest, on November 6, 1999. This will wind up the hamfest schedule until late February. On September 8, 1999, the Kentucky Department for Emergency Management conducted a Statewide exercise in preparation for the Y2K rollover on December 31, 1999. The exercise was a great success and shows KyDEM what ham radio people can do. It is with deep regret that we mention that Billy Mac Bradbury, KC4PWV, became a SK on September 8, 1999. The Scott County Amateur Radio and Emergency Service Club were called to action on August 16-17, 1999. There was a small child, Frank Downey, missing and the Scott County group responded with over 20 Hams. The child was found the next morning safe and sound. For their efforts, the Scott County Amateur Radio and Emergency Service Club will be presented a Public Service Commendation certificate. The certificate will be presented on September 11, 1999 by Mr. Ted James, WD4KYD, EC for Scott County. I had wanted to present the certificate, however I will be attending the Greater Louisville Hamfest on September 11.

Net	*QNI*	*QTC*	*Sess*	*Mgr*
MKPN	467	22	22	N4AFP
MKPN	1118	31	40	K4LID
KTN	1118	31	47	K4LID
KSN	233	31	77	K4AVX
TSTMN	469	30	42	WB8GWL
4ARES	532	31	30	WA4RRR

Tfc: W4ET, 3. N4GD, 20. AW4NW 23, KO4OL 48. KF4RBK 141, K4YKI, 17.

MICHIGAN: SM, Dick Mondro, W8FQT (**w8fqt@arrl.org**)—ASM: Roger Edwards, WB8WJV (**wb8wjv@centuryinter.net**). ASM: John Freeman, N8ZE (**n8ze@arrl.net**). SEC: Deborah Kirkbride, KA8YKK (**ka8ykk@concentric.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: Ed Hude, WA8QJE (**edhude@juno.com**). TC: Dave Smith (**DSmith@smithassoc.com**) QRV Bulletin Editor: Mike Pearsall, N8MP (**n8mp@arrl.net**). Have you registered with the FCC to use the new Universal Licensing System? If not, this would be a good time to get it done. It's fast and the way all transaction will be done in the future. I read a lot of newsletters each month from all the clubs in our Section. I must say that I am really impressed with the quality and content that I am seeing. Everyone that helps to put out a newsletter should be proud of the work that you do. Last year I was most impressed by some of the Holiday issues. Most went to extremes with color graphics and photos and I am looking forward to more of you doing that again this year. Yes, it gets costly to print color copy, but if you only do it once a year it really looks festive. If your clubs are interested in cost you may want to consider publishing an electronic version and send it via e-mail as an attachment or publish it to your club Website. I would also like to urge more clubs to put out a newsletter if only a single page. It is the best way to communicate with your members and a newsletter does not need to be fancy to be interesting. It's the content that matters and I see some one and two page newsletters that are really interesting reading. Thanks to all of you for giving me the privilege of reading about your club's activities and to those of you who don't have me on your mailing list, please see that I am added. There is no better way to keep us all informed about your club activities. Would anyone be interested in forming a group to judge a Section newsletter contest? If so please let me know. It would be fun and encourage a little competition. Let's all be mindful of the things that we have to be thankful for in the next few weeks as we approach

MFJ Contest Voice Keyer

Brand New design . . . Microprocessor controlled

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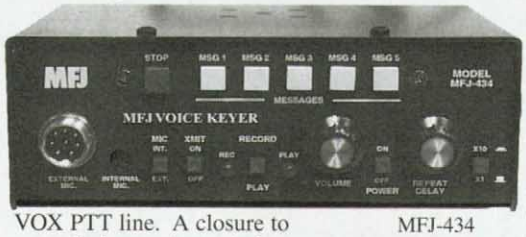
Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" and more! Contest by pressing a few buttons and save your voice.

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.

MFJ-434 **$179.95** plus s&h

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.

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.

MFJ *Professional grade* Boom Mic Headphones

For marathon contesting, DXing, traffic nets, ragchewing . . . These lightweight, fully padded Boom Mic Headphones make operating superbly comfortable! Flexible gooseneck microphone boom and speech frequency tailored microphone cuts through noise and QRM!

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.

Even casual operators will appreciate the advantages of MFJ's superbly crafted Boom-Mic headphones for *hands-free* operating at an incredibly low price.

MFJ-392, $19.95. Communication Headphones only. Great for ham radio, shortwave listening -- all modes, SSB/FM/AM/ Data/CW.

Each phone has individual volume and speech enhancement control. Superb leatherette padding.

Both MFJ-392 and MFJ-396 have MFJ *No Matter What*™ one year limited warranty.

MFJ Communications Speaker

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SSB, FM, AM, and CW never sounded so crystal clear! Plug in this MFJ-281 *ClearTone*™ speaker and bring out communication speech fidelity that you never knew existed. Restores the smooth sinewave sound that CW naturally generates and makes copying easier. It was carefully designed to improve intelligibility of speech in the frequency range of 600 to 4000 Hz while reducing undesirable noise, static and hum. A top grade 3" Mylar cone speaker is mounted in a well designed baffle. Its fine mesh metal grille allows sound to radiate without muffling. 8 Watts, 8 Ohms. Six foot cord. 3.5 mm mono plug. 3¾x3x2¼ inches.

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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!!!

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our Thanksgiving Holiday. Many times we don't take the time out of our busy lives to fully appreciate how fortunate we are. 73, Dick Traffic reports (August 1999): K8GA 243, KB8ZYY 220, WB8SIW 197, K8LJG 148, AA8PI 116, WX8Y 101, W8RTN 94, KA9EIZ 88, N8FPN 69, AA8SN 55, W8RNQ 50, N8JGS 47, K8AI 35, K8JN 35, K8UPE 27, K8ZJU 27, K8KV 29, W8YIQ 29, WR8F 25, N8TDE 23, N8OSC 23, WA8DHB 17, K3UWO 16, KC8CMQ 15, KC8GMT 9, K8CUC 8, KB8EIW 6, KI8GR 5, W8YZ 3. August 1999 NTS Net Reports.

Net	*QNI*	*QTC*	*Sess*	*NM*
QMN	653	358	62	WB8SIW
MACS	226	66	30	W8RNQ
MITN	419	151	31	N8FPN
UPN	1083	56	36	WA8DHB
GLETN	590	48	31	VE3SCY
SEMTN	407	58	31	WI8K
WSSBN	781	50	31	K8CPW
ARAHH	54	4	4	K8LAT
VHF Nets	439	43	62	KB8ZYY

OHIO: SM, Joe Phillips, K8QOE, Fairfield, (to contact me and other Cabinet members, see page 12)—ASM-NE Ohio: Bob Winston, W2THU, Cleveland; ASM-NW Ohio: Ron Griffin, N8AEH, Findlay; ASM-Central Ohio: Mary Carpenter, N8OAM, Westerville; ASM-SW Ohio: John Haungs, W8STX, Cincinnati; ASM-SE Ohio: Connie Hamilton, WD8MIO, Marietta; SEC: Larry Solak, WD8MPV, Mantua; STM: Jack Wagoner, WB8FSV, Hilliard,; ACC: Joanne Solak, KJ3O, Mantua; TC: Mike Brown, W8DJY, Middletown; PIC: (appointment pending); OOC: Carl Morgan, K8CM, Middletown; SGL: Jeff Ferriell, K8ZDA, Columbus...FOR NOVEMBER. Ohio Section welcomes the newest Ohio Section cabinet member - Connie Hamilton, WD8MIO, of Marietta, appointed Assistant Section Manager for Southwest Ohio. Connie, a 23 year ham radio veteran, is well known across Ohio for her work in traffic nets (a former net manager of the Eighth Region) and her work with the Young Ladies Radio League (YLRL) and Buckeye Belles. Connie said she will visit all counties in the SE Ohio region. I want to thank former ASM for SE Ohio, Bill Creighton, K8TUT, Athens, after his excellent work in establishing the position. Bill and his wife plan to travel more this year...The cabinet position of Public Information Coordinator has not been filled. If interested, contact me...Notes from the Ohio Section Conference are not available at press time but one announcement was made earlier. The Ohio Section Ham of the Year Award, usually announced at the Section Conference, will be renamed the ALLAN SEVERSON, AB8P (sk) MEMORIAL AWARD. Each future award certificate will carry the sentence which says it all -"Allan's dedication and service to Amateur Radio inspired a whole generation of Ohio Section leadership" - .....Since we are members of the Great Lakes Division, Ohio Section Hams will join Kentucky Section and Michigan Section hams in voting for Division Director and Vice-Director for a new three-year term. If you have not returned your ballot to ARRL Headquarters, do so now. Participate and make your voice heard. OHIO SECTION CONGRATS to: (a) new officers at Capital Cities RA; AA8YY, pres; N8TU, veep; and N8POV, editor; plus reelected officers, KB8ESU, sec; K8NIO, treas., (b) New Dayton ARA officers, N8ZGT, pres; N8EIO, veep; N8ZCP, sec; N8BAN, treas; and N8JE, KA8C, KB8PSD, trustees, (C) Mike Nie, KB8VMX, for his excellent *QST* story (page 72-3) about Cincinnati's April tornado in the October issue; (d) Terry Douds, WB8CKI, Lancaster, for his many AMSAT stories in various publications and (E) Ryan Swank of Van Wert High School for receiving the Van Wert ARC Scholarship. Ryan is not a ham but will further his electronic studies in college....Three HF frequencies have been selected for communications among ARRL sections and/or states during emergencies. These are 3.890 MHz (80/75m); 7.250 MHz (40m) and 14.245 MHz (20m).....If your Ohio ham radio club isn't a Special Service Club of the ARRL, contact Joanne Solak, KJ3O, (**ljsolak@apk.net**) and see if your group qualifies and you wish to enjoy its special privileges....Thinking about next month's Christmas gifts? Look over the numerous ARRL publications and see if there isn't a fine selection for those Hams on your gift list.....OHIO HAMFEST for November; (20) at Bethel for Grant County ARC;...de K8QOE. Now for traffic reports for August.

Net	*QNI*	*QTC*	*QTR*	*Sess*	*Time*	*Freq*	*NM.*
BN (E)	200	52	2247	30	1845	3.577	WD8KFN
BN (L)	194	94	384	31	2200	3.577	NY8V
BNR	82	43	64	29	1800	3.605	W8LDQ
OSSN	145	52	554	30	1810	3.708	WB8KQJ
OSSBN	1634	509	2377	92	1030,1615,1845	3.9725	KF8DO
OH Section ARES Net					1700 Sun	3.875	WD8MPV

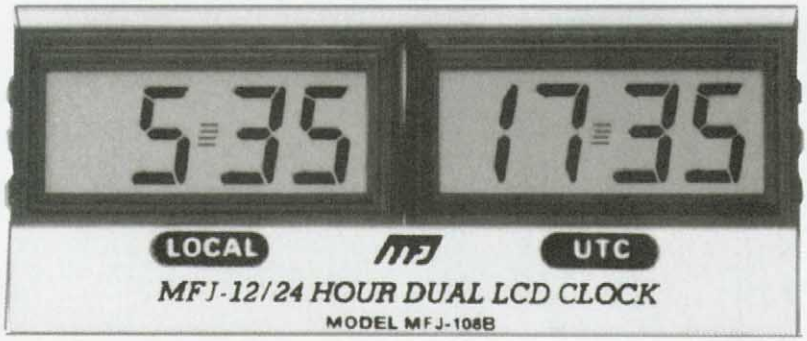
Tfc: KD8HB 235, WD8KFN 182, KF8DO 169, W8STX 158, KA8FCC 103, N8FWA 97, N8DD 87, WA8SSI 87, NS8C 80, WA8EYQ 58, W8LDQ 50, KI8IM 49, WB8FSV 46, K8WOQ 40, W8PBX 39, NY8V 38, W8RG 37, KC8DWM 37, KD9K 36, WD8KBW 31, K8IG 29, W9GGA 27, N8YWX 27, K8OUA 26, K8QIP 24, W8RG 21, KI8O 17, KC8FWU 17, WB8HHZ 16, N8GP 13, KC8HTP 12, W8BO 11, AA8XS 10, W8GAC 9, KB8TIA 9, W8RPS 8, KC8KYP 6, N8CW 6, KB8DJE 5, KC8HFV 5, WB8IOW 5, WD8MIO 5, N8GOB 4, W8GDQ 4, N8OKI 3, N8BBY 2, N8WC 2, W8DYF 1, 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. Net Reports (August 1999) Check-ins (QNI)/Traffic handled (QTC+QSP): AES 47/6 CDN 323/205 CGESN 51/0 ESS 348/180 HVN 523/239 NYPHONE 233/651 NYPON 302/241 NYS/E 393/402 NYS/M 230/183 NYS/L 279/428 SDN 365/163. Hope to see you all at Beaconfest in November! The Winter of Y2K is coming. Please check into the ENY Emergency Services Net every 1st Tuesday of the month at 8 PM on 146.97. 73 de KR2L PSHR: N2YJZ 169, WB2ZCM 142, K2BTP 136, N2JBA 126, W2AKT 126, WB2IIV 118, W2JHO 114. Tfc: N2YJZ 349 WB2IIV 135, K2BTP 84, N2JBA 74, N2TWN 71, W2JHO 59, WB2ZCM 51, KC2BUV 27, WA2YBM 24, KC2DAA 20, N2AWI 18, W2AKT 9, N2YGK 4, WA2BSS 4, N2MCS 1.

NEW YORK CITY / LONG ISLAND: SM, George Tranos,

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. MFJís famous *No Matter What*™ one year limited warranty. *$6 s&h.*

DXerís Wall Clocks

MFJ-125, $29.95. 12 inch DXerís 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. *Worldís 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.

Bright LED Clocks

MFJ-114B, $59.95. Bright, GIANT 1.75 inch red LEDs are the biggest and brightest weíve ever seen! 24 or 12 hour time with *seconds* digits. Easily seen 50 feet away -- even in the dark! 110 VAC. Great on your desk or mounted on the wall! 12½Wx4½ in.

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.

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 Radioís 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

MFJís *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.

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 youíre on the back row! Great for eyeball QSOs. 30 day money back if not absolutely delighted. *Not a hearing aid.*

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N2GA—ASM: KA2D, N1XL, K2YEW, W2FX, KB2SCS. SGL: N2TX. SEC: KA2D. ACC: K2EJ. PIC-East: N2RBU. PIC-West: K2DO. TC: K2LJH. BM: W2IW. OOC: N1XL. STM: WA2YOW. Congratulations to N2XOJ, KB2KLH, WB2GTG, W2RJL and N2AKZ for Public Service Honor Roll. Thanks to Bill, KB2RED, and Suffolk County Radio Club for help in reactivating the Suffolk County Traffic Net. Upcoming hamfests: GSBARC in Lindenhurst on Oct. 24, RCARC in Farmingdale on Nov. 14, MIARC in Patchogue on Nov. 28. NYC Marathon is Sunday, Nov. 7. Mark your calendar for Ham Radio University / Long Island on Sunday, Jan. 23, 2000, in North Babylon. Check the NLI Webpage at **www.arrlhudson.org/nli** for more information on upcoming events. NYC/LI VE exam list follows: NYC/LI VE exam list follows: Islip ARES, 1st Sat 9 AM, Slip Town Hall West 401 Main St. Slip, Len Battista, W2FX, 516-277-0893. Bears VE: ABC Bldg Cafeteria, 125 West End Ave at 66th St. Call Hotline 212-456-5224 for exact dates & times, Jerry Cudmore, K2JRC. Grumman ARC (W5YI) 2nd Tues 5 PM. Northrop-Grumman Plant 5 S Oyster Bay Rd via, Hazel St Bethpage, NY. Bob Wexelbaum, W2ILP, 516-499-2214, LIMARC, 2nd Sat 9 AM NY Inst of Tech, 300 Bldg Rm 409, Northern Blvd. Old Westbury, Al Bender, W2QZ, 516-623-6449. East Village ARC, 2nd Friday 7 PM, Laguardia HS, Amsterdam Ave and West 65 Street, Manhattan. Robina Asti, KD2IZ, 212-838-5995. Great South Bay ARC, 4th Sun 12 PM, Babylon Town Hall, ARES/RACES Rm 200 E Sunrise Hwy N Lindenhurst, Michael Grant, N2OX, 516-736-9126. Hellenic ARA: 4th Tues 6:30 PM; Pontion Society, 31-25 23rd Ave, Astoria, NY, George Anastasiadis, KF2PG, 516-937-0775. Larkfield ARC: 3rd Sat 9 AM, Huntington Town Hall, 100 Main St, Huntington, NY, Joe Coffield, W2DDZ, 516-266-3192, Columbia U VE Team: 3rd Mon 6:30 PM, Watson Lab 6th.floor 612 W 115th St NY, Alan Crosswell, N2YGK, 212-854-3754 PARC: exams held every three months at Southold School Oaklawn Ave, Southold, NY, on next to last Friday of the month.6:30 PM all classes of licenses. For info contact Ralph Williams/N3BT 516-323-3646. Mid-Island ARC, Last Tue. 7 PM, Brookhaven Rec Ctr, 20 Wireless Rd, Centereach, NY. Mike Christopher, KG2M, 516-736-9126. Report all changes to N2GA before the 12th of the month. Traffic: WB2GTG 249, N2AKZ 103, N2XOJ 91, KB2KLH 86, W2RJL 48, WA2YOW 19, KB2GEK 14.

