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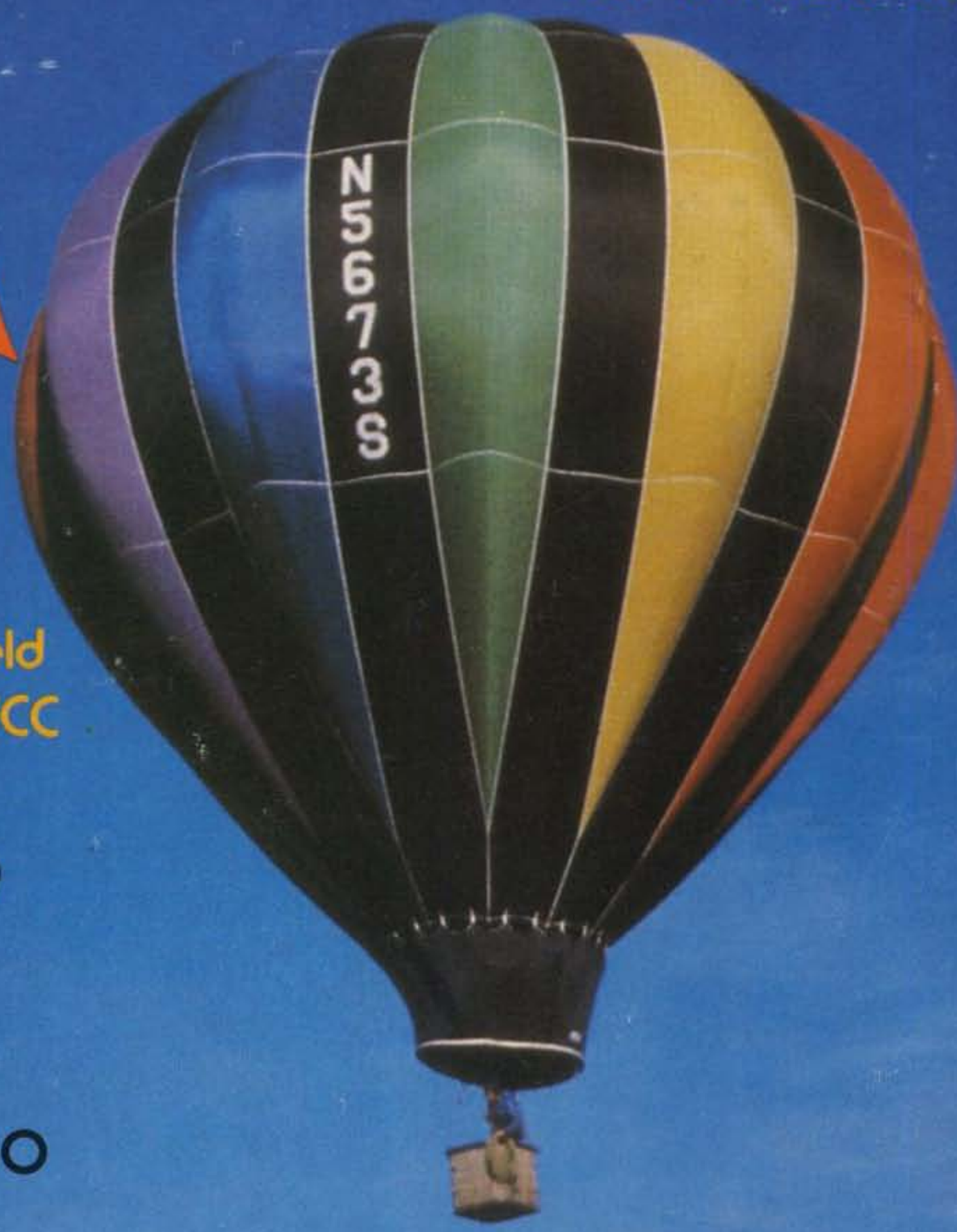

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THE RADIO AMATEUR'S JOURNAL

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Components are the latest in communication systems adapting to your stations' needs. The DTR-3KA and DTR-1200L are equipped with heavy-duty handles for easy rack mounting and rack brackets that can be easily removed. The DTR-1200L linear amplifier provides 1200 watts SSB and 1000 watts CW input continuous duty. It features large 3½" shadow box, back lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers. The DTR-3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dry dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 OHM impedance. Component racks available at your DenTron Dealer.

DTR-1200L Linear Amplifier

Frequency Ranges:

80 Meter Band	3.45 - 4.6 MHz
40 Meter Band	6.00 - 9.0 MHz
20 Meter Band	10.00 - 16.00 MHz
15 Meter Band	20.95 - 23.50 MHz
10 Meter Band	Export Model

Modes: USB, LSB, CW, RTTY, SSTV
Power Input: 1200W - SSB, 1000W - CW
Power Requirements: 234/117 VAC 50/60 Hz
RF Drive Power: 150 Watts maximum and 65 watts minimum for 1 KW DC input.
DC Plate voltage: Idle + 2300V approximate
Duty Cycle: 100% SSB, CW, RTTY, SSTV
Input Impedance: 50 Ohms nominal
Input VSWR: 1.5 to 1 average
Output Impedance: 50 Ohms nominal
Antenna load VSWR: 2 to 1 maximum
ALC: negative going, adjustable from front panel
Spurious Emissions: IMD - greater than 30 db down
Harmonics - greater than 40 db down
Switchable 12VDC accessory output voltage
Multimeter:

Plate Voltage	0 - 3000VDC
Plate Current	0 - 500ma
Relative Output	Adjustable

Front Panel Plate Voltage Switching
FCC Type Accepted
Size: 5¼" H x 17" W x 13" D (19" W with rack brackets)
Weight: 46 pounds

DTR-3KA Antenna Tuner

Frequency Coverage: 1.8 - 30 MHz continuous
Built in 2 KW PEP Dummy Load - Forced Air Cooled
Input Impedance: 50 ohms (Resistive) to transmitter
Antenna Inputs
- Coax 1, 2 & 3 - unbalanced—may range from a few ohms to a high impedance
- Long wire - low to high impedance
- Balanced line - 75-660 ohms

Power Capability: 3000 watts P.E.P.
Wattmeter: 200 watts forward
2000 watts forward
200 watts reflected
Accuracy: ± 5%
Remote sensor box
3½" backlit meters
Dummy Load: with manual or automatic forced air cooling.
Integral 3KW Balun

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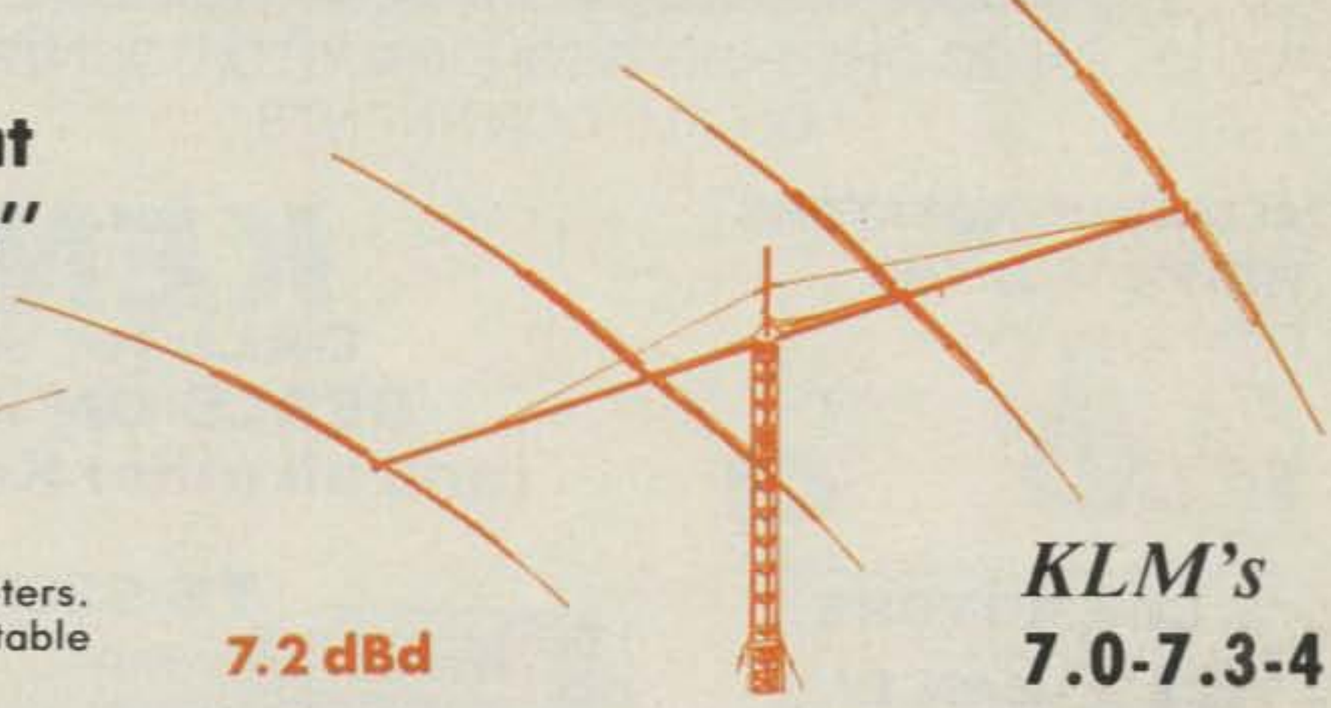

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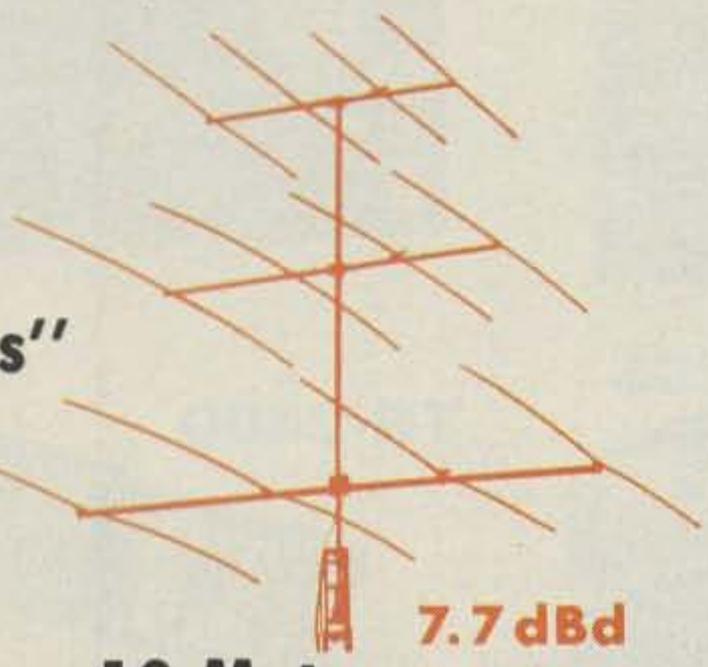
DX punch on 40 meters. Constant gain and low VSWR across the band-phone and CW. Linear loaded to reduce size and weight.



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7.7 dBd

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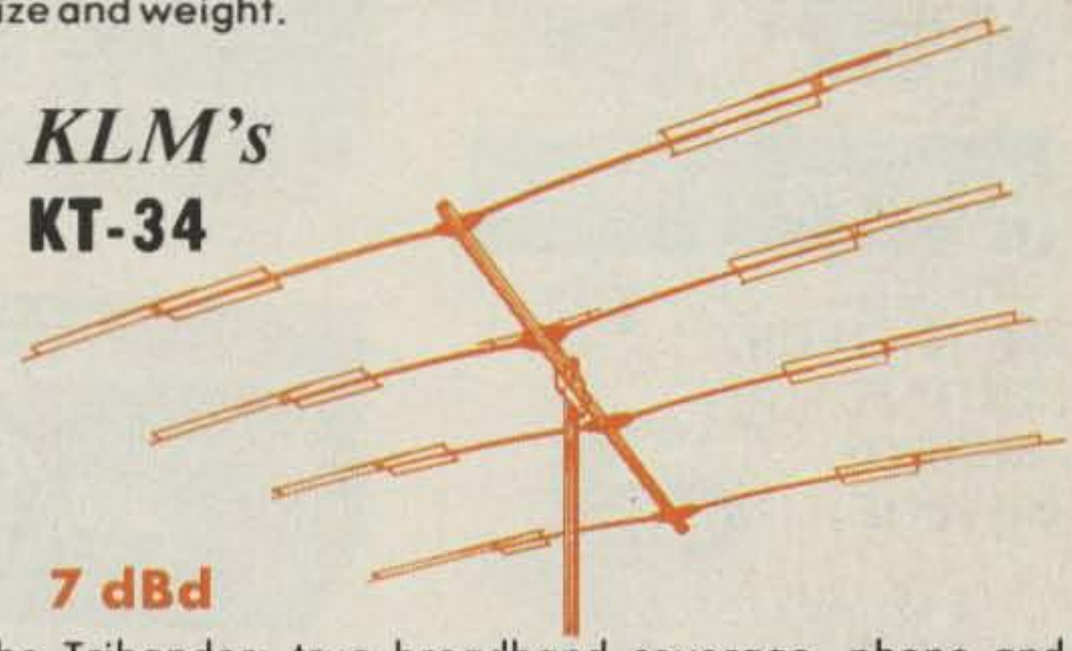
4 Element monobander power at a reasonable price. Full performance across each band, no tuning or matching. One man installation, stackable, ideal for lightduty towers and rotators.



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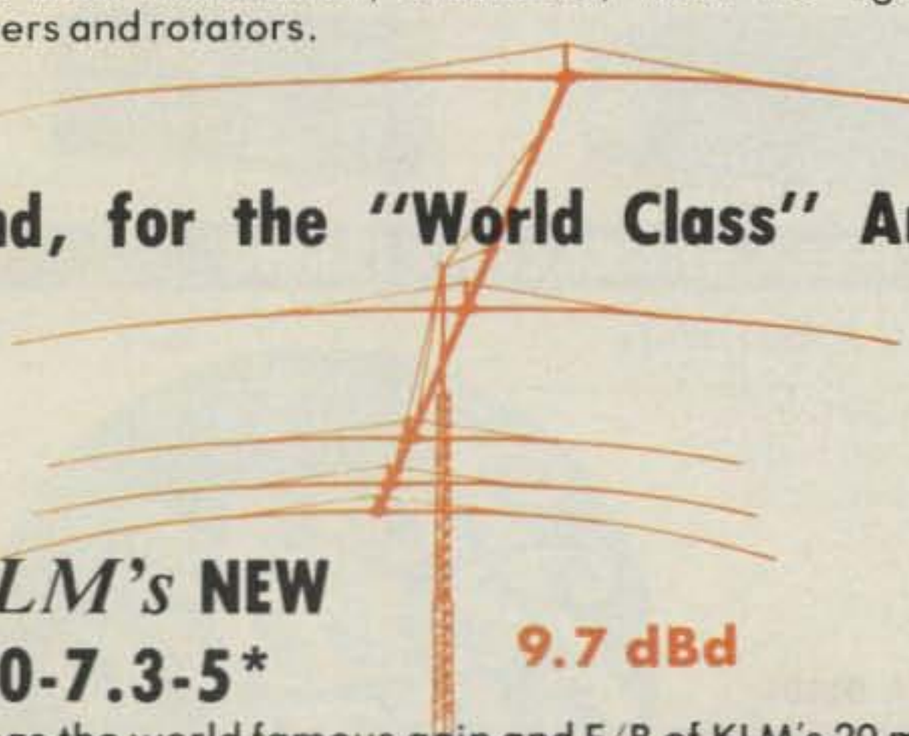

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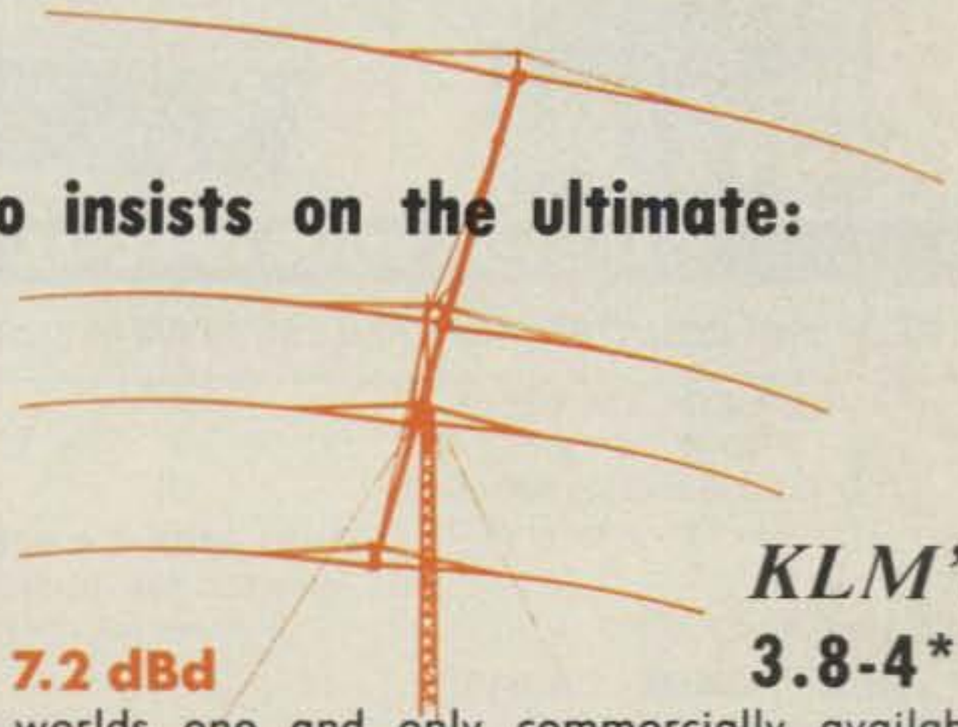

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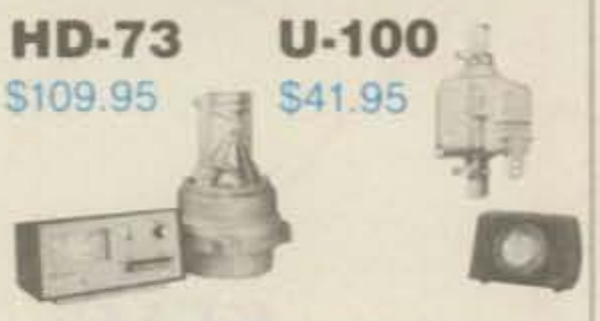

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CQ The Radio Amateur's Journal

ON THE COVER: Wilse, KL7CQ and his YL Betty, KL7AP arranged for this exotic "antenna party" to raise their Telrex 6 element 20 meter monobander to the top of an 80 foot tower.

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AN EDITORIAL

We're calling our June issue the "ulcer issue." Through an error by our printer, the June issue was mailed quite late for many of our subscribers. All records had indicated that it was mailed to them on time, but foul-ups do occur and this one was a beaut. Well, it was straightened out finally and the issues were mailed. We received numerous calls and letters from you as to the whereabouts of your June issue. I can't begin to count the number of extra issues we mailed from here to fill in those missing copies.

I want to thank all of you who called and wrote about the problem for your extreme concern for the issue and your understanding and concern for us. One reader wrote in thinking the Post Office was to blame (it wasn't) and included two 25¢ stamps for the postage for a replacement issue. It's a good feeling to know how many of you care about *CQ* and about us. We really appreciate it and thank you for your outpouring of support.

The following might be considered "What I Did Last Summer," except that this was written in June and we have more summer to go.

Meet Me In St. Louis

The intrepid *CQ* staff (K2EEK, K2MGA, W2LZX) attended the St. Louis Convention this past Memorial Day weekend. *CQ* was in fact the only amateur magazine to have a booth at the convention, and we took the opportunity to meet all the folks from the "Show Me" state who turned up. Following a familiar trend lately, computer exhibitors are turning up in greater numbers now in what were once strictly amateur radio shows. Within certain modes now it's becoming hard to tell where one leaves off and the other begins. Although we could see the arch, we didn't have the time to get a first-hand look or to travel through it. Maybe next time.

Fleamarket Folly

There's a local club on Long Island called the Long Island Mobile Amateur Radio Club, or LIMARC for short. About twice a year they have a fleamarket, and as tradition would have it, there's always bad weather. This last one was no different. Scheduled to open at 9:00 a.m. on a Sunday morning, people were lined up to sell at about 7:00. At about 7:30 the gates opened for the sellers and we were let in. Jack had his space and Dick had his in back of mine. We all thought it would be a good way to clean up the shack and pick up a few bucks to pay for some new gear. Well, about ten minutes into the set-up the clouds let go with rain. It rained just about all day. After an hour or so we were informed that the fleamarket was officially closed and the rain date would be in effect. We were told to save our tickets for that date and that they would see us then. No one left. Here were lines of buyers and sellers going about their business in the rain. People were climbing in and out of cars and vans looking at all of the treasures not really on display. Sometimes I think we're all a little crazy.

About five or six hours later people started to pack it in and go home. Most of us were soaked and cold. We all sold more than we thought the day would bring, and we even had the rain date to look forward to, "on the house" so to speak. It certainly was worth the cold I got to clear out some of my basement. I only hope there isn't a tornado or it doesn't snow this weekend for the rain date. There's always something.

LIMARC Followup

The rain date for the LIMARC Fleamarket proved to be a beautiful day and an ideal one for bringing out the crowds. I'd guess that a few thousand (or so it seemed) hearty hams braved the sun and clear weather to show up. As it didn't snow or rain, the LIMARC folks were at a loss as to what to do with nice weather. I've still got some great buys left for the next one they put on.

Big D

The beginning of June found Jack and I airborne again, this time to the Dallas Hamcomm show. Tom Gentry, K5VOU, has been building this show for the last three years, and this year was certainly bigger and better than last year's event. Once again *CQ* proved to be the only magazine exhibiting at Hamcomm and so we enjoyed the limelight. The Dallas crowd is very enthusiastic and seemed to be buying everything in sight. Most of the dealers agreed to the fact that sales were up, interest and enthusiasm were up and, most of all, everyone had a good time.

Atlanta

This is written the week following the Atlanta Hamfestival where the *CQ* crew spent a terrific weekend. There is a great deal of truth to Southern Hospitality. The people are warm and friendly and most cordial. I would guess that about 5 or 6 thousand turned out for the Hamfestival and crowded the hotel exhibit area. John Attaway, K4IIF, our DX Editor, flew up to be on the Program, and Karl Thurber, W8FX, our Antenna Editor, and his wife stopped by to say hello. *CQ* again was the only magazine present, so we really basked in our welcome and all of the encouraging comments of support we received.

I want to thank all of the folks who came by our booth at all of the events we attended for their good wishes and for the compliments they've paid us. All of the hard work has indeed been worth it.

73, Alan, K2EEK

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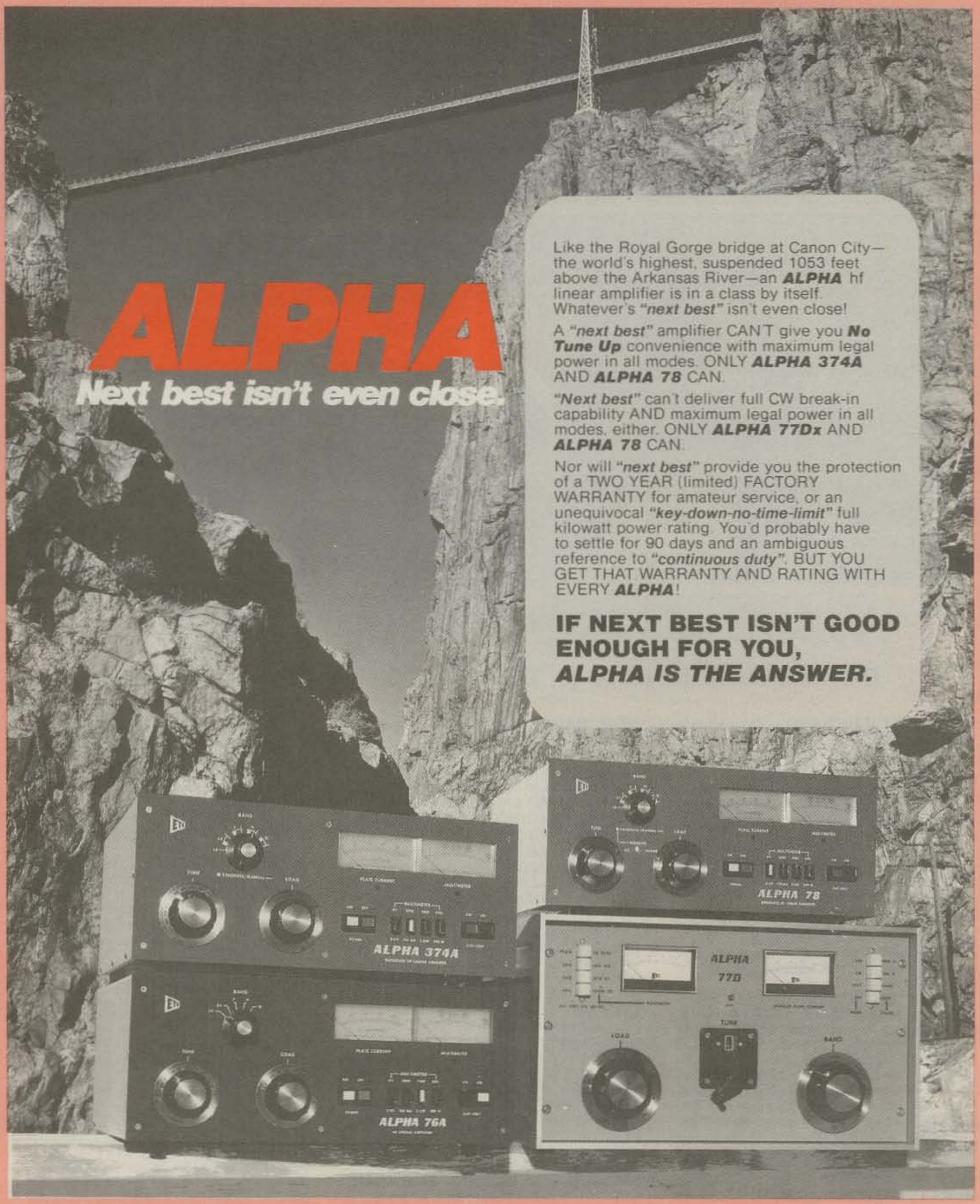

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As Chief of the Field Operations Bureau, FCC, James C. McKinney heads the largest organizational unit within the Commission. In this exclusive CQ interview, he discusses the problems and challenges that face both the FOB and the amateur service in the 1980's.

A CQ EXCLUSIVE

CQ Interviews: Mr. James C. McKinney

Chief, Field Operations Bureau, FCC

BY DR. THEODORE J. COHEN*, N4XX

James C. McKinney was appointed Chief, Field Operations Bureau (FOB) on March 19, 1980. A career civil servant, McKinney joined the commission as an Electronics Engineer in 1963 in 1963 following his graduation from West Virginia Institute of Technology. In the years that followed, he served as Assistant Engineer in Charge of the Washington field office, as Chief, Monitoring Branch; as Chief, Enforcement Division; and as Deputy Chief, Field Operations Bureau.

As Chief of the FOB, McKinney now heads the largest organizational unit within the Commission. The Bureau employs over 500 people, and it is responsible for the administration and enforcement of regulations and treaties relating to all non-government radio communications. Working out of 48 field offices and monitoring stations, and using over 120 mobile units, McKinney's personnel inspect non-government radio stations, investigate illegal operations and activities related to violations of the Communications Act, and monitor the radio spectrum around the clock to ensure that transmissions meet technical standards.

Prior to joining the Commission, McKinney worked as an announcer/engineer for Radio Station WMON, Montgomery, West Virginia, and as a reporter for the Associated Press. An aviation enthusiast, he enjoys flying his own plane whenever time permits. Other interests include motion-picture photography and volunteer work for several charities.

Though not a radio amateur, McKinney has long been a supporter of the amateur service, and he has folllowed its development over the past 17 years with great interest. Thus, as he takes control of the FOB, McKinney brings to the Bureau an awareness of the service's strengths and weaknesses and of its capabilities and limitations. It is with this background that he discusses below the problems and challenges both the FOB and the amateur service will face in the 1980's.

CQ: Based on statistics collected by your staff, the number of complaints to the Commission about deliberate interference to one amateur's transmissions by another amateur is growing at an alarming rate. In many cases, these complaints involve deliberate interference to scheduled net operations (e.g., EASCARS, WESCARS), to two-meter repeater operations, and to the transmissions from code practice and bulletin stations such as W1AW. In each case mentioned above, the interference is suffered by individuals or groups who have "claimed" a specific frequency, or a pair of frequencies, for their continued use. Uner the current Rules and Regulations, anyone can use any frequency, provided their transmissions do not cause interference to another station's transmissions. With this as background, do you think the Commission's rules adequately address the types of amateur operations which are used today? Or do you think the amateur service will require "guidance" (regulation) in this area?

McKinney: You are correct. Interference complaints concerning amateurs *are* increasing at a very rapid rate while other forms of interference complaints are decreasing. Our latest statistics indicate we are receiving about three times as many complaints this year as we received just two years

*Washington Correspondent, CQ.

ago. However, we ought to put this in perspective. Amateur complaints today comprise only 3% of the total number of interference complaints received at the Commission. But since amateur complaints are up from 1% a couple of years ago, the trend, and not the numbers, should be of concern. Most of these complaints deal with two areas: interference to "Net" operations in the h.f. spectrum and interference to two-meter repeater operations. Both of these situations involve the old amateur question of "frequency ownership" and, of course, both involve deliberate or malicious interference, which is extremely difficult and time-consuming to prove. While the Field Operations Bureau does not write rules concerning the amateur service (those rules are written in the Private Radio Bureau), it *is* our mission to assure compliance with the current rules at the local level. You may recall that the Commission released a Public Notice several years ago which drew attention to the "net" problem and indicated that guidance might become necessary. I suspect that Carlos Roberts, and others in the Private Radio Bureau, would agree with me when I say that both the amateur community and our field inspectors would appreciate a clarification of the present rules because they pertain to the matter of "property rights" to certain frequencies in both the h.f. and v.h.f. spectrum. On the one hand, the rules clearly state that all frequencies are available to all amateurs. On the other hand, both h.f. nets and two-meter repeaters are allowed by the amateur rules. Thus, frequencies tend, over a period of time, to become "usurped" by those who would operate large h.f. nets and busy two-meter repeaters. Enforcing today's rules is not impossible, but it is very difficult.

"Enforcing today's rules is not impossible, but it is very difficult."

CQ: What is the Commission doing about the interference problems now experienced by many individuals and groups of amateur operators?

McKinney: The monitoring officers and field inspectors *do* react to serious complaints of interference concerning radio amateurs. When cases are developed, they are forwarded to the Private Radio Bureau for possible sanction action. In the case of international interference, the Commission may contact foreign governments directly to attempt to eliminate the interfering source. We also have liaison with Military spectrum managers in the United States to resolve problems of interference caused domestically by government operations.

A monitoring technician tunes the h.f. receiver at the FCC's monitoring net control room in Washington, D.C.

CQ: The amateur service has always prided itself on being "self-policing." In reality, this amounted to each amateur exercising self-control over his or her own actions, with a dose of peer pressure thrown in for good measure. Given the level of intentional interference, foul language, poor operating habits, etc., observed on the amateur bands today, what actions can amateurs take to correct such spectrum abuses?

McKinney: First, I would suggest that amateurs do need to recognize that the amateur service today is not identical to the amateur service of 20 years ago . . . nor should it be. The amateur service is composed by and large of individuals who are not professional communicators. They bring their own life-styles and their own judgments as to what is acceptable behavior to the amateur service. In the same vein, the workplace of today is not the same as it used to be, nor is the student body of our high schools and colleges, nor any other institution, composed of large numbers of the general population. Changes in life styles and social values, however, should be accomplished within the bounds of good taste. Having said that, however, I would also suggest that when amateur violations of radio law and Commission regulations increase, it is time for self-policing to increase, and it is time for the amateur community to seek new and improved measures to control their own service. I guess what I am saying is that this is a time to increase our expectations that self-policing can work, and it is not a time to fret quietly in the corner over what may be perceived as a hopeless situation.

CQ: With respect to the problem of policing the amateur bands, has the new amateur call sign structure caused your bureau a problem? That is, are you still able to identify the class of license being exercised and the station location as quickly as before the new call sign scheme was instituted?

McKinney: The call sign structure is not a problem from an enforcement standpoint. Each of our monitoring officers has access to a current computer printout of the privileges authorized to each radio amateur. When a call sign is heard, it can quickly be checked to determine whether the amateur is operating outside an authorized sub-band. This procedure is no different than it used to be. We have always spot-checked the call signs even when station operations appeared to be in compliance with our rules.

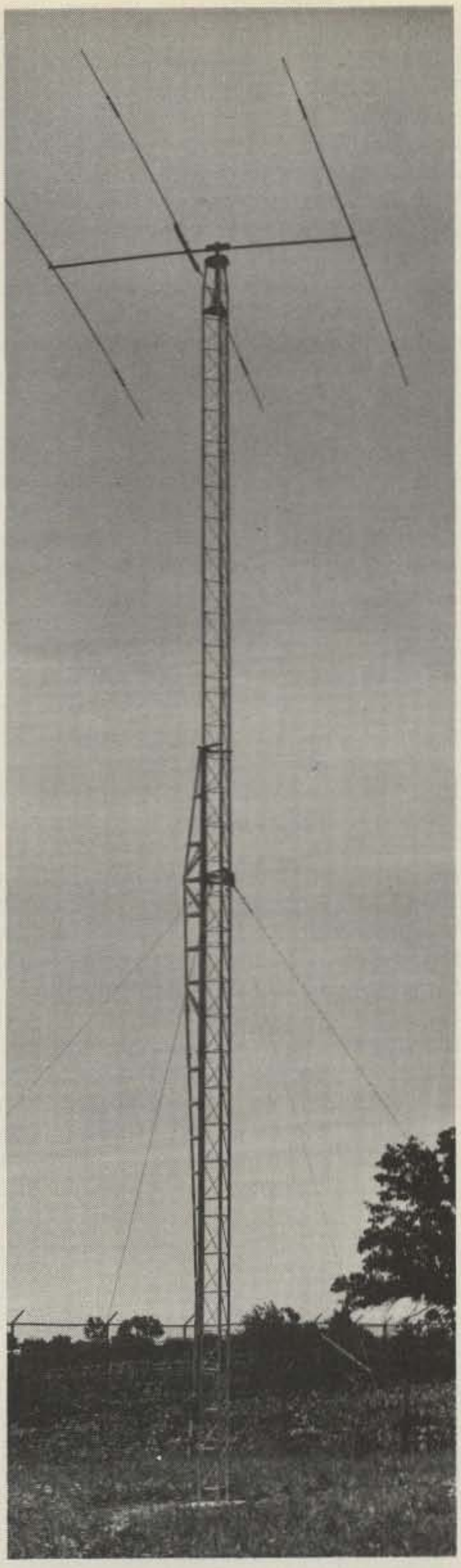
"The monitoring officers and field inspectors do react to serious complaints concerning radio amateurs."