NORTHERN NEW JERSEY: SM, Jeff Friedman, K3JF—September seems to be the month for Hams all over NNJ to support races of all kinds. Cherryville Repeater Assoc. supported the Skylands Triathalon which included a swim across Spruce Run, a bike race up Jugtown Mt and finished with a 5k run. The Ramapo Mountain Amateur Radio Club provided much needed radio support for the MS100. This bicycle race begins in Oakland and goes through Pompton Lakes, Wanaque, Ringwood and West Milford before overnighting in Vernon. Not to be outdone Amateur Radio operators from Ramsey supported the Ramsey OEM for the 22nd running of the Annual Ramsey Run. The Foundation for Amateur Radio announced that one of our very own young Hams Krista Birmingham KA2ANF was the winner of the Kevin Barry Perdue Memorial Scholarship. WAY TO GO Krista! NNJ Hams who served in the armed forces during the Cold War Era (9/2/45 to 12/26/91) may be eligible for the Defense Dept's Cold War Veteran Recognition Certificate. If you served during that time, honorably, send DD form 214 with any Govt or Military document with SS #, and name to Cold War Recognition, 4035 Ridge Top Road, Fairfax, Va. 22030-7445 FAX 702-275-6279. Additional info can be found on the Web at **http://coldwar.army.mil/** Don't forget to register under the new ULS system. To do business with the FCC at this point forward you must be registered. This is not an FCC rule but one enacted by Congress. You no longer use form 610. You now use form 605 for all transactions. You register by using Form 606 which may be requested through the Web **http://www.fcc.gov/formpage.html** or by calling 800-418-form(3676). If you wish to register via the Web go to **http://www.fcc.gov/wtb/uls/** and click on TIN/Call Sign Registration. Use your social security number for the TIN unless you have been assigned a TIN before. The Mount Holly National Forecast Office and Skywarn would like any Hams interested to join the NJ-PA-MD-DE-SKYWARN Mailing list. This list provides valuable information on severe weather within the area. You may join the list at the following site: **http://www.onelist.com/subscribe.cgi/NJ-PA-MD-DE-SKYWARN**. Somehow I think I would be remiss by not including something about Y2K as it approaches. Monmouth County OEM has teamed-up with N.J. Natural Gas in a unique way. The Gas company does not have radio communications outside of their utility freq. There only way to dispatch is through the phone system. In the event of phone service disruption, Monmouth County ARES will be on call via 2M simplex to setup stations within the OEM and NJNG to pass messages where protection of Life and Property is at stake. That's it for this month!

Net	*Mgr*	*Sess*	*QNI*	*QTC*	*QSP*	*QTR*
NJM	WA2OPY	31	172	75	69	345
NJPN	W2CC	36	173	41	30	165
NJSN	K2PB	24	106	8	8	249
NJN/E	AG2R	31	218	83	77	342
NJN/L	AG2R	31	183	40	29	226
NJVN/E	N2RPI	31	317	39	36	261
NJVN/L	N2OPJ	31	241	44	42	228

Tfc: N2XJ 194, N2OPJ 98, KC2AHS 66, N2RPI 43, K2PB 37, W2JG 36, K2VX 29, KB2VRO 14, N2QAE 10, N2TTT 2, KB2VVB 1.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, N0JL—ASM: N0LDD. SEC: NA0R. ACC: N0IJP@KE0BX. BM: K0IIR@W0CXX. SGL: K0KD. TC: W0DIA. Boyer Valley ARC has tried their first flea market. I hope it went well on Sep 19! Happy birthday, Orrie! Bonus in my EIDXA newsletter! Both a letter and a post card addressed to other folks! OK. I sent them on! They have some nice pictures of W0AWL's new beam... on a 100 foot tower! WB0ZRL makes a very good point about safety. Always know how to get away from the bottom of the tower. I have had the same experience, but with 400 feet of hardline trying to come down when the rope broke! SARA is having code practice on the 97 repeater in Sioux City. I enjoyed K0AARs 'awards' for Dayton. Nice job, John. TSARC is putting up two repeaters. One for APRS and one for packet. I hear they are planning a wx station for APRS. FMARC is having their Radio Rodeo and bunny hunt again this year. I attended several years ago and it was fun. I regret reporting the loss of W0IZ in June and

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

***New** MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!*

***The** world's most popular SWR analyzer just got incredibly better and gives you more value than ever!*

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

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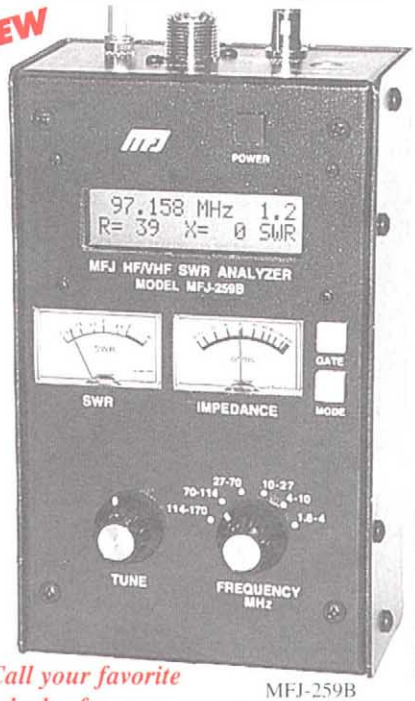

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MFJ-259B

$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 4x2x6¼ 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. 7½x2½x2⅛ 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. 4x2½x6⅞ in.

More hams use MFJ SWR Analyzers™ than any others in the world!

N0YDN in August. Are you ready for ULS? FMARC has new officers: WB0B, KB0ERK, and KA0DX. TSARC made nearly a kilobuck in ONE day toward equipment for their van. Want to know how? Check with WA0AUU. OARC had a birthday breakfast for N0HAK. 91. Both CVARC and TSARC are planning classes. My #3 son is now KC0GJR. Remember to vote for Director! 73 de N0JL. Newsletters were received from BVARC, NIARC, EIDXA, SARA, TSARC, FMARC, SEITS, DARC, CVARC. Tfc: W0SS 74, KA0ADF 69, N0JL 14, KA0ADF (Jul) 59.

KANSAS: SM, Orlan Cook, W0OYH—ASM/ACC/OCC: Robert Summers, K0BXF. SEC Joseph Plankinton, WD0DMV. SGL: Marshall Reese, AA0GL. Hi gang, The ARRL State Convention at Salina was a great success. The CKAR Club did a super job with a perfect building with big meeting rooms, huge swap area, and more than enough parking. Elden Miller N0KJ, is the 1999 KS Amateur of the year. 70 ARES and NTS hams attended the 2-hour Section meeting. One of our speakers, DEC Bob Haneke, WG0Q, shared with us his experiences with the Wichita tornado disaster. He brought out many good points we all can use. June, KB0WEQ, took us through how she built a ARES group to about 80 members in less then 2 years. The next convention is Aug 27 and we are planning for a bigger meeting. See **http://www .colossus.org/kar/** for 15 convention and section meeting pictures and more. Jul. Kansas Nets: sessions/QNI/QTC, KSBN31/927/98 KPN22/ 629/16 KMWN31/539/480 KWN31/666/419 CSTN 27/1607/95 QKS 57/250/195QKS-SS 6/15/1 JCA2/8/0 SEC 48/931/25 QNS DMV KB0AMY WD0DDG AA0HJ AA0IQ LJR KF4LM BV KB0PQP UXG TEN 386 msgs Ks 60% W/AA0FO KX0I K0PY NB0Z WB0ZNY = W0SS mgr DTRN Ks100% W/AA0OM N0WWR N0KFS KF0WS W0FCL KB0AMY N0KJ Mgr. BBS reports: W1AW Bul/Per/NTS AA0HJ 0/507/0 N0OBM 30/242/4 Ks Stns tfc N0KJ 522, K0PY 169, WB0ZNY 158, NB0Z 70, N0WWR 56, KX0I 53, W0OYH 34, W0FCL 30, K0RY 28, KB0GUS 24, KB0DTI 10, N0ZIZ 7, K0BJ 2.

MISSOURI: SM, Dale Bagley, K0KY—ASM: Tom Housworth, KI0JO. ASM: John Seals, WR0R. ACC: Keith Haye, WE0G. OOC: Mike Musick, N0QBF. PIC: Dennis McCarthy, AA0A. SEC: Fred Langeneckert, WA0US. SGL: E.B. DeCamp, KD0UD. STM: Tom Housworth, KI0JO. TC: Wayland McKenzie, K4CHS. Thanks to Ken Foster, KC0AMH and Larry Ballew, AB0HP, the Missouri Section Web Page has been on the Internet for a couple of months. The Web page address is at **http://www.qsl.net/arrl-mo/**. The Section Web Page will be improved and updated to make it more useful to the section membership. Woodie Moore, W0ODY, served well as the Hamfest Chairman for the Ozark Regional Hamfest in Springfield, MO. Midwest Vice-Director Bruce Frahm, K0BJ and MO SM Dale Bagley presented an ARRL Forum at the Hamfest. At the St. Charles Hamfest, Ken Fieser, KB0VLN, organized what has been described as one of the best Hamfests in recent years. Mac McKenzie, K4CHS, Section Technical Coordinator, was elected to the board of the Missouri Repeater Council. Nets: QCWA#35 4/95/0 N0UYN; PAUL REVERE 5/534/0 N0IWA, HAMBUTCHERS 22/794/52 KD4NK; WAARCI 5/104/0 KB0VZP, MOTN 31/546/139 K0IPM; MON1&2 54/181/80 N0WFF, ROLLABILLBOARD 31/344/6, NA0V, CARL 3/27/0 K0EZB. Tfc: W0WFF 148, KI0JO 114,KG0IV 8. PSHR: N0WFF 136, KG0IV 89, KI0JO 72.

NEBRASKA: SM, Bill McCollum, KE0XQ—ASMs: W0KVM, N0MT, WB0ULH, WY0F & WB0YWO. It is with deep regret to inform you that on August 27, Art Gakel, WB0YYE, became a Silent Key. Art was a member of the Lincoln ARC and had mentored many younger hams and helping with many public service events. The PIC (WA6POZ) informs me that he has appointed Bill, K0NSA as the PIO for the AK-SAR-BEN ARC. Attendance at this years' AK-SAR-BEN ARC Flea Market was good. I was able to visit with many of the sections' amateurs. 22 Omaha area amateurs provided Damage Assessment for the Red Cross following flooding on August 6 – 7. The Amateurs worked from the 7th to the 19th. Thanks to Kent, N0SQM, who put in many long hours. There was an excellent story in the July 31 issue of the Norfolk Daily News concerning the clubs' repeater/antenna relocation. Net Reports: NMPN: QNI 1495, QTC 6 & 31 sessions. Lincoln/Logan ARES: ONI 137, QTC 4 & 13 sessions. NE Storm Net: QNI 658, QTC 32 & 31 sessions. W0IRZ: QNI 60, QTC 4 & 4 sessions. NE 40 M Net: QNI 346, QTC 2 & 26 sessions. Tfc: KE0XQ 30, W0RWA 8, NY0F 6, WD0BFO 4, K0AEM 2, W0UJI 2, K0SW 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—BM: KD1YV. OOC: WA1TJT. PIC: W1FXQ. SEC: WA1D. SGL: K1AH. STM: K1HEJ. TC: W1FAI. It seems that everyone is busy getting settled as Fall gets underway and that each year is busier than the year before! I have been keeping very occupied with the new teaching schedule as well as coordinating the antenna work that must be done around here to allow for a good ham radio Winter! By now, all members should have received my annual newsletter which I like to write to keep in touch with all of you. Remember to let me hear your ideas—**k1eic@arrl.org**. IMPORTANT! Be sure to use the @arrl.org address because I have changed Internet service providers. The Meriden ARC is running another novice class this Fall with N1JEO at the helm—we'll be looking forward to working the newcomers! Don, N1HAX, coordinated the communications for the MS 4th annual Bike Tour. The ops provided primary communications between 3 rest stops and 4 sag wagons for 2 days and kept track of 167 riders. The Sights and Sounds Tour is a 2-day tour going through the Shoreline staring in Madison through Essex, Haddam and Moodus. Ham ops have participated in this event ever since it started four years ago. Many thanks to the Shoreline ARC, 146.775/R and the NE1A System 147.070/R. Participants joining N1HAX were: KA1RPS, K1JBS, W1LAM, N1QQV, K1IKE, KB1CQN, KB1DCY, KD1FN, N1NOL and NA1D. My personal thanks to you all and hearty congratulations on a job well done—their efforts were very well received by the coordinators of this event. Net sess/QNI/QTC: NESCON 31/307/96; ECTN 31/303/72; NVTN 31/170/53; CPN 26/205/71; CN 26/65/33. BEARS of Manchester 29/281/337. Tfc: NM1K 1888, KA1VEC 519, KA1GWE 149, WA4QXT 128, KE1AI 122, K1STM 119, N1VXP 75.

EASTERN MASSACHUSETTS: The following was submitted by STM Jim Hatherley, WA1TBY—

MFJ TUNERS

MFJ-989C *Legal Limit* Antenna Tuner

MFJ uses super heavy duty components to make the world's finest legal limit tuner

MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the worldí s most popular high power antenna tuner.

The rugged world famous MFJ-989C handles 3 KW PEP SSB amplifier input power (1500 Watts PEP SSB output power). Covers 1.8 to 30 MHz, including MARS and WARC bands.

MFJ's *AirCore*™ roller inductor, new *gear-driven* turns counter and weighted spinner knob gives you exact inductance control for absolute minimum SWR.

You can match dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave -- nearly any antenna. Use coax, random wire or balanced lines.

MFJ-989C **$359.95**

You get everything you've ever wanted in a high power, full featured antenna tuner -- widest matching range, lighted Cross-Needle SWR/Wattmeter, massive transmitting variable capacitors, ceramic antenna switch, built-in dummy load, *TrueCurrent*™ Balun, *scratch-proof* Lexan front panel -- all in a sleek compact cabinet (10¹/₄Wx4¹/₂Hx15D 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.

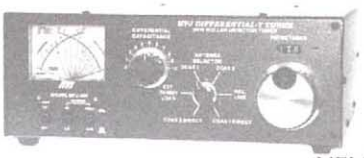
Large, self-cleaning wiping contact gives good low-resistance connection. Solid 1/4 inch brass shaft, self-align bearings give smooth non-binding rotation.

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™



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. 10¹/₄Wx4¹/₂Hx15 in.

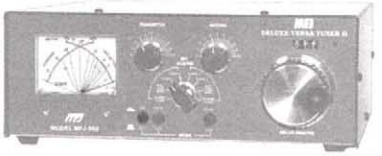
MFJ-986 **$329.95**

MFJ-962D compact Tuner for Amps

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 Ameritroní 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. 10¹/₄x4¹/₂x10⁷/₈ in.

MFJ-962D **$269.95**

MFJ-969 300W Roller Inductor Tuner



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. 3¹/₂Hx10¹/₂Wx9¹/₂D inches.

MFJ-969 **$199.95**

MFJ-949E deluxe 300 Watt Tuner

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. 3¹/₂Hx10⁷/₈Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-949E **$149.95**

MFJ-941E super value Tuner

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 10¹/₂Wx2¹/₂Hx7D in.

MFJ-941E **$119.95**

MFJ-945E HF+6 Meter mobile Tuner

Extends your mobile antenna bandwidth so you doní 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-945E **$109.95**

MFJ-971 portable/QRP Tuner

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 6x6¹/₂x2¹/₂ inches.

MFJ-971 **$99.95**

MFJ-901B smallest Versa Tuner

MFJí 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-901B **$79.95**

MFJ-16010 random wire Tuner

Operate all bands anywhere with MFJí s reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-16010 **$49.95**

MFJ-906/903 6 Meter Tuners

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-906 **$79.95**

MFJ-921/924 VHF/UHF Tuners

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2¹/₂x3 inches. Simple 2-knob tuning for mobile or base.

MFJ-921 or MFJ-924 **$69.95**

MFJ-922 144/440 MHz Tuner

Ultra tiny 4x2¹/₂x1¹/₄ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

MFJ-922 **$79.95**

MFJ-931 artificial RF Ground

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.

MFJ-931 **$79.95**

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Net	*Sess*	*QTC*	*QNI*	*QTR*	*NM*
EMRI	62	127	166	433	K1SEC
EMRIPN	31	78	148	441	WA1FNM
EM2MN	31	83	309	352	N1LKJ
HHTN	31	40	300	330	N1IST
CITN	31	81	323	578	N1SGL
WARPSN	5	13	67	NA	K1BZD
NEEPN	4	4	9	NA	WA1FNM
*CHN	31	43	102	326	W2EAG
**OSTN	26	12	45	100	KA1JXH

Tfc: WA1TBY 193, W2EAG 179, NZ1D 149, N1LKJ 105, WA1FNM 83, K1SEC 53, N1AJJ 49, N1SGL 39, N1IST 37, N1TDF 27, N1LAH 26, N1TPU 13, N1BNG 7, KB1EB 7, N1VUX 5.

MAINE: SM, Bill Woodhead, N1KAT—ASMs: WA1YNZ, KA1TKS. STM: NX1A. BM: W1JTH. SGL: W1AO. ACC: KA1RFD. OOC: KA1WRC. PIC: KD1OW. SEC: N1KGS. Asst. Dirs: W1KX, KA1TKS, K1NIT. Web Site: N1WFO. Fear of Y2K bringing down power grids and the sky falling down was given a setback, due to the tremendous response to a simulated communications failure for Dec 31, 1999. This test was conducted on Sept 11 among the majority of the hospitals state wide and the amateur community. Operators showed up at their appointed sites and proceeded to blow the socks off our ability to perform statewide and interstate communications in a variety of modes, such as digital, HF, and VHF. 3940 kc was the HF freq. and the KQ1L linked repeater system was the primary VHF mode, so all Ham were to participate. This will be an invaluable experience for all of us to grow with. Many of the hospitals are willing to make available permanent HF and VHF ant. For amateur use. So a very special thanks to all of you who made the test such a great success. 73, Bill.

NEW HAMPSHIRE: SM, Mike Graham, K7CTW—ASMs: WW1Y, W1NH, N1KIM. TC: WA1HOG. STM: WA1JVV. PIC: KA1GOZ. OOC: W1GTA. SGL: K1KM. BM: KH6GR. ACC: AA1QD. SEC (acting): WW1Y. Very sorry to have to report that Gary, N3CLZ, has had to step down as SEC. Jim, WW1Y, has volunteered to fill vacancy 'til new SEC can be found. Thanks to Gary's very hard work, we had very successful ARES meeting at Manchester ARC, with most ARES staff in attendance. Focus was on Y2K and SET planning for this fall and winter. I urge everyone to get "radioactive" on your local ARES nets. For contingency purposes **ONLY**, and working with NHOEM, ARES will activate at 2100 local New Year's Eve. We need everyone who can to participate. Stay tuned for further details. If you're traveling around the state on a Saturday and like breakfasts, check in with Harvey, W1ZIZ, e-mail **suwharv@grolen.com** from Amoskeag Radio Club in Manchester. Likewise in Nashua area, check with Neil, N1DMA, e-mail **neilr@innermedia.com**, Activities Chair for NARC. Twin State club offers an excellent on-line version of their club newsletter. A good idea for all clubs looking to cut costs. Planning an activity? Get details to me for announcing statewide. For now, best 73....de K7CTW. Net Sess/QNI/QTC: GSFM 31/264/40; GSPN K1ZO 35/141/30; TSEN 4/40/3; VTNH 31/198/222. Tfc: W1FYR 819, W1PEX 817, K1TQY 238, WA1JVV 135, N1NH 78, W1ALE 69, K1ZO 64, KA1OTN 26, N1CPX 19.

RHODE ISLAND: SM, Armand Lambert, K1FLD—Sky rockets in flight...look to the southern skies of RI on November 18 for the Rocket for School Program at Ninigret State Park. Web site (**http://users.efortress.com/mudbug/**) lists schedule of events. Radio operators are needed to support this event. Contact K1QVF, Patrick O'Connors, 401-949-1786 or fax 949-1831. Bring your camera and catch the fun. RI hosted this year's annual banquet/meeting of the 3905 Century Club. A New England clambake fed 78 people. Steve , N5SV, presided at the business meeting while Jeff, WA1VQI, and family made arrangements and hosted the events. Radio Ops from all over the country attended, even Alaska and Canada. Submit your clubs meetings, VE sessions, and activities to Dan, **ka1bno@arrl.net** for weekly announcements on the swap and sell net on 146.70.Y2K preparedness drill took place on 9/11 with much success. Amateur radio proved to be very essential and reliable resource to serve the community. My thanks to all for your support in the election and looking forward to serving you. ASM: W1YRC, SEC: N1JMA, ACC: WA1RI, PIC: WB1P, OOC: WA1ON, STM: KA1JXH, BM: KA1BNO, TC: K1DFT, SGL: NN1K.

VERMONT: SM, Bob DeVarney, WE1U—Well, it's the beginning of September, and this crazy summer is nearly over. The Champlain Valley Fair has come and gone, and the kids are back in school. The Charlotte Hamfest was fun, even if attendance was down due to the dismal weather. The VE session attendance sure wasn't down though. We had 18 candidates, and 10 of those came away with either a new license or upgrade. A bunch more earned partial credit, passing at least 1 element. All in all, a great session. Special thanks are due to the "guest VE's" that pitched in to help: Mike Raisbeck, K1TWF, and his wife, and William, K1WD. We couldn't have done it without you. Also thanks to the examinees for your patience while we coped with the wind and being a little overwhelmed with the numbers in the session. I'm still looking for anyone interested in participating in the National Traffic System nets, or becoming Section Traffic Manager. I'm also looking for news for the Section News column, so if you have anything you would like to see in *QST*, feel free to call me or e-mail it to me. 73 de WE1U.

NORTHWESTERN DIVISION

ALASKA: SM, David Stevens, KL7EB—OOC: KL7IKX. DEC: NL7DL, WL7JBV, WL7GK. TC: AL7CE. TS: KL7CC. ASM: WL7BJ, KL5T. Snipers Net 3920 daily 1900 AST, Bush Net 7087 daily 2000 AST, Motley Group 3933 Daily 2100 AST, and Alaska Pacific net 14.292 M-F 0830 AST. Congratulations to Jasek Maselko, KL0RW, of Juneau for reaching Mt Everest summit May 18. Matanuska 'Ham Tower Exemption' pass the borough assembly. Thanks to Ken Slauson, WB7SFO, and his grass roots effort. John Wolfe, AA0NN, and Lee Johnston, N5JUM, report EARS did real well Sept 18-19 in the US Air Force Anniversary QSO Party. PSHR AL7N 92, KL5T 113. Alaska Morse Wire: sent 1, received 7, delivered 4.

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—(August Report): A number of "Base Support Hams" helped the Cascade Bicycle Club's "Ride Across Washington" with local communications in the Omak, Republic, Colville, and Newport

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Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!

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These babies are clean . . . Your buddies wonít hear *any* RF hash on your signal! *None* in your receiver either!

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Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

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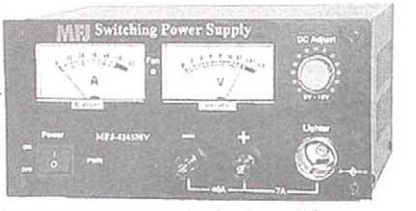

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MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

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Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

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 5½Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¼Hx9D 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. 5½Wx2½Hx10¼D in.

MFJ-4125
25 Amp
$109.95
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MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
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MFJís 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.

Itís highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- itís 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. 9½Wx6Hx9⅞D inches.

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Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

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New!
MFJ-1117
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MFJ-1118, $74.95. This is MFJís 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 transceiverís 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 iONi 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. 12½x2½x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has iONi LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! MFJ-1117, $54.95. For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

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areas. Many thanks to ECs Rich, K7UK; Leslie, N7YQP; Dale, KC7RIM; Dick, W7IFO, along with all the hams in each area who volunteered their help. Glenn Moore, N7VBW, earned a Meritorious Service Award for his volunteer and administrative support from the Spokane Co ARES/RACES. Congratulations, Glenn. STM Don reported that over 500 written messages were originated from the W. Idaho State Fair in Boise and the traffic was handled via CW on 40 meters with some going to the WARTS, FARM, and Montana Traffic Nets. Net Activity (for August): WSN: QNI 789, tfc 411; Noontime Net: QNI 8631, tfc 312; WARTS: QNI 3144, tfc 132. Tfc: K7GXZ 419, KA7EKL 325, W7GB 318, KK7T 47, W7UVP 0. PSHR: W7GB 138, K7GXZ 120, W7UVP 60.

IDAHO: SM, M.P. Elliott, KF7ZQ — OOC: N7GHV. SEC: AA7VR. STM: W7GHT. Announcing a new ASM. Jason Clark, KC7CPT, a 14 year-old General class ham will be ASM for Youth. Welcome aboard! CW activities at the Western Idaho State Fair resulted in four hams qualifying for BPL in August - W7GHT, KB7GZU, W7JMH and AA7WG. Congratulations! A CW demonstration was also held September 23rd at the Idaho State Museum. CW is alive and well in Idaho! Y2K preparations - New Year's Eve the FARM Net will monitor 3937 MHz and the IBDS will have Section ECs monitor 3990 MHz. These nets will pass emergency traffic should a Y2K event occur. 73 — Mike, KF7ZQ. Tfc: W7GHT 1237, KB7GZU 765, W7JMH 523, and AA7WG 211. PSHR: KB7GZU 341, W7JMH 276, and W7GHT 221. Net (SESS/QNI/QTC/Mgr.): FARM - 31/2071/122/W7WJH; NWTN - 31/1333/91/KC7RNT; IDACD - 22/648/32/K7UBC; IMN 31/311/291/N7MPS.

MONTANA: SM, Darrell Thomas, N7KOR—The Yellowstone Radio Club of Billings MT is to be commended for their new addition to the repeater system maintained by their organization. They have installed the new repeater with a frequency of 145.410 in the Bull Mountains near Roundup MT. Northeast of Billings. This repeater provides coverage in a very remote area that previously had no radio contact. In addition the repeater is linked back to Billings and connected with the others maintained by the YRC providing great VHF coverage across a wide area of Southeast, MT. Other repeater activity in the section includes additions being planned by the MARLA Group that will link their already wide area repeater system in the state to systems to the south. Tests indicate a possibility of 2-meter contact from Montana as far south as California and possibly eventually north into Canada. More on this as information becomes available. Net/QNI/QTC MSN 125/0 W7OW; MTN 1572/56 N7AIK. PSHR: N7AIK 95.

OREGON: SM: Bill Sawders, K7ZM—ASM: KK7CW, ASM: KG7OK. SEC: WB7NML. STM: W7IZ. SGL: N7QQU. OOC: NB7J. STC: AB7HB. ACC: K7SQ. The Oregon QSO party, normally held each May, will now be held annualy on the third Saturday in August. The unpredictable spring weather made it impossible for some clubs to make plans to travel to some of the rarest counties. The annual contest allows hams in other states, and countries to "work" as many Oregon counties as possible in one weekend. Nice awards go out to those stations who make the most contacts, with the most counties. More later. Oregon's highest repeater, and one of the highest in the Northwest, located on 9,015', Mt. Bachelor, has a new frequency, and a new sponsor. The popular 147.06 was replaced by the new 145.45 (-). The new OPEN repeater, will be maintained by the Central Oregon DX Club, with a PL tone of 103.5. The P.L. tone was made necessary to keep it from interfering with other repeaters, and to keep local pager intermod, out. Kudo's to the ORRC for the fast coordination of the new repeater, as over 200 inches of snow will bury the antenna during the winter. Many locals and visitors alike use the repeater during travel, and for events like the annual Pole-Pedal-Paddle, Winter Special Olympics, and the famous Mt. Bachelor bike races. Y2K is just around the corner. If all goes well, maybe it will turn out to be another 9/9/99. ARES/RACES will be on alert, however, as will all State Government agencies, in case of possible problems. Please give me the names and callsigns of your new 2000 club officers. An updated list will appear in the January column. Keep in touch. NTS traffic totals for August: KK1A 213, KC7ZZB 139, K6AGD 131, N7DRP 126, KA7AID 120, W7VSE 115, KC7SRL 56.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—ASM: W7QGP. SEC: N7NVP. OOC: AA7KE. STM: W7ZIW. PIC: KC7IAY. Heard a violation of the FCC Rules on the air lately? OO Bernie, N6DCD, reminds us that the FCC has entrusted us to police our own bands, that enforcement within our bands is indeed our business. Two local nets are alive and well, the Clark County ARES & Info Net and the Puget Sound Tfc System. Both liaison to Section nets. STM W7ZIW provides station activity reports as follows: N7AJ 54, K7BDU 895, W7LG 221, K7MQF 206, W7NWP 198, KJ7SI 36, K7SUQ 14, W7TVA 264, K7YOH 49, N7YSS 69 and W7ZIW 191. Around the Sound SEC N7NVP reports that the Dist 2 folks have been busy breaking new ground with seven members in Clallam Co providing communications for cross-country trials, where young horseback riders from the Pony Club compete with their horses over a three mile woodland track. Jefferson Co got a new ELT training unit & the training team successfully eluded the faithful trackers for 6 hrs. Bainbridge teams in Kitsap Co have obtained permission to install a 6 mtr repeater on the Fire Dept site. The topics at the Dist 4 meeting were district organization and preparation for SET. The meeting was also a farewell to EC Brant Culbertson, KA6INC, and a welcome to EC Chuck Weimer, KC7YWU. Over in Pacific Co. In Dist 5 the Clark & Cowlitz Co teams this summer & fall have supported everything from the DEM booth at the county fair to a bike ride and Fly-in! Support your community - be an EC.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: KF6RCO. SEC: KE6NVU. DECs: WA6TGF/Alameda County, KO6JR/Contra Costa County, WA7IND/Napa County, K6HEW/Solano County, N6UOW/Training, KE6HCI/Administration, W6CPO/Technical Services. STM: K6APW. OOC: W6NKF. TS: KF6NY. Check out the EB WWW Page at **http://www.pdarrl .org/ebsec/**. Webmaster is KB6MP. MDARC members who provided comms for the Concord - Mt Diablo Trail Ride Association Spring Trail Ride were KM6QX, KD6GLY, WA6DQN, KF6BUM, KE6ZIW, NM6Z, K6RHL, WA6JAU, KE6ZZG, and K6ZA. EBARC welcomes new members W6VFU, Clinton Schwarz, Craig and Maria Hauger, and KF6WXE. The club mourns the loss of member W6JRZ. ORCA members KF6GTT, W6CUY, W6UAB, KE6HCD, KE6MQW, KE6HKY, KQ6JZ, N6RCG, and K6JAT provided comms for the Fourth of July Fire Patrol. K6JAT and WB6NER are meeting with

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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.