CQ: The resolution of interference cases and of other cases involving abuses of the spectrum by unlicensed operators rests on the cooperation between the Commission and the U.S. Attorney's office. Of late, the U. S. Attorney's office appears to be more cooperative in assisting the Commission than it has in the past. Is this cooperation a recognition of the increasing number of problems experienced with illegal users of amateur frequencies, or of pressure, say, from senators and representatives who have received complaints from their constituents?

McKinney: We are receiving good cooperation today from the offices of U. S. Attorneys throughout the United States. I am not aware of any pressures from Washington on the local U. S. Attorneys, but I do know that they frequently receive a considerable number of complaints from their local constituents. When prosecutors perceive a "hue and cry" from the local population, they recognize the importance of trying to resolve the problems that create that "hue and cry." I suspect that during the past few years we have actually received more requests from U. S. Attorneys' offices to assist them in resolving local problems in comparison to the number of cases we have sent to them requesting prosecution. Remember, the local U. S. Attorneys' offices handle a wide variety of cases for us (e.g., marketing of illegal equipment, obscenity cases, threats by radio, unlicensed operation, etc.). Considering all of the responsibilities placed upon our local U. S. Attorneys' offices, I have nothing but praise for their interest in radio law violations and their willingness to work with us in resolving those problems.

CQ: What about the so-called h.f.ers, who operate without authorization between the 27 MHz Citizens Band and the 28 MHz amateur band, as well as in the 28 MHz amateur band?! Is your field office doing anything about these scofflaws?

McKinney: We consider individuals who operate on unauthorized frequencies to be very serious violators of radio law. We give a high priority to the investigation of such "out of band" operations. It is one thing to interfere with other stations within the service in which you are licensed, but it is quite another thing to transmit on frequencies that are not authorized to you. Such operation quickly renders meaningless any effort at spectrum management and efficient frequency use. Additionally, resulting interference can be very serious to services authorized to operate on the frequencies in question.



CQ: Besides the h.f.er problem at 27 MHz, there are other portions of the spectrum where unlicensed operations, especially in and around the amateur bands, are causing the Commission concern. How about the drug traffic and political broadcasting going on in Florida? What is the Commission doing about such operations?

McKinney: Use of amateur frequencies by drug traffickers in the Carribean, by unlicensed boaters in the same area, and by pseudo-international broadcasters are all of concern to us. We have moved in all of these areas in recent months, and I am hopeful that we will see considerable improvements in the southeastern United States in the near future. One major prosecution in Miami is pending now, but I can't discuss the facts of that case. The court has "sealed" the information.

"It is time for the amateur community to seek new and improved measures to control their own service."

CQ: The Commission is receiving a large number of complaints about 10 GHz equipment being used to jam police radar units. If this continues, the Commission will either have to impose a marketing ban on such equipment, or it will have to set standards for their manufacture. Is your office now attempting to resolve this problem before amateurs, once again, are penalized for abuses over which they have no control?

McKinney: This is not so much of a field enforcement problem as it is an equipment performance problem. That is, there is very little we can do in the field to deal with the user of such equipment. If this matter is to be resolved it will have to be accomplished with the cooperation—voluntary or forced—of the equipment manufacturers and distributors.

CQ: Do you think that current spectrum abuses, if left unchecked, will eventually lead to a breakdown in the Commissoin's ability to control the non-government sector's use of the spectrum?

McKinney: If the government does not stop the willful "out-of-band" operation, I believe we are in for a very rough time "down the line." Large-scale unlicensed operations on unauthorized frequencies make all efforts at effective management of the radio frequency spectrum useless. On frequencies that are subject to long-distance propagation, a very small number of "bootleggers" can preclude legitimate operations by a very large number of licensees over a wide geographical area. That is why we give a high priority to the investigation of cases involving "out-of-band" operations.

CQ: To what extent does the ARRL's Intruder Watch contribute to your efforts? Of what use does your bureau make of the data provided to you by the Intruder Watch?

McKinney: Intruder Watch information serves as a general alert mechanism to our monitoring operation. The data are best used to advise us of repeated interference sources; that is, to give us a profile of the signal, the times of operation, frequencies, etc. The information helps our watch officers focus their efforts to their best advantage. Where international interference is the source, Intruder Watch complaints can serve as the basis for an official U.S. Government complaint to a foreign administration.

CQ: Jim, your bureau has noted that a 15 to 20% cut in its budget is behind the move to curtail the practice of giving exams at hamfests and conventions. Would you comment on this?

McKinney: Your figures are correct. Our travel budget was cut about 20% this year, and we are prohibited from replacing some of our retiring employees. Perhaps even more painful is a cut we recently received in the number of miles we can drive. All of these reductions require that we give up some of the things we really should do. For example, we prefer to go to hamfests and other large gatherings to give amateur exams. It keeps the traffic down in our offices, saves the applicant travel expenses and provides with us an opportunity to meet the amateur community in a "positive" role rather than an enforcing role. But, something had to give. In order to continue our regular field exams at some 99 locations throughout the United States, we had to stop the special exam trips. The coming year, 1981, does not look any brighter, but I hope we will be able to re-start the field exam program in 1982.

The FCC's satellite monitoring facility at the monitoring station in Laurel, Maryland is equipped with a 5 meter dish antenna capable of receiving signals from 1 to 12 GHz.

"We consider individuals who operate on unauthorized frequencies to be very serious violators of radio law."

CQ: What other activities related to the amateur service may suffer because of budget cuts?

McKinney: Our response time will generally lengthen in all work that requires field travel and that does not involve an immediate threat to life and property. Field trips will also be shorter and farther apart than before. For the amateur, resolution of local interference problems will simply take longer and will require a greater spirit of cooperation among spectrum users.

CQ: Complaints of radio-frequency interference (r.f.i.) to electronic home entertainment equipment are still received at a rate of about 80,000 complaints per year. Most of these complaints involved a television receiver as the victim device. Would you favor Federal legislation which would empower the Commission to set r.f.i. susceptibility standards for home-entertainment equipment?

McKinney: As the one who must deal with those complaints, YES, I would strongly favor legislation to require the television industry to do a better job, at the least, of front-end filtering. The industry shows absolutely no indication of providing such filtering without legislation. The cost to the consumer would be very low, regardless of what industry spokesmen say. I have seen transmitter manufacturers work long and hard to produce a "clean" signal. We have $50 CB sets out there today with practically no har-

monic radiation, and yet a $700 TV set is often sold to the U.S. consumer without 10-cents worth of filtering. Marketplace forces are simply not working in this area. The set manufacturers put thousands of dollars into product development in order to sell sets which have a bright picture with electronic tuning, automatic color and tint, and digital clocks, but most refuse to install a $2.00 high-pass filter at the front-end. Now, having said that, I must tell you that many at the Commission and on Capitol Hill are reluctant to push for new legislation. It would run counter to the current thinking on the "deregulation" of industries and it would involve the government in more regulation at a time of high inflation and high unemployment. I appreciate those sentiments, too.

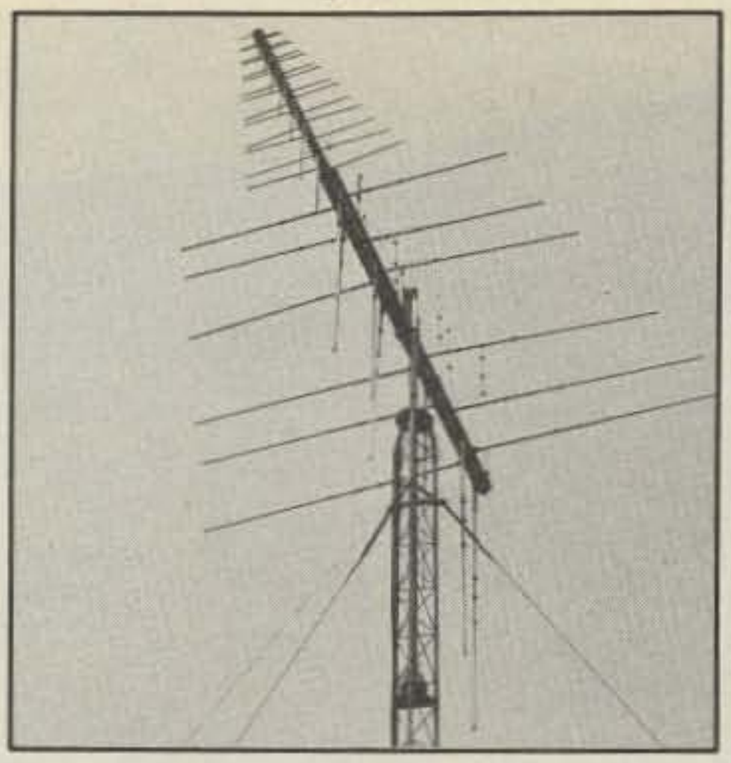
CQ: The Commission has done much in recent years to assist the consumer and the amateur in resolving r.f.i. complaints (we understand that the FCC's *Radio-TV Interference Problems* handbook is a best seller!). What else is the Commission doing to resolve r.f.i. complaints in which the victim device contains a design deficiency which makes the equipment susceptible to r.f. fields?

McKinney: We are about to experiment with a "no fault" arbitration or conciliation procedure for use in the field. However, I'd like to postpone an answer to this question for a few months until we see how that might work. Rest assured that we do continue to explore every avenue of relief in the r.f.i. area, and no suggestions are discarded without careful study. That t.v.i. book was a key ingredient in the progress we have made to date in reducing t.v.i. complaints. We want to build on that progress.

"We give high priority to the investigation of cases involving 'out of band' operations."

CQ: The ban on so-called "10-meter linears" was instituted, in part, to eliminate r.f.i. caused by illegal operations with high-power amplifiers. Has the Commission been able to determine whether the ban has been effective in reducing the number of r.f.i. complaints received, or, at the least, in slowing the growth in the number of complaints filed?

McKinney: The ban is highly effective. Before the ban you could buy linears for CB sets at Penneys, Sears, LaFayette, Radio Shack, and catalog discount firms (to mention just a few



A log-periodic, vertical/horizontal beam antenna used mainly for v.h.f./u.h.f. monitoring.

sources). In fact, these amplifiers were so readily available that many CBers bought them on "impulse." Now, however, our inspectors have great difficulty in even finding a case involving the illegal distribution of cheap linears. We have also had success in defending our position on linears in the courts throughout the country; as such, the interference caused by these devices is steadily decreasing. The amplifier ban was sorely needed, and it is working well. I was particularly pleased that we recently won a case in Federal court in which the ban had been challenged.

CQ: Many amateurs are building television receive-only (t.v.r.o.) satellite earth stations, and are receiving transmissions without permission from the satellite broadcasters. To what extent is your bureau involved in policing such operations? Is the Commission assisting private-network broadcasters in civil procedures against amateurs with t.v.r.o. installations so that the broadcasters can recover damages under the "theft of service" rules?

McKinney: Let me "beg-off" on answering this question just now. The seven Commissioners have not yet had an opportunity to focus on this issue, and some things are going forward which could swing enforcement in either direction. I would just make one point, however; distributors of programming on satellites who make no effort to "scramble" or encode their signals don't deserve much protection. What "expectation of privacy" can they have under the law if, like the man who shouts from the mountaintop for all the world to hear, they then complain that someone "listened in"? Regardless, I am personally worried enough about Section 605 of the Communications Act that I would not risk violating the law by building an earth station. I believe the FCC and the courts will be forced to deal with this issue in the next year. As regards those planning to build a system to "steal" satellite or MDS signals, I suggest they wait a while to see how this issue "falls out."

CQ: There are some in the Commission who advocate that operators in the amateur service become more involved in the technical aspects of the radio art. Yet, in the past, the development of new communication techniques (e.g., slow-scan television (s.s.t.v.), the use of ASCII, etc.) has been slowed because the Commission claimed that it did not have the capability to monitor transmissions made using these techniques. Put another way, technical experimentation within the amateur service has often been slowed by the Commission itself. Would you comment on this?

"We hope to re-start the field exam program in 1982."

McKinney: I think there is some truth to the statement. However, my concern has not been so much the desire that we, as monitoring officials, be able to intercept signals as it has been the inability of other amateurs to observe activities within their own band. For example, if the Commission allowed *any* emission, of *any* bandwidth, on *any* amateur frequency, two hams could effectively consume a whole band over a wide geographical area, cause a lot of interference, and go virtually undetected, until the FCC moved in direction-finding equipment. Additionally, businesses could usurp the ham bands with cheap international communications to avoid telephone tariffs, and the amateur community would be powerless to exert any self-policing or peer pressure. It would all appear legal. We also have to consider international intelligence concerns as well as international agreements. In summary, I think the Commission has moved about as fast as it should have in expanding the use of amateur frequencies.

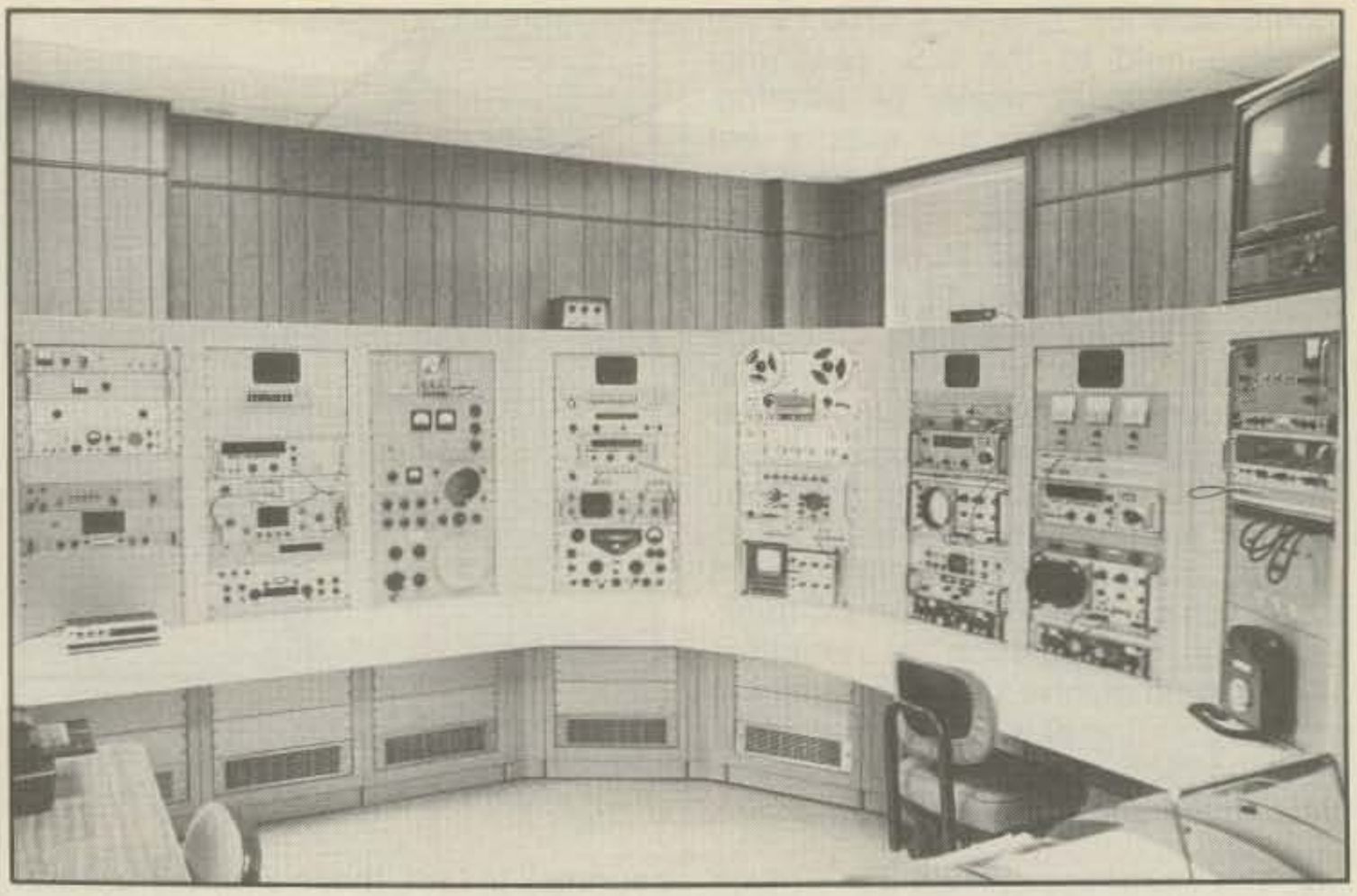
CQ: Is your bureau now studying the special problems it will face in monitoring operations which use various computer codes and various modulation schemes (e.g., spread-spectrum modulation)?

McKinney: Yes, we are working closely with the Office of Science and Technology (especially Dr. Michael

Marcus) in this important area. We are conducting valuable discussions with other agencies and with private industry to assure that we will be at the front of any technological breakthrough. And frankly, we are looking forward to working with these new areas of technology.

CQ: Though not an amateur yourself, Jim, you have been a long-time supporter and friend of our service. What, today, particularly impresses you about amateurs? Disturbs you?

McKinney: Thanks for calling me a "supporter"; not everyone would agree with you...The first "ham" I knew, Campbell Craver, was the radio operator at a broadcast station in my hometown (WMON, Montgomery, WV). Craver, who died several years ago, delighted in introducing neighborhood kids to the hobby. Campbell was a real professional in my eyes, and many hams I knew and have known over the years are just like him. I guess that is why I am basically optimistic about the service as a whole. It is made up of people who are dedicated to their communities, to assisting others and to learning about things that interest them. In Geneva, at the WARC last year, I had the opportunity to meet hams from all over the world. When it comes to professionalism, enthusiasm and the organizational ability to get things done, hams can't be beat! As for what disturbs me about amateur radio, not much does. As long as new hams are welcomed into the group as equals and are permitted to bring into the group new ideas and new approaches to aid in the growth of radio communications, we will all benefit.



The monitoring position at the FCC's monitoring station in Laurel, Maryland is typical of that used by all of the Commission's thirteen stations.

CQ: What is the feeling within your bureau towards the amateur service?

McKinney: I would say that the general view of the amateur service by a typical radio inspector is that it is a highly compliant service, peopled with users who try to obey the law but who tend to become frustrated very rapidly when their fellow users falter. It is a service with which we enjoy working, and it is one which largely handles its own problems.

CQ: Any other comments?

McKinney: I know there is a concern that FCC executives today are not "hams," as has often been the case in the past. Some amateurs feel this is the reason they aren't "getting a fair shake" at the Commission. Let me explain why I chose not to obtain an amateur license. First of all, I had to learn and pass a code test at 25 w.p.m., so the code is not the reason. And, in my first job I had to pass the *Commercial* exams, so I guess I could have passed the amateur tests. My not becoming an amateur has to do with perceptions. So many of the people with whom we deal in an interference situation, where you have a ham on one side and John Q. Public on the other, automatically believe that hams "stick together." Even if the amateur's transmissions are perfectly "clean" and the fault is totally in the TV set, it is very difficult to convince a homeowner that they must install a filter to resolve the problem. When a complainant asks (many times with a knowing smirk), "I assume you are a ham, too?" I want to be able to say *NO.* We in the government must be as impartial as we can be if we are going to have the trust of the public. I know the amateur community would want us to observe that impartiality in reality, as well as in perception. So, I fly my own plane. And when I can no longer do that and when I have departed from the hallowed halls of the FCC, *then* I will become an active amateur, and I will enjoy it fully, without concern for even the appearance of a conflict of interest.

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Size: 35, 42, 47, 49, 51, 52	$2.15
Size: 53, 54, 55, 56, 57, 58, 59, 61, 63, 64, 65	1.85
Size: 66	1.90
Size: 1.25 mm, 1.45 mm	2.00
Size: 3.20 mm	3.58

CRYSTAL FILTERS: TYCO 001-19880 same as 2194F

10.7 MHz Narrow Band Crystal Filter
3 dB bandwidth 15 kHz min. 20 dB bandwidth 60 kHz min. 40 dB bandwidth 150 kHz min.
Ultimate 50 dB: Insertion loss 1.0 dB max. Ripple 1.0 dB max. Ct. 0 + / − 5 pf 3600 ohms. $5.95

MURATA CERAMIC FILTERS

Models:	SFD-455D 455 kHz	$3.00
	SFB-455D 455 kHz	2.00
	CFM-455E 455 kHz	7.95
	SFE-10.7 10.7 MHz	5.95

TEST EQUIPMENT — HEWLETT PACKARD — TEKTRONIX — ETC.

Hewlett Packard:		
491C	TWT Amplifier 2 to 4 Gc 1 watt 30 dB gain	$1150.00
608D	10 to 420 mc .1 uV to .5 V into 50 ohms Signal Generator	500.00
612A	450 to 1230 mc .1 uV to .5 V into 50 ohms Signal Generator	750.00
614A	900 to 2100 MC. Signal Generator	500.00
616B	1.8 to 4.2 Gc Signal Generator	400.00
618B	3.8 to 7.2 Gc Signal Generator	400.00
620A	7 to 11 Gc Signal Generator	400.00
623B	Microwave Test Set	900.00
624C	Microwave Test Set	950.00
695A	12.4 to 18GC Sweep Generator	900.00
1702A	Storage Oscilloscope	1800.00
8691A	1 to 2 Gc Plug In For 8690A Sweeper	800.00
8692A	2 to 4 Gc Plug In For 8690A Sweeper	800.00
8693A	4 to 8 Gc Plug In For 8690A Sweeper	800.00
8742A	Reflection Test Unit 2 to 12.4 Gc	1800.00
Alltech:		
473	225 to 400 mc AM/FM Signal Generator	750.00
Singer:		
MF5/VR-4	Universal Spectrum Analyzer with 1 kHz to 27.5 mc Plug In	1200.00
Keltek:		
XR630-100	TWT Amplifier 8 to 12.4 Gc 100 watts 40 dB gain	9200.00
Polarad:		
2038/2436/1102A	Calibrated Display with an SSB Analysis Module and a 10 to 40 mc Single Tone Synthesizer	1500.00

RF TRANSISTORS

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2N1561	$15.00	2N5590	$8.15	MM1550	$10.00
2N1562	15.00	2N5591	11.85	MM1552	50.00
2N1692	15.00	2N5637	22.15	MM1553	56.50
2N1693	15.00	2N5641	6.00	MM1601	5.50
2N2632	45.00	2N5642	10.05	MM1602/2N5842	7.50
2N2857JAN	2.52	2N5643	15.82	MM1607	8.65
2N2876	12.35	2N6545	12.38	MM1661	15.00
2N2880	25.00	2N5764	27.00	MM1669	17.50
2N2927	7.00	2N5842	8.78	MM1943	3.00
2N2947	18.35	2N5849	21.29	MM2605	3.00
2N2948	15.50	2N5862	51.91	MM2608	5.00
2N2949	3.90	2N5913	3.25	MM8006	2.23
2N2950	5.00	2N5922	10.00	MMCM918	20.00
2N3287	4.30	2N5942	46.00	MMT72	1.17
2N3294	1.15	2N5944	8.92	MMT74	1.17
2N3301	1.04	2N5945	12.38	MMT2857	2.63
2N3302	1.05	2N5946	14.69	MRF304	43.45
2N3304	1.48	2N6080	7.74	MRF420	20.00
2N3307	12.60	2N6081	10.05	MRF450	11.85
2N3309	3.90	2N6082	11.30	MRF450A	11.85
2N3375	9.32	2N6083	13.23	MRF454	21.83
2N3553	1.57	2N6084	14.66	MRF458	20.68
2N3755	7.20	2N6094	7.15	MRF475	5.00
2N3818	6.00	2N6095	11.77	MRF476	5.00
2N3866	1.09	2N6096	20.77	MRF502	1.08
2N3866JAN	2.80	2N6097	29.54	MRF504	6.95
2N3866JANTX	4.49	2N6136	20.15	MRF509	4.90
2N3924	3.34	2N6166	38.60	MRF511	8.15
2N3927	12.10	2N6265	75.00	MRF901	3.00
2N3950	26.86	2N6266	100.00	MRF5177	21.62
2N4072	1.80	2N6439	45.77	MRF8004	1.60
2N4135	2.00	2N6459/PT9795	18.00	PT4186B	3.00
2N4261	14.60	2N6603	12.00	PT4571A	1.50
2N4427	1.20	2N6604	12.00	PT4612	5.00
2N4429	7.50	A50-12	25.00	PT4628	5.00
2N4430	20.00	BFR90	5.00	PT4640	5.00
2N4957	3.62	BLY568C	25.00	PT8659	10.72
2N4958	2.92	BLY568CF	25.00	PT9784	24.30
2N4959	2.23	CD3495	15.00	PT9790	41.70
2N4976	19.00	HEP76/S3014	4.95	SD1043	5.00
2N5090	12.31	HEPS3002	11.30	SD1116	3.00
2N5108	4.03	HEPS3003	29.88	SD1118	5.00
2N5109	1.66	HEPS3005	9.95	SD1119	3.00
2N5160	3.49	HEPS3006	19.90	TA7993	75.00
2N5179	1.05	HEPS3007	24.95	TA7994	100.00
2N5184	2.00	HEPS3010	11.34	TRWMRA2023-1.5	42.50
2N5216	47.50	HEPS5026	2.56	40281	10.90
2N5583	4.55	HP35831E/		40282	11.90
2N5589	6.82	HXTR5104	50.00	40290	2.48
		MM1500	32.20		

CHIP CAPACITORS

We can supply any value chip capacitors you may need.

PRICES

1 to 10	$1.99
11 - 50	1.49
51 - 100	1.00
101 - 1,000	.75
1,001 up	.50

1pf	27pf	220pf	1200pf
1.5pf	33pf	240pf	1500pf
2.2pf	39pf	270pf	1800pf
2.7pf	47pf	300pf	2200pf
3.3pf	56pf	330pf	2700pf
3.9pf	68pf	360pf	3300pf
4.7pf	82pf	390pf	3900pf
5.6pf	100pf	430pf	4700pf
6.8pf	110pf	470pf	5600pf
8.2pf	120pf	510pf	6800pf
10pf	130pf	560pf	8200pf
12pf	150pf	620pf	.010mf
15pf	160pf	680pf	.012mf
18pf	180pf	820pf	.015mf
22pf	200pf	1000pf	.018mf

HAMLIN SOLID STATE RELAYS:

120vac at 40 Amps.
Input Voltage 3 to 32vdc.
240 vac at 40 Amps.
Input Voltage 3 to 32 vdc.

YOUR CHOICE $4.99

ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

5.52-2.7/8
5.595-2.7/8/U
5.595-.500/4/CW
5.595-2.7LSB
5.595-2.7USB
5.645-2.7/8
9.OUSB/CW

YOUR CHOICE $24.95

CIRCLE 29 ON READER SERVICE CARD

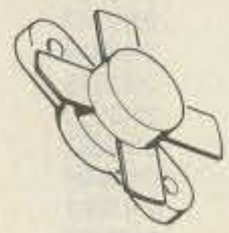
MOTOROLA Semiconductor

MRF454 $21.83

NPN SILICON RF POWER TRANSISTORS

. . . designed for power amplifier applications in industrial, commercial and amateur radio equipment to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%



The RF Line

MRF458 $20.68

NPN SILICON RF POWER TRANSISTOR

. . . designed for power amplifier applications in industrial, commerical and amateur radio equipment to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics –
  Output Power = 80 Watts
  Minimum Gain = 12 dB
  Efficiency = 50%
- Capable of Withstanding 30:1 Load VSWR @ Rated P_{out} and V_{CC}

MRF472

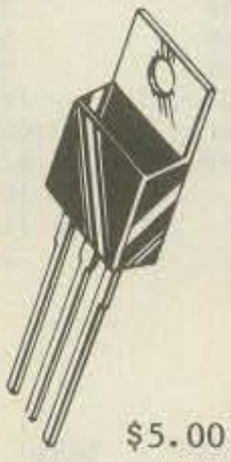
$2.50

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in large-signal output amplifier stages. Intended for use in Citizen-Band communications equipment operating at 27 MHz. High breakdown voltages allow a high percentage of up-modulation in AM circuits.

- Specified 12.5 V, 27 MHz Characteristics –
  Power Output = 4.0 Watts
  Power Gain = 10 dB Minimum
  Efficiency = 65% Typical

MRF475



$5.00

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in single sideband linear amplifier output applications in citizens band and other communications equipment operating to 30 MHz.

- Characterized for Single Sideband and Large-Signal Amplifier Applications Utilizing Low-Level Modulation.
- Specified 13.6 V, 30 MHz Characteristics –
  Output Power = 12 W (PEP)
  Minimum Efficiency = 40% (SSB)
  Output Power = 4.0 W (CW)
  Minimum Efficiency = 50% (CW)
  Minimum Power Gain = 10 dB (PEP & CW)
- Common Collector Characterization

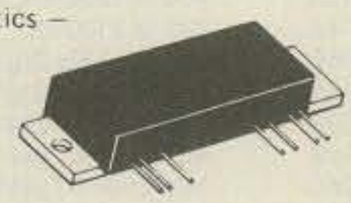
MHW710 - 2 $46.45

440 to 470MC

UHF POWER AMPLIFIER MODULE

. . . designed for 12.5 volt UHF power amplifier applications in industrial and commercial FM equipment operating from 400 to 512 MHz.