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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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MFJ's *Word Recognition Mode*™ gives you hundreds of commonly used words in ham radio. Practice recognizing *entire words* instead of individual letters. Learn to copy words without writing it down. Carry on an entire CW QSO without paper -- just like pros on 40 Meter CW. You can also save 10 words of *your choice* for word recognition practice -- *an MFJ exclusive.*

You'll never run out of practice

Select letter, number, punctuation, prosign or FCC character sets (has *only* letters, numbers and prosigns required on FCC tests), random call signs, random words, QSOs or combination sets for practice -- *you'll never run out of study material!* You can even make up and save your own words and character sets for practice.

MFJ-418
$79.95
plus s&h

MFJ InteractiveMode™

InteractiveMode™ lets *you* decide when to copy the next or previous group and how many -- great for beginners!

Normal or Farnsworth

Select normal or Farnsworth spacing.

Farnsworth makes it easier to learn *entire* characters. Stop counting individual dots and dashes that slows learning! Farns- worth character speed is adjustable 10 to 60 Words-Per-Minute for high-speed practice.

Fixed or Random Length Groups

Use fixed length or more realistic random length groups (up to 8 characters).

Change speed on the Fly

You can change speed *on-the-fly* while playing a session 3 to 60 words-per-minute.

SettingSaver™

Settings are automatically saved, ready to use next time -- no more #$%@ resets! Turn it on, hit replay. Go back to practice!

No Instruction Manual Needed!

Choose from easy-to-use menus on LCD. Simple 3 button operation.

LARGE LCD Display

Check your copy, select from menus and program custom characters and words on 2 line LCD display with 32 *huge* 1/4 inch high-contrast characters -- *powerful sound and sight learning!*

SilkySmoothSidetone™

Only MFJ gives you *SilkySmooth Sidetone*™ with *TruTone*™ sinewave and *SoftStart*™ dots/dashes -- lets you concentrate on learning without the distraction of harsh keyclicks. Use earphones for private practice or built-in speaker for groups. Adjustable volume. Loud powerful audio amplifier. Variable pitch 300-1000 Hz.

True Pocket Size

Fits in your shirt pocket with room to spare -- smaller than a pack of cigarettes. Tiny 2¼x3¾x1 in., weighs less than 5½ ounces. Uses 9 volt battery (not included).

Tapes can't compare

Tapes play the same old boring stuff over and over again. Unlike tapes, you'll *never* memorize the MFJ-418 random code sessions. You'll pay more for a few sets of code tapes. The MFJ-418 is less money, more fun and far more effective.

Pocket Tutor Accessories

MFJ-26, $12.95. Soft leather protective pouch for MFJ-418. Clear plastic overlay for display, knob/push button openings, strong pocket/belt clip secures your tutor.

MFJ-281, $12.95. Speaker for group practice. Loud, powerful audio! 3¾x3x2¼"

MFJ-291I, $4.95. Comfortable foam earbud earphone for private listening.

MFJ-3400, $19.95. *Morse Code: Breaking the Barrier.* "How to learn by the Koch Method" book.

More pocket size MFJ Morse Tutors

MFJ-417, $59.95. Similar to MFJ-418, but no LCD. Most software features.

MFJ-413, $39.95. Similar to MFJ-417, less random words, QSOs, SettingSaver™.

Other Morse Code Tutor Products

MFJ-552, $79.95. "On-the-Air" CW fun using your HT. *JimHandy*™ plugs into your dual band HT and converts it into a modulated CW transceiver -- just plug in a key!

MFJ-554, $79.95. Classroom Code Practice Oscillator. Clear, sweet sounding CW. Delivers full 1 watt into built-in speaker.

MFJ-414, $199.95. Deluxe Classroom Morse Code Tutor. Everything in MFJ-418 plus down/upload custom practice from PC, store exams, printer port, on-the-air interface, deluxe keyer.

MFJ Code Practice Oscillator

MFJ-557
$29.95

Learn to send Morse code with MFJ-557. Straight key with adjustable travel and tension, and built-in speaker with volume and tone controls lets you practice to your heart's content. Earphone jack. Heavy non-skid steel base stays put as you tap out Morse code. Use 9V battery or 110 VAC with MFJ-1312, $14.95.

MFJ-550, $7.95. Telegraph key only. **Plus s&h.**

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plus s&h

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 or semi-automatic/tune mode. RF proof. Fully shielded. Keys all transmitters. 4x2¼x4¼ inches.

MFJ-422DX, $79.95. Keyer only for mounting on your Bencher or MFJ paddle.

MFJ Communications Speaker

MFJ-281, $12.95. Restores smooth sinewave sound of CW. Makes copying easier! Enhances speech, improves intelligibility, reduces noise, static, hum.

DXer's 24 Hour Wall Clock

MFJ-125, $29.95. 12 inch diameter DXer's Quartz wall clock gives you 24 hour time. Has three smaller independently settable dials for 12 hour time, day of week and date. No more day/date confusion when logging DX!

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Oakland EOC ESC Henry Renteria, to plan the group's move to the new EOC in September. SARS welcomes new members WA6TRH, K6BYQ, and KC6AWA. The club mourns the loss of KB6OLZ. LARK's KLUTZ award was presented to KO6OA. The KLUB's new repeater voting system works quite well. HRC is still working on a noise problem on their two-meter repeater. Aug tfc: W6DOB 711, WB6UZX 18. PSHR: W6DOB. BPL: W6DOB. Tfc nets: NCN1/3630/7PM; NCN2-SLOW SESSION/3705/9 PM; NCN-VHF/145.21/7:30 PM; RN6/3655/7:45 PM & 9:30 PM; PAN/3651/7052/8:30PM. Your check-ins are always welcome.

NEVADA: SM, Bob Davis, K7IY—ASM: Jan Welsh, NK7N. SEC: N7JEH. TC: NW7O. ACC: N7FFP. STM/SGL: N7CPP. PIC: WW7E. OOC: N7ELV. Hello to the Nevada Section. We are deep into the fall of the year at this point and several organizations have indicated that they have just run out of time and resources this year in completing many of the projects on the books. This is the time of year that many of the clubs are holding their elections for officers and board members. Please participate in this important local club function. This may also be the time to ask some of the "Seasoned Veteran Hams" in your organizations to assist in the functions of your clubs. There is a vast warehouse of information and experience available just for the asking. The HF bands seem to be in generally good condition. This is always a good time to show them off to the New Hams in our ranks. A little "On the Air" experience can really start the Upgrade fires burning. In a show of appreciation, Elko ARC has awarded Life Membership to Ron, W7CFF, Gary, KD0TA and Ron, KG7OR. RARA net, Sat. 7:35 AM 3965. Hi to Dorothy, N7MXA. TNX & 73, Bob, K7IY. Tfc: N7CPP 10, KD6FQH 4.

PACIFIC: SM, Ron Phillips, AH6HN—ASMs: Harry Nishiyama, KH6FKG; Lee Wical, KH6BZF. Jim Reid, KH7M; George Heloca, Sr. KH6ANA; Mel Fukunaga, KH6H. SEC: Dennis Carvalho, KH7H. TC: Chuck Cartwright, AH7Y. PIC: Russ Roberts, KH6JRM. ACC: Bob Schneider, AH6J. The Section ACC, Bob, AH6J is on a two week vacation to Italy with plans to visit hams in the area. Bob is also planning to set up some local club visits before year's end. The Section is busy planning for the up coming SET in October, with the RACES & ARES groups on all islands. Please contact Dennis, SEC, KH7H for more info as to how to participate. Warren Munroe, KH6WM, reports the Honolulu Star-Bulletin obituaries contained an entry for Al Dickens, KH6HY, of Lawai Kauai, age 80. He was a very active ham in past years and will be sorely missed. Dean Manley, KH6B, reports HI QRP Club and Hilo ARC had their Summer picnic and camp out at Milolii Beach Park, Aug. 6-8, with the following represented: KH6DFW, KH6ANA, WH6DQ, NH6DR, AH6HB, K6RER, KH6H, NH6XB, KH6AFQ, W6ORS, KH6BMM and KH6B. Many thanks Dean for your report. I am getting more reports now from all islands concerning *QST* delivery and condition. Please keep them coming. 73, Aloha, Mahalo, Ron, AH6HN.

SACRAMENTO VALLEY: SM Jettie Hill, W6RFF—Section Emergency Coordinator, Jerry Boyd K6BZ, has sent in several reports of activity during the many fires in Aug./Sept. I commend the Emergency Coordinators and their ARES groups for many hours of volunteering during the fire season. If you would like to help, contact me for the nearest EC. John Lewis, KD6GSD, has been appointed the District Emergency Coordinator for the Sacramento Metropolitan Area. John was previously an EC. Sierra Foothills ARC reports long time member WA6HYO is a Silent Key. Have you registered with the FCC ULS? It is required before you can contact the FCC regarding a license. See *QST* for more information. It is time for clubs to be nominating Officers for next year. Have you done your part? Volunteer. Rocklin Police Dept. will be using hams for backup on New Years Eve. For info. call Matt at 632-4084. KB6YAD gave a program on slow scan TV to the Yuba-Sutter ARC. Golden Empire ARS held their annual "Steak Bake" at Woodson Bridge. New GEARS members; W6TAE, KE6DKT. WD6DCV spoke on ideas for kit building to the Sacramento ARC. A state wide hospital drill was held in Sept. to check out Y2K compatibility. Jim Maxwell, W6CF, will take over as the Pacific Division Director. Members will receive ballots for the Vice Director election. Please Vote. Northern Calif. Net meets on 3630 kHz at 7 PM, 3705 kHz at 9 PM and 145.210 MHz at 7:30 PM. Sacramento Traffic Net meets on 146.850 MHz at 9PM. All nets are daily. 73.

SAN FRANCISCO: SM, John Wallack, W6TLK—ASMs, N6KM, KE6EAQ. SEC: WB6TMS. TC: N1AL. New appointment; KE6WHH, DEC, Del Norte County. Congrats and commendation to KF6VSH of San Rafael for using his hand held transceiver to effect the rescue of a victim of a medical emergency. This was an excellent emergency response by a fine young ham. AA6VS, EC, reported that 6 ARES members stood by 6 critical locations during a 911 telephone outage at Sea Ranch and Timber Cove and activated an emergency net on the 147.825 repeater. The purpose was to relay emergency requests from the public to CDF dispatch. Thanks and a job well done by KE6RPA, N6YBQ, KE6RPB, WA6RWM, AD6EN and AA6VS. WB6QVU, EC and ACS Chief, reported that San Francisco ACS supported the Red Cross during the annual Bay to Breakers event. It was excellent training for the ACS members in supporting real medical emergencies during the 6 hour event. Remember, it is every radio amateur's responsibility to be prepared to provide emergency radio comm in the public interest.

SAN JOAQUIN VALLEY: SM, Donald Costello, W7WN—ASM: Mike Siegel, KI6PR. ASM: John Lee, K6YK. ASM: Pat Fennacy, W6YEP. SEC: Kent LaBarts, K6IN. ACC: Charles McConnell, W6DPD. OOC: Victor Magana, N1VM. There is a lot of weak signal work going on in the San Joaquin Valley Section John Lee, K6YK. Jeff, W7XQ, Dave Swickard, K6FJS, Jim Munday, W6JWM and many others working two meter ssb, moon bounce, AO27 and of course six meters. Just a reminder U.L.S. is up and running now so, be sure to register at the Web site described at the ARRL Web site. Be sure to write down ALL needed information from registration that is needed for future access of the U.L.S. system and put the info in a safe place. Registration for U.L.S. is a simple process on-line via the Internet. I am always looking for news about activities in the Section so, please forward stories to me at **w7wn@arrl.org** Locally, activity on the birds has been hopping. John Lee, K6YK, has been picking up many California counties working Jim Hertel, N6KMR, who drives a truck and works AO27 while mobile. Listen for Jim, N6KMR, via the bird if you need county contacts.

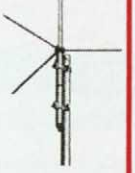
SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: KM6GE. BM: WB6MRQ. TC: WA6PWW. OOC: KB6FPW.

Discount 144 Mhz/440 Mhz Dual Band Base Antennas

The gain figures on these antennas are so high QST will not allow us to print it!!

High Performance, high power rating, low SWR and broader band coverage on both 2m and 70 cm. Using ring gaskets make the antenna waterproof. Easy to assemble. DC ground structure escapes high voltage caused by thunder lightning to the ground, protects radio equipment. Mast diameter accepted 1-3/16" to 2-7/16". Supplied with mast bracket, V bolt, support tube and all mounting hardware.

Model	UVS200	UVS300
Length	98.4"	204.7"
Gain	Call	Call
Configuration	2m 2-5/8w, 70cm 4-5/8w	2m 3-5/8w, 70cm 8-5/8w
Frequency	144-148/435-450	144-148/435-450
Max Power	200w	200w
VSWR	Less than 1.5:1	Less than 1.5:1
Connector	SO-239	SO-239
Price	**$59**	**$89**

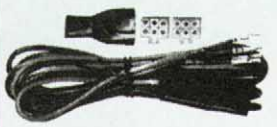


Customer Appreciation Day

Saturday, December 4, 1999

Manufactures that attended last year:

ADI, Alinco, Ameritron, Cushcraft, Garmin, Icom, Kenwood, Maha, MFJ, Mirage, Standard, Valor, Vectronics, and Yaesu



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IC756PRO Digital IF filter with 51 selectable bandwidths, microphone equalizer, manual notch function, TFT 5" color LCD, digital twin pass band tuning (PBT), and much more! *This radio has not been approved by the Federal Communications Commission. This radio may not be sold or leased, or offered for sale or lease, until approval of the FCC has been obtained. All specifications subject to change without notice or obligation.

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ICT81A Add the wide-open microwaves to your fun! Get 6m/2m/70cm/23cm all in one neat little package.

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VR-500 The VR-500 is a high-performance miniature handheld communications receiver providing general coverage reception from 100 kHz to 1300 MHz on the CW, SSB (LSB and USB), AM, and FM (Wide and Narrow bandwidths) modes (this coverage includes the AM and FM broadcast bands, HF Short-wave Bands, VHF and UHF TV bands, the VHF AM aircraft band, and a wide range of commercial and public safety frequencies!). Frequency Range: 0.1000 MHz - 1299.99995 MHz (Cellular Blocked) 90 mW AF Output (2 AA Batteries), 125 mW (EXT DC) Memory Channels: 1000, 8 Character Alpha Numeric Display, Direct Keypad Frequency Entry, Dual Watch, Band Scope, Alpha Numeric Recall, Memory Bank Scanning, Menu Mode for Feature Customization, Preferential Memory Scan, VFO Search, 58W X 95H X 25D mm, 220 g w/ Battery & Antenna, And Much More!

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Thanks to W6PRI for his traffic report this month! I am in the process of looking for a Section Traffic Manager. This person needs to have both extensive experience with NTS and a clear idea of the direction NTS needs to go in the next century. The West Valley ARC held their annual "ARRL Night." In attendence were ARRL pres Rod Stafford W6ROD, Director Brad Wyatt, K6WR, Vice Director Jim Maxwell, W6CF and Section Manager Glenn Thomas WB6W. The Saratoga ARA group is active with many public service activities, including a city parade and planning for the usual Halloween activity. Their net meets every Tuesday at 7:30 PM on 28.4 MHz (SSB) and 146.655- (114.8 pl). The Garlic Valley ARC usually meets at 8 AM on the LAST Saturday of each month, at the Gavilan Restaurant in Gilroy on Monterey Avenue The Palo Alto ARA had their annual dinner. PAARA meets the first Friday at 7:30 PM in the Menlo Park Recreation Center, 700 Alma Street, Menlo Park. The Lockheed-Martin ARC met at a San Jose Giants game. A good time was had by all. The Santa Cruz ARC heard from KO6RS on QRP EME. EME with 400 watts qualifies for 1000 miles-per-watt! The SCARC meets at 7:30 PM on the third Friday in the Education building of Dominican Hospital. The Millbrae ARC is planning their annual picnic for Sept 18. They meet the first Thursday at 7 PM in the Community Room of the Millbrae Library on 1 Library Ave. SCCARA meets second Mondays at 7:30 PM at HP Oak Room, contact Clark, KE6KXO, at (408) 262-9334 for more info. For general information on clubs and other activities in the section, take a look at the SCV section Webpage at **http://www.pdarrl.org/scvsec/index.html** - If you'd like to see your group mentioned in these pages, send a copy of your club newsletter to me, either at home (address in this *QST*) or via e-mail (**wb6w@arrl.org** or **wb6w@arrl.net**). I can only write about what you tell me about! See you next month! 73 de Glenn, WB6W. Tfc: W6PRI 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W—SEC: KE4JHJ. STM: K4IWW. TC: K4ITL. SGL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. ACC: W4CC. BM: KD4YTU. **http://www.ncarrl.org** Hurricane Dennis has come and gone, and come back again, and gone again ... and then comes Floyd. ARES has been active! We began to prepare for Dennis Aug 27. State and local EM activated ARES Aug 29. Most eastern NC EOCs, a logistic Staging Area (LSA) in Kinston and the State EOC in Raleigh were staffed from Aug 30. SKYWARN nets were activated, shelters staffed, and PIOs were distributing press releases BEFORE the storm arrived. After Dennis moved along the coast, many counties began closing shelters and EOCs. In some areas communications was disrupted and Amateurs remained on duty. The outer banks were without phones or power and Amateur Radio was the ONLY communications link. K4UOR, Dare county EC reported over 300 messages for various agencies attempting to restore services and access including coordination of logistics operations and helicopter flights into isolated areas. In excess of 100 outgoing H&W messages were also handled. Several hams on Hatteras and Ocracoke islands provided invaluable services for several days. When our role appeared to be diminishing, Dennis turned around and headed back. More hurricane and more ARES activity. Thanks to all who helped demonstrate, once again, that Amateur Radio is a communications resource that can get the message through when ALL the standard and exotic new technology doesn't work. The resource we offer is skilled and dedicated people using both proven and new communications tools. Our SEC, KEJHJ, Asst SECs, WA4MOK and N4UCO, and all the rest of you who make our ARES organization work are to be congratulated! Benson Hamfest Nov 14, Greensboro Hamfest (with ARES and NTS meetings) Nov 27. Aug traffic: W4EAT 499, AB4E 263, K4IWW 171, KF4VDW 143, KI4YV 126, W0UCE 125, W2CS 101, K4AIF 84, KE4JHJ 83, AC4DV 73, W4IRE 51, AC4ZO 41, KE4AHC 36, W3HL 34, AB4W 33, AA4YW 27, NT4K 21, WD4MRD 17, KF4PAK 16, W4CC 13, WA4SRD 13, N2JLE 12, KF4YHG 8, KF4OZF 7, KF4NIR 6, KT4CD 6, KB8VCZ 5, KF4YMA 4.

SOUTH CAROLINA: SM, Les Shattuck, K4NK—Greetings, to all South Carolina members. I am now in my new home here in Greenville and getting my towers up shortly. For your information, my new address is 127 Henderson St. Greenville, SC 29611. My new phone number is 864-421-0732. I'm sorry to be a little behind on some of my paper work. I was glad to see so many of you at the Shelby Hamfest. I hope you found something you were looking for. At least the weather was a little more comfortable. And a special thanks to the Carolina CW operators, whose tent and chairs were a welcome relief. By the time you read this the Hamfest in Rock Hill will be over and we will be at Sumter set up for their event. After that we will be off to Myrtle Beach. And don't forget Union in Dec. More on hamfests next month. Hope to see you on the bands. 73. Tfc (Aug): KA4UIV 132, KA4LRM 79, W4DRF 70, WA4UGD 32, KF4HAV 23, K4JMV 15, KT4SJ 10, W4CQB 5. PHSR (Aug) KA4UIV 191, KA4LRM 95. Congratulations, ladies.

VIRGINIA: SM, Lynn Gahagan, AF4CD—ASM: W4TLM. SEC: K4EC. SGL: KK4IY. TC: W4IN. OOC: KR4UQ. PIC: W2MG. STM, ACC: AF4CD. I am pleased to report that the District 14 Training Session that took place on August 14th at the Russell County Public Library in Lebanon was a big success. 59 Amateurs from all over the area participated including ones from Tennessee and West Virginia. This was the fifth session in a series of State staff sponsored sessions, with the previous venues being Chesterfield County, VA Beach, Roanoke and Warrenton. I would like to thank the following, DEC14 K4GV, ADEC KC4JMH, EC Tazewell Co KU4RK, EC Russell Co KE4LLW and his AECs; KD4JTK, KF4UJB, KF4UEL and many others that gave their time to make this event possible. A special thanks to NWS Jerry McDuffie, Chief Meteorologist, Morristown, TN, DOD Fred Vincent from VDES and Judy Cooling, Russell Co. Office of Emergency Service. Ed Forman, W4IN, ASEC "Area C" reports: On Sept. 11th District 3 held a SET simulating a commuter flight crashing short of a runway during a landing with mass casualties at the Charlottesville/Albemarle Airport. Participating were the Charlottesville/Albemarle localities, American Red Cross, VA State Police along with support from District 3 DEC K4DND, KG4CGP EC Spotsylvania County and many local ARES/RACES members. After an overall evaluation report, the ARES/RACES personnel did an outstanding job and conducted themselves in a highly professional manner. Bill Sprague DEC 8 reports packet is now up on the Eastern Shore providing solid digital communications to the VAEOC. This was a crucial link for ARES/RACES as the Shore is only serviced by the Chesapeake Bay Bridge Tunnel fiber optic link. If the span is damaged, 911 commu-

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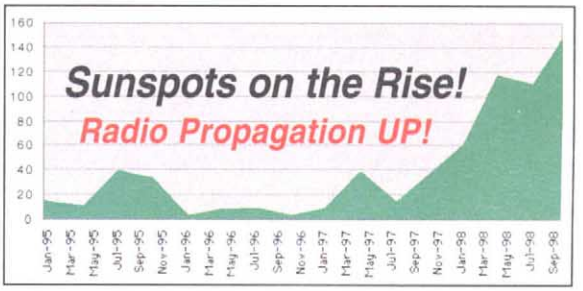

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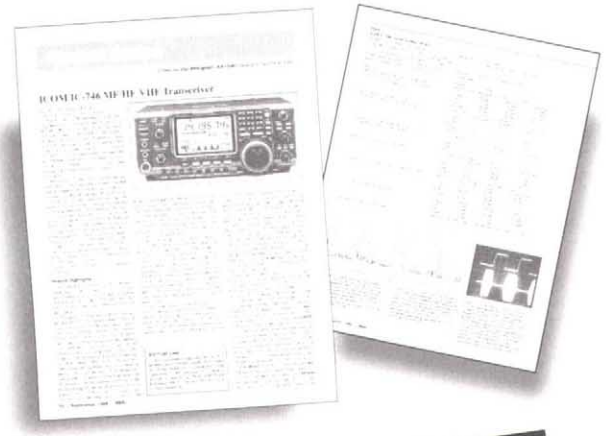

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WORLD RADIOSPORT TEAM CHAMPIONSHIP 2000

The amateur radio community owes a debt of gratitude to the energetic and ambitious amateurs in the small European country of Slovenia. Led by Tine Brajnik, S5ØA, the Slovenia Contest Club has agreed to host the **World Radiosport Team Championship 2000**, to be held in the city of Bled, from July 5 to July 11.

The on-the-air operating portion of the event will be held in concurrence with the IARU HF World Championship on July 8. Amateurs worldwide are welcome to come to Slovenia to experience the event or get on the air and participate in the contest.

Having attended the '90 event in Seattle and having been on the committee for the '96 event in San Francisco, I can attest to the goodwill and comradeship generated among the participants from around the world.

It is with great pleasure that I announce my appointment as the United States Treasurer of WRTC 2000.

Having seen the rewards that were reaped by WRTC '90 and '96, I strongly urge everyone to support the Slovenian effort by sending a donation. Donations in excess of $250 may be submitted via a directed contribution to the Northern California DX Foundation, earmarked "WRTC 2000" and sent to Bruce Butler, W6OSP, 4220 Chardonnay Ct., Napa, CA 94558.

Contributions less than $250 may be sent to Carl Cook, AI6V/P49V, 2191 Empire Ave., Brentwood, CA 94513.

For event information, please see the WRTC 2000 website at **http://wrtc2000.bit.si**

Thanking you in advance. 73, Carl Cook AI6V/P49V

nications and most other telephone connections cease. A VHF/UHF phone link to/from the 146.76 Williamsburg machine is in the works. KA4CBB advises the KD4SUU (SK) 6 meter and 442.150 repeaters will be re-located as his widow has contributed them to Chesterfield County for ARES/RACES use. Through the efforts of Gerry Smith, KB5XT, and Lynda Price, EM of the county, they will be placed on the County communication towers. 73 de AF4CD. Tfc: WA4DOX 195, K4MTX 182, KR4MU 163, W3BBQ 140, W4CAC 133, N4ABM 128, K4YVX 120, KE4AZL 54, WB4UHC 50, WB4ZNB 49, K0IBS 44, WD4MIS 34, KD4FUN 34, AF4CD 31, AA4AT 28, KE4PAP 26, W4HDW 19, WB2KQG 18, W4JLS 11, KE4NYY 10, W4TZC 4, KB4CAU 4, W4IN 4, N4FNT 2.

WEST VIRGINIA: SM, O.N. (Olie) Rinehart , WD8V—STM: N8OYY. SEC: W8XF. ASEC: KA8ZOO. SGL: K8BS. TC: K8LG. OOC: N8OYY. ACC: WD8MKS. APRSC: W8XF. DC: K8MHR. I simply refuse to have another ARRL State Convention at Jacksons Mill this century! The fact that this year's convention is history and next year's will be in a new century has a lot to do with my decision. For those of you who are unfortunate enough to miss this year's convention, I believe that it was very fruitful, and by all definitions of Amateur Radio, a success. I have not had the opportunity to see the financial report, but have every reason to believe that it was a success in that respect. You who missed the Saturday night auction with W1RFI, Ed, and W3WV, Jim's performance as auctioneers missed a great show. Try to envision Ed with "tie"! I will forever treasure my "one inch" slice awarded as a successful bidder. N8OYY, Ed Messenger, was drafted as STM. W8IMX, Bob, will continue as a liaison for CW nets. Cal, W8WWF, fortunately will continue as manager of the CW nets, both early and late. Juddie, KC8CON, has accepted net manager of the WVFN, and we are looking for an official Net Manager for the WVMN. Although not listed below, the UHF/VHF nets and activity in the WV Section is progressing and seems to be quite healthy. My appreciation to all whose ARES/RACES/NWS SKYWARN activities keep us all safe, secure and busy. Tfc: KA8WNO 344, WD8V 218, W8WWF 107, WD8DHC 101. PSHR: WD8V 212, WD8DHC 138, KA8WNO 118; WVFN 833/96/31 N8OYY; WVMN 428/31/22 (reported) WD8DHC; WVNE 133/90/31 W8WWF; WVN L 110/82/31 W8WWF; Digital 132 K8MHR.

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. The Amateur Radio Spectrum Protection Act (H.R. 783) needs everyone's support. Sep '99 issue of *QST* shows 89 co-sponsors for this important legislation, but *none* are from Colorado. I sent a letter to US congressman Joel Hefley (R-CO 5th) and received a disappointing, non-committal response. To quote his letter: *"I will have an opportunity to vote ...when it comes before the full house. I have noted your comments and will keep them in mind."* Perhaps he hasn't received enough letters to indicate the number of people in his district with an interest in this legislation. There are over 3,000 hams in his district, and we should be able to generate enough mail to get his attention. You can make a difference. Please take the time to send a note to Mr. Hefley or your own member of congress asking him or her to sign on as a co-sponsor. None of the other four Colorado members of the House have signed on either, so those of you in other parts of the state shouldn't hesitate to put pen to paper. As usual, the Mountain Amateur Radio club's swap/campfest was a fun time for all. Folks from all points within Colorado and many out-of-state plates attending and/or camping. If you have items for this column, e-mail them to me at **n0wpa@arrl.net**. 73, de N0WPA. NTS traffic: K0TER 73, N0OD 12, AD0A 8.CAWN: W0WPD 904, W0LVI 695, N0NMP 496, N0DKK 473, W0GGP 407, KI0ND 386, AA0ZR 372, N0JUS 327, WB0VET 301, K0HBZ 245, N7EQ 213, W0NCD 118.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS & N5ART. New Mexico Roadrunner Net handled 257 msgs with 1132 checkins. New Mexico Breakfast Club handled 257 msgs with 1132 checkins. Yucca Net handled 26 msgs with 654 checkins. CaravanYucca handled 26 msgs with 654 messages. Carolyn Club Net handled 8 msgs with 86 checkins. SCAT net handled 20 msgs with 788 checkins. Four Corners Net handled 20 msgs with 320 checkins. GARS Net handled 4 msgs with 41 checkins. Rusty's Net handled 86 msgs with 695 checkins. Valencia Co Net handled 6 msgs with 33 checkins. Congratulations to the Duke City (ARRL State Convention) Hamfest Committee who put together the best state convention in many years! The weather was perfect and the facility was great. Our VIPs, W6ROD, W0CP, AG0X, and Riley Hollingsworth, K4ZDH, made outstanding convention the best ever! Riley was our guest speaker at the Banquet on Saturday evening and what a success that was! Those who missed this one, missed a good one! Riley, an a note of thanks said, "I had a great time and it was a classy hamfest. We also noted that there were no illegal equipment in the fleamarket. Our thanks to all who made our hamfest a great success. ARES/RACES planning for Y2K is proceeding with several meetings around the state. Ham Radio seems to be much in demand! The Alamogordo Hamfest will be held this weekend, Sept 4. The International Hamfiesta will be Sept 18-19 in El Paso!

UTAH: SM, Mel Parkes, N5UVP—Hats off to all those in the Rainbow Canyons and Dixie Amateur Radio Clubs for a job well done on the Color Country Hamfest. All who attended were rewarded with a very excellent program and activities. I would also like to say thanks to everyone throughout the state who participated in Jamboree On the Air it is a great way to introduce young people to Amateur Radio. I really enjoyed my visit to the Utah Box Elder Thiokol (UBET) Club last month and enjoyed the chance to meet and socialize with some of our hams in the northern part of our state. Thanks for letting me be part of your activities. Well the year and century are rapidly drawing to a close. Start making plans to attend the Utah VHF society meet in February and don't forget the Utah Hamfest July 7-9 at Ruby's Inn near Bryce Canyon, you don't want to miss this one. 73 de N5UVP.