- Specified 12.5 Volt, UHF Characteristics –
  Output Power = 13 Watts
  Minimum Gain = 19.4 dB
  Harmonics = 40 dB



- 50 Ω Input/Output Impedance
- Guaranteed Stability and Ruggedness
- Gain Control Pin for Manual or Automatic Output Level Control
- Thin Film Hybrid Construction Gives Consistent Performance and Reliability

Tektronix Test Equipment

B	Wideband High Gain Plug In	$ 51.00
CA	Dual Trace Plug In	150.00
K	Fast Rise DC Plug In	63.00
N	Sampling Plug In	200.00
R	Transistor Risetime Plug In	116.00
W	High Gain Differential Comparator Plug In	283.00
TU-2	Test Load Plug In for 530/540/550 Main Frames	50.00
1A2	Wideband Dual Trace Plug In	216.00
1S1	Sampling Unit With 350PS Risetime DC to 1GHZ	730.00
2A61	AC Differential Plug In	133.00
3S3	Dual Trace Sampling DC to 1GHZ Plug In	250.00
3S76	Dual Trace Sampling DC to 875MHZ Plug IN	250.00
3T77A	Sampling Sweep Plug In	250.00
3L10	Spectrum Analyzer 1 to 36MHZ Plug IN	1000.00
50	Amplifier Plug In	50.00
51	Sweep Plug In	50.00
53B	Wideband High Gain Plug In	25.00
53/54B	Wideband High Gain Plug In	45.00
53/54C	Dual Trace Plug In	112.50
53/54D	High Gain DC Differential Plug In	38.00
53/54G	Wideband DC Differential Plug In	68.00
53/54L	Fast Rise High Gain Plug In	68.00
84	Test Plug In For 580/581 Main Frames	75.00
107	Square Wave Generator .4 to 1MHZ	48.00
RM122	Preamplifier 2Hz to 40KHZ	63.00
123	AC Coupled Preamplifier	25.00
127	Power Supply For 2 Plug In's	148.00
131	Current Probe Amplifier	50.00
184	Time Mark Generator	363.00
R240	Program Control Unit	150.00
280	Trigger Countdown Unit	84.00
455	Portable Dual Trace 50MHZ Scope	2000.00
465	Portable Dual Trace 100MHZ Scope	2500.00
503	DC to 450KHZ Scope Rack Mount	250.00
535A	DC to 15MHZ Scope Rack Mount	263.00
543	DC to 33MHZ Scope	300.00
561	DC to 10MHZ Scope Rack Mount	150.00
561A	DC to 10MHZ Scope Rack Mount	200.00

Scopes with Plug-in's

567	Digital Readout Scope with a 6R1A Digital Unit and a 3S3 Dual Trace DC to 1GHZ Sampling Plug In and a 3T77A Sweep Plug In.	750.00
561A	DC to 10MHZ Scope with a 3S76 Dual Trace DC to 875MHZ Sampling Plug In and a 3T77A Sweep Plug In. Rack Mount	600.00
565	DC to 10MHZ Dual Beam Scope with a 2A63 Diff. and a 2A61 Diff. Plug In's	900.00
581	DC to 80MHZ Scope with a 82 Dual Trace High Gain Plug In	650.00
661	Sampling Scope with a 5T3 Timing Plug In and a 4S2 Dual Trace DC to 3.5GHZ Sampling Plug In.	575.00

Tubes

2E26	$ 5.00	4CX350FJ	$116.00	6146W	12.00
3-500Z	102.00	4CX1000A	300.00	6159	10.60
3-1000Z	268.00	4CX1500B	350.00	6161	75.00
3B28/866A	5.00	4CX15000A	750.00	6293	18.50
3X2500A3	150.00	4E27	50.00	6360	6.95
4-65A	45.00	4X150A	41.00	6907	40.00
4-125A	58.50	4X150D	52.00	6939	14.75
4-250A	68.50	4X150G	74.00	7360	12.00
4-400A	71.00	572B/T160L	39.00	7984	10.40
4-1000A	184.00	6LF6	5.00	8072	49.00
5-500A	145.00	6LQ6	5.00	8106	2.00
4CX250B	65.00	811A	12.95	8156	7.85
4CX250F/G	55.00	813	29.00	8226	127.70
4CX250K	113.00	5894/A	42.00	8295/PL172	328.00
4CX250R	92.00	6146	5.00	8458	25.75
4CX300A	147.00	6146A	6.00	8560A/AS	50.00
4CX350A	107.00	6146B/8298A	7.00	8908	9.00
				8950	9.00

CIRCLE 27 ON READER SERVICE CARD

MICROWAVE COMPONENTS

ARRA

2416	Variable Attenuator	$ 50.00
3614-60	Variable Attenuator 0 to 60dB	75.00
KU520A	Variable Attenuator 18 to 26.5 GHz	100.00
4684-20C	Variable Attenuator 0 to 180dB	100.00
6684-20F	Variable Attenuator 0 to 180dB	100.00

General Microwave

Directional Coupler 2 to 4GHz 20dB Type N		75.00

Hewlett Packard

H487B	100 ohms Neg Thermistor Mount (NEW)	150.00
H487B	100 ohms Neg Thermistor Mount (USED)	100.00
477B	200 ohms Neg Thermistor Mount (USED)	100.00
X487A	100 ohms Neg Thermistor Mount (USED)	100.00
X487B	100 ohms Neg. Thermistor Mount (USED)	125.00
J468A	100 ohms Neg Thermistor Mount (USED)	150.00
478A	200 ohms Neg Thermistor Mount (USED)	150.00
8478A	200 ohms Balanced Neg. Thermistor Mount (USED)	175.00
J382	5.85 to 8.2 GHz Variable Attenuator 0 to 50dB	250.00
X382A	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	250.00
X885A	8.2 to 12.4 GHz Phase Shifter +/- 360°	250.00
394A	1 to 2 GHz Variable Attenuator 6 to 120dB	250.00
NK292A	Waveguide Adapter	65.00
K422A	18 to 26.5 GHz Crystal Detector	250.00
K375A	18 to 26.5 GHz Variable Attenuator	300.00
8436A	Bandpass Filter 8 to 12.4 GHz	75.00
8439A	2 GHz Notch Filter	75.00
8471A	RF Detector	50.00
342A	VHF Noise Source	100.00
X347A	8.2 to 12.4 GHz Noise Source	250.00
H532A	7.05 to 10 GHz Frequency Meter	300.00
G532A	3.95 to 5.85 GHz Frequency Meter	300.00
J532A	5.85 to 8.2 GHz Frequency Meter	300.00
809A	Carriage with a 444A Slotted Line Untuned Detector Probe and 809B Coaxial Slotted Section 2.6 to 18 GHz	175.00
809B	Carriage with a 442B Broadband Probe 2.6 to 12.4 GHz and a X810B Slotted Section	200.00
809B	Carriage with a X810B Slotted Section and a PRD 250A Detector Mount 2.4 to 12.4 GHz	200.00

Merrimac

AU-25A/	801115 Variable Attenuator	100.00
AU-26A/	801162 Variable Attenuator	100.00

Microlab/FXR

Y410A	Frequency Meter 12400 - 18000 MC	250.00
N414A	Frequency Meter 3950 - 11000 MC	350.00
X638S	Horn 8.2 - 12.4 GHz	60.00
601-B18	X to N Adapter 8.2 - 12.4 GHz	35.00
Y610D	Coupler	75.00

Narda

3095/	22909 Directional Coupler 7 to 12.4 GHz 10dB Type N	250.00
4013C-10/	22540A Directional Coupler 2 to 4 GHz 10db Type SMA	90.00
4014-10/	22538 Directional Coupler 3.85 to 8 GHz 10dB Type SMA	90.00
4014C-6/	22876 Directional Coupler 3.85 to 8 GHz 6dB Type SMA	90.00
4015C-10/	22539 Directional Coupler 7.4 to 12 GHz 10dB Type SMA	95.00
4015C-30/	23105 Directional Coupler 7 to 12.4 GHz 30dB Type SMA	95.00
3044-20	Directional Coupler 4 to 8 GHz 20dB Type N	125.00
3040-20	Direcitonal Coupler 240 to 500 MC 20dB Type N	125.00
3041-20	Directional Coupler 500 to 1000 MC 20dB Type N	125.00
3043-20/	22006 Directional Coupler 1.7 to 4 GHz 20dB Type N	125.00
3003-10/	22011 Directional Coupler 2 to 4 GHz 10dB Type N	75.00
3003-30/	22012 Directional Coupler 2 to 4 GHz 30dB Type N	75.00
3042-20	Directional Coupler 950 to 2 GHz 20dB Type N	125.00
3043-30/	22007 Directional Coupler 1.7 to 3.5 GHz 30dB Type N	125.00
22574	Directional Coupler 2 to 4 GHz 10dB Type N	125.00
3033	Coaxial Hybrid 2 to 4 GHz 3dB Type N	125.00
3032	Coaxial Hybrid 950 to 2 GHz 3 dB Type N	125.00
784/	22380 Variable Attenuator 1 to 90dB 2 to 2.5 GHz Type SMA	550.00
22377	Waveguide to Type N Adapter	35.00
720-6	Fixed Attenuator 8.2 to 14.4 GHz 6 dB	50.00
3503	Waveguide	25.00

PRD

U101	12.4 to 18 GHz Variable Attenuator 0 to 60dB	300.00
X101	8.2 to 12.4 GHz Variable Attenuator 0 to 60dB	200.00
C101	Variable Attenuator 0 to 60dB	200.00
205A/367	Slotted Line with Type N Adapter	100.00
195B	8.2 to 12.4 GHz Variable Attenuator 0 to 50dB	100.00
185BS1	7.05 to 10 GHz Variable Attenuator 0 to 40dB	100.00
196C	8.2 to 12.4 GHz Variable Attenuator 0 to 45dB	100.00
170B	3.95 to 5.85 GHz Variable Attenuator 0 to 45dB	100.00
588A	Frequency Meter 5.3 to 6.7 GHz	100.00
140A,C,D,E	Fixed Attenuators	25.00
109J,I	Fixed Attenuators	25.00
WEINSCHEL ENG.	2692 Variable Attenuator +30 to 60dB	100.00

COMPUTER I.C. SPECIALS

MEMORY

MEMORY	DESCRIPTION	PRICE
2708	1K x 8 EPROM	$ 7.99
2716/2516	2K x 8 EPROM 5Volt Single Supply	20.00
2114/9114	1K x 4 Static RAM 450ns	6.99
2114L2	1K x 4 Static RAM 250ns	8.99
2114L3	1K x 4 Static RAM 350ns	7.99
4027	4K x 1 Dynamic RAM	3.99
4060/2107	4K x 1 Dynamic RAM	3.99
4050/9050	4K x 1 Dynamic RAM	3.99
2111A-2/8111	256 x 4 Static RAM	3.99
2112A-2	256 x 4 Static RAM	3.99
2115AL-2	1K x 1 Static RAM 55ns	4.99
6104-3/4104	4K x 1 Static RAM 320ns	14.99
7141-2	4K x 1 Static RAM 200ns	14.99
MCM6641L20	4K x 2 Static RAM 200ns	14.99
9131	1K x 1 Static RAM 300ns	10.99

C.P.U.'s ECT.

MC6800L	Microprocessor	13.80
MCM6810AP	128 x 8 Static RAM 450ns	3.99
MCM68A10P	128 x 8 Static RAM 360ns	4.99
MCM68B10P	128 x 8 Static RAM 250ns	5.99
MC6820P	PIA	8.99
MC6820L	PIA	9.99
MC6821P	PIA	8.99
MC68B21P	PIA	9.99
MCM6830L7	Mikbug	14.99
MC6840P	PTM	8.99
MC6845P	CRT Controller	29.50
MC6845L	CRT Controller	33.00
MC6850L	ACIA	10.99
MC6850P	ACIA	4.99
MC6852P	SSDA	5.99
MC6852L	SSDA	11.99
MC6854P	ADLC	22.00
MC6860CJCS	0-600 BPS Modem	29.00
MC6862L	2400 BPS Modem	14.99
MK3850N-3	F8 Microprocessor	9.99
MK3852P	F8 Memory Interface	16.99
MK3852N	F8 Memory Interface	9.99
MK3854N	F8 Direct Memory Access	9.99
8008-1	Microprocessor	4.99
8080A	Microprocessor	8.99
Z80CPU	Microprocessor	14.99
6520	PIA	7.99
6530	Support For 6500 series	15.99
2650	Microprocessor	10.99
TMS1000NL	Four Bit Microprocessor	9.99
TMS4024NC	9 x 64 Digital Storage Buffer (FIFO)	9.99
TMS6011NC	UART	9.99
MC14411	Bit Rate Generator	11.99
AY5-4007D	Four Digit Counter/Display Drivers	8.99
AY5-9200	Repertory Dialler	9.99
AY5-9100	Push Button Telephone Diallers	7.99
AY5-2376	Keyboard Encoder	19.99
AY3-8500	TV Game Chip	5.99
TR1402A	UART	9.99
PR1472B	UART	9.99
PT1482B	UART	9.99
8257	DMA Controller	9.99
8251	Communication Interface	9.99
8228	System Controller & Bus Driver	5.00
8212	8 Bit Input/Output Port	5.00
MC14410CP	2 of 8 Tone Encoder	9.99
MC14412	Low Speed Modem	14.99
MC14408	Binary to Phone Pulse Converter	12.99
MC14409	Binary to Phone Pulse Converter	12.99
MC1488L	RS232 Driver	1.00
MC1489L	RS232 Receiver	1.00
MC1405L	A/D Converter Subsystem	9.00
MC1406L	6 Bit D/A Converter	7.50
MC1408/6/7/8	8 Bit D/A Converter	4.50
MC1330P	Low Level Video Detector	1.50
MC1349/50	Video IF Amplifier	1.17
MC1733L	LM733 OP Amplifier	2.40
LM565	Phase Lock Loop	2.50

MHz electronics

(602) 242-2037
(602) 242-8916

2111 W. Camelback
Phoenix, Arizona 85015

CIRCLE 28 ON READER SERVICE CARD

a monthly feature by
KARL T. THURBER, JR., W8FX

Antennas

DESIGN, CONSTRUCTION, FACT, AND EVEN SOME FICTION

HF Verticals, Plain And Simple

In last month's column, author W8FX concluded a two-part discussion of variations on the dipole antenna. Included were facts on Vees and inverted Vees, vertical dipoles, slopers, T2FDs, double bazookas, double Zepps, and extended double Zepps. In this issue, he embarks on another two-part spread covering popular h.f. vertical designs. This month, the simpler forms.

Band	Frequency (kHz)	Use	Driven Element	Radials
160	1850	160-low	126′ 6″	129′ 9″
160	1950	160-high	120′ 0″	126′ 4″
80	3600	C.W.	65′ 0″	66′ 8″
80	3725	Novice C.W.	62′ 10″	64′ 5″
80	3750	Mid-Band	62′ 5″	64′ 0″
75	3850	Phone	60′ 10″	62′ 4″
40	7075	C.W.	33′ 1″	33′ 11″
40	7150	Mid-band	32′ 9″	33′ 7″
40	7175	Novice C.W.	32′ 8″	33′ 6″
40	7225	Phone	32′ 5″	33′ 3″
20	14050	C.W.	16′ 8″	17′ 1″
20	14175	Mid-band	16′ 7″	17′ 0″
20	14275	Phone	16′ 5″	16′ 10″
15	21075	C.W.	11′ 2″	11′ 5″
15	21175	Novice C.W.	11′ 1″	11′ 4″
15	21225	Mid-band	11′ 1″	11′ 4″
15	21350	Phone	11′ 0″	11′ 3″
10	28050	C.W.	8′ 5″	8′ 7″
10	28150	Novice C.W.	8′ 4″	8′ 7″
10	28750	Phone-low	8′ 2″	8′ 5″
10	29075	Phone-high	8′ 1″	8′ 4″
10	29475	OSCAR (receive)	8′ 0″	8′ 2″

+ Dimensions, which are approximate, are rounded to next higher inch.

+ Driven element dimensions are derived from the formula

$$f\ (\text{in feet}) = \frac{234}{f(\text{MHz})}$$

+ Radial dimensions are derived from the formula $f\ (\text{in feet}) = \frac{240}{f(\text{MHz})}$

Fig. 1- Quarter-wave vertical antenna lengths.

Put any two DX'perts together and begin a discussion of antennas and you're almost certain to trigger a heated exchange on the merits of vertical vs. horizontal polarization. We don't really want to get into the thick and heavy regarding the pros and cons of these two antenna types just now, other than to make a few general comments. So let's lay the groundwork.

Horizontal vs. vertical polarization. Because of its economy and simplicity, the vertical antenna has long enjoyed popularity within the amateur community. Its appearance is usually neat, it's suitable for multiband operation, it doesn't require a great deal of horizontal space, it's relatively easy to construct, and it's not normally hard to adjust. But what about performance?

On the lower h.f. bands, 160 through 40 meters, the vertical is hard to beat, and in fact can work surprisingly well if it is mounted unobstructed by foreign objects, has a good ground system, and is properly matched to the transmission line. At practical heights, the vertical antenna lays down a very low-angle, horizon-hugging signal in all directions, which favors transmission and reception from distant points. Polarization, *per se*, is not a big factor in h.f. skywave propagation, due to the nature of the ionosphere, which mixes signal polarization.

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Compared with a horizontal antenna at heights of 30 to 40 feet, the vertical will *usually* perform better over longer distances—around 700-800 miles and up, whereas the horizontal will normally turn in a better performance over shorter distances. On the lower bands, where full-size ¼-wavelength antennas are often impractical, a shorter radiating element may be used, but this wastes power in the loading coil used to resonate the antenna.

Nearby objects, such as buildings, trees, and utility wires, can also absorb energy and upset the radiation pattern. It may be helpful to elevate the antenna above the obstructions, by installing it on a roof or mast. This may be done if an artificial *ground plane* is installed, as will be described later.

While the vertical's low-angle-of-radiation characteristic is a desirable one, the omnidirectional pattern becomes a disadvantage when working DX. One's power is spread across the compass, rather than being concentrated in the desired direction. Reception suffers in that signals from all directions are received equally well, and man-made noise seems to be

picked up stronger on the vertical. On the higher h.f. bands—20, 15, and 10—where multi-element antennas take on manageable dimensions, a Yagi beam or Quad will easily outperform the vertical and dipole alike.

A final point: The vertical polarization and low angle of radiation can aggravate television interference (TVI) and broadcast interference (BCI), as well as problems caused by r.f. getting into nearby telephone lines and hi-fi equipment. Be aware that vertical polarization used in crowded urban quarters may cause problems along these lines.

Vertical antenna theory and some basic designs. The vertical is popular on the h.f. bands, since it's possible to obtain low-angle radiation for both local (ground wave) and DX work. if installed with its bottom end less than ¼-wavelength high and operated over a reasonably conductive ground, it's indeed a good performer. In fact, the vertical is almost exclusively used for broadcast.and many h.f. point-to-point circuits. It produces high current density in the ground beneath and around it, however, and therefore requires an extensive ground system—as many as 120 radials in broadcast service (more on this later).

Vertical antennas are commonly of ¼-, ½-, or 5/8 to 0.64-wavelength. The longer antennas produce some gain relative to the basic ¼-wave; for example, the ½-wave vertical yields about a 2 dB gain, and the 5/8-wave radiator a 3 dB gain. The height required, as well as the non-standard feedpoint impedance (which requires a base matching device), makes them unwieldly except on the higher bands, 15 and 10 meters, and on the 27 MHz CB frequencies. Thus, most popular h.f. verticals are of the Marconi or resonant ¼-wave type. When the antenna is cut to ¼-wavelength, the feedpoint impedance is approximately 35 ohms, allowing a fair match to popular 50-52 ohm cables without the use of tuning coils or other matching devices. The antenna can be shuntfed or series-line matched to effect a near-perfect impedance transformation over all or a considerable portion of a band.

The ¼-wave vertical is mainly a single-band antenna, although a 40-meter vertical will take power on 15, an especially attractive situation for the Novice. In this instance, the 40-meter ¼-wave turns out to be three-quarter waves on 15. (Any odd multiple of quarter waves will allow relatively low-impedance feed directly with coaxial cable.)

The vertical physically consists of two components, the driven element and the ground connection or ground plane. The approximate driven element length is derived from the equation

$$L \text{ (in feet)} = \frac{234}{f \text{ (MHz)}}$$

This length is only approximate, since *exact* resonance will be determined by the diameter of the wire, tubing or rod used to construct the antenna. Buried radials need not be resonant, but those installed above ground should be slightly longer than the driven element. Their dimensions are given by the formula

$$L \text{ (in feet)} = \frac{240}{f \text{ (MHz)}}$$

Fig. 1 shows formula-derived driven element and radial lengths for each h.f. amateur band.

For multiband operation, except for the special 40/15 meter situation, a base loading coil is used to tune out the antenna's reactance. The typical base-loaded vertical is simply a piece of tubing, 16-25 feet long, with a tapped inductor at the bottom to allow *manual* resonating on each band or band segment. Be aware that adjustment is required *at the antenna's base*

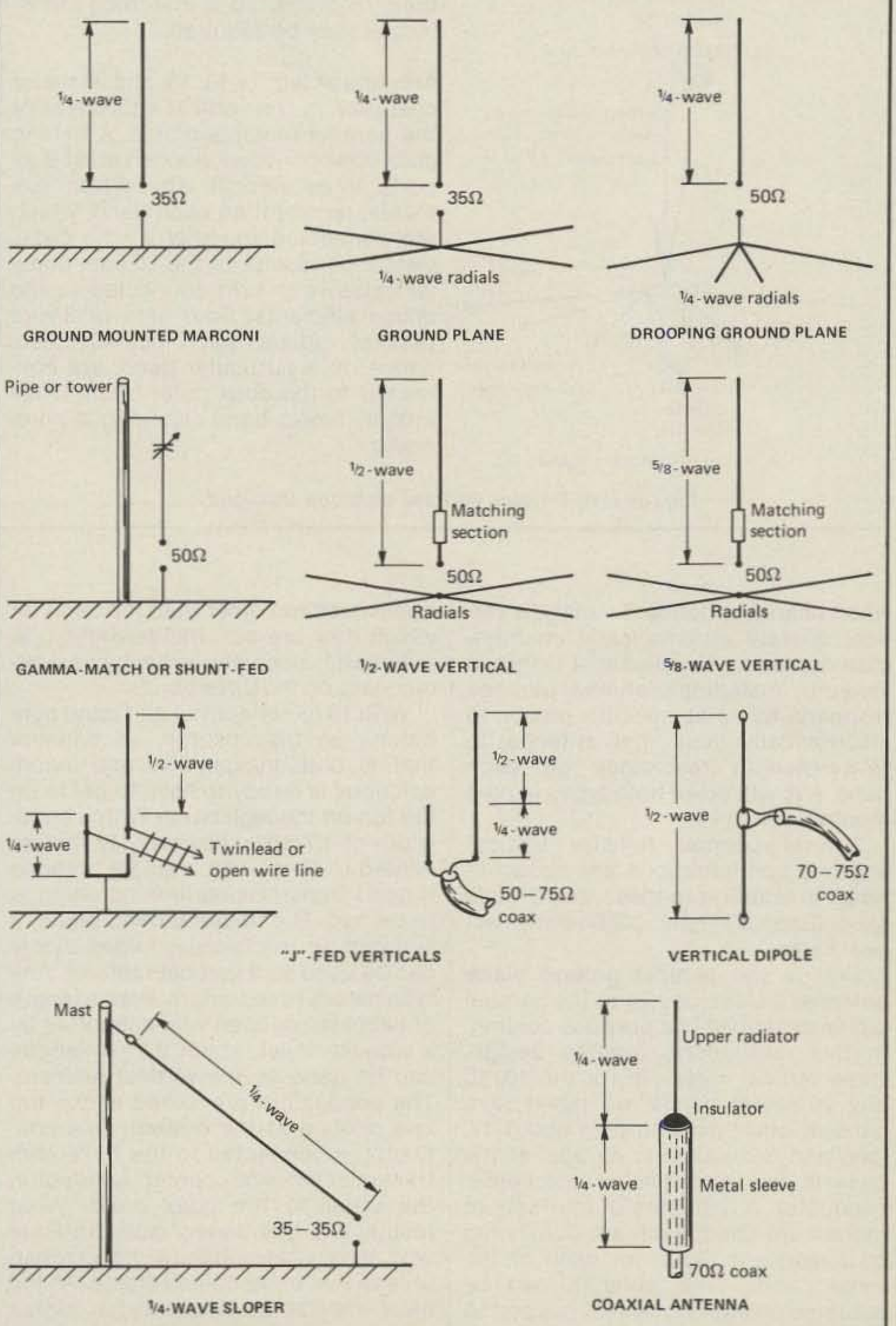
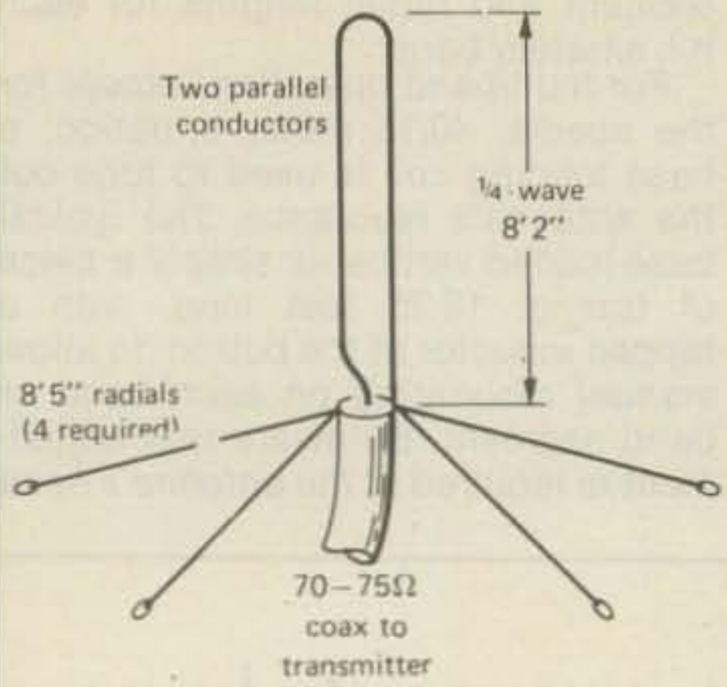
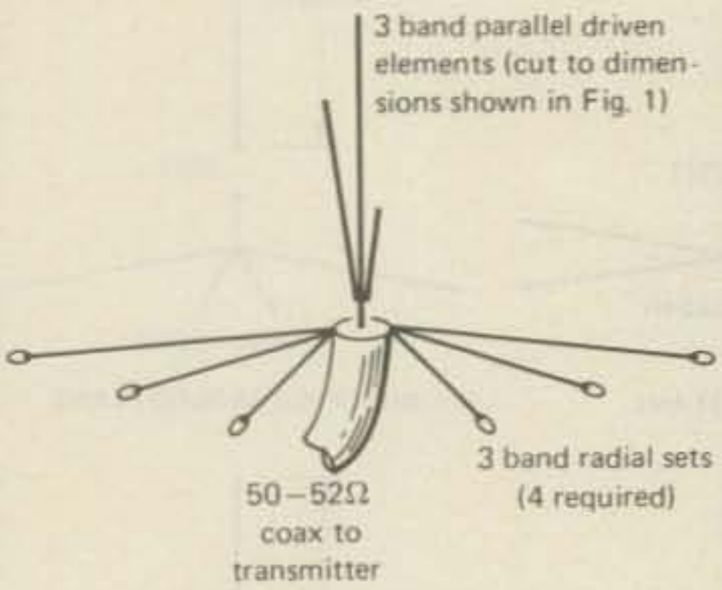


Fig. 2- Representative vertical antenna configurations. Note: Impedances are approximate and the drawings are not to scale.



(A) FOLDED GROUND PLANE



(B) PARALLEL GROUND PLANE

Fig. 3- Two unique vertical antenna designs.

The trombone-shaped 10 meter antenna at left is made from two parallel conductors, joined at the top and separated at the bottom. One is connected to the coax lead-in's center conductor, the other to the braid shield and radials. Copper or aluminum tubing can be used to form the driven element, as can 300-ohm TV-type twinlead or 450-ohm open-wire line. This broadband antenna should allow coverage of the entire 10-meter band with acceptably low s.w.r. Feedpoint impedance is slightly higher than 75 ohms, so a matching transformer may be required.

Antenna at left for 10, 15, and 20 meter operation is the vertical equivalent of the parallel multiple dipole. A fishing pole, dowel or other wooden mast supports three vertical wire driven elements, resonant on each band, which are connected together at the base. Center conductor of the 50-ohm coaxial cable is in turn connected to the driven elements. Four sets of 3-wire parallel radials, each cut for resonance on a particular band, are connected to the coax outer braid. Once initially tuned, band changing is automatic.

when changing bands. To make a vertical operate *automatically* on more than one band, the electrical length is varied by installing pretuned, parallel-resonant traps at specific points to electronically "cut" the antenna to ¼-wavelength resonance on each band. (We will cover both types in next month's column.)

Several popular full-size vertical antenna configurations are shown in fig. 2. In addition to these, two simple specialized designs particularly appeal to me.

One is the **parallel ground plane antenna,** a close cousin to the parallel dipole described in a previous column. In this inexpensive, no-trap design, three vertical wires cut for the 10, 15 and 20 meter bands are taped to a cane or other wooden pole about 17′ long and connected *in parallel* at the base to the transmission line center conductor. A minimum of four sets of radials are used, each set consisting of a resonant radial for each of the three bands. The antenna can be mounted on any convenient support. A good match to coax is possible on each band without adjustment after initial trimming; the nonresonant driven elements have a high impedance and are therefore practically nonexistent on other than the band for which they are cut. Bandswitching is automatic since the antenna is self-resonant on the three bands.

With 10 meter activity and band conditions on the upsurge, an antenna that is both inexpensive and inconspicuous is handy to have to get in on the fun on the high band. With a bandwidth of 1.7 MHz, however, 10 meters is hard to cover with a single antenna if good transmission line matching is to be had. The **folded ground plane**, a variation of the familiar *folded dipole* can be used as a vertical radiator. Any type parallel conductors, even a length of twin-lead or open wire supported by a wooden mast, about 8′2″ in length, can be used as the vertical element. The conductors are joined at the top and opened at the bottom. One conductor is connected to the 70-75 ohm transmission line center conductor, the other to the coax braid. What results is a trombone-shaped antenna with a very wide bandwidth comparable to that of the folded dipole. As the base impedance is somewhat higher than 70 ohms, a matching network may be required for low s.w.r.

Both of these two interesting designs are shown in fig. 3.

Don't forget the ground. With most verticals, operation against a low-resistance ground is a "must" if the antenna is to radiate better than the proverbial wet string. Indeed, the importance of an efficient ground system for the vertical can't be overemphasized. Why is this so?

The vertical, in its simplest form, is designed to be *electrically equivalent* to a dipole stood on end. When mounted close to the ground, the earth takes the place of the "missing half" of the dipole. The antenna can work effectively in this mode only if there is a low-resistance connection to ground, since the ground circuit resistance, along with the radiation resistance of the antenna, determines the amount of current flowing in the antenna circuit and therefore the power radiated. A ground circuit resistance of more than a few ohms will substantially detract from the mirror effect the earth is to provide and can result in extremely low antenna frequency—possibly as low as 10%. To secure a good ground, rods, wire mesh screens, and radial wires are used.

If local conductivity is exceptionally good or if the soil beneath the antenna is chemically treated to increase conductivity, a simple 4-6′ metal stake *may* serve as the ground connection. Far better and more efficient are ground wires arranged in the form of wagon wheel spokes radiating from the central ground rod, with each radial preferably terminated in a ground rod. Wire size or type conductor is unimportant; the radials do not have to be of any particular length, they do not have to be laid in a straight line, and they don't even have to be buried. A large number of *long* radials is better in reducing ground losses that a number of *short* ones. However, since the largest losses occur in the ground near the base of the antenna (where current flow is highest), it's better to use a larger number of radials of shorter length than a smaller number of longer ones, for a given amount of wire. Wire mesh (such as chicken-wire screening) can be used effectively under the antenna, in the area of highest ground loss.

If a good ground can't be obtained, of if the ground mounted antenna would be surrounded by power-absorbing objects, you can mount the antenna atop a mast or on a roof, installing your own artificial ground system (ground plane) under the vertical. The antenna is supported by at least four ground plane radials, installed at the base of the elevated antenna and connected to the braid of the coax and to the supporting tower or mast (if metal). The ground plane radials should be ¼-wave-

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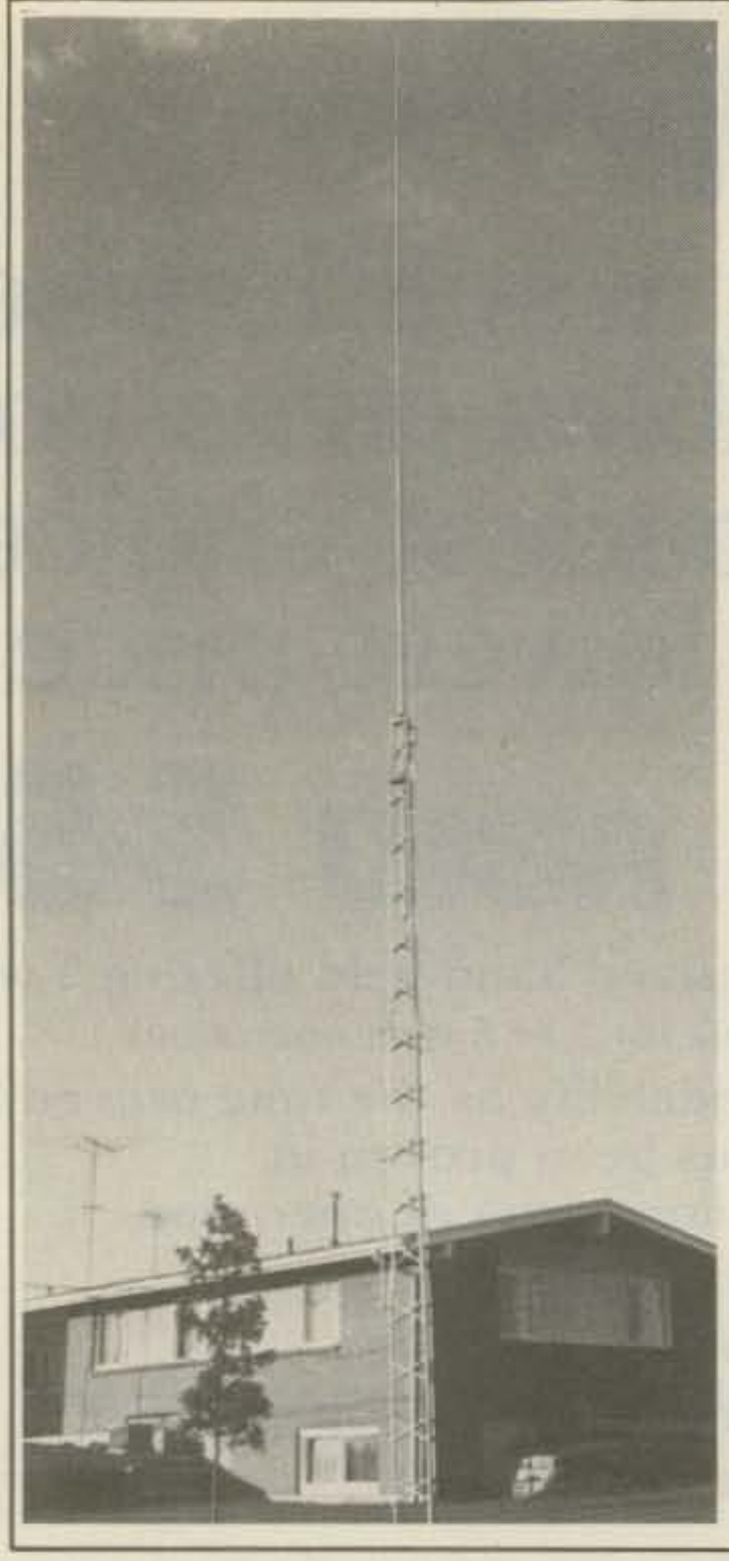

Antenna of the Month: Hy-Gain 18HT Multiband H.F. Vertical

The Hy-Gain 18HT is a full-size, automatic bandswitching vertical which covers 80 through 10 meters. It features a stub decoupling system which effectively isolates various sections of the antenna so that an electrical ¼-wavelength (or odd ¼-wavelength multiple) appears on all bands. With the addition of a base loading coil, the antenna can also be used on 160 meters.

The galvanized 24′ tower requires no guying in winds up to 75 m.p.h. The top mast is constructed of 6063-T832 taper swagged aluminum that extends the antenna to an overall height of 50′. A special hinged base assembly allows complete assembly at ground level and easy raising and lowering.

The matching system employed allows an s.w.r. of less than 1.5:1 to be attained at resonance on all bands (80 through 10 meters). Typical 2:1 s.w.r. bandwidths are 700 kHz on 10; 300 kHz or better on 15, 20 and 40 meters; and 250 kHz on 80 meters.

length for the band to be used. They should be insulated at the far ends and separated from guy wires by egg insulators.

Four or more radials provide an effective ground plane mirror for the antenna, and they also act as decoupling stubs to choke off current flow on the mast used for support. The radials may be run parallel to the earth or sloped downward; sloping them at a 45-degree angle will raise the feedpoint impedance, possibly allowing a direct match to 52-ohm cable without the use of a matching device. For multiband operation, paralleled radial sets should be used for each band, though 40 meter radials will suffice for 15-meter operation due to their odd-harmonic resonance on the higher band. (Multiple conductor TV rotator cable or twin-lead can be used for the parallel radials if the conductors are peeled back to form ¼-wave radials on each band.)