WYOMING: SM, Bob Williams, N7LKH—The WY ARES/RACES, in conjunction with WEMA, the Wyoming branch of FEMA, ran another Y2K exercise from 2300 to 0100MDT 8 Sep 1999. The drill was designed to identify problems stemming from the potential problem in computer programs where 9999 means all stop. More than half of the 23 county EOCs

YAESU

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were operated using emergency power with both VHF and HF radio frequencies for communications. Each county EOC checked into the master EOC in Cheyenne at the beginning of the exercise and again after 2400 when the 9999 clock ticked over. The preferred link turned out to be HF, which has turned out to be the case in a number of recent exercises in the Wyoming Section. There were around 70 participants both at the EOCs and from home stations. No 9999 problems appeared. The primary criticism was that the exercise was dull and boring. It would have been improved if there was more in the way of simulated problems to be solved and more messages created to be passed around. The comments mostly involved the dullness of looking at a silent radio for several hours with no idea what was going on elsewhere. One real emergency was handled by the Carbon County EOC involving a semi wreck on I-80 during the exercise. The next exercise is scheduled for 30 Sep-1 Oct for the beginning of the next Federal fiscal year. August traffic: NN7H-336. August PSHR: NN7H-134.

SOUTHEASTERN DIVISION

ALABAMA: SM, Bill Cleveland, KR4TZ—ASMs: W4XI KT4XA KD4PDQ. SEC: AF4HE. STM: WB4GM. BM: KA4ZXL. OOC: WB4GM. SGL: KU4PY. ACC: K4LI. TC: W4OZK. PIC: KA4MGE. The Montgomery ARC will have its hamfest on November 13, 1999, and this year's hamfest is also the Alabama ARRL State Convention. Doors open to the public at 9:00 AM and admission is $5.00. The Talk-in station will be W4AP and will operate on 146.84(-) repeater. For more information, call Arthur Price (KF4ILP) by phone at 334-272-2681, by e-mail at **kf4ilp.arthur@worldnet.att .net**, or you can visit the Montgomery ARC Website at **http://jschool.troyst.edu /~w4ap/**. It's November, and the holiday season is just around the corner. In the spirit of Thanksgiving, I would like to thank the following for their efforts in promoting amateur radio, and helping me with my section duties: Walter Verney-AF4HE, Gene McGlaughn-WB4GM, Christopher Arthur-KT4XA, Rik Doll-KU4PY, Ellis Dobbins-K4LI, Greg Sarratt-W4OZK, Ricky Barnes-KA4MGE, John Murphy-KA4ZXL, Dr. Gordon King-W4XI, Farris Mosley-KD4PDQ, Bob Luman-W4MPQ, Mike Glennon-KB4JHU, Hank Willmon-WA4GQS, R.T. Johnson-WB4TVY, Chris Sells-AC4CS, Ricky Kimbrell-KC4RNF, Ray Mize-KU4IJ, Tom Moore-KL7Q, Alabama-ALERT, all the radio operators that actively participate in the section's nets, all the ARES ECs and DECs, all the Alabama ARRL field appointees, and all the active amateur radio clubs in Alabama. I would also like to thank Laura Cleveland-KF4SFZ, Trilby Cleveland, and Walter's wife Elaine for allowing Walter and I to travel all over the place and meeting all the fine people in Alabama. God Bless & 73, Bill.

GEORGIA: SM: Sandy Donahue, W4RU—ASM/So Ga: Marshall Thigpen, W4IS. ASM/Legal: Jim Altman, W4UCK. SEC: Tom Rogers, KR4OL. STM: Jim Hanna, AF4NS. SGL: Charles Griffin, WB4UVW. TC: Eddie Kosobucki, K4JNL. ACC: Bob Lear, K4SZ. OOC: Monroe Gaines, KF4NXD, November is the traditional month for Thanksgiving. It is appropriate that we amateurs have the opportunity to give thanks to Riley Hollingsworth, K4ZDH, the FCC's chief enforcement official, on Nov 6-7 at the Alford Memorial ARC Hamfest at the Gwinnett County Fairgrounds. Give thanks for putting teeth back into the regulations. Riley will also be at the GA State ARRL Convention/Gainesville Hamfest on July 8, 2000. Thanks to the Paudling County ARC in Dallas, GA. for inviting me to a meeting. This is a new club, with enthusiastic members dedicated to serving the communications needs of their community. The Claxton ARC will have its annual hamfest in the fruitcake capital of the world, Dec 4. As I am writing this we are gearing up for a possible visit from Hurricane Floyd. Hope it stays away, but if it doesn't the state ARES under the able leadership of KR4OL will be up to handling communications needs. 73, Sandy. Tfc August: WB4GGS 411, KA4HHE 124, WU4C 122, K4BEH 72, W4WXA 72, AF4NS 67, KU4WJ 38, WB2NYM 28 K4JNL 8, K4BAI 6.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM-E Central, AC4PF. ASM-W Panhandle, KO4TT. ASM-APRS: WY8O. ACC: WA4B. BM: N4GMU. OOC: AF4EW. PIC: KF4HFC. SEC: WA4NDA. SGL: KC4N. STM: WX4H. TC: KO4TT. Packet: N4GMU. The month of August brought the first hurricane to give us concern in Florida. The east coast stood ready to give it their best shot. Fortunately, we were not needed by any of the disaster agencies. We all trust that we won't be needed during the balance of the hurricane season, however, we must not let our guard down, as we never know about any disaster. The SEC, Nils, WA4NDA, should have contacted each DEC, and EC in the Northern Florida Section relative to activating the Emergency Net at the turn of the Century. By now, you should have heard about the reason for activating, as well as establishing contact with each EOC, and SEOC in the Section. I am sure we will be discussing this at the Jacksonville Hamfest. The Section meeting will begin about 10 AM on Saturday morning. We will not have the customary ARES, traffic forums, but will have a Program Forum. It has been noticed that several of you are handling traffic, but have not requested Official Relay Station Appointment from the Section Traffic Manager. If you a member of the ARRL, and handle traffic, you are eligible for an ORS appointment. The Official Emergency Station appointment is available if you are a member of ARRL, and participate in emergency situations. However, you should request this appointment thru your EC who in turn will contact the SEC. While on the subject of appointments, each of your should prepare a monthly "Station Activity Report", SAR, and submit it to the STM. This is also applicable to the PHRS monthly report. The reason for reporting is for the Headquarters to have some idea of the usage of the frequencies. It is one of the basis for informing the Congress the activity involving Amateur Radio. Every little bit of information is needed by our Headquarters, and if we do not provide them with the details, we are only hurting ourselves. Hope to see you in Jacksonville. 73, Rudy. Tfc: WX4H 118, KE4DNO 676, NR2F 211, KE4OAV 202, KE4PRB 161, AD4DO 127, KF4NFP 111, KF4TQX 108, AB4PG 84, W5MEN 82, AF4GF 67, K4JTD 46, KF4TM 44, W4KIX 33, N9MN 28, N4JAQ 27, K1JPG 26, WB2FGL 25, N4ORZ 24, KB4DCR 21, N4EC 20, WA4NDA 17, N4GMU 17, WB2IMO 15, KJ4HS 15, KM4WC 10, KE4WBI 10, WB9GIU 8, KE4HIY 7, KF4HIK 6, WD4LIF 6, WA4EYU 4, WX4J 4, W8IM 1.

PUERTO RICO: SM, Raul Escobar, KP4ZZ—Can you believe that it's November already? It's finally fall of the year and I'm thoroughly enjoying the weather... hope you are too! Our family wants to extend a happy Thanksgiving to each and everyone, and hope you have a great holiday with friends and family. Well, contesters you better fasten your seat belt because these two months are going to be great in contest! We

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DFK-7B	22" cable kit; TM-733A	59.95	SC-41	Soft case; PB-32	9.95
DTU-2	Digital paging; TM-541A	19.95	SC-43	Soft case; TH-79/PB-33/34	9.95
MB-13	Mobile mt; TS-50S	29.95	VP-1	Bumper mount, spring	19.95
MB-14	Mobile mt; TM-742AD	29.95	YG-455CN-1	250Hz CW fltr; TS-950SDX	99.95
ME-1	Mem. expand;TH-28A,TM-251A	9.95	YK-88CN	270Hz CW filter; R-5000	69.95
PB-36	7.2V batt; TH-235	9.95	YK-88S-1	2.4kHz SSB filter; TS-450	69.95

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are almost at the end of the hurricane season we are blessed for this year of the hurricane activity down here, and we haven't had to take down the antennas, hi,hi. Remember PRDXC meets every second Monday of the month at UPR, also visit the PRARL home page they have lot of info. **http://prarl.LCE.org**. Send me you activities info. See page 12 for address and e-mail. 73, Raul.

SOUTHERN FLORIDA: The following was submitted by STM Phyllisan West, KA4FZI—New Section ASM's: The recently appointed Assistant Section Managers for the SFL Section are: Phyllis Dibble KD4CQG (Central FL) Polk, Hardee, Desoto, Highland, and Glades Counties. Ray Kassis, N4LEM (Palm Coast FL) Osceola, Brevard, and Indian River Counties. Neil Lauritsen, W4NHL (West Central FL) Hillsborough, Manatee, Pinellas, and Sarasota Counties. Bruce Reid WB9SHT (Treasure Coast FL) St. Lucie, Okeechobee, and Martin Counties. Phyllisan West, KA4FZI (Southwest FL) Charlotte, Collier, Hendry, and Lee Counties. With hurricane season upon us, I am updating the emergency traffic net schedule and will send each ASM and involved net manager a copy to be given to all EC's in their district. I am pleased with the increase of SARs and nets sending reports each month. Along with the digital system in place, our FL traffic system appears prepared to handle emergency messages efficiently. Tfc: W7AMM 697, KA4FZI 420, WA9VND 401, KB4WBY 334, K4SCL 231, KC4ZHF 225, KD4GR 172, AB4XK 167, WB4PAM 127, KD4HGU 123, WA4CSQ 115, KG4CSW 90, AA4BN 84, WA4EIC 80, AA4HT 68, K4RBR 56, W4DWN 42, KT4XK 40, W4DL 38, KE4UOF 36, KJ4N 35, AF4NR 34, W8SZU 31, AD4IH 30, K9ALX 29, KE4VBA 18, KT4PM 16, W4WYR 13, KT4TD 13, W3JI 11, KE4WBI 10, W1KAM 10, KF4KSN 9, K4OVC 7, K4FQU 5, KF4YEM 4, K4ENA 2, W9LBY 2, KF4UTH 1, K4LKL (club) 1.

VIRGIN ISLANDS: SM, John Ellis, NP2B, St Croix—ASM: Drew, NP2E, St Thomas. ASM: Mal, NP2L, St John. SEC: Vic, WP2P, St Croix. PIC: Lou, KV4JC, St Croix. ACC: Debbie, NP2DJ, St Thomas. NM: Bob VP2VI/W0DX, Tortola. September 11 as this is being written, everyone watching the Weather Channel, Floyd has passed us but TD #9 is out there. St Croix ARC met today and voted to have a Christmas party, anyone who has been a member for the past 5 years will be called and invited - no charge. Date tentatively set for Dec 4 at 2030Z until? Activity kind of low in the Club, hopefully this will bring it up! Tuesday night nets meet 2215Z on 147.25 for St. Croix, 2230Z on 146.81 for St Thomas and St John. Some folks preparing for the contest season by putting antennas up, some preparing for the peak of the hurricane season by taking them down. Local repeaters 146.63 St. John, 146.81 St Thomas, 146.73 Tortola BVI, 147.25 and 146.91 St Croix. Go simplex on the repeater output frequency if repeater is down. That's it from the tropics this month, 73, John NP2B.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford Hauser, KD6XH—The last two (2) months have been very busy for many people. The Hamfest at Kingman was a good event with many more vendors and good weather. Thanks to the Hualapai ARC for providing a good time by everyone, to include the hamburgers and hotdogs for lunch. Pima Co ARES people held two (2) exercises for Y2K preparation this summer and also provided communications for the "Corona De Marana" MS bike tour. Tucson area Amateur Radio operators have provided communications for this bicycle event for many years. The Tucson "Tour de Tucson bike ride is this month and 70 people will be needed for this event. Phoenix area Amateur Radio operators have several similar events that use over 50 people per event. Now that the SW convention is over with for this year, please provide me with feedback on the good, the bad, and ugly of the convention. It is time to plan for next years event where it will be in Scottsdale and Walt would like to incorporate any changes necessary to make it a great convention. Yes, the year 2000 Southwest Division Convention will be held in the Phoenix area. If your club or even you as an individual would like to help in the planning process, and working at the convention, please let me know and I will show you how to contact Walt. He does need additional help. Yes, there will be a fall Hamfest at Mesa community college. The date will be 4 Dec. Mesa community college is located at the intersection of Dodson Road and the Superstition freeway. My present scheduled calls for me to be at the Yuma ARC on 3 Nov, and the Bullhead City ARC on 22 Nov. Again a reminder, If you call and leave a message and I do not get back to you in 2 days, call again. Also, if I am not available you can contact Bernie Sasek (520-297-5885), Jim Swafford (520-298-7793), or Gary Capek (602-237-4314) for help or information. 73s Clifford Hauser, KD6XH. Net QNI/QTC/sess: 737/70/31. Tfc: K7VVC 620, W7EP 119, W7DNJ 17.

LOS ANGELES: SM, Phineas J. Icenbice, Jr. W6BF – SCN report for August 99, from Barry Geipel, AD6HR, is as follows: 21 Sessions /QTC 54/QTR 245/QNI 61. Barry can always use help, please contact him if you would like to be involved and learn with the traffic handlers. **bgeipel@ primenet.com**. It is unfortunate that some great people are only recognized after they have become a Silent Key. My salute is to W6YUY, Bob Bloom. Bob sold high quality radio parts and equipment at the TRW Swap meet for many years. I bought a built by "BOB" antenna switch from Bob for $50.00. The tag attached was as follows. If you will not pay the $50.00 price that I am asking. Then there can only be six reasons that you do not do so now! 1)You are not interested in owning a one of a kind quality collectors item. 2)You do not have a need. 3)Your spouse won't let you spend the money for your "Hobby," no matter what! 4)You cannot afford it no matter what! 5)You already have a Bird, of fine commercial quality. 6)You do have the money but really do not recognize either the quality or the bargain. (Attached is a detailed spec. sheet of measured characteristics.) The only thing that Bob did not know was that Mr Bird had given me one of his super antenna switches in 1955, and I did need a second switch so I bought it. I am certain that many of you have purchased items from Bob and found his "crusty" and realistic approach to, quality, price and perfection in measurements, very refreshing! We all miss Bob, a really great radio engineer and builder. APRS is one of the most impressive systems that we technical types can use when performing at public service events. Car 54, where are you? Yes, we know. At several events in Southern California where APRS was employed the Police were most impressed and even amazed at the accuracy of locating moving vehicles. Very soon, cell phone location, will be available for emergencies. This information will be useful to law enforcement and 411 emergency callers. The basic sensor in APRS is GPS and will work in locations without cell phone

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IC-4008A Family radio service HT..... **89**[95]
IC-M3A 5w VHF marine HT..... **189**[95]
IC-M45AW 25w VHF marine xcvr ..... **199**[95]
R-100-11 1MHz-1.8GHz Receiver ..... **849**[95]

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relay sites. APRS also has a map display of the area with each station marked on the map so that deployment of personnel and equipment can be effectively utilized. GPS is a great position-measuring tool with three dimensional capability. Plug and play capability is now available from several of our leading manufacturers. So if you are really interested in PUBLIC SERVICE with amateur radio, check out APRS. KC6VVT, Pat and Tuck, K6ZEC, (**k6zec@arrl.org**) are long time users of APRS and can provide some useful guidance. The San Gabriel ARS, also has several members with APRS equipment and experience. A listing on my Web site will be started for APRS. Please Contact KK6WO, Mike, our Webmaster, with your info for my LAX Web site. (LAX Web site is: **qsl.net/arrlsw/lax**. Vy 73, de Phineas, W6BF.