In difficult apartment or business locations, where the antenna can neither be ground mounted nor used with an artificial ground plane, you may still be able to use a vertical if you can find a large mass of metal close by the antenna base that has a direct or capacitive-coupling to ground, such as air conditioning or heating systems, structural steel frames, downspouts, etc. Windowsill-mounted "semi-verticals" may be used where roof-mounted antennas are prohibited, if a cold-water pipe or radiator connection can be found and/or if tuned radials or a *counterpoise* is used for r.f. grounding. The metal bodies of trailers, mobile homes and campers may be used as parts of a ground system for verticals. Results are unpredictable and will likely vary from band to band. On-the-air performance depends to a large measure on one's dogged persistence in trying to secure an effective ground system.

Antenna of the Month

Beginning this month, and from time to time in subsequent columns, we will feature an "antenna of the month." We'll pick an unusual commercial antenna design and review its technical details for the benefit of *CQ* readers who may be contemplating purchase. In the future, we may be able to include unique homebrew designs, so if you have a special design you are particularly proud of and want to share it with other readers, send along a technical rundown. Good photo and sketches are a must.

See you then.

73, Karl, W8FX

Announcing

● **Expedition to Venus** - Fort Venango Mike and Key Club, W3ZIC, of Oil City and Franklin, Pennsylvania, will sponsor an expedition to Venus—that is, Venus, PA—on September 6 and 7. Operations will be on Novice and General portions of the band, all modes, all bands, including 2 meter f.m. on 147.12, 147.72. Operation will be in Clarion County, an extremely scarce one. A certificate will be awarded; send Clarion County, an extremely scarce one. A certificate will be awarded; send s.a.s.e. to Joseph Szabat, W3LST, 228 Plummer St., Oil City, PA 16301.

● **South Jersey Radio Association's 32nd Annual Hamfest** - The South Jersey Radio Association is hosting a 32nd Annual Hamfest in this, their 64th year of existence. The Hamfest will be held on Sunday, September 7th, on the grounds of Pennsauken Senior High School on Hylton Road (1½ miles S.E. on Rte 73 from the Tacony Palmyra Bridge) in Pennsauken, N.J. There will be a flea market and in addition, prize drawings, contests, Bingo for the ladies, and games for the children. In case of inclement weather facilities indoors can accomodate exhibitors and attendees. Admission is $3. Tailgate or booth space is $5 per seller. Talk-in on 146.52 simplex; 146.22/82 PARA SJRA Repeater. For more information contact Edwin T. Kephart, W2SPV, 4309 Willis Ave., Pennsauken, N.J. 08109.

● **Butler Hamfest** - The Butler County ARA Hamfest will be held on September 7th from 9 a.m. to 4 p.m. at the Butler Farm Show Grounds, Rt. 68, Butler, Pennsylvania. Free outside fleamarket, indoor fleamarket, refreshments, prizes. $1 donation for admission, free parking, children under 12 admitted free. For more information contact WA3GDS, Dan Metrick, 130 Rieger Rd., Butler, PA 16001.

● **W9DXCC Convention** - The Northern Illinois DX Association will host the W9DXCC Convention on September 13 at the Arlington Park Hilton, Arlington Heights, Illinois. A full program for DXers is planned. For details write: Howie Huntington, K9KM, 65 South Burr Oak Drive, Lake Zurich, IL 60047.

● **Indiana Hamfest** - The Porter County Amateur Radio, Inc. will hold its annual Hamfest at the Porter County Fairgrounds in Valparaiso, Indiana on September 14. Flea market, technical sessions, door prizes, bingo, food. Dealers and commercial exhibitors; free indoor and outdoor space. Gate opens at 6 a.m. Talk-in on 147.96/.36 and 146.52 MHz. Advance tickets, $1.50. At the gate $2.00. For tickets and information, write to Charles Baker, W9SJN, P.O. Box 251, Portage, IN 46368.

● **Tu-Boro ARC Auction** - The Tu-Boro ARC will hold its Annual Auction on September 18 at the Odd Fellows Hall, 149-14 14th Avenue, Whitestone, New York. 6 p.m. for sellers, 7 p.m. for buyers. Donation $1.00 per person. Beer and soda available. For information call: Walt, WB2PFO at 212-539-5732 nights, and Ed, WB2IBQ at 212-746-4082. Talk-in on 146.52.

● **Cincinnati Hamfest** - The Cincinnati Hamfest will be held on Sunday, September 21st at Stricker's Grove, State Route 128, Venice (Ross), Ohio. Exhibits and booths, prizes, refreshments, flea market, talks, entertainment, and more. Admission and registration is $4. For more information request a copy of the "Hamfest Issue" of "The Mike and Key" from W8ALW, 3965 Harmar Court, Cincinnati, OH 45211.

● **Skyview Radio Swap and Shop** - The Skyview annual Swap and Shop will be held on September 21 from 12 to 4 p.m. at the Sokol Camp, Lower Burrell, Pennsylvania. For more information send a s.a.s.e. to Jim Jackson, K3VRU, RD # 1, Box 7A, Apollo, PA 15613.

● **Radio Association of Erie Hamjam** - The Radio Association of Erie, Pennsylvania will hold their annual Hamjam on Sunday, September 28th at the Rainbow Gardens at Waldameer Beach Park, Erie, Pennsylvania to promote the Amateur Radio Fraternity.

● **On-the-Air Reunion** - An on-the-air reunion, sponsored by the Canal Zone Amateur Radio Association (CZARA), Panama, to foster continued friendship among former KZ5's, will be held in the contest period of 48 hours beginning 0001Z, September 27. A1 and A3 modes only, no cross mode operation allowed. Listen within the lowest 25 kHz of the c.w. and phone segments of the U.S. General Class portion on each band. Contest call will be "CQ Ex-KZ5 Reunion." No power limitations. Extract of contest logs must be mailed by October 31, 1980 and must be marked either "Reunion" or "Balboa Award." Send to John B. Barham, HP1XOG, PSC Box 4481, APO Miami 34001. Former KZ5's who choose not to submit an entry are encouraged to provide current call signs and address via QSL or post card to the above address. Also contact the above for more information about the contest.


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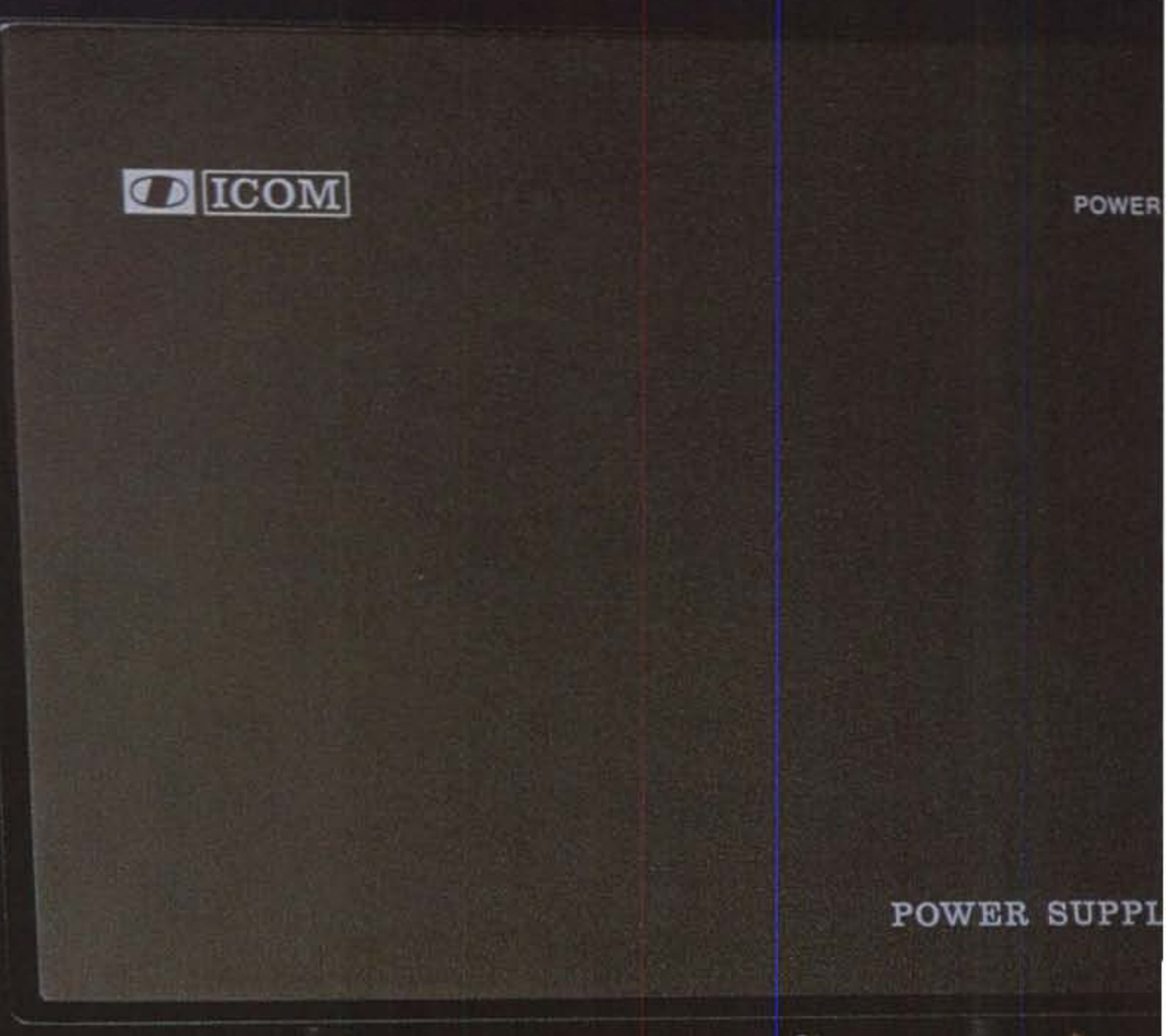

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a monthly feature by

JOHN A. ATTAWAY, K4IIF

DX

NEWS OF COMMUNICATIONS AROUND THE WORLD

We attended the Fresno DX Convention (DX-80) for the first time this year, and a mighty event it was with presentations on Palmyra and Kingman by K6LPL, the Neutral Zone DXpedition (8Z4A) by JY4MB, Abu Ail by DJ9ZB and HB9MX, Spratly by K4SMX, YASME by Lloyd and Iris, Rhodes and Africa by K5VT and climaxing with the DX Hall of Fame Award presentation to Hugh Cassidy, WA6AUD, which was accompanied by a 5-minute standing ovation. Our heartiest congratulations to Convention Chairman Dave Bell, W6AQ, and his DX-80 Committee consisting of Joe, N6AHU; Frank, W6AOA; Larry, N6AR; Dick, W6ET; Irv, WA6GOY; Norman, W6ORD; Bernie, W6PJX; Marty, N6VI and Freid, WA6WZO, all of the Southern California DX Club. Next year will be the Northern California DX Club's turn again, and rumors hint that the site may be moved to the greatly expanded Visalia Airport Holiday Inn's convention facilities. Nothing definite yet, however, so don't write for reservations.

The DX Forum at Fresno produced a startling recommendation which I know will interest you. It started with an observation by Dave, K6LPL, that rocks, reefs and sandbars were not real countries and should be deleted from the DXCC Countries list. One would have expected this idea to be shouted down by a room full of rabid DXers. When we last mentioned it in the *CQ* DX column several years ago it required a wheelbarrow to cart home all the letters of protest received at Box 205, the theme of which was the need for new countries to keep the award alive and excitement in the world of DX. However, at Fresno the group roared its approval and voted unanimously (as near as I could tell) in favor. Jack Troster, W6ISQ, Dick Baldwin, W1RU, and I looked at each other in amazement.

P.O. Box 205 Winter Haven, FL 33880

At the Dayton Hamvention, Joe Arcure, Jr., W3HNK, (left) receives his DX Hall of Fame plaque from CQ Publisher, Dick Ross, K2MGA. For a complete story on the election of W3HNK to the DX Hall of Fame see page 78 of the December 1979 issue of CQ. (Photo courtesy Skip, WB8OWM)

So what now? We don't know! Perhaps this was just a temporary abberation. On the other hand, maybe it will be referred to the League's DX Advisory Committee. If you have thoughts on the matter we suggest that you drop a note to the Committee and let them know how you feel.

De Extra

For Those Who Remember...
(Thanks WA4JTI and *QRZ DX)*

"At the Saturday DX Forum at Dayton this year a scene took place which stirred the hearts of many. The moderator canvassed the audience for those individuals who had operated from other countries, and asked each one to stand and list his accomplishments. I thought to myself, 'There is one man who could really turn this place upside down if he were here and could tell us of all the places he had been.'

"Then over to my left my gaze stopped upon a familiar countenance. My heart skipped a beat. They passed the microphone quickly down the aisle to where he stood, almost hidden by the huge throng present in the hall. Yes, the hair was grayer and maybe a little thinner, but the voice

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52...JA4DLP
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54...JH1LBR
55...K2ARO
56...W0SD

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299...K8UNV
300...VP9CP
301...W6SWM
302...VE2QO
303...WA3LJP
304...K5WE
305...SM3DMP
306...YB0WR
307...K8BTH
308...K4SE

15 Meter Phone

49...WA0TKJ
50...WB3CIW
51...W7OK

40 Meter Phone

3...SM0AJU

15 Meter C.W.

31...K5UR

20 Meter C.W.

107...K5NW
108...VE7CNE
109...HI8LC
110...W3AP
111...K5WE
112...SM5AKT

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1923...WB3DEN
1924...PA0JIL
1925...DL3EW
1926...DL7QG
1927...DJ1TV
1928...DA2DC
1929...WA1WTP
1930...WA5CST
1931...K5WE
1932...SM2HAG
1933...K0CF
1934...KB5DQ
1935...DL9DB
1936...K4SE

C.W. and Phone

4810...WA8OVC
4811...WA3DMH
4812...AI9F
4813...OH2PQ
4814...JA3ANW
4815...W9TY
4816...KB3ES
4817...W9YAE
4818...F6CWA
4819...WB9ZKK
4820...K5TSQ
4821...SV1IW
4822...G4CQK
4823...VE1ALJ
4824...YU3TUX
4825...WB8POK
4826...WA1FCN
4827...W0TT
4828...W2FC
4829...SM7EL
4830...SM6HTC
4831...JR1FVW
4832...DF3AS
4833...W4WJ
4834...VE2FGU

Applications and reprints of the latest rules may be obtained by sending a self addressed stamped envelope (30 cents) size 4½ × 9½ to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. Applicants forwarding QSL cards either direct to the W A Z manager or to a check point should include sufficient postage for the safe return of their QSL cards. The processing fee for all C.Q. awards is $5.00.

No - 31-32

was still strong and those old eyes for a split second once again sparkled like we remembered them from a long ago era. He spoke of some of his visits such as Sikkim, Bouvet, Aldabra, Desroches and countless others of the rare and exotic. Then the fellow announced in that all too familiar sweet southern drawl that he had held some 169 callsigns during his DXpeditioning career.

"The applause started as a low rumble from across the room, and built into a shattering crescendo as the much-traveled one received a long standing ovation. There was hardly a dry eye in the house when the tribute ended and the old gent silently slipped from the room, disappearing into the Dayton crowd. I guess there are those who were with me in the audience that day who until now still do not know who our visitor was. His being there took us back several years to a time when chasing the new one was somehow more fun than it is today.

"Thanks, Gus, for helping us remember."

For those interested in that "golden era," Gus, W4BPD is publishing a series on his famous DXpeditions in *The Dxers Magazine*, P.O. Drawer DX, Cordova, S.C. 29039.

Here and There

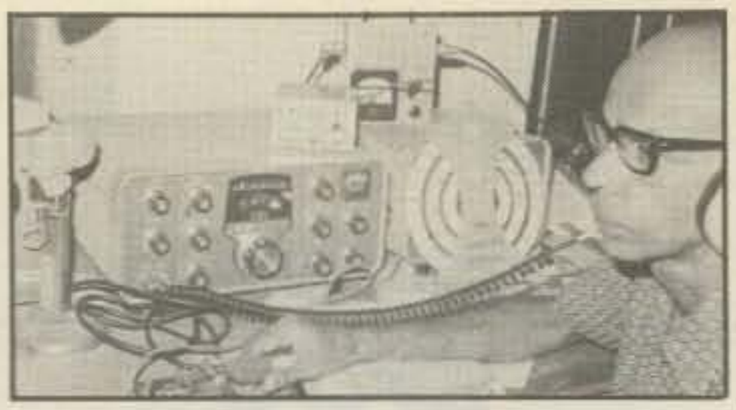
160 Meter DX—Stew Perry, W1BB, (DX Hall of Fame—1968) is still offering the *160 Meter DX Bulletin* free to anyone who sends a self-addressed, stamped envelope to his home QTH, 36 Pleasant St., Winthrop, MA 02152. Stew has published this bulletin since 1932. If you are interested in the ultimate DX challenge, try 160.

Stew congratulates Ed, WA4SGF, on working all states by 160 meter *mobile*. Ed worked KH6CC during the 1979 CQ Worldwide C.W. Test, report 4/4/9, for his 50th state with the mobile rig on top band.

New DX Bulletins—The Japan DX Radio Club is now publishing an English language bulletin for foreign countries. If interested, contact the editor, Kouichi Asai, JA8KB, 90-49, Oasa, Ebetsui, Hokkaido, 069-01, JAPAN. The President of JDXRC is JA3BG and Directors are JH1VRQ and JA8KB.

The *DX'ers Newsletter* is a new biweekly bulletin published "for the little guy as well as DX that's rare. If you haven't got it, it's rare." The editor is Roger Carson, WD4PEQ, P.O. Box 1458, Morristown, TN 37814.

Prefixes—EY6C is a special prefix in the Soviet Republic of Azerbaijan, Oblast 002. CI3LSS was a special events station by the Radio Club of the Listonal District School in Ontario.



Kris, VU2KMK, is looking for the U.S. on 14028 daily from 0100 to 0200 GMT and again from 1200-1400 GMT using an SB-101 to a dipole. QSL to Doug Hendricks, N7UT, 4906 Pinewood Drive, Salt Lake City, UT 84107. (Photo via N7UT)

OE25 was used by Austrian hams last spring as a jubilee celebration.

A Lidville Limerick by WA4JTI—

A Dxer not knowing the call,
Entered a pileup deep wall to wall,
After calling all day,
Much to his dismay
He found that he'd worked Montreal.

The moral—next time you hear a pileup on a strange prefix check it out before you dive in. You might not need it.

An American At The Other End

The following article was written exclusively for the *CQ* DX column by Art Candell, HH2A, who has provided a first Haiti contact for many happy DXers. If you are intereted in the trials and tribulations of an American operating at the other end, please read on:

Many hams, listening to the exotic flow of communications originating out of the U.S.A.—much from expatriate Americans, who dream and fantasize that someday they too will somehow get the opportunity to sit on the other side of a DX pileup with some sort of a rare call to fascinate their compatriots, chairbound to some prosaic stateside call area.

Quite a few years ago, I too had this dream, which eventually materialized following my becoming a foreign correspondent for a leading wire service which led to various rare, and not-too-rare, QTH's—and much of the dream came true, but by the same token, it ain't all milk and honey.

During the regime of the late Francois Duvalier, and for several years of the reign of the present President, Jean-Claude Duvalier, hamming was forbidden in Haiti, except for a few special fortunate ones who held an "HH" call by special permission, and who were seeked out as a real special rarity.

Unfortunately I was not one of those privileged ones. But when the ban was lifted 2½ years ago, I was one of the first to become officially licensed and shortly thereafter

CQ DX Honor Roll

The *CQ* DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Total number of countries on the list as of deadline is 319. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the *CQ* DX Honor Roll, annual updates are required. Honor Roll updates may be submitted at any time, in any number. Updates indicating no change will be accepted to meet the annual requirement. The fee for endorsements involving the issuance of a sticker is $1. Other updates require an SASE for confirmation of total. The basic award fee is $5.

C.W.

W6PT	319	W3GRS	314	W4BQY	307	N6FX	298	DJ7CX	287
ON4QX	318	N4PN	312	N6CW	305	DL3RK	294	JA1GTF	286
K6EC	316	K6JG	310	W2GT	304	W1NG	293	W4OEL	284
W9DWQ	315	W8KPL	308	K9MM	304	WA8DXA	289	K3FN	283
W6ID	315	N6AV	307	K4CEB	303	N4MM	289	JH1VRQ	275
DL7AA	314								

S.S.B.

WA2RAU	319	F9RM	316	YV1KZ	312	W0YDB	302	VE7HP	289
W6EUF	319	WA2EOQ	316	ZL1AGO	312	WB6DXU	301	G4CHP	289
W9DWQ	318	K6YRA	316	W0SD	132	W0SR	301	K5DUT	287
K8DYZ	318	W4SSU	316	W6RKP	311	DL6KG	300	WA4JTI	286
W3NKM	318	W3CWG	316	W3GG	311	HP1JC	300	W7OM	285
W6REH	318	W4UG	316	K6XP	311	N6AW	300	YS1O	285
XE1AE	318	K6JG	316	VE2WY	310	WA4WTG	300	N5FG	285
W4EEE	318	ZL3NS	315	DJ9ZB	310	K8LJG	299	K1UO	282
W2TP	318	VE3GMT	315	F2MO	310	I5WT	299	VK4VC	281
I0AMU	318	K4MQG	315	K5OVC	310	K8PYD	297	W6DN	281
K6WR	318	K9LKA	315	I4ZSQ	309	OE3WWB	296	I0MBX	279
K2FL	318	SM6CWK	315	N4MM	309	I6PLN	296	K9HQM	278
VE3MR	317	K6EC	315	N6AV	308	DJ7CX	295	AI8S	277
DL9OH	317	I8YRK	315	W0SFU	308	F9MS	294	K3MWV	277
TI2HP	317	SM6CKS	314	W9SS	306	W9DQ	294	W4BQY	277
I0ZV	317	OZ3SK	314	XE1KS	306	VE3FJE	294	JA6GDG	276
W3GRS	317	ZS6LW	314	YV5DFI	305	W1NG	293	ZL1BIL	276
W9JT	317	EA4LH	314	W8ILC	304	LU1BAR/W3	292	I8KNT	276
I8AA	317	K9MM	313	DL6KG	304	JH1VRQ	292	YU2RTW	276
W9KRU	317	G3FKM	313	VE7WJ	303	K4LSP	291	XE1CI	276
I8KDB	317	N4WF	313	I3LLD	303	K9RF	290	AA4A	275
W3AZD	317	W4DPS	313	DK2BL	302	9H4G	290	DJ2AA	275
W9QLD	316	W6YMV	313	N2SS	302	VE7CE	289	K9PPY	275
VE3MJ	316	OE2EGL	313	W6FET	302	OK1MP	289		

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started operating with my call, HH2A.

For one of those strange reasons, unaccountable by propagation formulas and rational explanations, my home, perched about 800′ over sea-level and overlooking the Caribbean in Haiti's capital city, Port-au-Prince, turned out to be one of those hot, fantastically good, propagation spots for no apparent reason, consistently bringing in S9+ reports using low power. When I went on the air, this good signal together with the still rare "HH" prefix brought an overwhelming response. A rational QSO was all but impossible, and the thrill of working a pileup with 500 stations, all seeking an HH card, which constituted the bulk of contacts, was soon lost in the inability of holding a nice, peaceful rag-chew with a single station. To avoid this, it became my habit, at that time, to operate on the low end of 14, 21, and 28—outside of the American band, where, guiltily, I picked up so much DX, unencumbered by stateside stations that soon, this too became a jaded situation as cartons and cartons filled up with DX cards from just about every country with electricity to power a transmitter.

The pressure became less as more and more "HH" stations went on the air, enabling me to make more personal contacts resulting in many interesting and lifelong friends in the states—one of the great spinoffs of ham radio. Let's go into a bit of detail at this time concerning the fun and problems of an expatriate American ham with the call, HH2A.

One of the most exciting DXpeditions of the decade was the 8Z4A Neutral Zone expedition carried out by the Royal Jordanian Radio Society in celebration of the 44th birthday of King Hussein, Nov. 14, 1979. A total of 40,800 s.s.b. and c.w. contacts were made on 80-10 meters. This series of photographs, taken during the DXpedition, were given to K4IIF at the Fresno DX Convention by Mohammed Balbisi, JY4MB, a member of the Executive Committee of the Society and one of the DXpedition operators.

Mohammed, JY4MB, takes a break.

Naiel, J Y5US, is rested and ready to hit the rig again.

Hassan, J28AA, needs a stretch after a long turn at the operating position.

Mohammed, JY4YJ, and Zedan, JY3ZH, pose at snacktime.

First the pleasures. Perhaps the best is the attachment to the American culture. Here, away from the MacDonald's, gas shortages, weather and local politics of the U.S.A., ham radio provides, at least for me, a very necessary positive, psychological link with the small things going on in the homeland... snowstorms, elections, and many other events taken for granted by you, but missed by those not involved. It's nice to know that a phone patch can be made during an emergency, and again, most of all, there is the rewarding experience of accumulating a large group of wonderful friends in almost every state.

One frequently hears of the discourtesy of the American ham but possibly with the exception of some profane and outlandish procedures during the heat of pileups, this is largely untrue. I would place American hams about in fourth position, worldwide, in operational procedure. Perhaps in first place would come the Canadians, followed by Japan, Germany and England. Unfortunately at the rock bottom of the scale, and I know this will bring a lot of outcry, is the operation coming out of various South American countries, notably, Venezuela and Colombia.

When talking to a foreign ham, under no conditions discuss politics in his country. Few countries have the total freedom of the American to criticise or expound his theories, and it is a good idea to stay away from politics, local or international, as well as any other subject which can be even remotely deemed controversial. While the American ham can talk about almost anything except using the ham bands for business or commercial purposes, many countries specifically provide a broad spectrum of penalties for discussing politics, religion or other taboos. To be safe, use discretion and don't get on matters which might, without your being aware, put the ham on the other end in an embarrassing situation at the very least.

QSL cards can be quite a chore, and an expensive one as well. Despite my continuously and clearly identifying my QSL manager, Frank, AJ9D, I continue to get cards mailed directly, with no IRC's enclosed, pleading "please QSL." Impossible. It costs me about 60¢ to airmail a card direct,

CQ DX Awards Program

S.S.B.

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859	WB5RQM	866	WD0EPE
860	W7KNT	867	VK2FD
861	K9TI	868	WB3FIY

C.W.

429	K9TI	433	UA6AAF
430	UA3ADY	434	UW9AT
431	UL7PBN	435	UB5LCN
432	UA6AJF	436	N6AXD

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310	W0SD/312	275	K9HQM/278
310	K6XP/311	275	W4BQY/277
300	N4MM/309	250	KB8KW/251
300	W0SFU/308	200	WB3DJF/203
300	YV5DFI/305	150	WB3FIY/154

C.W. Endorsements

300	W4BQY/307	200	VE7CNE/203
275	N4MM/289	200	N8BM/203
250	W0SR/254	150	UA4LM/175

The total number of active countries as of deadline was 319. Complete rules and application forms for the CQ DX Awards Program may be obtained by sending a business size no. 10 envelope...self-addressed and stamped to Billy Williams, N4UF; CQ DX Awards Manager; 911 Rio St. Johns Dr.; Jacksonville, Fla. 32211 USA.

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and the quantities make for a situation in which I would soon go broke. In the name of all overseas amateurs with a stateside QSL manager, please send him your card *together with an SASE.* In 99.99% of the cases you will quickly receive a response.

A pet peeve of mine is "QSL Bureaus," which appropriate my IRC's and return envelopes—everything but the card, which I receive sometimes as much as two years after it was mailed. Don't send me your card via a "Bureau." QSL'ing for an overseas station is a thankless, expensive, and time-consuming task. Sadly, we do not need your cards, but knowing you need ours, we attempt to do the best we can, and the best is via a QSL manager. If you *DO* QSL direct, you won't get a response without some IRC's—sorry about that, and so much for QSL'ing.

Basically, after many years of hamming I am a rag-chewer. If I am so engaged, and you badly need "HH2" for your DXCC, and are biting off bits of your mike in anticipation, please don't start yelling "BREAK!" or jump in on top of the QSO. Please wait, wait patiently, until it finishes, at which time, I'll be more than happy to meet you. There is an exception however. During an "anything goes" pile-up, by all means, flip on the linear and get into some of that good, old, all-American competition; just don't lose your cool. We enjoy it at this end as well, but keep your transmission brief with just a signal report and basic information. Cruelly, we have no interest in your WX, what kind of a rig and antenna you have and the phonetic spelling of your QTH, "Watahootchie-On-the-Smilhawonga River." We don't care how old you are or where you make your bread. Tell us all this at some other time when we can lend a more sympathetic ear. Your face would turn red if you knew what the other hams attempting to make contact during your long-winded discourse were calling you!

One of our truly great pleasures is having one of you from the states stop in to visit us, and perhaps for the first time, sit on the downwind side of DX. Your excitement and thrill is a joy to behold! If you intend to do some hamming while visiting a foreign QTH, be advised that their regulations are totally different, and in many cases conflict with those to which you are accustomed.

In no case pack that shiny new transceiver and associated gear in your suitcase and blythly attempt to carry it through customs. In many cases it will be picked up. If you send it down, you might have to pay a duty almost equal to its cost to get it out of customs. Your best and most reliable source is a resident ham. Ask him about procedures, licensing, operating, etc. He, in most cases, will be happy to assist you. Don't rely on information obtained from foreign consulates and embassies in the U.S.A., as in most cases they are quite misinformed. The resident ham is the guy to help you.

We living overseas do not have the network of sophisticated Coast Guard services, Civil defense procedures or other highly developed assistance in time of emergency disasters such as hurricanes and earthquakes. If you hear an emergency call during such a disaster, if you can help, jump in, otherwise, to put it bluntly, SHUT UP. More interference is caused by hams attempting to be genuinely, but ineffectively, helpful than by the more notorious freaks and psychopaths who get some sort of sick, vicarious pleasure in disrupting an emergency net where lives and property are genuinely at stake. If you are totally uninvolved, if you live in Iowa or Kansas, for God's sake, don't break into a hurricane net and ask for the latest coordinates. Put on your TV and find out; stop asking for inappropriate information totally not applicable. If the net control operator asks a *specific* station to relay information, and it isn't you, even if you heard the information requested, don't respond. If there appears to be difficulty after that, wait for a lull, and *REQUEST* permission to relay.

By and large, with very few exceptions you're wonderful members of a great fraternity. I can truthfully say that you fulfill an important part in the lives of overseas Americans fortunate enough to be amateurs. God Bless you and thanks for being on the other end.

73, John, K4IIF

The WPX Program

Mixed

839...JA5ESR
840...N6PV
841...DM3WYJ
842...HA9RE
843...VE3IPR
844...YU2RQN
845...DF7GK

S.S.B.

1268...N4IB
1269...9G1JI
1270...9G1JU
1271...WB9TDR
1272...JH5FQO
1273...IT9YSW
1274...JA5NG
1275...JA6JNF
1276...EA1ACH

C.W.

1943...JA5SIX
1944...PA2CHM
1945...W0YBV

VPX

188...DL-E02-1659-861
189...JA0-2791

Endorsements

Mixed: 400 JA4ESR, N6PV, DM3WYJ. 450 K7PJO, VE3IPR, YU2RQN, K9BQL, DF7GK. 500 W0UBT, VE3DUS. 550 K7AGJ. 600 JA7FFN/1, N4IB. 650 VE1MX, W6YMH. 700 N3RL, I5AFC, N8BM, LA7JO. 750 KL7AF. 800 W2HAZ, WA8QIY. 900 K9BG. 1000 W0SFU. 1900 YU2DX.

SSB: 300 WB9TDR, JH5FQO, JA5NG, JA6JNF, EA1ACH. 350 9G1JI, AC2J, WB0LXM. 400 N4IB, K9BQL. 450 9G1JU, IT9YSW. 600 EP2TY, N3RL, KL7AF. 650 I5AFC. 700 W5ILR, DL7MQ. 1100 WB2NYM.

CW: 300 JA5SIX, PA2CHM, W0YBV. 350 K7PJO. 400 N3RL, SM6INC. 450 IT9VDQ, WB3JUK. 550 N8BM. 900 W1WLW. 1450 DL1QT.

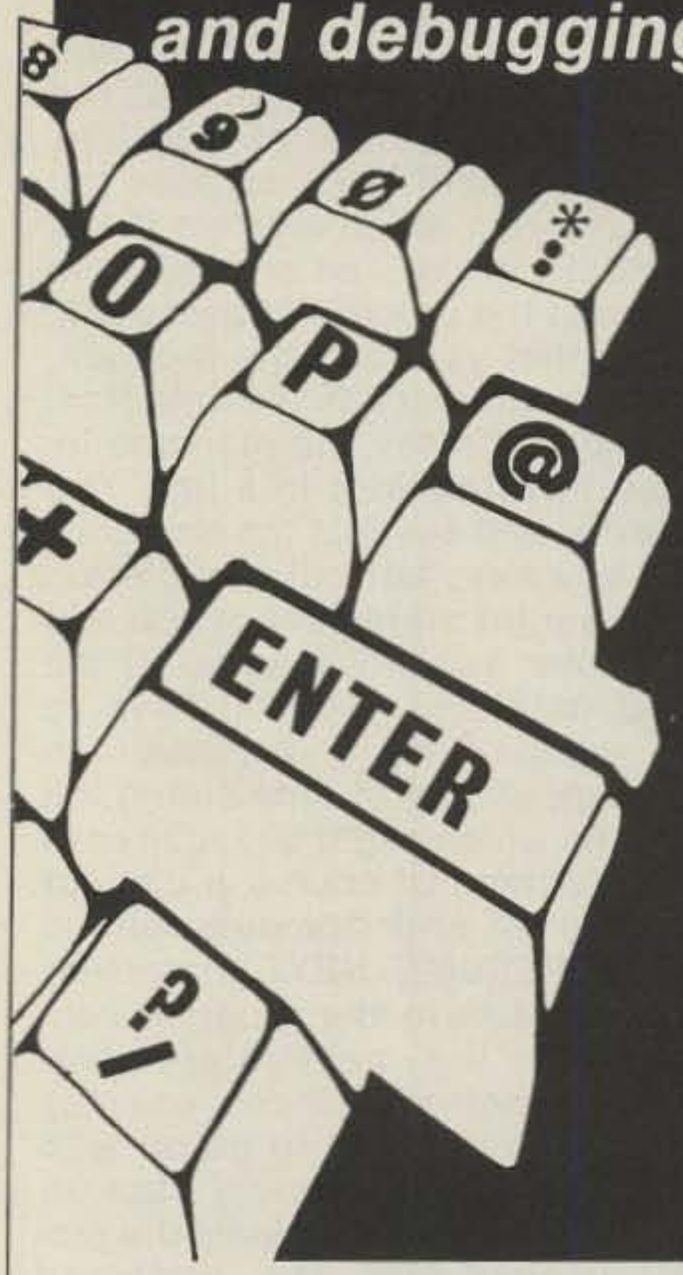
15 meters: KL7AF, I0RIZ.
20 meters: N4IB, JA5SIX.
Asia: JA4ESR, OE1KJW, I0RIZ.
Europe: WB8ZRL, K7PJO, N0ZA, DF8ZH, WB3JUK.
No. America: AC2J
Oceania: JA4ESR.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, 5014 Mindora Dr., Torrance, Calif. 90505. U.S.A.

QSL Information

A7XE - Via DK3GI
A7XH - To DJ9ZB
A7XM - c/o DJ9ZB
C9AA - Via EA1QF
CN8AK - To WA3HUP
CR9AK - c/o VS6AG, P.O. Box 541, Hong Kong
D68AP - Via WB2OHD
EA6GB - To WB1DQC
EL2AV - c/o N6FL
EL9RL - Via W9YD
FK8CR - To W7OK
FK8BW & FK8CQ - c/o DJ5CQ
FO8DX - Via K1MM
HH2VP - To N4XR
HK0BKX - c/o WB4FQH
HI8QW - Via VE3LMW
HL9UN - To KA6B
HL9WY - c/o AF7V
HM1NN - Via JK1HCE
HS1AMT - To W2TK
HT1AR - c/o K7UU
HV3SJ - Via I0DUD
IJ7BVS & IJ7DMK - To I2DMK
J3AE - c/o K1EM
J3AH - Via W2GHK
J3AO - To W4YHB
JY5ZM - c/o WB4RRJ
KA6WW - Via AJ6M, 810 Camino Cortez, Yuba City, CA 95991
K7SE/VP2A & K7SE/PJ5 - To John Irwin, 2744 North Tyndall Ave., Tuscon, AZ 85719
KS6BV - c/o WB6FBN
OA4AWD - Via VE2AQS
OA4TZ/OA9 - To WD4PEQ
OD5FB - c/o WA2QAU
OD5JP - Via DJ9ZB
S79MC - To N4NW
TI9CC, TI9JVA, & TI9XXX - c/o TI2CF
TL8WH - Via W5RU
TU2IN - To K3HBP
TZ4AQS - c/o ON6BC
VP2AJ - Via WB2TSL
VP2AZG - To WB4SXX
VP2EEW - c/o WD9ALG
VP2KAJ - Via WB8LDH
VP2MFI & VP2MFJ - To K1RIF
VP2MOC - c/o K2YY
VP2VEJ - Via WB3KGY
VP2VEN - To K5GOE/6
VP2VEZ - c/o W5HF
VQ9DM - Via K1BZ
VQ9TT - To WB5DCY
VQ9WE - c/o WA6IJZ
VS5KV - Via N2OO
VS6CT - To WD9WPR
W6ENK/KH4 - c/o WB9FMC
WA1GXE/C6A - Via G.C. Mitchell, P.O. Box 509, Marsh Harbor, Bahamas
W7LPF/DU2 - To N2CW
XT2AW - c/o KN1DPS
YB0ACL - Via W4QO
ZD7HH - To W4FRU
ZD8TC - c/o N2CW
ZK1CE - To George Adkins, AD1S, P.O. Box 32735, Oklahoma City, OK 73123
ZK1DR - Via W0WP
ZS1DM - To WA4JQS
ZS3HL - c/o WA1ZXF
3D2CC - Via VE6AKV
4S7JA - To VE3IPR
4X4BL - c/o WA2KNC
4X4JS - Via WA2KWP
4X4XB - To KA5BBL
5N0NAS - c/o W89MFC
5T5AY - Via W4LZZ
5T5CJ - To W4BAA
5Z4YW - c/o VE3AHV
6H1J - To XE1J
7X5AH - Via AD1S, P.O. Box 32735, Oklahoma City, OK 73123
8P6OH - To W2FLO
8Q7AR - c/o K2TJ
9A10NU - Via I4ZSQ for contacts in 1980 CQ WPX Contest
9J2BO - To W6ORD
9K2DX - c/o W6LV
9M6MU - Via N2CW
9V1TX - To N5FN

Me make a mistake? Impossible! Well, maybe. K8BG takes us through some of the special features the Radio Shack TRS-80 provides for dealing with testing and debugging programs.



INTRODUCTION TO BASIC

A Computer Programming Language

Part IX - The Level II EDIT Mode

BY BUZZ GORSKY*, K8BG

In part eight of this series on BASIC, we examined some of the techniques which are useful for testing and debugging programs. The TRS-80® has a number of special features which are particularly helpful with this process, and most of this segment will be devoted to those.

The Level II system has an **EDIT** mode which permits the alteration of BASIC program lines with a minimum of fuss. Often a syntax error will involve only one character of a line. If that line was a full 255 characters, nearly three lines, on the screen, in length, then it would indeed be frustrating to have to retype the entire line. Furthermore, in the retyping process, the odds of injecting a new error would be large. In order to facilitate the editing process, the EDIT mode makes it possible to make changes, including additions and deletions to program lines, with a minimum of retyping.

The edit mode is entered from the command mode by typing EDIT followed by a currently valid line number. If the entire line were to be deleted, then it would be simplest to type **DELETE** (line number) rather than using the edit mode. However, if the line is to be mostly or partly saved, then the editor can be used. Once in the edit mode it should be possible to make as many changes in a line as desired, without returning to the command mode until all changes are complete. One can return to the command mode by hitting **E** for exit, or by hitting the **ENTER** key. If editing mistakes are made, then the alterations will be ignored and the line will be left unchanged by typing **Q** for quit.

Once in the edit mode, there are several ways of moving to the place where the programmer wishes to make changes. If the space key or the left-arrow are hit, the machine will space or back-space thorough the program line one character at a time. One can also type a number followed by either space or left-arrow and the machine will space forward or backward the number of characters indicated. One can also use the **S** for search command. Suppose what you wish to correct is located just after the second equals sign in the line. You would then type **2S=** and the machine would search for the second occurrence of the equals sign and stop right there. In each case the number preceding the letter **S** indicates how many of the characters to search and the character indicates which character. Whether it's easier to space through a line, or locate a spot with the **S** command, depends on the circumstances or personal preference. In a complex line with lots of parentheses it may be easier to just space thorough the line rather than start counting parentheses in order to search out the correct one. On the other hand, if there is one dollar sign two and a half lines into a program statement, and you wish to correct something that occurs just a few characters after that, then **1S$** will certainly do the trick.

Once you find what you want, you can change, delete or insert material. To change characters you type a number followed by **C** for change, and the machine will then let you type the number of characters indicated, and it will replace the current characters with what you type. You will see the changes as you do the typing. If you do not type a number then the **C** command will let you change one char-

*712 Hillside Drive, Carlisle, PA 17013

acter. You can delete characters with the **D** command. As with the change, a **D** preceded by a number will delete that many characters while a **D** alone will delete one character. You will see the deleted material indicated on the screen between exclamation points. Once you have deleted material, be careful about spacing through that material since you will be spacing through material which appears on the screen, but no longer exists in the computer's memory representation of the program statement. Thus after doing deletions, if you wish to make further alterations in the line, it is best to hit **L** for list, twice. The first time you hit the **L** the machine will display the rest of the program line, and the second time it will display the entire line, with the deletion made. (You can use the **L** command at any time in the edit mode, not just here.) Material can be inserted with the **I** command. After typing **I**, any text that you type will be inserted into the line.

In order to make more than one change in a line, it is convenient to be able to leave a given sub-command and not return to the command mode, but rather remain in the EDIT mode. This is done by holding down the shift key and hitting the up-arrow. So for example, if you have inserted some material and you now wish to space through the statement seeking another error, you can hit shift/up-arrow, and you will then be able to execute any other of the EDIT commands.

The **K** for Kill command provides a quick way of doing some deletions. If you are at the space where a string, located between two quotations, appears, and you wish to delete the string and then insert another, you could count the characters in the string and hit **nD**, where **n** is the number of characters. You could also type **1K"** which would delete from the current location through the next occurrence of the quote character; the quote character would not be deleted. You would see the deleted material inside exclamation points, just as when using the **D** command. After the deletion, it would be easy to use the **I** command to insert new material.

The **X** command moves to the end of the program line and places the programmer in the insert mode. That is the command to use when you wish to add material to the end of a line. The **H** command is another special insert command. It will delete all of the line following wherever the display is located and will accept new material in the insert mode. The **A** command is the last. Like the **E** command **A** ignores previous corrections. But with **A** you remain in the EDIT mode.

As you can see the EDIT mode is a great time saver during the editing process. Features of the command mode can also save a great deal of time. Most program statements can be typed in the command mode and will be executed, and those that will not will result in an error message. How is that useful? Well suppose you have a program which requires that a fair amount of data be entered from tape during the process of execution. Suppose that you load the program, then the program loads the data from tape. Then let's say the machine indicates a syntax error in a line. You list the line and see that the only error is that you have left out a quotation mark in a print statement. If you edit the mistake, you will lose all of the entered data and you will have to begin again. Such a process can waste a great deal of time during the many runs which might be required in a long program. Of course you might have used an error trapping routine with the **RESUME NEXT** statement which would have the program continue with the next statement. However, in some instances, you may not want the program to go on with the next statement in every case. In such instances, you can keep the program running from the command mode. Let's say that the quotation mark error is in a single statement line (that is the **PRINT** statement is the only thing in the line) and that the number of the next line is 125. Since the print statement is not mandatory for the completion of the program, you can type **GOTO 125** in the command mode and the program will continue with line 125, effectively ignoring the error. You can then note the error on a scratch pad and correct it after the program run is complete. On the other hand, suppose that the line with the quotation mark error continues with some computational statements which cannot be ignored if the program is to run properly. Must you then resort to editing and starting again? No! In the command mode you can duplicate the required parts of the statement, ending with **GOTO 125** and then the program execution will continue as if the error had not occurred.

While in the command mode you can change the value of variables without causing termination of program execution. Let's say that you see that a string variable which is used in various parts of the program, and is supposed to be set to the null string after each part, was not set to the null string in a given place. Again, if you add a statement to do that, you will be editing the program, and you

will not be able to continue execution. However, you can type **Z$ = ""** in the command mode and then type **CONT** to continue the program.

The command mode can also be used to re-do something that has not occurred properly. Suppose that there are ten **INPUT #-1** statements in the program for acquiring data from tape. Nine do OK, but the tenth generates a faulty data message. You can run the tape back to the point required for the tenth statement and in the command mode type **GOTO n** where **n** is the statement number for the tenth **INPUT** statement. This will cause re-execution of that line, and hopefully will get the data into the machine. If there is really something wrong with the tape so that data will not enter, you could enter it all by hand in the command mode, assuming of course that you knew what the data was. Once you begin to use the command mode in this fashion to help during the debugging process, many similar examples will become obvious to you.

I will conclude this segment by introducing two branching statements which can help to keep a program organized and easy to use. These are the **ON N GOTO** and **ON N GOSUB** statements. In each case a variable **N** is used to control where the program will go. Suppose you have a program that takes care of the station log. On line 100 the program begins a routine which lets you look at previous entries. On line 300 you can make new log entries, and in 500 the program will print out the log. You might use the following routine to operate the program.

```
50 PRINT "ENTER 1 TO EXAMINE
   LOG ENTRIES"
60 PRINT "ENTER 2 TO MAKE
   NEW LOG ENTRIES"
70 PRINT "ENTER 3 TO PRINT OUT
   LOG ENTRIES"
80 INPUT N: ON N GOTO 100,300,
   500
```

This routine would display the instructions and then let you enter a value for **N** from the keyboard. If you enter a **1** the program will branch to line 100, but if you enter **2**, it will go to 300, and if you enter **3** it will go to 500. Of course, you could accomplish the same thing with a series of **IF THEN ELSE** statements, but this is much easier, especially with a long list. You do have to be careful that **N** is within proper limits or things will get messed up. For example, in the little routine above, if **N** is zero or negative, an error will result. If **N** is four or greater then the program will ignore the **ON N GOTO** statement and the program will continue with the next program statement. Thus with some statements like this, it may be important to check **N** first. For example we could change line 80 to the following:

```
80 INPUT N: IF(N<=0 OR N>3)
   THEN 80 ELSE ON N GOTO
   100,300,500
```

Now the program would examine the value of **N** and if it were out of limits, line 80 would run again, giving you another chance to enter a correct value, before the **ON N GOTO** statement is encountered.

In some cases, you may wish to execute a subroutine based on an index variable such as **N**. In this case you can use the **ON N GOSUB**. . . statement where a series of line numbers follow. When **N** is **1** the first subroutine is entered, for **N = 2** the second is begun, and so on. As with any other subroutine, when the **RETURN** is encountered, the program will return to the statement following the **ON N GOSUB** statement.

While this month has not introduced a great deal of new programming material, these items are exceeding useful in the process of programming. In the next installment in the series, I will demonstrate a few additional BASIC statements which can be used to implement machine language programs through BASIC and I will discuss briefly machine and assembler language.

Contest time is fast approaching. W3RJ once again comes through with another simple modification to turn a Collins S-Line into a QSK contest machine . . . on c.w.

The Collins S-Line As A C.W. Transceiver With Full Break-In (QSK)

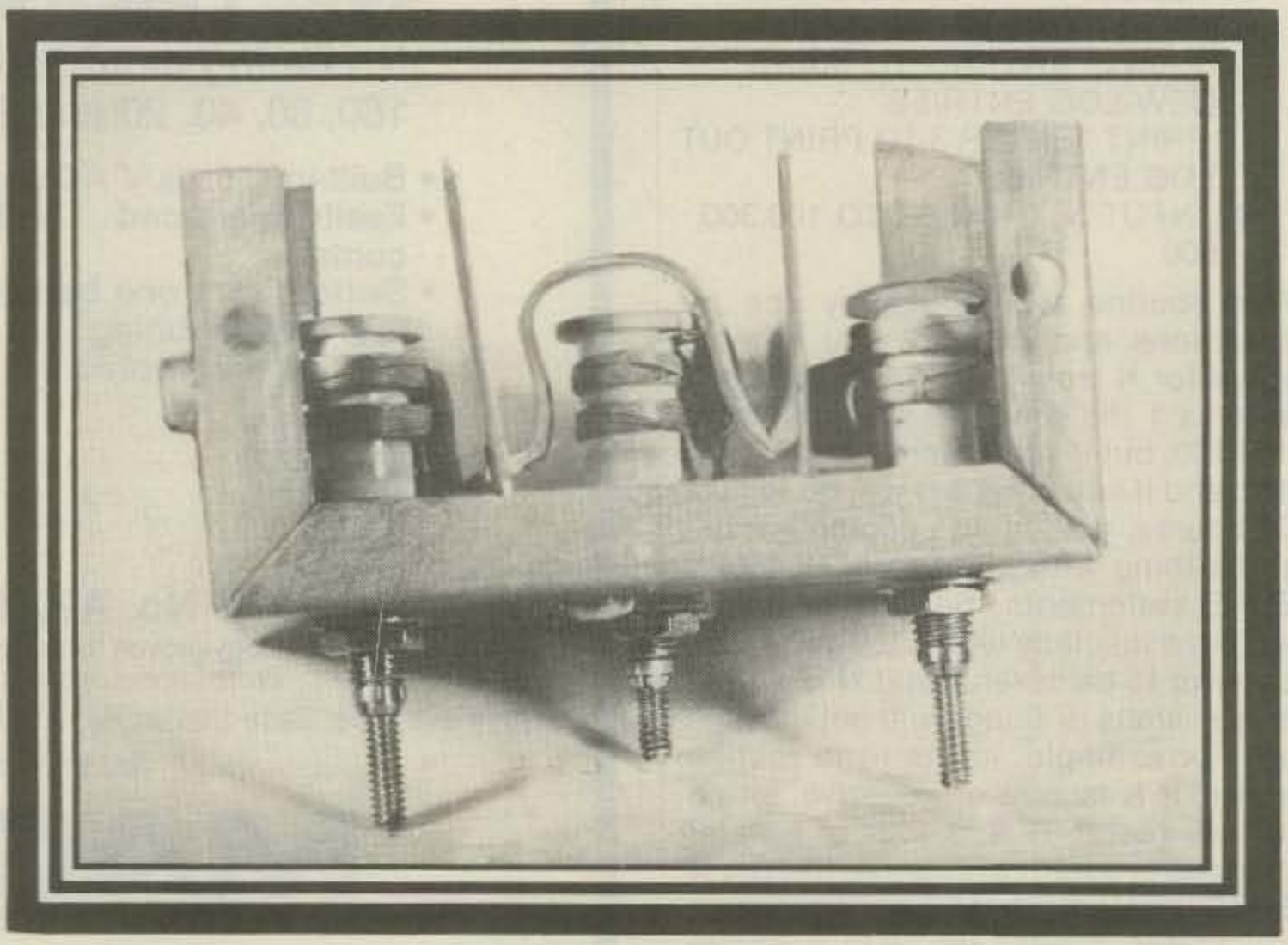
BY RICHARD KLINMAN*, W3RJ

In a pair of previous articles[1,2] I have described how to modify the Collins S-Line to operate full break-in (QSK) on c.w. The only thing standing in the way of perfection when using the S-Line in that configuration is the lack of transceiver capability in c.w. As originally supplied by Collins Radio, the 32S transmitter and 75S receiver cannot operate transceive on c.w. This note will show exactly how to achieve such capability. Only one very simple and minor modification to the 32S transmitter is required.

The 32S transmitter will not transceive on c.w. with the 75S receiver because the 32S b.f.o. uses the same crystal for both c.w. and s.s.b. If you attempt to transceive in the c.w. mode you will discover that the transmit frequency is 1.350 kHz away from being zero beat with the station you are listening to. The offset is exactly what is needed for u.s.b. but is incorrect for c.w. Other radio sets, like the Heath SB and Drake 4 series, are generous enough to supply the separate b.f.o. crystal in the transmitter for c.w. operation. The frequency of this crystal is selected for the correct offset for c.w. transceive operation. The same may be done with the 32S transmitter. With the price so high you would think that Collins Radio would throw in the extra crystal. The modification for the 32S transmitter enabling c.w. transceive consists of adding a 455.000 kHz b.f.o. crystal that is used only in the c.w. mode.

The required crystal can be obtained from International Crystal Mfg. Co., 10 North Lee, Oklahoma City, OK 73102, to the Collins specifications for the regular u.s.b. and l.s.b. b.f.o. crystal except the frequency which must be exactly 455.000 kHz. To physically match the two original b.f.o. crystals the case should be specified as F-700 with wire leads. The crystal's cost is $16.30 (at the time of this writing) and the International part number is 413243.* More frugal hams would do well to search the surplus market because many crystals in this frequency range are available. Of course, the same case and lead style may not be found. For example, one surplus house[3] has advertised what appears to be a usable crystal for $5.25.

To add the crystal, open the transmitter and locate the two original b.f.o. crystals Y12 (l.s.b., 453.650 kHz) Y13 (u.s.b. 456.350 kHz) and wafer S8F of



The 455 kHz trap filter. Note the internal shielding between filter sections to minimize b.f.o. feed through.

*RD 1, Flint Hill Rd., Coopersburg, PA 18036

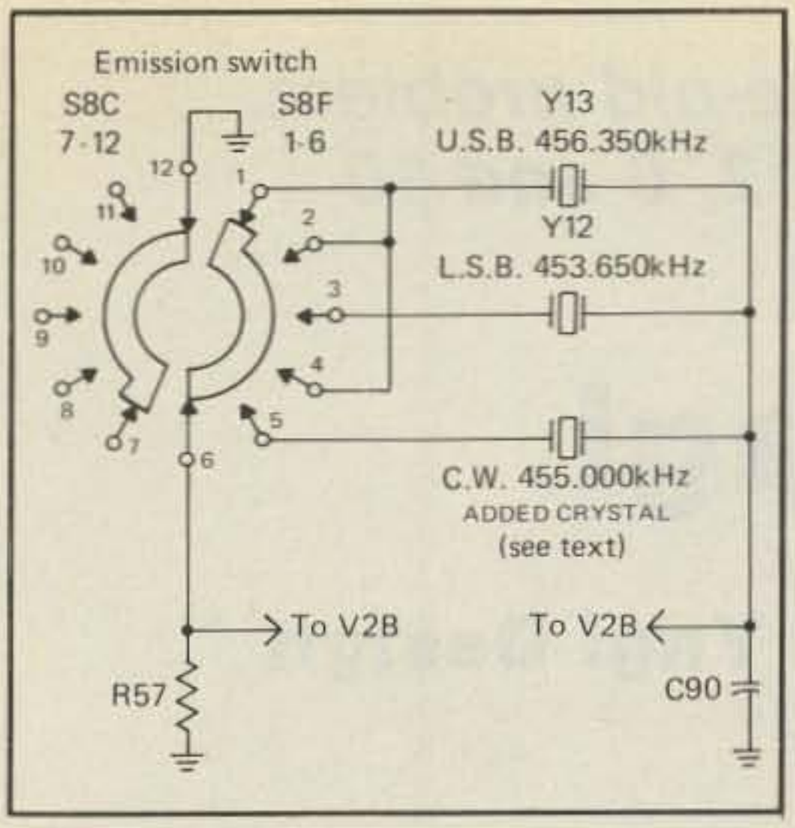


Fig. 1 - Modified 32S-3 b.f.o. circuit for c.w. transceive.

the emission switch. Follow the lead of the u.s.b. crystal Y13 to pins 1, 2, 4 and 5 of S8F. Cut out the wire connecting the u.s.b. position, Pin 4, and the c.w. position, Pin 5, on this wafer. Stack the c.w. b.f.o. crystal below the original crystals and solder one lead to the lug where Y13 and Y12 are joined. Cover the other lead with an appropriate length of insulation and solder it to the c.w. position, Pin 5, on wafer S8F. Tack solder a bare wire to the case of the new crystal. Do not solder to the bead of solder already on the crystal case. Solder the other end of the wire to the ground point used for the two original crystal cases. That completes modification of the 32S transmitter.

Adding the c.w. b.f.o. crystal allows transceive operation on c.w. However, after this modification the effectiveness of break-in operation when using the receiver v.f.o. is reduced due to b.f.o. backwave. Backwave will not be noticeable either before or after the b.f.o. modification when using the transmitter v.f.o. in "split" c.w. operation. The backwave arises from the free running b.f.o. oscillator when the QSK is in the c.w. position. An identical problem arose in modifying the Heath SB-401 for break-in. This problem was solved by keying the BFO.[4] Direct application of this solution to the 32S transmitter renders the spot button inoperative. In the S-Line the b.f.o. backwave enters the receiver through the v.f.o. transceive cable. This cable carries the 2.5 - 2.7 MHz v.f.o. signal from the receiver to the transmitter frequency control switch. Unfortunately, it also provides a parasitic path for the unwanted 455 kHz b.f.o. signal. The backwave has been eliminated through the use of a 455 kHz stop filter, or trap, as shown in fig. 2. The filter is inserted in the v.f.o. transceive cable near the transmitter. It is built in a 3 1/4" x 2 1/8" x 1 5/8" mini-box as shown in the photograph. Note the internal shielding between filter sections to minimize b.f.o. feed through. The filter is tuned until no b.f.o. backwave can be heard in the receiver with the transmitter frequency control switched to the receiver v.f.o. To accentuate the backwave during filter adjustment, a dummy load should be used as the receiver antenna. The backwave should be nulled to the point where it is completely inaudible. While the filter does have some insertion loss at the v.f.o. frequency, it has negligible practical effect on transmitter operation.

Operation in c.w. transceive is simple. Regardless of what audio tone the operator selects with the b.f.o. control, once the received signal is tuned in and peaked at the selected tone the transmitter is always exactly zero-beat with that received signal. Operation couldn't be much simpler than that. ▣

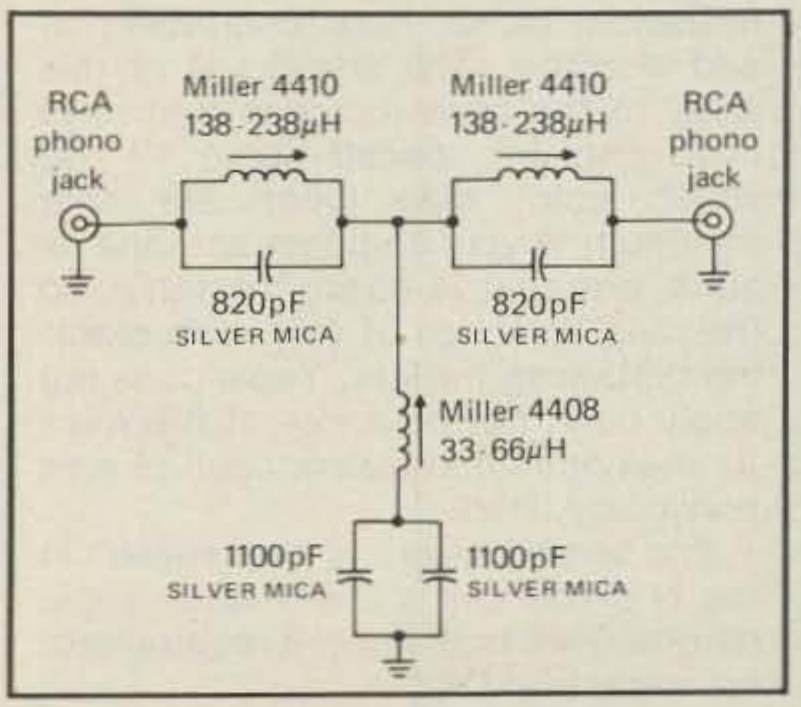


Fig. 2 - 455 kHz trap filter for the v.f.o. transceive cable.

Footnotes

*The International catalogue number is 413243 with specifications: frequency 455.000 kHz, CS (:01%), 26C, 20 pf; tsl type 57, holder type 09, load 02, fctr 00, Cal/1, angle -01.

[1] R. Klinman, "A Vacuum Relay TTL QSK Antenna Switch," *CQ*, July '76.

[2] R. Klinman, "Vacuum Relay QSK in a Commercially Equipped Station. Part I, the Collins S-Line," *CQ*, Dec. 1977.

[3] Lectronic Research Laboratories, Inc., Atlantic and Ferry Ave., Camden,N.J. 08104 (609-541-4200).

[4] R. Klinman, "Vacuum Relay QSK in a Commercially Equipped Station, Part II, the Heathkit SB400/401," CQ, July 1978.

Here's an interesting approach to an age-old problem. The basic design can be scaled for 1¼, 2, 6 and 10 meters.

The Ultra-Yagi

A Different Approach to U.H.F. Yagi Design

BY T.E. WHITE*, K3WBH

Ever since a couple of those wonderful folks who brought you the Z-car invented the Yagi-Uda antenna, amateurs have toiled countless hours to find the one combination of spacing, length, thickness, stacking distance, etc., that would produce the "perfect" beam. Some succeeded in developing fantastic gains, but nobody succeeded in making that gain (and attendant low s.w.r. and high F/B ratio) usable over more than a couple of MHz. This is just what we *don't* want at u.h.f., where antennas must perform well over wide ranges.

Here is a design that flies in the face of some "established" criteria, yet works over a spread of 10 MHz or more, while staying within usable gain, F/B and s.w.r. parameters. And perhaps the best "discovery" of all is that huge stacking distances are not required.

The antenna shown here is for use at 420-435, but it may be scaled to 1¼ or 2 meters or even 6 and 10. On 2, for example, it would also cover the upper end of the aircraft band and the satellite band, working well from 135 all the way to 148 MHz.

Our "Ultra Yagi" uses the *digonal* reflector system (no, not di **a** gonal) to preserve usable F/B ratio over a wide band. The reflector elements are longer than previous formulae would have them. All elements are of 1/8" rod. The boom is ¾" square tubing as is the reflector spacer.

The DE is not a ratio assembly but a straight folded dipole. It may be fed directly with 300 ohm line or with a 4:1 balun and coax, but coax losses at these frequencies are severe if runs exceed 25 ft. Impedance has been measured at from 240-260 ohms at the DE terminals (a lot higher than the 80 ohms one might think).

D1 is very close to the DE. D2 and D3 are equal length. Not until D4 and 5 are reached do we start shortening D's. And if we wish to add more D's, we do *not* do so at the far end. Rather we in effect break open the boom and insert D's of the same length as D2-3. The two forward-most D's remain at their staggered lengths (the last D is much shorter than you might think proper).

The antenna shown has 2 R's, 1 DE, and 5 D's, or an 8 element beam. Increase of slightly over 1.5 dB at max. gain point can be obtained by inserting 2 additional D's as explained above. The former D4 and D5 thus become D6 and D7, without change in previous length or difference in length.

Further gain beyond this can far better be obtained by stacking 4 bays vertically (assuming horizontal polarization) rather than continuing to add directors. The advantage of this array to the constructor is that bays need only be spaced about 19", at which point side lobes are near minimum. A very compact antenna results, one that is easily rotatable. So the "old" practice of very wide stacking distances for long Yagis does not apply here, nor do some of the rules for maximum aperture or capture area previously used.

The beam pattern is "squeezed" in the H plane and a lower wave angle results. This is the prime requirement for terrestrial DX.

If 2-bay stacking is used, a fairly simple parallel harness of open-wire line provides a roughly 125 ohm mid-

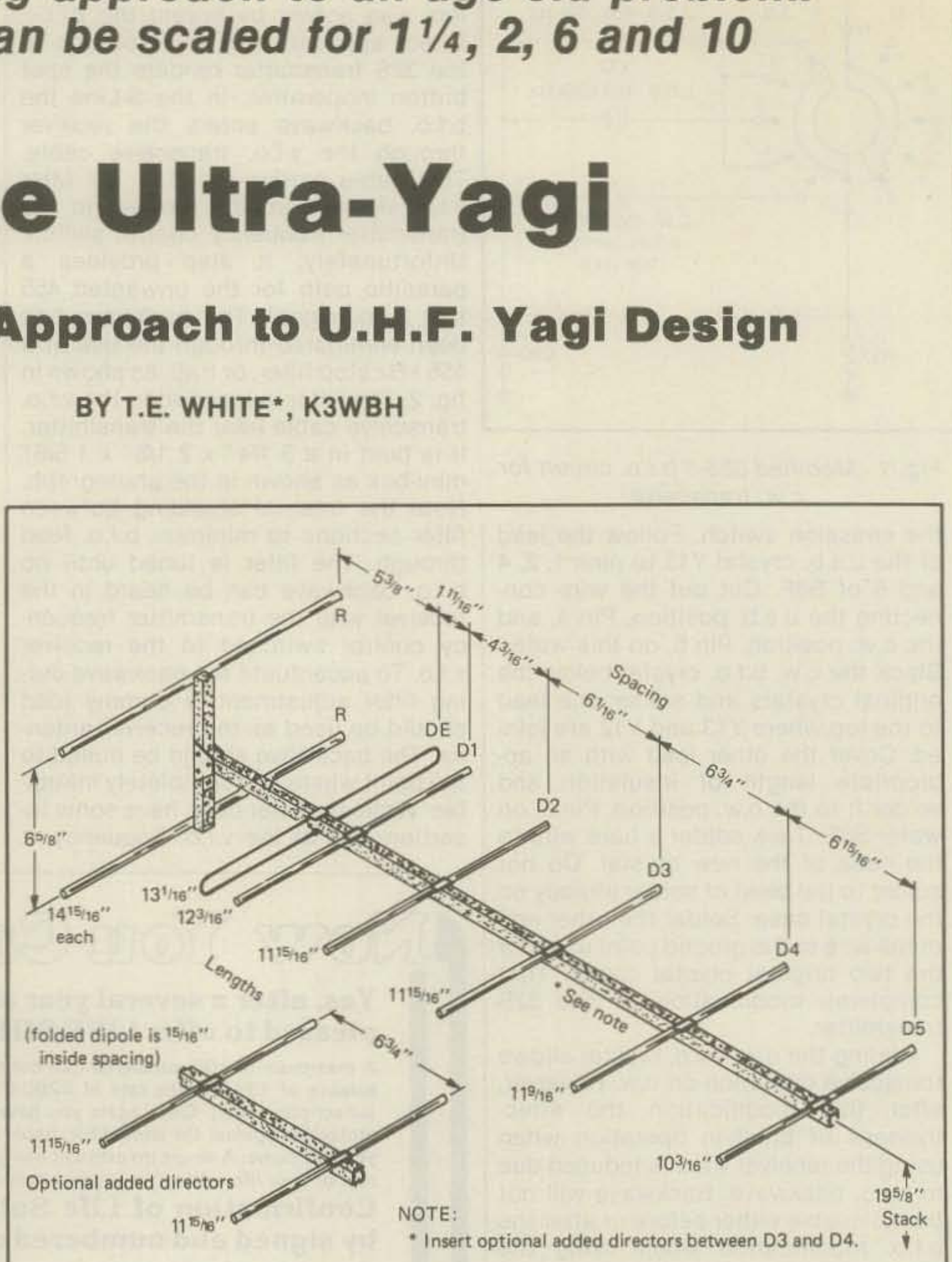


Fig. 1—Dimensions and spacing for the ultra-yagi.