ORANGE: SM, Joe Brown, W6UBQ—ASMs: Riv Co, Joe, KO6XB, 909-685-7441; Org Co Art, W6XD, 714-556-4396; SB Co, James, KE6LWU, 909-824-2454; Sec New/PIC Mike, WB9MJQ, 909-985-1610; SEC: Ted, N6RPG, 909-947-1769.HDSCS AEC Joe Moell, K0OV, has an article, featured in the Sept 99 issue of CQ VHF "When the Earth Starts Shaking Its Too Late to Plan." Joe highlights the value of the radio disaster kits that many HDSCS members have developed as well as other information about preparing to support hospitals. Taken from Hospital Disaster Support Communications System. A very good idea suggestion and recommendation from "Push to Talk," of the Inland Empire Amateur Radio Club for all newsletter editors institute the following two articles or columns to be printed in your club newsletters. One is Welcome New Members and Renewals and enter the persons name and call sign under the proper category because members like to see their names in print for something they did. Example: Steve Naetzker, WA2KPI, Mike Overholser, KE6MWN, Renewals: Charles Redmon, KK6SY, Emily Redmon KF6SGV. To us from Smoke Signals of the Fullerton RC. Be prepared by doing some thoughtful soul searching as to how you can give some time to your club FRC is a great club because people have and are giving their time and talent to make a superior club If you can't always be their because of your job, know that there are good people, who will fill in for you. Congratulations are in order for the following of Trustee; Roy Lothringer, N6SLD, 714-896-2477, Pres; Mike Obermeir, KD6SNE, 714-777-5070, Sec; Nate Shaphran, W6UTE,310-559-8877, Treas: John Clarke, KD6PZF, 714-839-3118. Amateur Radio suffers from the lack of a promoter - there isn't any ONE organization that can justify promoting ham s ARES/RACES teams – to promote Amateur Radio. We all need to promote ham radio through every tool we can muster. STM N6GIW reports for Sept '99'. Tfc totals KO6RZ 229, KC6SKK 136, AD6HR 127, W6QZ 120, N6GIW 51, N3IVO 42, N4ZHG/6 12, Dig tfc: N6GIW NTS Mailbox 332, W6QZ NTS BBS 147, PSHR: W6QZ 149, AD6HR 129, KC6SKK 124, KO6RZ 120, SCN/V net mgr KO6RZ rpts 31 sess, QNI 225,QTC 86, SCN/1 net mgr AD6HR rpts 21 sess, QNI 1, QTC 64. 73, WB9MJQ for W6UBQ.

SAN DIEGO: SM, Tuck Miller, K6ZEC, 619-475-7333— A great big thank you and congrats go to Field Service department rep Jo-Ann Arel on her impending retirement. Jo-Ann has been working closely with the Section Managers from all across the country for many years, making field organization appointments, sending out supplies, and making sure the SM elections go off without a hitch. I am sure everyone at HQ will miss her sorely. N1NAG, great picture in *QST*. November, the month to remember and give thanks for all of our blessings. Not only am I very thankful for my family, but I am also very grateful for all my ham radio friends who are always willing to lend a hand for ham radio events. Ham radio is a very important part of my life, which I am sure it is with you. Public service should be one of your priorities, as that is one of the basic tenets of our service. A great big thanks go to all the folks who participated in Special Olympic events and what used to be the annual I Love A Clean San Diego. We had 25 hams helping us out with communications, and the folks at ILACSD were extremely grateful. If you are a club president or newsletter editor, please send me a copy of your clubs paper each month. I like to keep up on all the goings on. Remember to check out periodically the section Website at **www.qsl.net/sdgarrl**. We try to keep it up to date. Send pictures, either by e-mail or snail mail, and we will try to get it on the net. Happy Thanksgiving! For traffic KT6A 813, WA6ODQ 423, KD6YJB 333, W6FFF 206, KE6IQQ 64, KO6BU 20, KD6IVF 20, WA6IIK 1 BPL: KT6A 813. PSHR: KT6A 141, WA6ODQ 138, KD6YJB 79, KD6IVF 70. 73, Tuck, K6ZEC.

SANTA BARBARA: SM & STM, Rob Griffin, K6YR— (805) 543-3346 & k6yr@arrl.org—SEC: Jack Hunter, KD6HHG. AAC: Michael Atmore, KE6DKU. OOC: Howard Coleman, W6HQA. PIC: Jeff Reinhardt, AA6JR. TC: Warren Glenn, KM6RZ. ASM-Ventura, Don Milbury, W6YN. ASM-Internet, Jack Bankson, AD6AD. DECs: SB-Dave Lamb, WA6BRW. SLO-Bill Peirce, KE6FKS & Ven-Dave Gilmore, AA6VH. New Stn Appointment: 'Chappy', W6VIF, a 30-yr traffic-handler is a new Official Relay Station (ORS) from Santa Maria. Welcome! I must salute Ed, KC6GRY, Poinsettia ARC Newsletter Editor & Publisher for putting together a consistently top-quality club organ. Here's why: It's on time; includes the critical 'who, what, how & whys' of the club (w/ phone #s); always a fine experiment project, often also a great antenna article; a calendar summary; and upcoming club events in detail. Tks, Ed! Our Asst. SM - Internet is posting "up-to-the-minute" info on the Santa Barbara Section WWW Site. Check it out on a regular basis to keep up on fast-moving developments. The address is: **www.qsl.net/arrlsb**. Also remember our Section traffic nets: SCN slow speed NTS Net, M thru F at 7:15 PM on 3598 kHz & SCN/SB at 2100 local on 147.000+ (131.8), 224.90- (131.8) & 448.875- (100). PSHR/Tfc: K6YR 178/393, KF6OIF 122/- & KE6MIW 108/25, W6VIF 13/-. That's 30. 73, Rob K6YR.

WEST GULF DIVISION

NORTH TEXAS: SM, Don Mathis, KB5YAM—SEC: K5UPN. STM: KC5OZT. TC: W5CWO. BM: KB5YAM. SGL: N5GAR. OOC: WB5UDA.AAC: WN5PFI. ASMs: KX5K, K5RE, W5FB, KK5QA, KK5NA, N5JZ, KD5HIS, AD5X, W5GPO. Visit the section Web page at (**http://www.lsic.net/net/ntexas.html**) for the most current information. I would like to welcome a new ASM, Jim Dye, N5JZ. Jim will be taking over the responsibility for the Section Web Pages and general all around assistant. I would also like to welcome John Fullingim, WN5PFI, the new section ACC. John will be forming a team that will be responsible for maintaining section contact with all the section clubs. Jess Freer, KD5HIS, has accepted the additional responsibility as my regional ASM for districts 8, 9, and 10A. Jess will provide a local contact for all section business in these districts. Please keep him informed to all activi-

ties in those districts. As this article hits the press, we will be in the middle of the Y2K planning. Please keep us informed as to your needs. The section Web page will contain our current plans for local and sectional support. I would like to encourage all hams in the section to consider working on one or more of the many sections jobs. We always need additional help in just about every area including traffic handling, emergency communications, and many others. No matter what your interest, we have a job for you!! Visit us at the Denton Ham Fest on October 16, we will be having section meetings in the afternoon, all are welcome to join us. We also have a good line of forums and speakers. The Denton Ham Fest Web page is: **http://lsic.net/dhf**. Tfc: N5JZ 318, KB5WEE 237, KC5OZT 199, K5AO 140, WA5I 92, KC5VLW 85, K5MXQ 65, KB5TCH 59, N9BNQ 42, KB5YAM 34, W5TIT 23, AC5Z 23, AC5PO 12, KD5AHW 4, N8QVT 2.

OKLAHOMA: SM: Charlie Calhoun, K5TTT—ASMs: N6CL, W6CL. SEC: W5ZTN. STM: AB5RV. ACC: KB5BOB. PIC: WA9AFM. OOC: K5WG. SGL: W5NZS. TC: K5KXL. John Brassfield, N5SAM, reports that his son, Jason Brassfield, KC5EQB, received the Leonard Hanstein, W5MEL, Memorial Scholarship from the Oklahoma City AutoPatch Association. His plans include attending Oklahoma City Community College. His sister, Shannon Brassfield, KB5RBX, received the same scholarship in 1996 and is a senior at the University of Oklahoma. This year is the sixth year that the club has awarded the scholarship. The Rogers County Wireless Association will hold a special event station Nov 7-8 at the Will Rogers Memorial. They will be celebrating Will Rogers Days and sporting special event call W5R. For more info check out their Web site **http://www.rcwa.org**. Congratulations to Linda Creason, AB5JA, who was elected to fill the vacancy in the secretary/treasurer position in the Pittsburg County ARC. Terry Dalpoas, KM5UQ, was appointed to Social Director. I think the HPM celebration was a big success. I tried to hand out as many /130 contacts as I could. I heard many Oklahoma stations signing /130 as well. Thanks for your participation. I had a lot of fun with this one, this year. I've also been doing some major reorganization at the QTH. Woodworking is another hobby of mine. Right now, I'm redesigning the shack, building some custom cabinets and countertops for a new workstation and operating positions. A new tower should be up soon, hopefully before the winter contest season. 73, Charlie. Tfc: WB5NKD 1089, WB5NKC 1040, KF5A 927, K5GBN 400, KE5JE 110, KM5VA 110, KI5LQ 103, AB5RV 58, WA5OUV 47, KK5GY 42, W5REC 32.

SOUTH TEXAS: SM, E. Ray Taylor, N5NAV—ASMs: NR5ED, N5WSW, W5GKH, K5DG, N5LYG, WA5UZB, KK5CA, WA5TUM, KB5AWM, WA5JYK, K5PFE, and K5SBU. STM: W5GKH. SEC: K5DG. ACC: N5WSW. PIC: KA5WSS. TC: KJ5YN. BM: W5KLV. OOC: W5JAM. SGL: KM5HY. November is the month we have been waiting for. Soon the hurricane season will be over. The U.S. has had plenty of problems this year. Floyd is building as I write this. Bret came into an area less populated, but still caused lots of damage. When Bret got into Mexico there were 8 deaths. Our hearts go out to those that lost love ones. Hams responded quickly to furnish shelter communications in San Antonio. Since all agencies were on the same HF frequency, DPS was able to have live traffic reports as people evacuated Corpus Christi, via ham mobile units. We do need a few more mobile stations about midway point. Fortunately Bret did not come into Corpus as perdicted. N5XCI and some more hams went into the affected area to provide communications for the Red Cross damage assessment team. I also know that WD5AAH is still with the FEMA team. I don't have all the call signs of those that went with these teams. I must have reports in order to make mention in *QST*. The National Hurricane Center and The Hurricane Watch Net addressed a letter to me that I would like to share with those in the field during Bret. This includes the NCSs, the shelter communicators, etc, because you are the ones that deserve the credit.' Ray, On behalf of the Hurricane Watch Net and the operators at the National Hurricane Center, I want to express our appreciation for the support provided by the members of the South Texas Section before and during the landfall of Hurricane Bret. I suppose that if there is any good place for a category 4 hurricane to hit, Kenedy County was one of the better, but that very light population also makes it difficult for the forecasters at the National Hurricane Center to get real time information - ground truths, as they call them – from inside the storm. South Texas hams were able to help fill this void. A report received from Padre Island was quoted in one of the advisories as the first indication that tropical storm force winds had reached land. In another case, a report from a station that the rain had stopped at his location was received with some skepticism by the forecasters until they used the Brownsville radar to zoom in on the area and saw that there was indeed a dry spot in the storm. They would have never looked for this had it not been for the ham radio report. This gives them a better understanding of the structure of the storm and what it is going to do. The quality of the reports that we received from your section was well above what we normally receive and reflects the high level of training and organization in your section. All South Texas amateurs should be proud of the job they did as the storm approched. 73, Jerry Herman, N3BDW, Net Manager of The Hurricane Net." Have a great Thanksgiving. Remember the turkey has the last laugh, you stuff him, the next day he stuffs you. 73 and God bless. Tfc: KA5KLU 1092, W4RRX 198, W5SEG 188, W5KLV 166, NR5ED 101, N5OUJ 82, W5GKH 55, W5ZX 51, WA5FXQ 46, N5NAV 53, W5ZIN 36, K5UCQ, N5HK 6, W5OYY 13, N5LF 1.

WEST TEXAS: SM, Charlie Royall, WB5T, 915-944-0469, **cnroyall@wcc.net**—ASMs: Cley, K5TRW. Ron, KB5HGM. Jerome, K5IS. Fred, W6VPI. Sandy, W5MVJ. SEC: Alex, N5LRH. OOC: John, KO5D. OBM: Frank, N5WT. WTX Sec Web page is linked to West Gulf Div at **www.telepath.com/N5OK**. A real fox hunt-track the balloon and recover the equipment! Top of the Panhandle ARC, Reach for Space, Flight 15, Perryton High School, pay load ATV 439.25 MHz, Beacons 3.579, 28.322, 144.330, 147.475, HF net 7.155, 28 Aug. Dyess AFB ARC news page; check it out - **www.qsl .net/kd5fjm/news**. SKs: Leland Crellin, KC5LIW, age 76, and retired after 30 years with the Air Force. Ed Baldwin, K5MKK, age 65, an Army veteran of the Korean War. No one could ever beat Ed to be the first check-in on the San Angelo ARC 2-meter net. Mark Ellis Hilton, N5PRX, Midland TX, age 51, a Navy Vietnam veteran. All were very active Hams and will be missed. When you give thanks at your Thanksgiving Day meal, remember the veterans, those missing in action, and those still serving in our Armed Forces, particular those serving on foreign soil. 73 de Charlie, WB5T.

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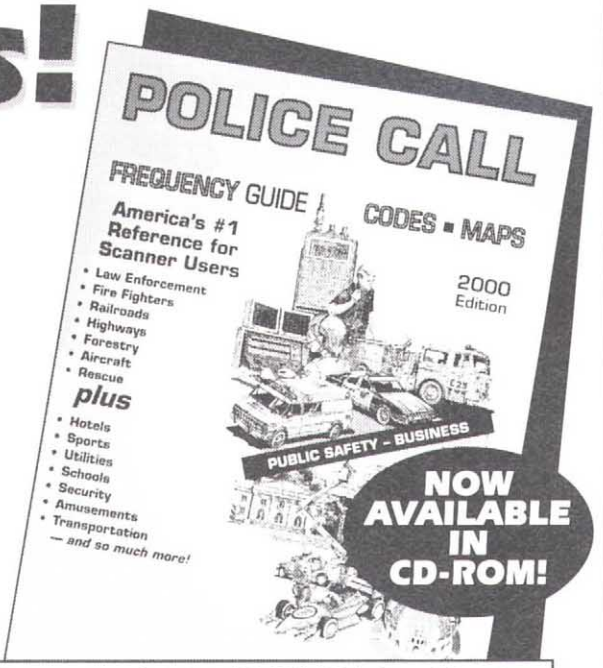

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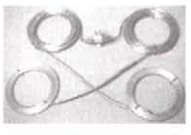

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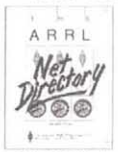

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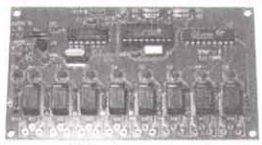

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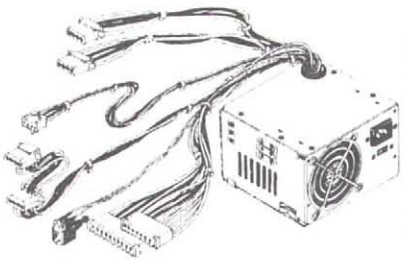

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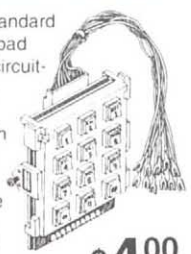

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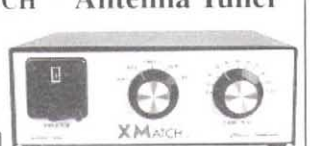