*36 Lake Ave., Fair Haven, N.J. 07701

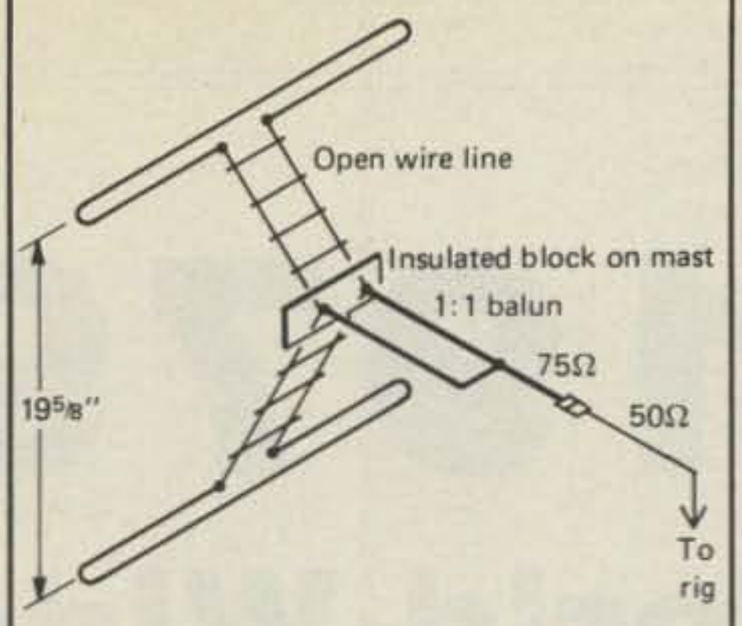
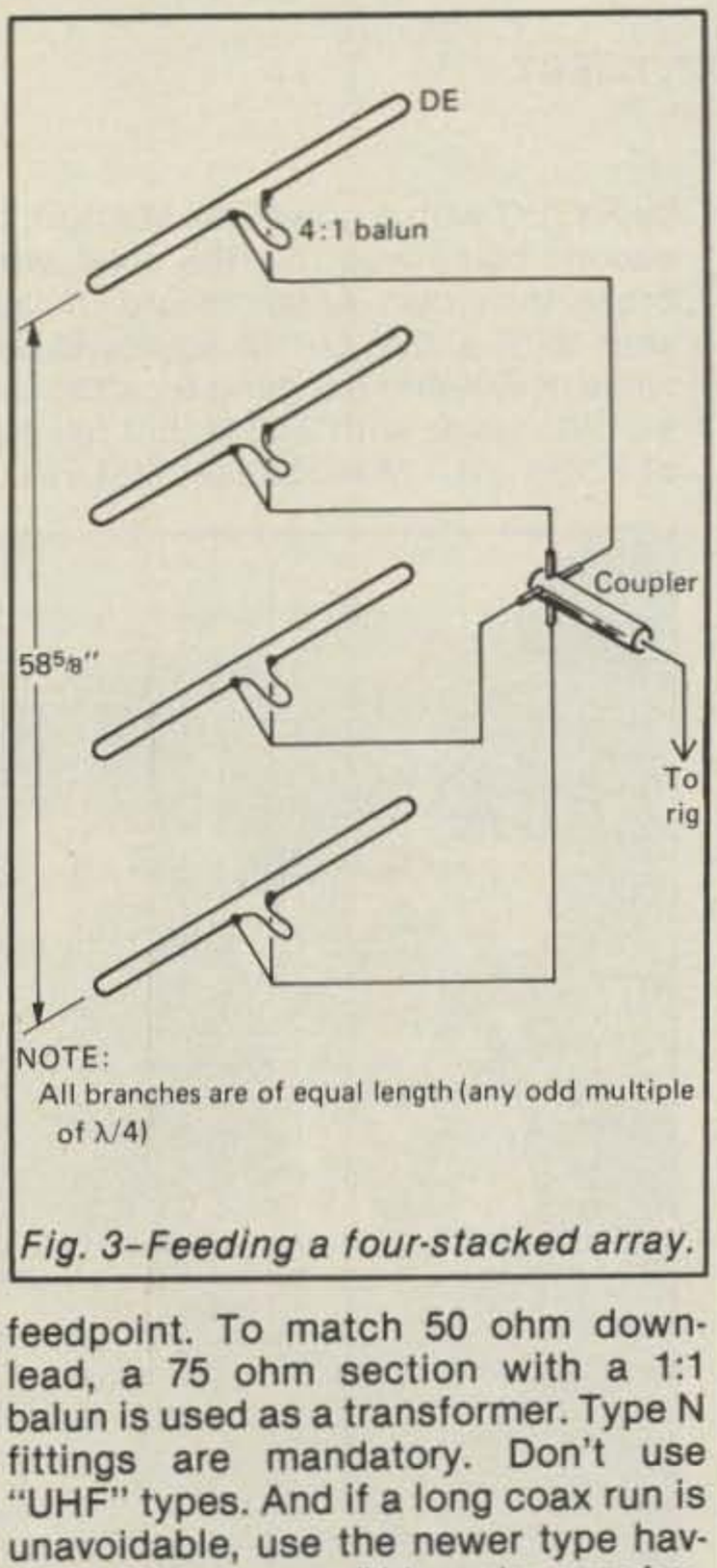


Fig. 2–A feed system for a two-stacked array.



NOTE:
All branches are of equal length (any odd multiple of λ/4)

Fig. 3–Feeding a four-stacked array.

feedpoint. To match 50 ohm downlead, a 75 ohm section with a 1:1 balun is used as a transformer. Type N fittings are mandatory. Don't use "UHF" types. And if a long coax run is unavoidable, use the newer type having a #18 or even #14 center conductor.

Four-bay arrays should use 4 equal lengths of coax with 4:1 λ/2 loop baluns. These ideally should terminate into a 4-port transformer-coupler (commercially available from KLM Electronics), with a 50 ohm run to the shack.

The overall dimensions of even a 4-bay array are quite reasonable, and many hours of good DXing will reward the u.h.f. amateur who constructs this "Ultra Yagi."

1979 CQ World-Wide DX Contest Phone Results

BY LARRY BROCKMAN*, N6AR, and BOB COX*, K3EST

The DX Contest is Born

Way back in 1948 some guys decided that a DX contest ought to be just that—a *World Wide* DX contest. They started with a judicious blend of zone and country multipliers, no quotas, a single weekend per mode time format, a worldwide format (i.e. world work the world), and multi-op/single op and single band/all band categories (in those days all bands meant 80, 40, 20 and 10 only). Larry Le Kashman, then W2IOP, announced the new contest in the August, 1948 issue of *CQ* magazine. The idea was an immediate success, with PY2AC the first phone winner, followed by G2PU and W8KMC. The first c.w. winner was GI6TK, with a Single Op/All Band score of 452,000. His score prompted Vic Clark, W4KFC, to comment that "The first c.w. winner has set a record that may be impossible for subsequent entrants to top!" That record lasted just 3 years.

For 31 years now that contest has been steadily growing under the able direction of former WW Contest directors W2IOP, W6QD, W9IOP, W1WY, and K6SSS. We now have over 5000 entrants this year, and have seen an almost steady 10 percent growth each year. Oh, there have been some changes over the years, such as the addition of 15 and 160, the addition of the "club competition" (won the first year, 1955, by the Southern California DX Club), and many rule clarifications and refinements. But, that 31-year history has seen the establishment of a consistent and complete set of meaningful records, the oldest of which are a 1957 28 MHz European single band c.w. record that was broken this year, and a 1964 7 MHz African single band c.w. record set by 5A1TW, now N2AA. The CQ WW Trophy program is subsidized by private donors. These trophies are the most prized contesting achievement awards in the world.

So, gentlemen, tell me again where the crowd will congregate for the 1980 DX Olympics. Of course, it will be for the 1980 CQ WW DX Contest, and none can compare.

The 1979 Phone Contest

The 1979 Phone Contest heralded the peak of the current sunspot cycle with a pademonium that just had to be observed to be appreciated, let alone believed. Just about every 10 meter record was obliterated, with over a dozen 28 MHz single band scores over 1 million. All in all, 27 new records were set.

Dick Norton, N6AA, captured the World High Single Operator Honors for the second year in a row as visiting operator at 9Y4VT with 6.7 million. The Europeans swept the remainder of the top 4, with G3FXB (a new European record), UR2QD, and DJ4PT in that order. The U.S.A. top spot went to Larry Pace, N7DD with a fabulous, new all-time high U.S.A. score of 3.16 million. Congratulations to Larry, who had finished second for three consecutive previous years.

In the Multi-Single category, HI8XWP, manned by K1DG and K1AR, toppled the old 9M all-time record set last year by FY7BC with a great 9.87 M effort. In second place was the R6F crew, who broke their own Asian record of last year with a fine 9.0 M score. Meanwhile, K4VX and the gang took the top slot Stateside with 3.85 M, but fell shy of K5GA's 4.1 M record set last year.

Here it is, the VP2KC team that shattered the all-time world-record contest score. From top, l. to r., row 1—W4GIW, VP2KC, K4PHE; row 2—WB4RUA, N4NG, K4UEE; row 3—K3OIH, W3BTX, N4PN; row 4—AA4V, W4IVM, N4WW; row 5—K4PI, WA4PBW, K5PP, N5UR, K1PBW; row 6—JA3ODC, N4RJ, WD4RCU, W4HR.

*7164 Rock Ridge Terrace, Canoga Park, CA 91307

**5801 Huntland Road, Temple Hills, MD 20031

Multi-Multi Bigness

The Worldwide Multi-Multi winner was VP2KC with an incredible 37.8 million. This amounts to the all-time high contest score ever achieved anywhere, any mode. You would have to see their 1.8 MHz log to believe it—a 526 contact, 11 zone, 47 country effort with skilled K1PBW doing the operating. We looked very suspiciously at such an outrageous effort, but our judicious check as well as the many log comments from others all over the world convinced us it's for real. Congratulations on a fine team effort, guys.

This was apparently the year for other big double-digit MM efforts too. The 9Y4FRC crew of the Frankford Radio Club finished second with a whopping 24 M, with KH6XX in third place at 21 M (a new Oceania record). Stateside, a new all-time high of 13.8 M was amassed by the guys at N2AA, as they bested their own 1978 record.

Single Bands

In the single band categories, it was 28 MHz that was the big story. Ville, OH2MM, piled up 4068 contacts for an unbelievable African and Worldwide all time high 1.83 million score from OH2MM/CT3. He was followed by rival EA8AK at 1.6 M and KV4FZ at 1.48 M (a new North American record). Not only that, the Stateside winner, WA2SPL, demolished the U.S.A. record with a fine 735 K, over 50% more than the old record. In fact, after having seen all the logs this year, our comment on 28 MHz activity is wrapped up in just one word—WOW! A 500 kHz swath of 10 meter phone was absolutely packed from before dawn until well after dark with all kinds of good, juicy DX. WOW!

On 21 MHz H31LR took the top spot from Panama, setting new World and North American 21 MHz records with 1.45 million, while Vince, K1RM, edged out committee member K9DX and old U.S.A. 21 MHz record holder WA6EKL with a superb 870 K single band score, the best ever achieved by a W station. The World high 14 MHz effort was by Larry, UA6HZ, with just over 1 M and a new European record, while the top U.S.A spot went to K0KX at 335 K.

The low bands suffered some reduction in activity this year. However, Marty, OH2BH, posted a new African 3.8 MHz record with a surprising 235 K at his CT3BZ location as he took the 1979 World High. W0MJ captured the U.S.A. top spot. On 7 MHz, Italy's I5NPH smashed the old European 7 MHz record with 273 K, and finished World High in his first single band

OH2BH (left) and OH2MM (right) conquered the all-time single band African records for 80 and 10 meters respectively from this QTH. They came well prepared.

Vince, K1RM, who demolished the old USA single band record on 15, is shown here with the winning station.

contest. Meanwhile, K4JRB snagged the USA High with 76 K. 160 meters surprised all of us with some fine activity—the first ever from some of the Russian multipliers, and a welcome addition, too. Those extra countries helped perrenial 1.8 MHz winner PA5ØHIP to best his own 1974 European record with a fine 7644 score. W8LRL posted a U.S.A high of 2945.

Other Records

Other continental records were set by: JH1JGX (Asian 28 MHz); HS1ABD (Asian, Single op/All Band); G3MXJ (Europe 28 MHz); EM6A (Europe Multi-Single); YU3EY (Europe Multi-Multi); KH6CC (Oceania, 1.8 MHz); and VK4VU (Oceania 21 MHz). Congratulations, fellows, on your stupendous performances.

Low Power Category

In the world of QRPp it was John, W6PQZ, and his solar powered Argonaut that took World and U.S.A. high with 168 K, followed by WA2JOC. We would also like to mention K1CGJ's outstanding 10 meter QRPp effort too—82 countries with 5 watts in just 2 days. Who needs a list, anyway.

Honorable Mention

By the way, we feel that one other special honorable mention is due the crew at U0Y. Their fine 3.7 million Multi-Single score represents the largest ever score from zone 23, and contesters from all over the world are indebted to them. What a fine all-band effort that was from a rare zone—in fact, the rarest zone.

More on Cross Check Sheets

Three years ago, the contest rules were changed to require that entrants submit a cross check sheet (or dupe sheet) for each band on which 200 or more QSOs were made. We have been utterly dumbfounded over how that's been misinterpreted, especially overseas. For starters, let's just clarify what "Cross Check" sheets are *not*. They are not duplicate copies of your log and they are not lists of all your duplicate contacts.

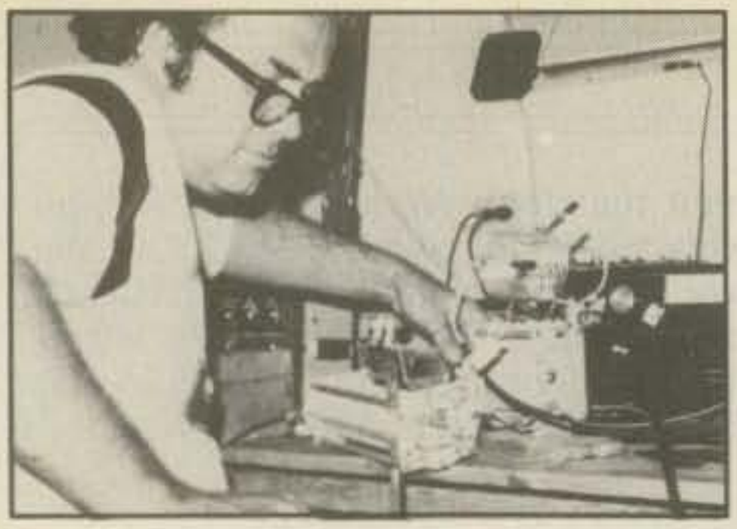
What we mean by a "Cross Check" or "Dupe" sheet is an alphabetical or other ordered list of *all* stations contacted on a particular band such that you can easily determine whether a contact is a duplicate (a second contact on the same band) as you fill the sheet in. When you find a duplicate, simply cross it out with a line in your log and allow 0 points in the scoring for that contact.

Some folks use the ARRL cross check form (ARRL form CD 175). Still others use a matrix with call area numbers for rows, and letters for columns. The letters heading the columns in the matrix can represent the first letter of the suffix, the last letter of the call, the prefix of the call, etc. One then goes through one's log contact by contact and fills in the matrix with the call letters or the suffixes of the calls as appropriate.

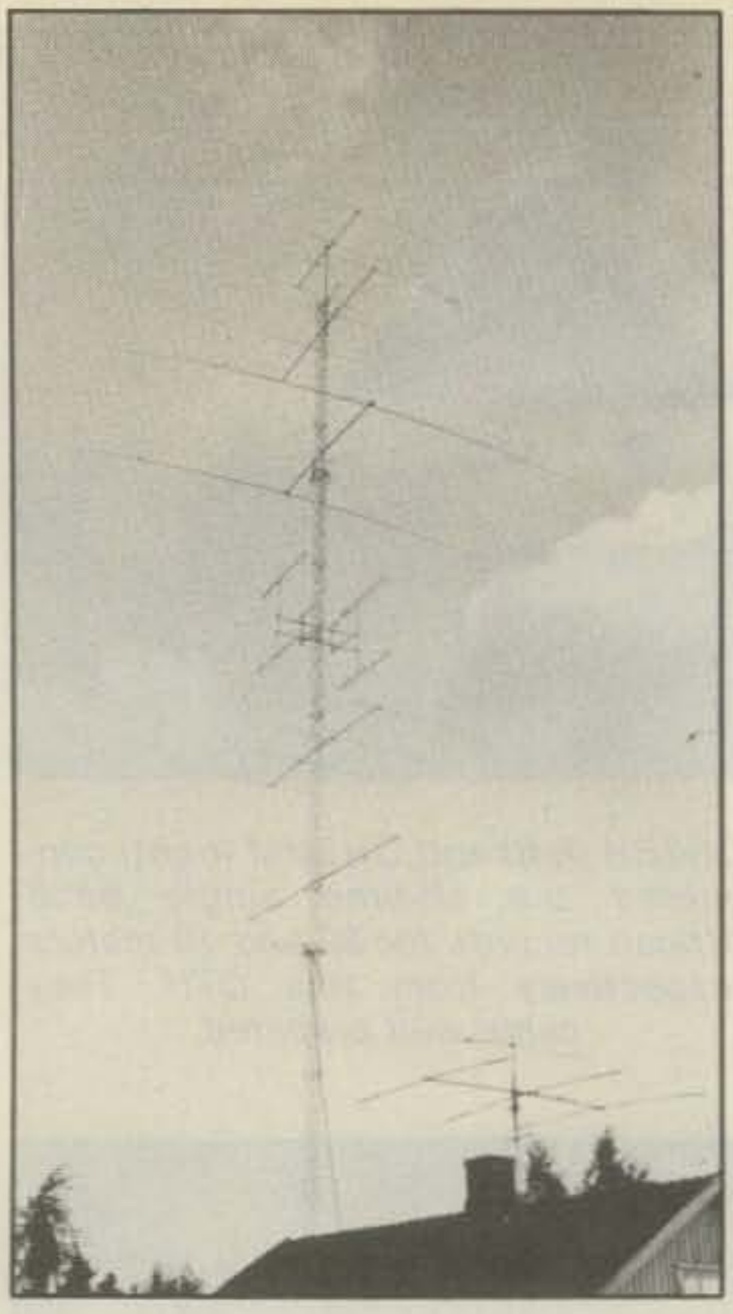
We don't really care what forms you use for duping your log. But please do dupe check it, and be sure to send us the work sheets (dupe or cross check sheets). If you don't, we may disqualify you. We hope that the above helps to straighten out some of the confusion.

Rules Changes

There are several rule changes for the 1980 contest which we would like



The professional touch to the 9Y4FRC 160 meter antenna tuner is given here by Joe, W2REH.



Here's the antenna layout at OH1BR as constructed by OH8QD—Wow!

Chet, KX6PP, sported this fine rig.

Ken, JR2GMC, sent this photo of the tired JA2YKA crew after the contest.

Doc, W4SME, is shown at the VP1RX Multi-Single operating position.

The JA3YKC team poised and ready.

DK8FZ during the contest.

to highlight here. First, beginning in 1980, we have added a definition of what constitutes a station for the Multi-Multi category. This became necessary because of reports over the past few years that some Multi-Multi stations were spreading out over as much as a 10 mile (20 km) radius. Come on, guys, that's a no no. So, from now on we will require that in the Multi-Multi category all transmitters must be within a 500 meter diameter, or confined within the property limits of the station licensee's address, whichever is greater.

Secondly, we have changed our rule on signing portable such that you are only required to sign portable if you are operating in a different country or a different zone (CQ zone). When you sign portable, sign your call such that you reflect the correct call district for your portable location. The third change relates to violations of the Multi-Single 10-minute time rule. In the past few years, we have reclassified entrants from Multi-Single to Multi-Multi if they exhibit excessive violations of the 10-minute rule. However, the rule did not reflect this policy; it was changed to reflect this policy for 1980.

Lastly, we have changed log submittal requirements to read that "recopied logs must be accompanied by a photocopy of the original log." That means we want a photocopy of your original log, no matter how sloppy it is. If you also want to send a computer printout or a recopied log for clarification, that is fine. But, *we require* a photocopy of the original log.

At the Fresno and Dayton Conventions, the co-directors received a lot of flack at the contest forums about our inflexible position on this point. However, we are the ones who have to check 5000 plus logs each year, and we know best how to do that. In fact, the committee members overwhelmingly approved our rules change, because they feel it's a must in doing a proper log check.

Speaking of Changes

We have tried computerized log checking on some of the logs this year for the first time. Although we had some problems, we are confident that they will be worked out. Computerized log checking is a change we are sure will help remove some of the inequality in our log checking between various committee members. Stated another way, the computer is more consistent.

We've made one more change. We are changing the log form so that it will hold 80 contacts per side rather than 40. Hoepfully that will cut down the mailing costs for everybody. Also, we are in the process of changing the mailing address for the magazine on the summary sheets to reflect CQ's recent change of address. One thing you can all do to help us reduce the delays in forwarding the logs is to send your logs to the director in charge of the mode rather than to the magazine. That would be K3EST for the Phone Contest in 1980, and N6AR for the CW contest. However, because the directors switch off every year on Phone and CW, it is important in subsequent

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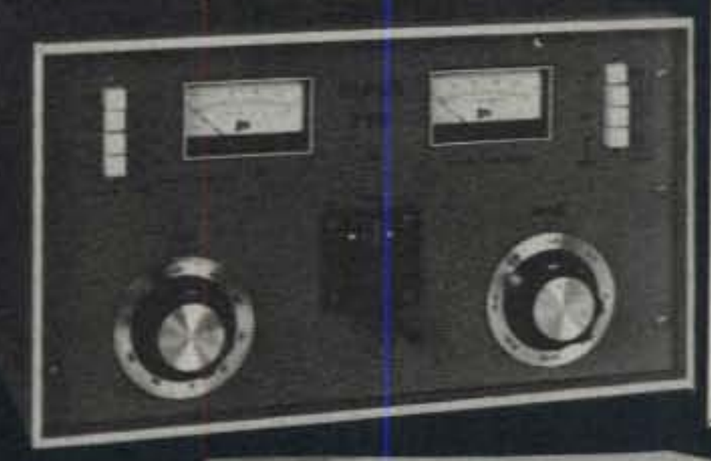

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years that you check to be sure you are sending the log to the right director.

Parting Comments

Even now, the CQ contest committee is still hard at work processing the CW logs, which we will report on in detail next month. This year we have added John Battin, K9DX, and Doug Zweibel, WB2VYA, to our ranks. They fill slots vacated by John Kanode, N4MM, and Tom Taormina, K5RC, who retired from the committee at the end of 1979. We know you will join us in thanking all of the committee members for the fine voluntary work they do in checking the thousands of logs sent in.

We also wish to extend a special thanks to Dick Norton, N6AA, who poured over each Contest result issue from 1948 to date and provided us with much of the information in our opening.

Well, the plans are in motion for the 1980 big event next month. So, we will see you all in the pileups, and good luck.

73, Larry, N6AR, and Bob, K3EST

For the 1980 WW DX Contest logs go to the following:

Phone—Bob Cox, K3EST, 5801 Huntland Drive, Temple Hills, MD 20031

CW—Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307.

U.S.A. QRM

Very frustrating to hear BV2B and not to be able to get through the pileup with QRP... *K1LOM.* College Board scheduled the PSAT for the first day of the contest*#3&#-*... *WB1ANT.* CQ should sponsor an XYL trip for the weekend... *K2OLG.* 10 Meters was terrific—63 countries mobile!...W0MHK/M2. Too many DX stations only call QRZ—no call sign... *WB3ICL.*Six minute WAC on 10 Meters on CQ's!... *K2VV.* My first phone contest in 50 years... *W3ARK.* Many stations would avoid dupes by giving their calls more often... *AD3V. Definitely* lives up to its name, the CQ World *War* Contest... *N1EE* Had to take time out for sleep, work, Steeler Football, beer, women, etc... *N3VA.* Never again will I go to a class reunion on contest weekend—oh, the pain... *K1CGJ.* Got to be crazy to operate QRP—always on the bottom of the pileups... *KA5N.* Tuner caught fire half way through the contest... *N1ACJ.* First full time contest effort in over 10 years—lots of fun... *W2VJN.* Have to get something up for 40... *WB3EKV.* Around 10 Z Sunday heard VK5OP and VK3AZY calling on 160 but could not break... *K4VX.* 10 M brought back memories of 1957... *KC4B.* ANNOBON!... *W6GO.* Took off 3 prime time hours to chase 3C0AB... *K7HCD.* Next time I am going to use something more than a dipole... *K7IM.* I got my first license 5 days before the contest. Wow, what an introduction to ham radio!... *N0BHQ.* Again lost voice 6 hours from end of contest. Maybe I should give up smoking... *W9ZRX.* When I found our that arch rival and friend K8MR was going to VP2MRX, I offered a donation to get him out of 8 land... *K8MN.* Worked UA0SGL on 10 M with 5 W PEP input... *WB0CGJ.* Love DX ops who identify... *AC4X.* Worked VS5DX with one minute to go... *W4DR.* Best contest in the world... *WD4IZR.* 3C0AB called with 13 minutes left... *K4ISV.* Am now bald after listening to all the rare DX that wouldn't listen up on 40... *N4KE.* FB8XV called me on a JA run on 20 M... *K5JA.* Now hold the record for the number of antennas erected after dark during the contest—3... *K5FUV.* After 15 years of CQ WW CW, my first SSB—Thank goodness for CW... *K5BDX.* It was a lot easier as 9L1JT... *K4ZIN/6.* A 7 element Yagi is a real advantage except when it won't rotate... *K0RF.*

DX QRM

This was the best CQ contest of the 28 CQ contests I've operated in the last 10 years. The log processing seems to be the most time consuming part of it all... *OH3XZ.* (AMEN—ed.) No possibility to win from here—poor US condx... *OH1IJ.* Very poor conditions on 160... *OH2BO.* Thunder, lightning, short power failure... *9H1EV.* After 24 hours 2800QSOs. Then Xcvr and Linear quit, so went to bed for 10 hours. Borrowed a rig and finished barefoot—what a pity... *YU3ZV.* I did not complete a single QSO without signing my call, yet still had over 100 dupes from USA... *SP3DOI.* First time on 7 MHz—where was VK... *I5NPH.* Very good propagation, but much splatter from USSR stations... *IT9VQC.* Frustration is looking for a CE contact...EI2BB. Never heard bands so crowded for so long—especially 10 M... *G3YBH.* How do Annobon bunch justifying 25 kHz of band! Traffic directors didn't help things either... *G3VPW.* Have you ever seen 506 multipliers with 467 QSOs... *SM0AJU.* Activity low on 160, but lots of multipliers ... *PA5@HIP.* 30 hours of operating—125 hours of logs and QSLs... *GM3WBZ/LX.* MUF was so high we worked EI2W on 50 MHz... *VE1DXA,* We'll have zone 2 on the air again next year... *VO2WL.* USA operators were tremendously well disciplined, but the Europeans were quite rude... *W8TN/6Y5.* Every year the contest gets more popular... *UK2BBB.* FB operations from the US boys... *UC2ACA.* First serious operation since my return from the Kurile Islands... *UV3GM* (ex UA0). I'd like to get WAC-SSB with the endorsement "During 14 minutes"... *UW3EH.* Where are our 2 points for JA? 160 M was something different... *UK9AAN.* Try working 12 hour days and then come home to the contest... *VP2ML.* Those rare prefixes should be used in the WPX Contest—they create a lot of confusion in the WW... *KP4AM.* Very hard to work 40 and 80, but 10 M was permanently open here... *LU4MEE.* Bad conditions 60% of the time... *HK3DMC.* I think my QSL manager (K1RH) intentionally forgot to mail my amplifier tubes for me for fear what I might create for him... *K9EF/8R1.* No doubt the best contest of all... *YV5EED.* Toughest contact was the Annobon expedition amongst all the QRM... *VK6NE.* Good fun until TVI shut me

down... *VK3SM.* What a long way New Zealand seemed to be from the rest of the World with 80 M conditions so poor... *ZL1BIL.* With 100 Watts and a low dipole, working *anything* outside of JA was a thrill... *W7LPF/DU2.* Worked more countries in this contest than in the last year and a half... *VX3JAU.* Plan to double my score next year... *ZD7BW.* A thrill to have rare expedition stations call me... *VU2HI.* Really surprised to work VX3EDC at 0600 Z on 10 M... *HS1ABD.* Band was open all night long with HS1ABD a real surprise at 0600 Z... *VX3EDC.* Typhoon approaching, so had to pull down the big quad and use a long wire in the test... *DU1GF.* If you missed Zone 2, you can blame yourself... *VO2CW.* Conditions were so good, I didn't know which band to be on... *VE4EW.* Plainly put, this contest was FUN... *CZ6WQ.* Typhoon 7 days before the contest greatly reduced activity from Tokyo... *JR1RCR.* Conditions between the USA and Europe were so good many USA stations did not turn their antennas towards Japan... *JR1RNC.* My biggest thrill was to work OY9R through the big signals... *KA2BD.* I got a call from 3C0AB with my CQ contest... *JE3TBM.* I did my best to work as many US stations as possible... *JH1JGX.* Fantastic conditions—QRM, QRM, QRM... *JA7BSK.* I got Zone 2 for the first time in this contest... *JA1NID.*

STATION OPERATORS

Multi-Operator Single Transmitter

AA4FF & K4GVO, K4MKR, N4CMJ, W4WWQ, WA4DLY, WA4RTS, WA4VCV, WB4ZPF, WD4EXG, WD4GCE, **AA6DX** & WD6EQG, WD6AOJ, **AA8N** & KB8JK, WD8RHS, **AA9D** & WD9EBQ, KA9CKI,**AB0I** & AB0W, AB0X, AE0K, N0XA, N0XX, KA0BCW, K0UAA, WA6DGX, K0XR, WB0TNY, K0VBU, WB0UXI, W0YR, **AE1D** & WA0SJM, **AI8V** & N8ATR, W8GBE, **AI9J** & K9EVB, **AK0A** & K0RWL, WA0ZHY, W0VWW, WB0TNY,WD0HTC, WD0YBC, KA0BKT, **CE2AA:** CE2NH, CE2CC, CE2BNT, CE2BWO, CE2GK, CE2BXN, CE2HN, CE2ZHI, CE2PH, CE2DW. **DA2CF:** DA1MH, DA1TP, DA1HO. **DF3GY** & DA1MH, DA1QR, DF3GN, DF4KC, DF8UD, DA1FN, DL1GAL. **DJ6TK** & DF3BU, DF3BV, DJ1BC, DL1BQ, DK8BE, DJ6KH. **DL0JK** & DK6FT,DK8ZL, DF2ZO, DF2ZN, DF5ZU, DD4ZY, DJ3AS, DK9FD.**DL0TP:** DA1JV, DA2GM, DF4NU, DF4NG, DF4NJ, DL4NV, DL9CP, DC2NX, DK5AD, DK8NX, **DL0UE:** DL3LU,DL7BI, DL8RL, DL8INA. **DL0WU:** DJ4AX, DJ8SW, DK4EM,DK4TP, DK9TF, DL9TF, DL9DY. **DM2CDL** & DM2CCL. **DM3GC:** DM2BMC, DM2BGC, DM3SGC. **DM3RF** & DM3ZRF, DM4WFF. **DM5IG** & DM5XIG, DM5AIG. **EA3AB** & EA3AOT, EA3BFR. **EA6ET** & EA6BW, EA6CE. EA6CP, EA6EU. **EA8ND** & EA8SB. **EM6A:** UA3AEA, UA3AJA, UA3XAC, UV3CC, UW3BO, UA6APW, UA6APP, UA6APR, **F3TV:** F6BEE, F6ARC, F6DIM.**F79WARC:** F6AXP, F6BII, F6BDE, F6FFA, F6FHO, F6ECX. **G3HTA** & G3RUX. **G3RRS** & G3UKS, G3SJK, G4CEB. **G6CW:** G3YUT, G4AFJ, G4ANS, G4HNS, G3TVY, G8PSP, G8TKY, G4HIC, G8UGS, G4EKW, G4CKG, G4IJX, **G6UW:** G3CWI, G3ZAY, G3ZHL, G4BAH, G4BNE, G4FAM, BRS-32525, JOAN & SUSAN. **G8JC:** G2UJ, G3TQD, G3TQZ, G3UDR, G4BYB, G8ASO, G8NSL, G8NWR, G8TIC, G8TUP. **GI6YM:** GI3LEG, GI5UR, GI4CFQ, GI4FUM, GI4FNU, GI4GYE, GI3AXI, GI3IVJ. **GW6GW:** GW3GHC, GW3KYA, GW3NJW, GW3NYY, GW3NWS, GW3OAY, GW4BLE, GW4EAI. **HA2KMR:** GRABA, FANOS, KAROLY, LASZLO. **HA3KHC:** TIBOR, LAJOS, FERENC, GABOR, ZOLTAN. **HA6KVC:** PETER, ISTVAN, TIBOR. **HA7KSV:** GYORGY, ERNO, JOZSEF, SANDOR, SANDOR, PETER. **DL7RT/HB0:** KL7RT, DL7SP, HEIDI. **HH2MC** & HH2BM, K4UTE, W4FDA, W4WEG, WB4EYK. **HI8XWP:** K1AR, K1DG. **HK3AXT** & HK3AFD, HK3TF, **HK4RCA**, HK4ABY, HK4DUM. **HW6LY:** F6BDN, F6DQG, F6DQX, F6EDM, F6KDP. **HZ1AB:** W7KJJ, W7SJ, WA0LSB, WB0LOA, WD5ELS, KI4GP, DICK & BOB. **I1DIE** & I1ANF, I1GJC,I1GUB, I1GSB, I1PCT, I1RBP, I1VVZ, **I1KN** & I1LBH, I1JJZ, I1FNX, I15BU, I1ANP, W3US, ANNA. IW1PDP, **I3EJ** & I3YXQ, I3LDP. **I7WL:** CLUB. **IV3VXU** & IV3PUE, IV3ZLC, IV3YIB. **IY1PHX:** CLUB. **IZ3MAU:** I3MAU, IV3PRK, I3EVK, I3BYT, I3ON, YU2AMM. **IM0ARI:** IS0BYR, IS0DTK, IS0FGD, IS0TOA, IS0OGW, IS0MIJ, IS0JZJ. **JA2YKA:** JH2QXG, JR2GMC, JR3URO, JA4UDP, JH4VBQ, JE2RQF, JA9NFO, JE3UXO. **JA3YFI:** Hiroshi, Kimihiko, Tsuheo. **JA4YFH:** JA4XKL, JH4BXA, JH4DIT, JD4FMI, JH4MVB, JH4SQJ. **JA4YPE:** JH3BJN, JF3EGT. **JA6YDH:** JE6ASN, JH6DRF, JR6DUL, JR6JKS, JE6LFQ, JH6NFR, JH6NLY, JH6RAD, JH6SWF. **JA7YAA:** JH7AEF, JH7WTC, JH7IMN, JH7WHM, JR7OMD, JR7OMF. JG1UJD/7, JA9PPC/7. **K1GW:** & K1KA, W1HNZ, **K1IK:** & WA1YTW, WA1YSM. **K1RQ:** & W1ZT, WB1HIH. **K1RU:** & K1YR. K1UO & KA1AJH, N1AC. **K2BK:** & W2IFK. **K2CC:** AB2L, ADZY, WA2MYU, WA2WSX, K2IA, N2AKT, KA2QAI, WB1AFZ. **K2FL:** & NZATX. **K2GBH:** & WA2STM, WA2KCL. **K2ITG/3:** & WB2KCN. **K3KNH:** & K3SME, WA3NHO, N2SB. **K3LR:** & AF3P, WB3EUB, K3VK, K8CX, B. MEYER. **K3PA:** & K3YL. **K3QMR:** WB3KKX, WB3LCD. **K3RA:** & WA3VUQ, KO4Q. **K3UC:** & K3VOU, AJ3H. **K4VX:** & K4YEP, WA4IVL, K0CME. **K5KG:** & K5LZO, K5MA, WAZXR. K5QY: & K5EG, N5BQQ, WB5NQH, WB5PBZ. **K6TZ:** WA6KTZ, WA6SRJ, W6EMS, KA6S. **K7SP:** & N7AJI, N7CW, K7JUR, N7RP, WA7NAY, N7VS, N7NR. **K8JLB:** & K8DD, AC8W,WA8BSF. **K8NA:** & N8JW, K8IA, W8TA, W8SYR, WA8TBQ, K8ZRH. **K8XR:** & K8OO, K8EX, K8LA, N8ACA, DPDA. **K8YVT:** & K8EM, WB8TSA, K8EYW, KA8BQO. **K9SD:** & K9BGL, K9HWU, W9NNE, WB9TKC, KA0CDG, WB0FCS, WD0FPX, W0FF, K0FU, W0HBH, K0KL, WB0WQZ, WB0YZG, W0ZH. **K0BJW:** & K0PKK, WD0FHY. **K0JSY:** & W0WP, K0AT. **KA2ABA:** & WA2ZFW. **KA5C:** & AA5D. **KA8Y:** & WD8MHJ. **KB2GJ** & WB2OON. **KB4GX:** N4ND, W4MYA. WD4KUK. **KC4B:** & AA4M, WB2ROJ. **KH6N** & KH6HGP, **KI4M** & N4AJZ, WB4LIB, WA4LTG, WB4NZU, KD4Y, K4ZGB, **KL7HR** & AL7AF, KL7IUM, KL7IVX, KL7JKI. **KL7USA:** KL7JIO, WB7QYG/KL7, P. Bittengle. **LA5X:** LA1EE, LA3RT, LA6UM, LA7XK, LA9DL, LA9ZO. **LA7A:** LA4NL, LA6UT, LA8UL, LA8QU. **LA7JO** & LA6OT, LA9TQ. **DK9WB/LX:** DK9WB, DKSWL. **LZ1KWS:** Dimitur, Gawlina. **LZ2KPS:** Kiril, Atanas. **N1ACJ:** & KA1BBD. **N1MM:** & K1TO, K1XM, KA1GD. **N1TZ:** & K1SF, K1DKX, K1FIR, WA1UZH, K1KNQ, W1BR. **N3GB:** & WA3ECT. **N3UN:** & N3II, WB3EFC, WB3BOA. **N4HB:** & N4ZJ, WB4BVY, WA4KNP, KB8HN. **N4IB** & N4KE. **N4OE:** & WA4WQH, N4BWD. **N4UF** & WD4ITK, K4LK. **N4ZC:** & K4BF, K4MQG, WA4OBO, WA4ZMM, WA4ZQQ. **N6AV** & WB6RXW. **N6VR:** & N6ADI, KB6PE, WA6OYS, WB6VQO. **N7BJA:** & WB7USQ. **N8BKX:** & KA8FDW. **N8RA:** & K8WW, N8AID, K8NZ, AK8U. **N9LE OE4SZW** & OE3GSA, OE7UU. **OH2AA:** OHZBRW, OH2DS, OH2BQS, OH2BCP, OH2BNP. **OH4TO** & OH4TH, OH4SL, OH4SE, OH4UI. **OH7UE** & OH7UR. **OH2BP/OH0:** OH2BP,OH2PQ, OH2BNE. **OK1KCF:** OK1KD, OK1KZ. **OK1KPU:** OK1JAX, OK1JDX. **OK1KUR:** OK1AYE, OK1DAY, OK3CWE, OK3CLD. **OK2KMR:** OK2SEO, OK2BQZ. **OK2KNP:** OK2BSA, OK2BSP, OK2SGW. **OK3KAG:** OK3ZWA, OK3ZFM, OK3CDX, OK3YBD, OK3COM, OK3CIR. **OK3KTY:** & OK3CQU, OK3-27178. **OK3USZ:** OK3ZAF, OK3FON, OK3PQ, OK3-4158, OK3-26701. **ON5KH:** ON4BB ON5JE, ON6MD. **OY9R** & OY5J, OY8I, OY8KH. **PA5GN:** PA3ADC, PA2AWU, PA0ERA, PA0GIN, PA0GAM, PA0VAJ. **PI51ARS** & PA0HTR. **RGF:** UB5EC, UY5LK, UB5MCD, UB5MDC, UB5MNM, UB5MBY, UB5MDA. **SK2GJ:** SM2 EKQ, SM2FJG, SM2INV, SM2ICQ. **SK3LH** & SM3DSP, SM3JBO, SM3ICU, SM3JLA, SM3CEF, SM3GCR, SM3JAW, SM3IUV, SM3IXY, SM3KMM, SM3IZB, SM3IQN. **SK4EA:** Club. **SK6AW:** SM6CVE, SM6DER, SM6FJB, SM6HCX. **SK6HA:** SM6HIO, SM6HYE, SM6IBF, SM6ITE. **SM5AOE** & SM6BJI, **SM0MC** SM0ATN, SM5AZU. **SP2PDI:** SP2FAX, SP5GRM, SP8GQU, SP8GWI, SP9ICA. **SP6PZB:** SP6FAF, SP9FIH. **SP9PDF:** SP9BMG, SP4FUY, SPZ-7531, SP8JPX. **SP9KCB:**

(continued on page 56)

KENWOOD
...pacesetter in amateur radio

Top-Notch.

VBT, notch, IF shift, wide dynamic range

TS-830S

Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

TS-830S FEATURES:

- **160-10 meters, including three new bands**
  Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- **Wide receiver dynamic range**
  Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.
- **Variable bandwidth tuning (VBT)**
  Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.
- **IF notch filter**
  Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.
- **IF shift**
  Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.
- **Various IF filter options**
  Either a 500-Hz (YK-88C) or 270-Hz (YK-88CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.
- **Built-in digital display**
  Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.
- **Adjustable noise-blanker level**
  Built-in noise blanker eliminates pulse-type (such as ignition) noise. Front-panel threshold level control.
- **6146B final with RF NFB**
  Two 6146B's in the final amplifier provide 220 W PEP (SSB)/180 W DC (CW) input on all bands. RF negative feedback provides optimum IMD characteristics for high-quality transmission.
- **More flexibility with optional digital VFO**
  VFO-230 operates in 20-Hz steps and includes five memories. Also allows split-frequency operation. Built-in digital display. Covers about 100 kHz above and below each 500-kHz band.
- **Built-in RF speech processor**
  For added audio punch and increased talk power in DX pileups.
- **RIT/XIT**
  Receiver incremental tuning (RIT) shifts only the receiver frequency, to tune in stations slightly off frequency. Transmitter incremental tuning (XIT) shifts only the transmitter frequency.
- **SSB monitor circuit**
  Monitors IF stage while transmitting, to determine audio quality and effect of speech processor.

Ask your Authorized Kenwood Dealer about the many operating features offered by the TS-830S... at a very reasonable price!

NOTE: *Price, specifications subject to change without notice and obligation.*

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/ SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- TL-922A linear amplifier
- SM-220 Station Monitor
- PC-1 phone patch
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF
- HC-10 digital world clock
- HS-5 and HS-4 headphones
- MC-30S and MC-35S noise-cancelling hand microphones

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT / COMPTON, CA 90220

Hand-shack.

Synthesized, big LCD, 10 memories, scanning, DTMF

Touch-Tone ®

TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.
- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 0.8 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF (Touch-Tone®) encoder**
  Uses all 16 buttons of keyboard while transmitting.

- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Subtone switch**
  Activates subaudible tone encoder (not Kenwood-supplied).

- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "MO" memory.
- **Reverse operation**
  Nonlocking switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **Extended operating time**
  With LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output), for longer operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Microphone PTT and audio terminals

Charger terminal

Earphone Jack

STANDARD ACCESSORIES INCLUDED:

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- AC charger
- Hand strap
- External-microphone plug
- Earphone

NOTE: *Price, specifications subject to change without notice and obligation.*

OPTIONAL ACCESSORIES:

- ST-1 base stand (shown) which provides 1.5-hour quick charge and automatic switch to trickle charge, floating charge (operate while charging), 4-pin connector for dynamic microphone, and SO-239 antenna connector
- BC-5 DC quick charger (1.5 to 2.0 hours)
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook

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FOR FT-301

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500 MHz. Freq. Counter - 6 Digit

YC 221 **$ 89.00**
DIGITAL READOUT FOR FT-221

BIRD 43 **$135.00**
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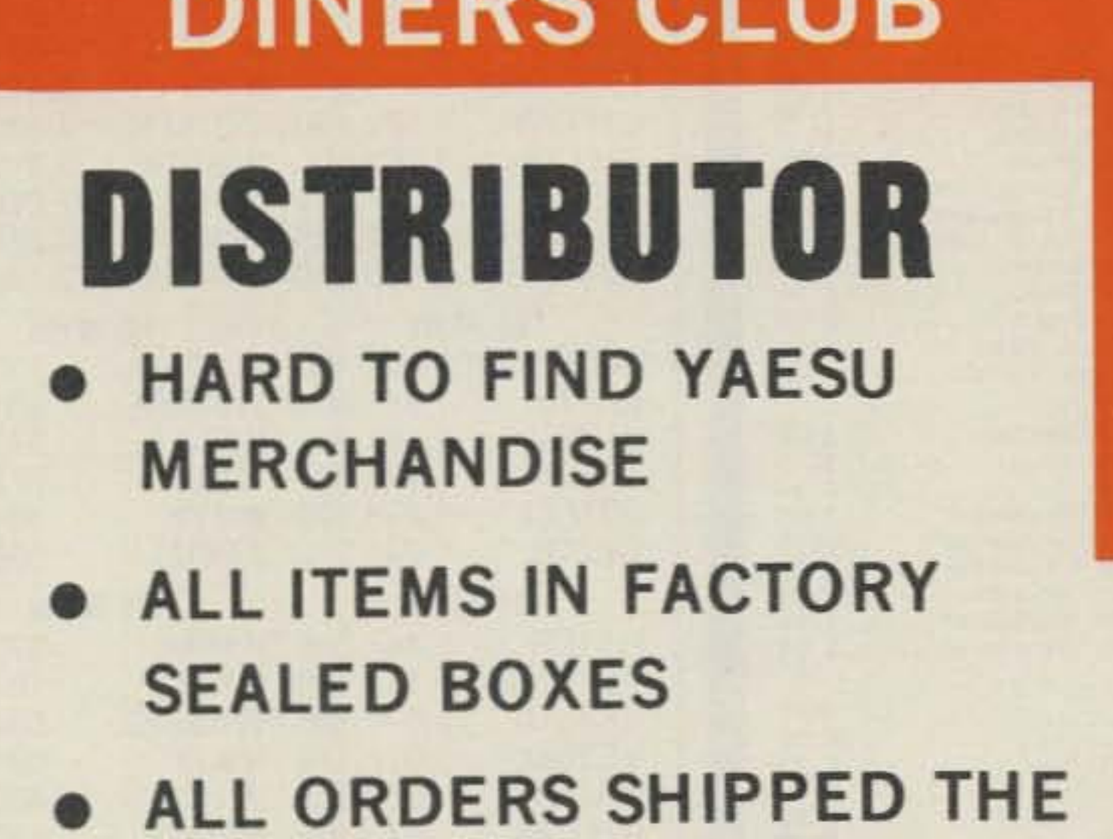

SWAN METERS

WM-6200	$49.95
WM-200	$64.95
WM-1500	$64.95

FT 227 RB **$335.00**
10W 2MTRS.
Scanning Transceiver

FP 301D **$225.00**
12V 25 AMP P/S + BUILT IN SPEAKER & 24-HOUR CLOCK

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25 WATT 2 MTRS.
with TT MIKE

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FOR FT-101E

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35 Amp P.S. **$149.00**
12 VOLT

OMNI T/T PAD **$25.00**
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CIRCLE 78 ON READER SERVICE CARD

TOP SCORES

WORLD

Single Op All Band	
9Y4VT	6,682,185
G3FXB	4,708,014
UR2QD	4,658,155
DJ4PT	4,577,100
PA52TMS	4,413,952
OH6JW	4,389,460
OH1VR	4,182,000
YU3ZV	4,067,774
N1GL/VP9	3,962,635
CZ6KW	3,493,340
28 MHz	
OH2MM/CT3	1,827,150
EA8AK	1,685,805
KV4FZ	1,482,525
ZS3LK	1,421,164
G3MXJ	1,296,826
DK3GI	1,248,072
21 MHz	
H31LR	1,448,848
VE7CML	1,111,776
VK4VU	1,079,335
VE3BMV	1,072,176
UR2QI	962,850
OH1MA	870,500
14 MHz	
UA6HZ	1,020,181
YW1AVO	908,202
DL8PC	901,992
OH8OS	834,536
VE7IG	802,872
YU7GMN	800,100
7 MHz	
I5NPH	273,144
IT9SKQ/IG9	190,008
DM2CMF/A	163,068
JA2BAY	154,442
OH8SR	135,360
I2VRN	115,900
3.8 MHz	
CT3BZ	235,114
VE3ECP	64,496
VX3JAY	63,840
YV3AMW	62,172
VE1AI	57,154
W0MJ	48,664
1.8 MHz	
PA50HIP	7,644
UQ2PM	6,210
GM3ZSP	6,068
VE3BBN	4,818
UR2RFK	4,110
G3SZA	3,895

USA

Single Op All Band	
N7DD	3,113,788
W1ZM	3,035,790
W7RM	2,875,450
K1VTM	2,654,834
K7RI	2,418,028
W3BGN	2,330,496
W9ZRX	2,310,165
W1CF	2,268,420
W3GRF	2,225,430
W9RE	2,184,776
28 MHz	
WA2SPL	735,528
W5MYA	681,360
K5TJ	572,908
AA8U	572,866
W0YK	564,944
AE6U	538,902
21 MHz	
K1RM	870,237
N7XX	767,016
WA6EKL	694,416
K9DX	591,527
W1NG	480,654
K6SMF	432,684
14MHz	
K0KX	335,041
K9RF	274,762
K0DD	248,976
W5FO	242,744
W1NG	215,930
W2TA	214,200
7 MHz	
K4JRB	74,970
N4KE	66,852
N7UR	53,922
WB9QPN	36,852
W9NWE	32,144
W8JWR	28,548
3.8 MHz	
W0MJ	48,664
W8EDU	45,150
K8XX	32,400
KG4W	32,096
WA4SVO	19,906
W9LF	17,385
1.8 MHz	
W8LRL	2,945
K5UR	2,436
K5YY	1,080
AD4U	1,007
W1BB	748
W2XQ	630

Multi-Op Single Transmitter

HI8XWP	9,872,267
R6F	9,029,396
EM6A	8,120,574
IZ3MAU	7,600,746
UK9AAN	7,584,440
DL0WU	7,213,895
K4VX	3,811,563
W4QAW	3,564,304
K8NA	3,550,728
WA7NIN	3,546,282
AB0I	3,457,531
W5WMU	3,057,780

Multi-Op Multi-Transmitter

VP2KC	37,770,012
9Y4FRC	24,035,927
KH6XY	21,990,252
YU3EY	16,646,364
SK2KW	14,675,871
N2AA	13,299,750
N2AA	13,299,750
K8LX	7,508,970
W2YV	7,405,846
K0RF	6,290,136
W3MM	6,229,350
K2US	6,002,866

BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSO's/Zones/Countries on each band.

WORLD TOP SINGLE OPERATOR—ALL BAND

Station	160	80	40	20	15	10
9Y4VT	44/5/11	304/16/44	324/18/63	838/32/79	1082/29/78	2040/30/84
G3FXB	12/2/12	80/8/38	209/14/46	599/32/86	876/31/77	1934/29/82
UR2QD	23/3/13	73/9/34	119/10/50	623/28/81	727/33/87	2160/35/104
DJ4PT	14/2/9	19/12/47	430/23/75	886/28/65	940/27/59	1685/27/64
PA52TMS	12/2/8	203/11/51	174/12/52	514/33/91	528/33/85	2068/37/97
OH6JW	31/3/16	163/14/47	147/17/57	730/34/87	1433/34/81	1042/32/83
OH1VR	34/4/17	128/9/42	188/24/64	713/32/71	1019/30/81	1234/33/93
YU3ZV		36/7/28	63/11/43	1037/34/84	1140/32/84	1023/31/85
N1GL/VP9		389/12/29	106/11/21	757/28/62	851/26/66	1568/26/59
CZ6KW	2/2/1	65/11/13	24/12/18	537/32/77	953/28/71	1950/30/85

WORLD TOP MULTI-OPERATOR SINGLE TRANSMITTER

HI8XWP	10/4/9	276/14/52	511/22/65	1076/30/96	2362/32/96	3370/32/99
R6F	36/6/19	176/14/47	235/14/53	1653/38/109	1206/35/95	2337/30/88
EM6A	20/6/16	107/12/49	94/12/51	2006/35/113	1186/37/111	2088/34/91
IZ3MAU		157/15/45	205/24/68	1420/36/93	1612/36/101	1678/32/85
UK9AAN	49/6/19	225/17/48	312/25/73	1198/38/114	1640/38/115	707/34/108
DLØWU	16/3/16	43/9/43	396/17/54	1270/32/99	1218/34/109	1643/37/106

WORLD TOP MULTI-OPERATOR-MULTI-TRANSMITTER

VP2KC	526/11/47	1079/22/95	1703/28/107	4208/39/153	5417/39/145	4835/36/130
9Y4FRC	61/6/16	711/15/52	1120/22/77	3291/35/115	3537/34/120	3829/36/117
KH6XX	105/10/13	423/27/42	642/30/59	2357/39/123	3727/39/133	3735/39/124
YU3EY	83/6/24	614/12/64	485/18/73	2863/40/134	2693/39/124	2834/38/109
SK2KW		432/14/55	334/25/69	3093/39/123	2871/35/107	3321/40/112
N2AA	109/8/16	406/24/79	366/28/84	1646/40/152	2198/40/144	1354/36/120

USA TOP SINGLE OPERATOR-ALL BAND

Station	160	80	40	20	15	10
N7DD	55/9/14	50/15/28	74/20/42	420/34/76	794/35/86	813/34/100
W1ZM	16/4/9	93/14/46	79/15/45	306/34/92	736/35/106	744/32/102
W7RM	12/6/6	115/19/28	202/17/36	218/28/72	1130/31/76	647/34/84
K1VTM	13/3/6	90/15/43	116/15/55	281/31/84	793/33/96	570/28/94
K7RI	8/4/3	100/15/23	253/17/33	231/29/80	841/26/67	577/34/81
W3BGN	9/5/7	46/9/29	77/16/45	475/33/95	632/30/95	474/27/86
W9ZRX	13/5/8	42/13/25	90/16/53	200/35/74	402/32/102	897/34/98
W1CF	16/3/9	114/18/51	66/13/43	301/28/82	431/29/86	779/30/99
W3GRF	2/2/1	49/14/31	75/13/41	386/27/85	605/33/105	529/30/93
W9RE	19/5/10	55/14/33	74/18/42	309/32/82	362/29/91	794/33/95

USA TOP MULTI-OPERATOR SINGLE TRANSMITTER

K4VX	11/4/10	60/19/45	85/24/65	344/33/99	833/36/118	895/33/117
W4QAW	11/4/11	44/16/36	106/21/60	403/37/112	669/37/116	804/35/122
K8NA	6/4/4	52/16/39	121/21/63	625/38/124	661/34/109	663/32/107
WA7NIN	12/6/5	96/19/85	320/21/41	260/31/88	1042/29/75	841/34/94
ABØI	7/4/6	21/9/19	80/20/57	640/39/113	901/36/111	719/35/92
W5WMU	11/4/8	54/16/37	248/20/58	389/39/108	788/35/111	573/34/95

USA TOP MULTI-OPERATOR MULTI TRANSMITTER

N2AA	109/8/16	406/24/79	366/28/84	1646/40/152	2198/40/144	1354/36/120
K8LX	19/3/8	326/17/44	159/20/61	1047/38/118	1461/37/118	1366/35/110
W2YV	21/5/10	284/20/67	159/20/62	768/37/103	1499/34/119	1373/35/117
KØRF	26/7/10	186/19/43	440/24/53	525/36/102	1470/35/100	1261/36/106
W3MM	30/6/11	132/17/49	174/24/66	891/39/118	1320/37/140	807/32/115
K2UA	29/4/8	164/20/58	170/20/64	714/38/115	1320/36/132	877/34/118

Club. **SP9KRT:** SP9FKQ, SP9HMF, SP9CXX, SP9HNB. **SP9PRO:** SP9EWO, SP9PT, SP9LJD. **TD4NX** & TG9AL, TG9GI, TG9RB, **TF3IRA:** TF3CW, TF3JB, TF3RB, TF3KX, TF3UA, TF3US, TF3YH. **UØY:** UAØAAK, UAØACQ, UAØMF, UAØABK, UAØADR, UAØAFQ. **UK2AAB:** Kosurer, Pilosyam, Krushinsky. **UK2AAG:** UC2-009 105, UC2-0090490, UC2-009568. **UK2AAP:** Bilchenko, Khudanov, Trothevskiv. **UK2ABC:** Sologub,Shirko, Antonenko. **UK2BAG:** UP2BAA, UP2BAF, UP2BZ, UP2DT. **UP2BAS:** UP2PAJ, UPL-038609. **UK2BBB:** UP2BDM, UP2BAS, UP2BBB, UP2PCW, Rakouskas, UP2PX, UP2BAW, UP2-038517. **UK2BBE:** UP2-038918, UP2-038919, UP2-038938. **UK2BBF:** UP2BFN, UP2BGF, UP2-0381541. **UK2BCC:** UP2-38728, UP2-038346. **UK2BCG:** UP2BBX, UP2PCB, UP2BFH, UP20381615, UP2-0381618. **UK2IAJ:** UC2ICK, UC2-00850, UC2-00873. **UK2PAD:** UP2-038794, UP2BEG. **UK2PAO:** UP2BFU, UP2BCX, UP2-038574, UP2-038440, UP2-038610. **UK2PAP:** UP2PAX, UP2NV, UP2DX, Romas. **UK2PAR:** RP2BET, UP2BDX. **UK2PAT:** UP2BCO, UP2BCW, UP2-038521. **UK2PCR:** UP2BBT, UP2BCT, UP2PCR, UP2BDF, UP2BFI, UP2BFL,UP2PAV, UP2-0381524. **UK2PRC:** UP2BDM, UP2BDG,UP2-038469. **UK2RAE:** UR2-0831511, UR2-0831512, UR2REN. **UK2RAQ:** Liivrand, Varjo, Eenlo, Soone. **UK2RDX:** UR2RRJ, UR2RCN, UR2REZ, Mart Andnis, Edmund, Paul, Nigul. **Uk3AAC:** UA3AGX, UA3HK, RA3ACE, UA3-170266, UL7-03115/UA3. **UK3AAH:** UA3-1201171, UA3DNV, UA3DNK, UA3DHH, UA3DDF, UA3DPX. **UK3DAU:** Uvarov, Semenov, Zhuralev. **UK3QBM:** UA3QDW, UA3QBP, UA3QBG. **UK3WAC:** Vosudaev, Salov, Gondkarov. **UK4AAN:** UA4-156585, UA4-156613. **UK4ABW:** UA4AHT, UA4-156-654, UA4-156590. **UK4ABZ:** UA4AM, UA4ACE, UA4BD, UW4AK, UA4ATZ, UA4-15672, UA4-156676. **UK4CBL:** Kùdzashov, Kakozin, Vasenkin. **UK4FAD:** UA4-148286, UA4-148388, UA4-148362. **UK4WAA:** UA4WWS, UA4WBG, UA4-095398, UA4WAG. **UK4WAB:** Baranov, Krylov, Pankov, Sakerin. **UK4WAR:** T. Fomin, A. Fomin, Chernishev, Islamov, Lapin, Margunov, Ohotnikov, Orlov, Shertsov, Zagumennov, Zapolsko. **UK5CAA:** UB5CDW, UB5CDU, RB5CCV. **UK5ECN:** UB5EFB, UB5EII, UB5-0601138. **UK5FAD:** Dadutov, Grishehenko, Koredov. **UK5IAZ:** UB5-0731151, UB5-0731277, UB5-0731619, UB5-0732239, UB5-0733137, UB5IRX. **UK5IBB:** Kotelnikov, Darbinayan, Savenkov, Gordienko. **UK5MAG:** UB5MDP, UB5MIR, UB5-059121. **UK5MBQ:** UB5MGC, UB5-059073, UB5-059075. **UK5MCO:** Maldenov A., Koliensnichenko A. **UK5MDI:** UB5MBM, UB5-059111, UB5-05957, UB5-059305. **UK5QBE:** Club. **UK5VBE:** Makuhin, Borinsow, Palamazehuk. **UK6LAZ:** UA6LHK, UB5-073113, UB5-060650, UB5-060901. **UK6HAR:** Club. **UK6LWA:** UA6LXJ, UA6-150622, UA6-150643. **UK7GAA:** UL7GBB, UL7-01899, Rezinkin. **UK7NAQ:** UI7NAA, UL7NAC, UL7NCG. **UK8JAA:** UJ8JCL, UJ8JCR, UJ8JCU. **UK8MAF:** Govorin, Subbotin, Kibalnikov. **UK9AAN:** UA9AN, UA9ACZ, UA9AEN, UA9AIS, UW9BY. **UK9ADY:** UA9AFZ, UA9ADH, UW9AT, UA9ADI, UA9AAX. **UK9HAD:** Kiryushkin, Mukin, Bibick. **UK9SAD:** Ponbaimekh, Freidman, Vereshehagin. **UK9UAC:** Club. **UKØIAI:** Konstantin, Ivan, Peter. **UKØLAK:** UAØLFK: RAØLFI, UAØ-107178, UAØLCZ. **UKØSAW:** UAØSDU, UAØ-124153, UAØ-124303. **UKØUAZ:** Pryeljadnov, Kin, Ponomamazyow. **VE1DXA:** VE1AIH, VE1AVX, VE1BXC, VE1MX, VE1UG. **VE2CAR:** VE2DAR, VE2DC, VE2QO, VE2DWL, VE2YA, VE2EGH, VE2GBB, WA2GEN, WA2GEP. **VE2DU** & VE2AKD, VE2AUF, VE2BJC, VE2EFL,VE2FIM, VE2FIT, VE2FNT. **VE3DOP** & VE3FLE, VE3GCE, VE3IDY, **VE3KKB** & VE2BXP, VE3CRG, VE3CTX, VE3KID, VE3KIE, VE3KIM. **VE4XK:** VE4RM, VE4VV, Randy, Terry. **VE5CHS:** VE5HN, Dave, Tim, Trent. **VE7AV:** VE7AXH, VE7ENI. **VE7CFB:** VE7AXI, VE7DAM, VE7DAW, VE7DEG, VE7DFJ, VE7DIG, VE7DJR, VE7DJW, VE7DWQ. **VO2WL:** VO2AC, VO2AH, VO2AG, VO2BF, VO2CC, VO2CM, VO2PB, D. Arava, B. Kean. **VP2E:** W3HNK, W4GSM. **VP2SAX:** W6KG, W6QL. **VP2VFK:** NGCW, N7RT, W7KHN. **VP9DX:** G3ZGR/VP9, VP9HE, VP9HM, VP9HP, VP9IV, VP9IW, VP9JK. **VQ9CI:** VQ9JJ, VQ9MR, VQ9TR. **W1BK** & K1TXh, N1CW, WA1UAR. **W1YN** & AG1C. **W2HG:** WA2LOG, **W2VJN:** K2BMI, N2BA, + NET. **W3GG:** & N4TX, WA3UIY. **W3GNQ:** & KA3EFO. **W3GOC:** & W3KT, K3CY. **W3HYJ:** + NET. **W3TV** & W3AOH. **W4FRU:** & K4TIA, WA4YBV. **W4QAW:** & W3ZZ, N4EA, W3IDT. **W4MGX:** + NET. **W4SS/C6A:** W4SS, Others. **W5VX:** & K5TSO,W5MCO. **W5WMU:** & K5OA, W5XZ, K5KU, N5AN. **W6BIP:** & WA6PYN. **W6GO:** & K6HHD. **W6VLD:** WA6DPQ, N6KN, K6TXA, WA6EUM, WB9LDD, WA6HJK, N3AYL, WA2HSK, WA6AJZ. **W6YRA:** WB6LHO, WA6SGH, K5VT, WBØAZD, KA6GSW. **W7FG:** W5LFS, AC5P, AC5B, WD5DWT. **W7IVX:** & WB7PQU. **W8CEF** & K8CMO, KB8EI, WB8ZYJ, WB8IFP, WD8IFP, WD8DEL, AC8M. **W8CNL** & AC8I, W8UVZ, WA8WG, WB8LDH, WB8RXN, K9MK, WB9TIY. **W8NGO** & WA8WDZ. **W8TN/6Y5:** W8TN, WB8TGS. **W9DUB** & K9BN, K9JF, K9HOL, W9RN. **W9OFV** & N9AKE, K9UN, N9CD, WB9HIP, WD9CVQ, WD9CVS. **W9RX** & WB9IWN, **W9YT** AC9C, K9EC, KA9CRD, W9MO, WB9PYE, WB9KMQ, WD9BCM. **WØEE:** WD9EWE, NØARN, WBØUGX, WBØLTD, WBØQLU, WBØZLB, WBØTJP. **WØYC:** AGØI, NØAIL, KØER, WQØUQ, KAØFVR, WBØRAJ. **WA2JAS:** KA2CLQ, WB2QEU, KB2J, KA2EXU, KA2ELB, KA2ESK, KA2GJE. **WA3EKL** & WA3BDF, WA3KCY, K3ZZ. **WA3JVG** & WB3KNS, WA3JVHm WA3LCY. **WA4QQV** & WA4QMQ, KR4N, KQ4L, WB4KLI. **WA7NIN** & WB7TYF, AI6V, N6TV, N6SF. **WB2ITR** & WB2CJN, **WB2YOF** & WB2CJN, **WB2OYF** & K2TD, KA3BLP, **WB3CZK** + NET, **WB3EKV** & WA3EUL. **WB7RUV** & N7AKQ, **WD8PNF** & AC8N. **WB9ZBE** K9GM. **WBØUFL** & WBØOYA. **YO3KSC:** YO8BOV, YO8BDP. **YO3KWA:** Club. **YO5KAD:** YO5AFJ, YO5LP. YO6KBM: YO6OO, YO6DB. **YU3FOP:** Club. **YU7AJD:** YU7RS, YU7-631, YU7-668, YU7-688, YU7ORS, Dule. **YZ4Z:** YU1OFT, YU1OIF, YU1OIQ, YU4UFO, YU4RS-6643. **Zd7DX:** N1DX, K5UC. **ZL2AH** & ZL2PU, ZL2NAN. LAPSLIC, **ZS6BPL** ZS6BQP. **4Z4SG:** 4X6AU, 4Z4NXI, Ron. **9Q5WH** & 9Q5DH. (WB4ZNH & WN4FVU.)