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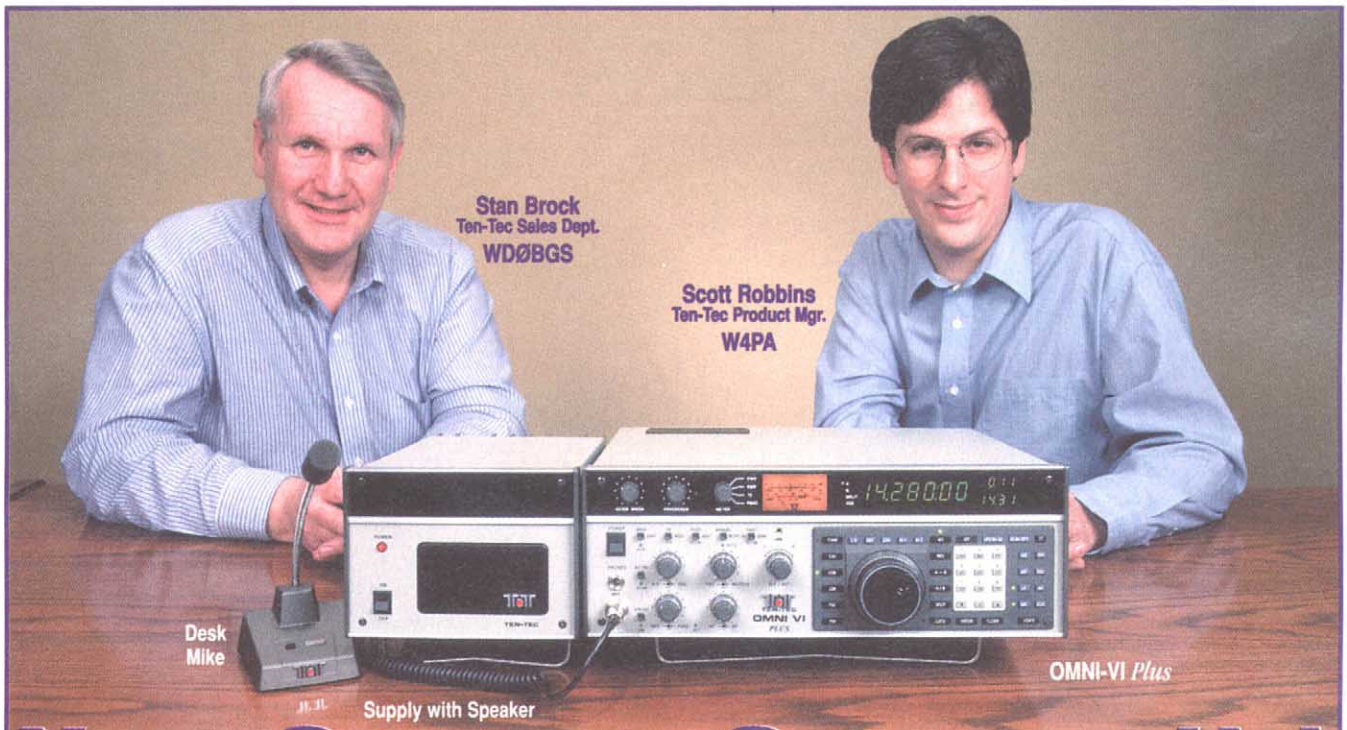

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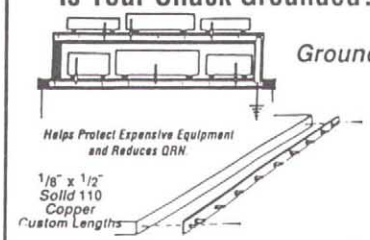

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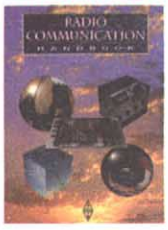

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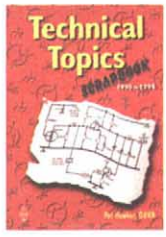

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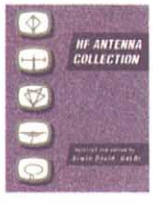

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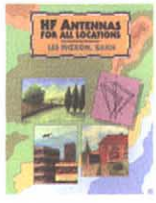

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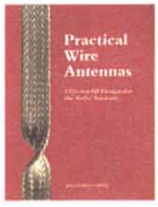

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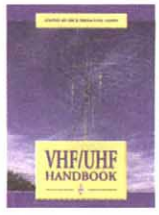

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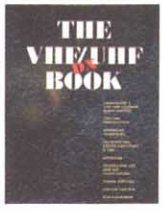

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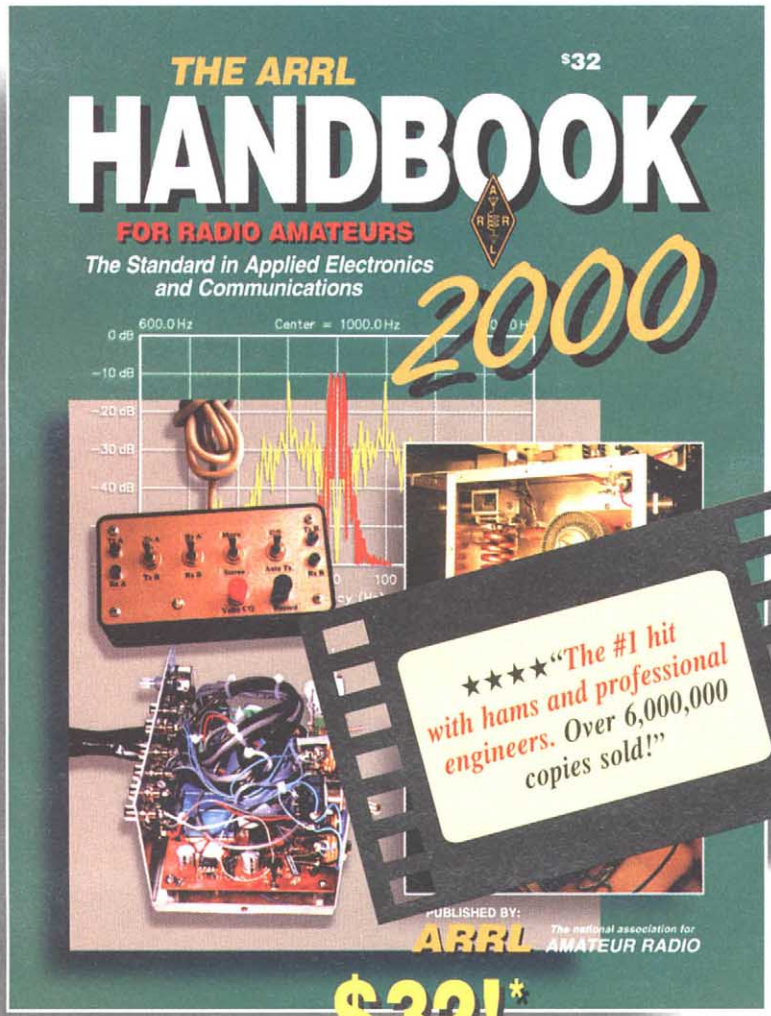

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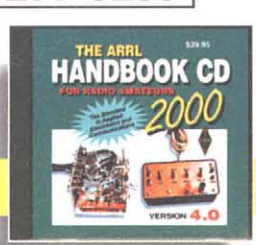

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Mixers, Modulators and Demodulators
Filters
Receivers, Transmitters, and Transceivers

Practical Design and Projects (cont.)
DSP
Transmission Lines
Antennas
Station Setup
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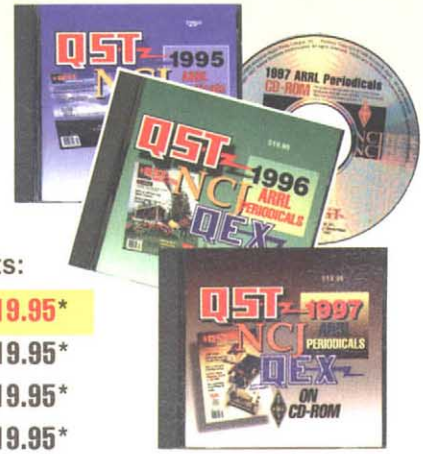

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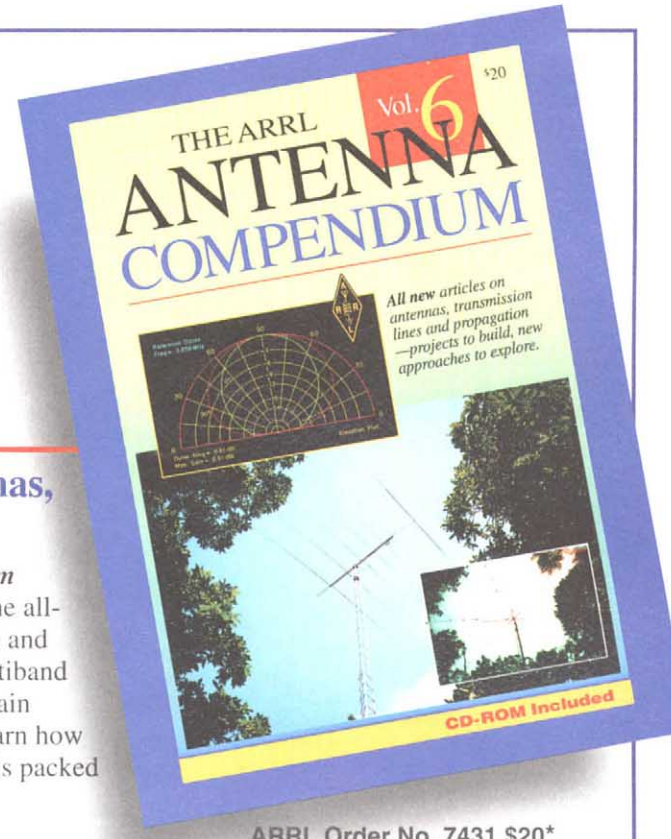

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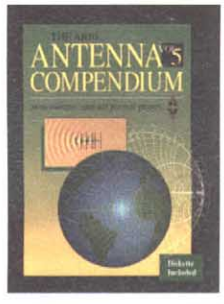

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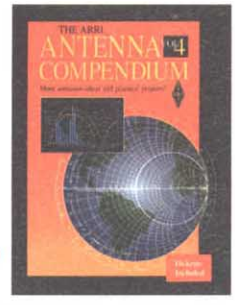

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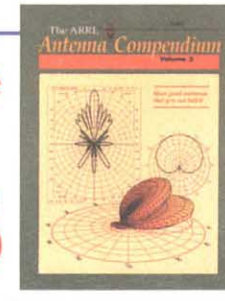

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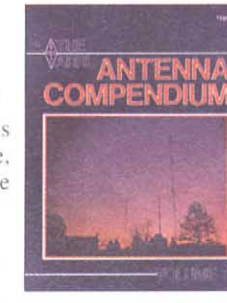

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A & A Engineering: 156
AAT Communications Corp: 132
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Advanced Battery Systems, Inc: 116
Advanced Receiver Research: 144
Advanced Specialties: 157
AEA division of TEMPO RESEARCH CORP: 146
Alinco Electronics, Inc: 11
All Electronics Corp: 166
Alpha Delta Communications: 142, 164
Alpha/Power, Inc: 7
Amateur & Advanced: 157
Amateur Electronic Supply LLC: 139, 141, 143, 163
AM-COM: 155
American Radio Relay League: 6, 114, 122, 126, 136, 138, 157, 162, 164, 167, 168, 169, 170, 171, 172, 173
Ameritron: 27
Amidon: 156
Antique Electronic Supply: 150
Antique Radio Classified: 150
ARCRON ZEIT: 124
ARRL Publications BOOKCASE: 13, 14
Associated Radio Communication: 122
Austin Amateur Radio Supply: 118, 119
Autek Research: 150
Better RF Co., The: 156
Bilal Co: 150
Buckmaster Publishing: 132, 134
Burghardt Amateur Supply, Inc: 115, 154
Butternut Antennas: 168
CABLE X-PERTS: 159
CHAMPION RADIO PRODUCTS: 116
Circuit Specialists, Inc: 124
Code Quick: 128
Comdac: 157
Command Technologies: 161
Communication Concepts: 130
Communications Electronics Inc: 147
Communications Specialist Inc: 128
Conex Electro Systems: 144
CORD SCHUETTE: 121
Creative Services Software, In: 161
Cubex Company Inc: 164
Davis Instruments: 121
Davis RF Co.: 164
Denver Amateur Radio Supply: 126
Digital Communications Inc: 116
Directive Systems: 159
East Coast Amateur Radio: 157
Elecraft: 163
EQF Software: 167
Farallon Electronics: 164
First Call Communications, In: 148
Gap Antenna Products Inc: 120, 140 165
Geo Tool: 165
Glen Martin Engineering: 158
Ham Contact, The: 132, 160
Ham Radio Outlet: 108, 109, 110, 111, 112
Ham Station: 158
Hamtronics Inc: 26
Heights Tower Systems, Ltd: 154
High Sierra Antennas: 160
Hi-Res Communications Inc: 159, 160
Hobby Highway: 163
Hy-Gain: 18
ICOM America, Inc: Cover II, 1, 3
IIX Equipment Ltd.: 163, 164
International Antenna Corp: 155
International Components Corp.: 121
International Crystal Mfg Co: 154
Intuitive Circuits Llc: 159
J Martin Systems: 167
Jun's Electronics: 153
K2AW's "Silicon Alley": 124
Kachina Communications Inc: 145
KB6KQ: 157
K-Com: 148
Kenwood USA Corp: Cover IV
KJI Electronics: 157
KK7TV Communications: 152
Lakeview Company, Inc: 124
LDG Electronics: 168
Lentini Communications: 118, 119
Lewallen, Roy W., W7EL: 157
Lightning Bolt Antennas: 166
Logic: 155
M & S Computer Products Inc: 164
M2 Enterprises: 151
Maha Communications & Elec.: 2
Metal & Cable Corp: 130
MFJ Enterprises: 123, 125, 127, 129, 131, 133
Micro Computer Concepts: 116
Mirage: 113
Mr. NiCd: 174
N4XM XMatch Antenna Tuner: 166
NOMOSNO: 145
ONV Safety Belt Co: 152
Palomar Engineers: 160
PC Electronics: 122
Peet Brothers: 128
Personal Database Applications: 155
Pouch, The: 160
Premier Communications: 8
Print Products International: 121
QSLs by K2QFL: 165
QSLs by W4MPY: 166
QSLs by WX9X: 154
Quantics: 161
R & L Electronics: 135
Radio Amateur Callbook: 140
Radio Bookstore: 136
Radio City: 118, 119
Radio Club of J.H.S. 22 NYC: 148
Radio Depot: 157
Radio Era Archives: 158
Radio Works: 149
Radioworld Inc: 154
Rapidan Data Systems: 167
Rederring Embroidery: 142
RF Components: 157
RF Inquiry Co Ltd: 120
RF Parts Co: 25
Rohn: 126
Ross Distributing Co: 166
RT Systems: 165
SGC Inc: 166
Spider Antennas: 156
SSB Electronics: 145
Success - Easy: 165
Surplus Sales Of Nebraska: 134
Tempo Research Corp: 146
Tennadyne Corp: 130
Ten-Tec Inc: 17, 167, 169
Texas Towers: 175, 176
The Scott Group: 149, 151
Tigertronics: 146
Timewave Technology Inc.: 130
TJ Antenna: 154
Traffie Technology: 152
Tropical Hamboree: 150
Universal Mfg Co: 121
Universal Radio, Inc: 118, 119
Vectronics: 117
Visual Conception, Inc: 158
W & W Manufacturing Co: 155
W2IHY Keyer: 128
W5YI: 134, 154, 168
W9INN Antennas: 165
Warren Gregoire & Associates: 157
Wheeler Applied Research Lab: 128
World Radio Sport Team Championship 2000: 138
Yaesu U.S.A.: Cover III, 22, 23
Yost & Co., E.H.: 174

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FT-840
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FT-600
This compact 100 Watt HF Transceiver offers the utmost in operating simplicity. The MIL-STD rated FT-600 covers the 160-10M Amateur bands with General Coverage Receive, 100 memory channels, Direct Keypad Frequency Entry, and a front-mounted speaker.

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