STATION OPERATORS

Multi-Operator Multi-Transmitter

AA4S & N4WH, WA4BBN, WD4DJA, WD4DIY, K4ZV, WA4FXJ, KB4AF. **CP1AA** & CP1CQ, CP1BP, CP1DM, CP1HI, CP1IL, CP1DFE, CP1IE, CP1FFS, CP1MGS, CP1AT. **DLØPG:** DK3BJ, DJØVZ, DK4QT, DK9JL, DJ2JS, DF1QQ, DJ1FC, DJ9IE, DF1DN, DKJHH, DL8QF. **DLØWW:** DJ4XN, DL3ZA, DL6NK, DL6OE, DK7FC, DK8WD, DF1ZE, DF3FK, DF5ZF, DF7ZP, DF8ZO, DF9ZW, DA1UY, DC3ZM, DD9FB. **GM3MBP** & G3YOG, GM8IIO. **HB7H:** HB9DE, HB9LG, HB9AEG, HB9AFC, HB9AIB, HB9ALM, HB9BAL, HB9BLQ, HB9MEC, HB9MGX, HB9MFS. **JA1YXP:** JA5IEP, JA8MRV, JA4XPT, JH4KAH, JA4QNJ, JR6NJD, JI1HGD, JAØXUF, JH4OWG, JA5BWP, JH8BHP, JA4QLX, JE3UBC. **JA2YEF:** JR2VDA, JH2TBS, JH2VOR, JR2LDM, JR2PVI, JR2TPD, JR2TWA, JR2VWZ, JE2ATB, JEZCYP, JE2KIH, JE2LDO, JE2RDI, JE2RWP, JE2TUH, JE2WBH, JF2ACB, JF2GNY, JF2KKL, JF2NTV, JF3EIT, JF3THB, JA9QNC, JAØUEX. **JA2YXV:** JA2RWN, JH2AIX, JH2BCW, JH2BUS, JH2CMI, JH2FTH, JH2KTA, JH2KTY, JR2OET, JR2CFW, JE2MEL, JE2TEL, JF2AIW. **JA3YBF:** JR3AJZ, JR3FOT, JR3VSW, JE3MCC, JE3OPD, JE3PED, JF3ELY, JF3KZB, JF3JCT, JH4CES, JA5XUU, JH3KIL, JHØFQP, JA9QPF. **JA3YKC:** JH2LRS, JR2SQU, JA3REU, JA3UPK, JH3JRB, JH3KWQ, JH3PKS, JR3KEG, JR3SUK, JR3FRR, JR3XGK, JR3RIU, JR3BKH, JE3BLA, JE3MAS, JE5GZB, JA5TDH, JA5MOU, JA6VXM, JH3VOT. **JA4YBU:** M. Mishima, K. Furakawa, E. Inamura, T. Date, A. Inata, T. Fukuma, M. Funak:. **JA7YRR:** JA7CEC, JA7CFB, JA7CLN, JA7CLX, JA7CXV, JA7FDY, JA7JUD, JA7LBY, JA7MQM, JA7MQQ, JA7RQE, JA7OZW, JH7MEV, JH7MEX. **JH1YDT:** JH1BBT, JH1GNU, JR1IJV, JE1QMV, JE1SCJ, JF1ASB, JF1EAL, JF1ODO, JF1SDH, JG1XLZ, JI1MYH, JI1SHX, JK1RJU, JL1PNH, JH3MNT, JAØVSH. **K1RX** & K1HI, K1WB. **K1VR** & AF1O, K1MEM, W1FJ, W1JZ. **K2UA** & K2BU, N2SS, N3AD, WB2SST, N2MM, KA3BKR. **K3WW** & K3WJV, KB3GJ, K2ZSY, N3EC. **K8GL** & K8DU, WB2LMU. **K8LX** & K8MD, N8EA, W8WW, WA8ZDT, WB8ALP, WN8PEE. **KØRF** & N3VS, N7DF, WØUN, KØDY, KØGU, KBØHQ, WBØCMM, WDØDSU. **KØUK** & KØCL, WØKEA, NØAFO, K9MWM, AE1V. **KH6XX** & N6ZV, AE6E, K7SS, W7EJ, AH6Z, W7ZR, G3VZT, G4BTY, VE7BTV. **KL7D** & AL7D, KL7Y, AL7J, AL7O, KL7HDS, KL7JHD, WB6FXN, KL7DP, WBØUKN. **KL7IRT** & KL7ENY, AL7Z, AL7AK, KL7IKP, KL7AY, KL7R, KL7JET, KL7JHN, KL7AG, KL7JIZ. **LA9K:** LA3AO, LA4BL, LA5SS, LA4MV, LA1FH, LA2IY, LA2QV, LA2SQ, LA6WU, LA8TF. **LH2A:** LA2AD, LA8BU, LA9HT, LA6GQ, LA3GW. **N2AA** & K1KI, N1XX, W1PM, K2BQ, K2GL, K2NG, K2SS, K2TT, K2UR, N2WT, WA2OVR, WA2SFB, WB2VIA. **N2RM/6Y5:** N2RM, N2ME, WA2HGM, WB2GTW. **N3AW** & N3DA, N3AFU. **N3EG** & AA3B, W2NM, WB3DJF, K3GQJ, W3GM. **N3LR:** W3BI, WB3HFQ, N3ANW. **N3RD** & N3RS, W3XU. **N6SV** & N6RJ, N6DJ. **N7RO** W7EKM, AI7P, WA7ZWG, KA7AUH, WL7AFF. **SK2KW:** SM2ALH, SM2HAK, SM2HZQ, SM2DMU, SM2EKM, SM2CEW, SM2DFQ, SM2CPF, SM2DLZ, SM2EPR, SM2HRW, SM2HTF, SM3DMP, SMØGMG, SMØGMZ, SMØGNU, Stig. **VP1RX** & W4BSO. **VP2KC** & N4PN, N4RJ, K4PI, W4HR, W4GIW, W3BTX, K3OIH, AA4V, K5PP, N5UR, N4WW, W4LUM, N4NX, W4PPT, K4UEE, K1PBW, K4PHE, WB4RUA, WD4RCO, WA4PBW, JA3ODC. **W2IGZ/7** & W7ACI, KB7HB, K7RDG, WB7WVT, WB7WVI. **W2RR** & K2IGW, N2CU, WA2AOG, WA2ECA, WA2LCC, WA2SON, WB2ABD, WB2AIO. **W2YV** & K1EB, W2SQ, W2YX, N2NT, K3UA. **W3KWH:** K3RYA, K3TP, KØBUD, N3ML, N3BAW, W3IOH, W3SVJ, W3UHM, WA3FYJ, WA3VXJ, WA3SYB, WA3DKY, WB3EML, WB3EHQ, WB3HAI. **W3LPL** & W3MR, W3XY, K3RT, WB3DNL, WB4SGV, N8RC. **W3MM** & K3OO, K3UU, W3VV, WB3AOP. **W3RJ** & K3VW. **W6RDF** & N6ND, N6ZI, N6RM, N6AGX, K6XT, W6UQF, WB6HGJ. **XE2MX** & K6NA, N6ZZ. **YU3EY** & YU3DM, YU3BO, YU3EO, YU3FK, YU3MY, YU3TBW, YU3SO, YU3TU, YU3TVI, YU3TCB, YU3TUW, YU3UEW, YU7PCF, YU4VXS. **YU7BPQ** & YU7OQQ, YU7OQX, YU7AJN, YU7ABJ, YU7BCP, YU7RS, YU7GZS, YU7UK, YU7QFS. **YU7KWX** & YU7PEG, YU7PEZ, Bokim, Stamisic. **ZZ5EG** & PY5OW, PY5CA, PY2BW, PY2ZBU, PY5PS, PY5OC, PY5OGG, PY5WRO, PY5VM. **4U1ITU:** K1ZZ, W2QD, W3JPT, K3KWJ, W4KFC, WØBWJ, G3CCZ, DJ7ZY, VE3DA. **4X6A** & 4Z4DX, 4X4DK, 4X4JU, 4X4OC, 4X4KK, WA7SIN, W4ART, 4Z4MK, 4Z4DT, 4Z4KX, 4Z4NVX, 4Z4JT, 4Z4TI, 4X4UH. **9Y4FRC:** N3ED, WA3LRO, W2REH, K3GM, K3JLT, K3RL, 9Y4VU.

PHONE TROPHY WINNERS AND DONORS

Single-Operator All Band
World
G3FXB, Al Slater
Donor: Bill Leonard, W2SKE
U.S.A.
N7DD, Larry Pace
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Donor: Jack Baldwin, VE3BS
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VP2ML, Chod Harris
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KG6JIA, Tom Haddon
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World QRPp
W6PQZ, John Akiyama
Donor: Adrian Weiss, K8EEG/0

Single-Operator Single Band
World (28 MHz)
OH2MM/CT3, Ville Hillesmaa
Donor: K2HLB Memorial, No. Jersey Dx Assoc.
World, 21 MHz
H31LR, Obie J.E. Johnson
Donor: Lee Wical, KH6BZF
World, 3.8 MHz
CT3BZ, Martin Laine
Donor: Fred Capossela, K6SSS
U.S.A., 3.8 MHz
W0MJ, Randy Davis
Donor: Arnold Tamchin, W2HCW
U.S.A. (21 MHz)
K1RM, Vincent Sgroi
Donor: So. California DX Club
Canada (28 MHz)
CZ6WQ, Joel Weiner
Donor: Gene Krehbiel, VE7KB
Carib./C.A. (28 MHz)
KP4O, Heriberto Salls
Donor: Pedro Piza, Jr., KP4RF
Oceania, 14 MHz
YB0ADI, Michael Selby
Donor: VK3JW Memorial, Pacific DX Net
Oceania, 21 MHz
VK4VU, R. Martin Luther
Donor: Pacific R.A.T.S.
South America (14 MHz)
YW1AVO, Stradiotto Italo
Donor: Rafael Ponce De Leon

Multi-Operator Single Transmitter
World
HI8XWP (Oprs. K1AR, K1DG)
Donor: Don Wallace, W6AM
Canada
VE1DXA (Oprs. VE1DX, VE1UG, VE1AIG, VE1BXC, VE1VX)
Donor: Calgary Amateur Radio Assoc.

Multi-Operator Multi-Transmitter
World
VP2KC (Oprs. N4PN, N4RJ, K4PI, W4HR, W4GIW, W3BTX, K3OIH, AA4V, K5PP, N5UR, N4WW, W4LVM, N4NX, W4PPT, K4UEE, K1PBW, K4PHE, WB4RUA, WD4RCO, WA4PBW & JA3ODC)
Donor: Radio Club Venezolano
U.S.A
K8LX (Oprs. K8LX, K8MD, N8EA, W8WW, WA8ZDT, WB8ALP & WN8PEE)
Donor: Dale Hoppe, K6UA

Contest Expeditions
World - Single - Operator
9Y4VT (Opr. Richard J. Norton, N6AA)
Donor: Stuart Meyer, W2GHK

World - Multi - Operator
9Y4FRC (Oprs. N3ED, WA3LRO, W2REH, K3GM, K3JLT, K3RL, 9Y4VU)
Donor: Bill Schneider, K2TT

WORLD TOP 10 QRP$_p$
(5w input)

1. W6PQZ 168,156
2. WA2JOC 155,700
3. UA3PAZ 132,250
4. N2GC 121,992
5. JK1GDD 114,400
6. WB2RWW 105,000
7. G3FTQ 90,985
8. WA4FHQ 89,262
9. VE1AUT 87,584
10. K1CGJ 84,590

Number groups after call letters denotes following: Band (A = all), Final Score, Number of QSO's, Zones and Countries. Certificate winners are listed in Bold Face.

PHONE RESULTS
SINGLE OPERATOR
NORTH AMERICA

UNITED STATES

W1ZM	**A**	**3,035,790**	**1974**	**34**	**400**
			(Opr. K1ZM)		
K1VTM		**2,654,834**	**1863**	**125**	**378**
			(Opr. K1JX)		
W1CF	"	**2,268,420**	**1707**	**121**	**370**
			(Opr. K1UA)		
W1RR	"	1,685,440	1318	113	345
W100	"	1,259,520	1061	121	289
K1IU	"	776,652	776	93	273
K1BV	"	376,110	620	58	152
KA1EP	"	370,899	543	61	180
K1KJT	"	315,264	600	50	142
WA1ZAM	"	286,454	401	69	190
W1AW	"	271,895	427	68	168
			(Opr. W3AZD)		
K1CC	"	248,145	393	64	169
N1R1	"	191,880	373	48	132
WA1YEC	"	172,312	330	49	132
K1GQ	"	161,800	293	54	141
W1DO	"	4,760	40	12	28
W1BB	**1.8**	**748**	**21**	**7**	**10**
K1NBN	"	84	8	3	4
K2DM	**A**	**1,583,349**	**1349**	**105**	**312**
N2IC	"	**1,499,339**	**1310**	**106**	**295**
W2SUA	"	**1,410,732**	**1109**	**115**	**332**
			(Opr. AA2Z)		
N2LT	"	1,011,381	1006	95	262
K2XA	"	853,596	836	98	264
W2GD	"	822,447	838	99	268
WA2BFW	"	801,161	802	102	265
K2PH	"	741,510	844	82	233
K2VV	"	721,142	984	73	184
K2HR	"	625,189	744	78	199
WA2AUB	"	623,492	651	93	253
N2MR	"	617,044	634	91	262
WA2DPU	"	533,967	594	93	236
AI2C	"	514,080	554	97	243
N2VW	"	429,660	499	89	226
WB2RNT	"	336,168	521	54	178
W2NS	"	281,474	456	59	152
K2OIX	"	266,172	392	72	174
KB2DE	"	251,220	390	71	166
KA2K	"	225,862	364	60	161
W2BTU	"	196,539	360	53	138
W1GD/2	"	179,242	309	60	157
AC2J	"	118,174	260	49	112
K2JF	"	117,260	246	46	118
WA2LUM	"	113,100	271	34	111
K2PE	"	109,372	266	40	108
KB2EZ	"	102,378	229	45	106
WB2ODH	"	89,910	258	37	98
N2CQ	"	87,120	212	41	103
K2PF	"	82,082	197	44	110
WB2MEW	"	73,984	203	44	84
K2QF	"	73,947	158	53	104
W2SDO	"	57,950	162	38	84
KA2CDJ	"	56,816	163	39	95
WA2JCX	"	49,408	166	38	90
N2AWH	"	42,536	157	30	74
K2FS	"	32,487	104	42	77
WB2PXA	"	32,232	126	37	65
W2PFQ	"	27,482	151	27	64
K2EQU	"	18,216	85	21	51
K2JCC	"	17,292	93	21	45
W2FGY	"	16,946	83	25	49
WB2GES	"	14,364	81	19	44
WA2TJE	"	12,728	67	30	44
WB2MVC	"	7,315	54	16	39
K2HPV	"	7,308	45	21	37
WA3PHA	"	5,830	42	17	36
W2DW	"	5,658	43	14	32
WB2FZU	"	2,523	30	9	20
WA2CZY	"	1,144	31	7	15
WA2SPL	**28**	**735,528**	**1659**	**36**	**116**
N2PP	"	**457,457**	**1090**	**34**	**109**
WA2IFS	"	227,942	562	32	111
W2KZE	"	133,947	398	27	94
WA2VUR	"	114,885	361	28	83
WB2JGQ	"	109,763	352	26	83
AE2A	"	101,915	425	20	65
WA2NEW	"	96,552	420	19	62
WA2ZWH	"	81,320	298	24	71
WB2JGP	"	66,960	254	25	68
W1WY	"	130,200	265	60	126
K1SA	"	116,219	248	42	121
K1LXJ	"	100,128	239	41	108
KA1CVM	"	88,452	248	31	95
WA1OEZ	"	82,011	213	35	102
K1TN	"	74,884	145	63	131
W1HX	"	73,144	167	48	116
W1DYH	"	63,139	208	24	79
N1EE	"	50,778	155	42	84
K1RB	"	48,280	132	46	90
W1SD	"	45,458	139	34	85
W1ITC	"	33,384	110	38	69
N1RC	"	22,042	102	40	67
W1XX	"	17,864	85	23	54
K1IJU	"	14,457	84	16	45
W1CWU	**28**	**380,163**	**1097**	**33**	**96**
K1EM	"	243,950	731	29	90
W2NSD/1	"	170,250	531	30	95
K1WJ	"	134,915	396	28	93
WB1EUB	"	97,014	318	30	81
W1BIH	"	72,574	196	33	98
W1PWK	"	31,898	138	19	63
W1TN	"	25,056	124	21	51
WB1DFV	"	15,939	97	14	49
W1CTR	"	4,785	55	9	24
K1RM	**21**	**870,237**	**1768**	**38**	**129**
W1NG	"	480,654	1051	35	127
WA1ZLD	"	93,345	315	22	83
K1RZ	"	29,796	382	22	56
N1ATO	"	6,258	50	13	29
K1NG	**14**	**215,930**	**523**	**37**	**106**
WB1ANT	"	205,084	640	32	86
W1GG	"	186,184	481	35	101
AB1U	"	86,070	266	32	82
K2JGG/1	"	82,764	261	33	88
K2MFY	"	63,342	266	20	61
WA2GUM	"	50,996	243	20	56
K2OLG	"	45,212	128	31	96
WB2TKD	"	35,787	157	20	59
W2QKJ	"	26,609	157	14	45
KB2KN	"	21,299	123	17	42
W0MHK/M2	"	20,244	87	21	63
WB2VPV	"	9,912	81	7	35
N2ALK	"	6,846	64	14	28
KA2COY	"	6,201	43	14	39
WA2TJF	"	5,850	126	20	19
WB2OJX	**21**	**37,825**	**172**	**24**	**61**
WA2YLY	"	8,400	65	13	35
W2TA	**14**	**214,200**	**557**	**35**	**101**
WB2LOF	"	136,458	355	36	97
N2BAP	"	12,544	80	16	40
K2HPR	"	12,376	88	16	36
W2XO	**1.8**	**630**	**38**	**5**	**10**
W3BGN	**A**	**2,330,496**	**1713**	**119**	**357**
W3GRF	"	**2,225,430**	**1646**	**119**	**355**
			(Opr. KBDQ)		
N3BB	"	**2,012,279**	**1461**	**129**	**350**
K3TW	"	1,787,212	1455	121	313
W3FA	"	1,245,624	1086	100	308
			(Opr. WA3ZAS)		
K3NZ	"	1,185,030	1101	98	280
AD3V	"	1,110,708	986	118	300
K3ZJ	"	1,066,648	1022	101	273
K3MWV	"	1,011,126	836	113	318
N3RL	"	869,600	779	107	293
W3FV	"	768,534	782	100	254
K3ND	"	584,695	600	97	250
K3II	"	567,113	634	87	230
W3UJ	"	529,038	633	83	208
W3IQS	"	515,504	581	86	233
WB3CIW	"	493,920	588	82	212
KB3HE	"	491,876	572	84	224
W3GK	"	447,678	590	70	196
WB3AVN	"	422,425	515	90	215
N3HW	"	408,456	668	55	161
W3YFV	"	394,457	544	75	184
K3IU	"	380,528	483	77	195
W3MA	"	373,320	443	83	222
WB3IXG	"	358,683	564	56	165
K3WOK	"	300,570	448	54	179
WA3WRD	"	258,720	394	63	168
W3KT	"	217,056	324	66	172
W3ARK	"	203,840	396	43	139
AF3E	"	179,172	263	59	174
W3GRS	"	168,028	258	66	172
K3AV	"	164,619	308	49	140
W3OV	"	148,518	247	72	150
WA3Y1V	"	143,352	288	54	127
AD3Z	"	138,128	247	55	139
WA3FNK	"	128,609	265	49	120
WB3GCG	"	115,217	299	41	96
WA3IMY	"	96,778	223	51	115
WA3DMH	"	94,116	220	42	104
K3SA	"	86,190	169	59	111
W3CJI	"	65,416	161	39	98
W3BB	"	63,940	181	33	82
W3HVM	"	62,176	169	46	88
K3KHL	"	52,924	190	30	71
K3TP	"	49,104	147	47	91
W3PC	"	47,784	132	40	92
W3ETB	"	46,750	145	37	88
W3ALB	"	44,428	139	32	84
K3VY	"	43,896	143	40	84
W3IW	"	40,677	157	26	65
N3GW	"	33,285	113	29	76
K3TGM	"	33,065	134	19	66
W3BNQ	"	29,376	107	29	73
WB3EFI	"	29,148	125	32	52
WA3YTI	"	26,226	107	28	65
W3KFQ	"	22,540	90	21	49
N3RW	"	15,444	80	18	48
WA3NAN	"	12,040	65	26	44
WB3AZE	"	6,996	54	19	34
W3FQE	"	800	15	7	13
K2PLF/3	**28**	**330,616**	**821**	**34**	**109**
W3DPH	"	59,192	217	26	72
WB3KHF	"	41,550	192	22	53
N3RC	"	1,326	19	9	17
KB3BV	"	1,320	22	10	12
W3EWL	**21**	**226,349**	**520**	**34**	**117**
WB31CL	"	115,404	333	29	89
AD3R	"	95,770	245	28	94
N3VA	"	54,488	192	24	74
WA3YEY	"	38,151	167	23	58
W3KHQ	"	34,578	122	28	74
KA3CMR	"	11,700	80	15	37
KP4GO/3	"	9,114	89	17	32
K3SWZ	7	595	14	5	17
N4RV	**A**	**1,945,008**	**1441**	**123**	**345**
N4RA	"	**775,019**	**756**	**103**	**268**
W4EI	"	**754,031**	**781**	**91**	**256**
K4EZ	"	555,698	619	95	224
N4AA	"	450,296	507	82	226
K4IQH	"	445,770	581	80	190
WB6WOK/4	"	418,971	706	62	151
K4IIF	"	413,280	525	89	198
AA4DR	"	377,608	451	92	216
WA4QMQ	"	342,364	482	73	178
W4OUN	"	341,432	463	80	188
W4BV	"	344,944	430	84	204
AC4X	"	334,264	462	71	183
WA4MAV	"	324,360	581	79	186
K4KUZ	"	314,118	423	90	187
W4RW	"	301,665	455	59	162
W4DM	"	298,420	404	81	184
WA4NTP	"	296,216	454	73	171
N4MM	"	239,592	327	84	184
W4OVU	"	227,664	308	83	189
KB4CD	"	218,190	372	57	153
N4XD	"	212,688	375	63	148
K4ZLE	"	203,250	310	74	176
K4OD	"	201,924	313	75	162
KB4O	"	190,992	432	54	130
W4MYA	"	166,600	339	58	117
K4LQ	"	165,354	236	92	162
WD4NBX	"	151,938	287	64	143
N4IA	"	126,360	250	45	135
N4XM	"	121,875	249	59	136
AA4RM	"	120,342	239	56	130
AK4T	"	120,152	240	58	126
K4POL	"	117,477	246	39	132
KC4M	"	110,360	219	58	120
K1ER/4	"	105,245	241	53	102

W4WJJ	"	92,820	243	39	101
KA4C	"	89,376	192	52	116
W4OWJ	"	86,443	206	64	169
WB4WHE	"	76,884	223	32	97
N4AM	"	75,920	190	42	104
W4BFR	"	73,700	194	38	96
W2HAE/4	"	71,258	179	50	108
W4KMS	"	68,688	165	43	101
WD4HSA	"	65,219	206	41	80
W4ZEI	"	60,320	189	30	86
K4RD	"	57,810	148	53	88
K4VHC	"	53,212	180	25	81
N4BGN	"	43,758	130	35	82
K4BYK	"	42,560	103	59	93
WD4PJT	"	39,270	159	32	53
WD4NNP	"	32,594	146	27	59
WD4NAE	"	32,542	110	29	77
K4PR	"	29,993	148	30	59
WB4KHJ	"	21,812	112	31	51
W4UVP	"	20,944	100	24	53
W4UYC	"	20,700	87	32	60
W4GTS	"	19,987	93	33	46
KA4ALC	"	15,678	132	26	41
WA4TPS	"	15,067	93	18	43
WB4YPT	"	8,062	55	19	39
WD4CTA	"	7,812	50	22	40
WA4OPV	"	7,366	46	21	37
AJ2E/4	"	7,210	45	32	38
W4ZR	"	4,850	37	129	31
WB4GRK	"	2,662	45	13	24
WB4NYL	"	2,211	24	14	19
W4RX	**28**	**490,472**	**1141**	**34**	**114**
W4QQN	"	**437,613**	**921**	**37**	**112**
N4SW	"	423,253	964	36	115
		(Opr. N3IO)			
K3KG/4	"	408,332	987	36	112
K4BAI	"	230,691	634	31	100
W4DR	"	212,976	539	34	102
		(Opr. WD4REE)			
WA4SWY	"	206,640	568	32	94
N4KG	"	194,560	520	32	96
WD4IKI	"	127,312	416	28	81
WA4IKZ	"	104,864	314	30	83
K4HAV	"	96,305	331	28	75
WD4IZR	"	85,200	302	26	74
WD4LYA	"	84,151	292	28	75
WD4IBO	"	61,560	240	28	62
WB4VQO	"	58,113	206	28	71
N4CD	"	50,464	212	24	59
N4AOJ	"	50,348	223	23	59
K4KKJ	"	46,704	197	23	61
W4OGG	"	16,320	50	10	33
KA4EOJ	"	2,340	30	10	20
K4ISV	**21**	**381,918**	**855**	**37**	**122**
N4CT	"	328,328	786	34	109
W4ZTW	"	153,925	426	35	96
AB4H	"	147,618	377	32	107
K4KIU	"	103,398	330	27	87
KB4SW	"	64,770	261	33	69
WA4HNL	"	43,804	1659	26	68
K4JRF	"	27,669	147	20	49
WD4AVY	**14**	**58,328**	**229**	**28**	**64**
K4AUL	"	33,600	140	23	61
WD4KQJ	"	5,390	56	11	24
K4JRB	**7**	**74,970**	**265**	**25**	**77**
N4KE	"	66,852	244	26	82
WA4DRU	"	19,512	103	16	56
KD4M	"	7,056	56	12	37
AK4Q	"	3,627	40	10	29
KG4W	**3.5**	**32,096**	**279**	**18**	**50**
WA4SVO	"	19,906	121	20	54
KE4I	"	9,384	83	12	39
AD4U	**1.8**	**1,007**	**100**	**7**	**12**
K5NW	**A**	**1,131,174**	**1056**	**121**	**273**
K5KLA	"	**1,077,363**	**1111**	**105**	**244**
N5JB	"	**854,152**	**845**	**103**	**241**
K5DX	"	640,085	692	99	214
K5WF	"	624,162	650	96	198
WA5IGD	"	544,730	649	88	217
AD1S/5	"	471,843	564	94	215
K5DB	"	383,915	555	70	175
WD5EWP	"	354,627	480	89	184
W5OSJ	"	285,000	431	79	171
WD5HSX	"	228,651	372	62	137
AI5A	"	228,212	367	70	166
KA5W	"	214,830	383	73	137
K5AQ	"	211,091	310	88	163
AE5H	"	207,378	303	88	193
W5RRR	"	207, 024	336	65	163
		(Opr. W5LSZ)			
W5JC	"	193,829	295	76	163
N5TX	"	189,810	352	55	135
W5JWM	"	155,097	329	52	119
K2SCU/5	"	130,986	284	53	118
WD5CGC	"	123,510	254	56	123
W5KCR	"	121,576	246	64	118
N5BET	"	113,160	238	46	92
W5OB	"	112,048	240	60	128
K5DEC	"	91,931	224	49	112
N5KT	"	89,610	220	45	100
W5BE	"	82,836	195	49	107
W5SOD	"	82,795	210	51	94
N5UA	"	72,063	193	57	100
N5HB	"	71,307	195	54	85
N5AXR	"	64,701	196	35	82
W5DUI	"	63,345	184	44	79
AF5D	"	59,568	151	53	93
KB5GL	"	51,566	159	37	81
W5SNU	"	42,210	131	43	83
W5LUU	"	40,222	125	41	78
W5ODD	"	39,114	117	46	77
N5FW	"	27,900	108	34	59
N5NO	"	19,635	88	23	54
W5VD	"	11,907	65	28	53
W5QF	"	9,295	60	23	32
WD5IOE	"	6,784	80	16	37
WB5VZJ	"	6,656	48	23	29
K5LM	"	1,872	22	17	19
N5BT	"	663	24	9	4
W5MYA	**28**	**681,360**	**1411**	**39**	**128**
K5TJ	"	**572,908**	**1250**	**38**	**120**
K5JA	"	522,815	1163	39	116
K5MR	"	385,002	936	37	109
W5VGX	"	209,160	610	30	90
AF5K	"	186,720	606	36	84
K5FUV	"	176,930	486	34	96
WA5BYG	"	86,623	327	28	75
WD5CSK	"	82,194	287	29	74
WB5UDX	"	74,802	298	24	67
K5WA	"	64,800	256	25	65
K5IG	"	46,750	201	22	63
K5RF	"	42,687	194	22	59
WD5INS	"	38,052	166	24	60
K1DWQ/5	"	33,784	151	21	61
W5CB	"	32,100	150	22	53
WA5BKN	"	25,872	196	12	32
N5DY	"	16,531	101	20	41
N5ARB	"	5,084	48	16	25
W5EDZ	"	1,007	21	9	10
WD8DKJ/5	"	162	10	4	5
W5JW	**21**	**297,296**	**760**	**34**	**102**
N5AU	"	**225,504**	**487**	**37**	**125**
K5BZU	"	192,992	496	36	112
W5LKP	"	107,008	321	37	91
WA5QBO	"	101,525	281	33	98
WB5LBT	"	99,712	272	33	95
KB5FU	"	52,900	216	27	65
KA5BML	"	20,942	107	23	51
K8TD/5	"	19,783	105	24	49
K5BDX	"	17,476	95	20	48
N5CR	"	8,427	56	19	34
W5IYR	"	8,268	59	16	37
WD5BEP	"	902	21	10	12
W5FO	**14**	**242,744**	**576**	**38**	**114**
K5NU	"	166,032	447	36	108
K5UR	**1.8**	**2,436**	**108**	**9**	**20**
K5YY	"	1,080	30	7	13
N6RO	**A**	**2,115,540**	**1709**	**131**	**307**
N6KT	"	**1,804,419**	**1671**	**118**	**261**
N6AR	"	**1,256,884**	**1126**	**125**	**273**
K6RR	"	1,099,899	1148	101	232
		(Opr. N6IN)			
N6OJ	"	820,864	1159	79	163
N6AW	"	717,696	743	106	230
W6OKK	"	441,395	728	74	141
K6ELX	"	441,262	864	62	116
W6FQF	"	431,760	624	78	162
KD6F	"	410,652	676	87	157
N6MB	"	393,734	570	77	165
N6QQ	"	305,532	440	85	161
W6BJB	"	260,337	556	61	100
W6CN	"	260,043	449	64	139
WA6EJL	"	230,805	386	72	151
N6AN	"	226,590	413	58	137
W6TPC	"	208,071	398	65	118
W6HXW	"	190,806	287	74	157
N6XH	"	188,805	323	72	133
W6YA	"	184,032	295	68	148
W6BYH	"	161,356	274	74	140
WB6SHL	"	118,184	230	57	130
WA6LFF	"	95,520	214	54	106
WB6JMS	"	94,240	250	63	92
WB6RWJ	"	86,530	191	58	112
W6OUL	"	78,624	195	47	97
N6UW	"	78,057	201	52	95
WA6BHR	"	69,120	200	31	77
W6MFC	"	69,046	152	53	105
W6LEN	"	62,475	190	44	75
K6VI	"	61,664	250	24	70
WD6FLB	"	57,232	184	44	68
W6OVO	"	53,456	186	38	66
N6BTY	"	41,311	145	41	68
N6JM	"	41,064	130	43	73
KB6RO	"	36,936	132	44	64
N6ST	"	34,240	183	32	48
KB6HT	"	29,283	92	55	74
AJ6V	"	28,558	100	46	63
N6DN	"	24,108	125	38	44
W6KBD	"	15,209	83	24	43
K6AV	"	14,678	70	31	51
W6QDE	"	12,258	79	22	32
KB6FN	"	10,854	75	20	34
WB6OKK	"	9,288	75	11	32
AA6EE	"	9,280	79	30	28
WB6NBE	"	9,050	66	19	31
AF6S	"	8,512	49	27	49
AK6P	"	8,122	36	26	36
WB6IHZ	"	7,847	48	26	33
N6BCY	"	5,133	67	12	17
AE6U	**28**	**538,902**	**1343**	**36**	**111**
K6HNZ	"	**521,136**	**1441**	**33**	**93**
WA6OCV	"	484,005	1444	33	90
W6PU	"	470,408	1258	34	93
N6NU	"	352,176	984	35	97
K6YRA	"	160,035	402	36	105
WB6MBF	"	115,584	363	32	80
K6SVL	"	67,014	164	38	108
WA6NHB	"	43,902	197	22	59
AI6Z	"	40,656	175	24	60
W6YMH	"	38,885	181	22	55
K4ZIN/6	"	36,928	208	18	46
WA6KXN	"	36,350	259	18	32
WA6VNR	"	31,125	150	22	53
W6OGC	"	29,736	187	23	33
WD6EWG	"	16,464	133	21	28
KB6GU	"	12,550	91	20	30
W6ZM	"	5,198	40	15	31
W6ILH	"	2,940	27	17	25
W6NXB	"	825	44	6	5
WA6EKL	**21**	**694,416**	**170**	**36**	**102**
K6SMF	"	432,684	1166	33	93
K6EVR	"	423,038	1086	33	101
W6UA	"	107,976	289	36	96
N6TO	"	62,792	230	28	66
N6CDA	"	30,940	120	30	61
W6OK	**14**	**41,420**	**159**	**30**	**65**
N6WR	"	10,850	81	20	30
K5GOE/6	7	1525	29	10	15
N7DD	**A**	**3,113,788**	**2206**	**147**	**346**
W7RM	"	**2,875,450**	**2324**	**135**	**304**
K7RI	"	**2,418,028**	**2010**	**125**	**287**
		(Opr. K7TI)			
W7IL	"	1,686,894	1613	113	253
K7LR	"	1,001,832	1073	103	235
W7JYW	"	335,160	689	58	110
K7SFN	"	266,944	547	68	104
K7ZA	"	262,892	403	73	156
AJ7S	"	236,368	456	65	122
W7LGG	"	193,640	354	67	121
K7LAY	"	149,520	312	49	119
WB7BNP	"	129,752	250	72	124
N7AM	"	128,885	285	62	111
W7GUR	"	122,464	242	56	122
K7YDO	"	68,034	178	46	92
WB7WEI	"	62,694	179	47	82
WA7KNK	"	54,197	137	57	86
WB7SQM	"	28,026	151	38	43
KA7BAY	"	24,854	109	29	57
KQ7APJ	"	23,725	121	27	46
N7CT	"	13,144	133	27	26
KA7DHU	"	12,834	122	16	30
WB7NCD	"	9,888	68	36	60
W7DA/7	"	9,278	102	14	29
		(Opr. N7ABA)			
K7RS	"	7,525	69	21	22
WA7YFJ	"	4,278	50	16	15
W7BCT	"	3,952	63	21	46
KB7HP	"	2,940	19	5	15
W7DOQ	"	2,240	26	14	18
K7NF	"	1,792	19	13	19
K7CY	**28**	**350,994**	**874**	**36**	**101**
N2AIR/7	"	**324,401**	**950**	**31**	**90**
K7HCD	"	272,422	699	34	100
WA7KPH	"	232,962	713	33	80
N7ABJ	"	144,648	408	32	91
W7EPA	"	126,567	359	35	88
K7LXC	"	112,330	489	28	66
WB7PIJ	"	101,151	397	24	65
K7HBN	"	69,090	230	31	74
W7AYY	"	64,206	261	23	64
K7IDX	"	59,400	195	28	80
WB7UVA	"	34,965	196	20	43
WB7PCJ	"	34,930	183	21	49
W1YY/7	"	33,327	171	23	46
WB7TKK/7	"	13,392	95	19	29
AF7S	"	6,027	44	14	35
N7XX	**21**	**767,016**	**1970**	**32**	**102**
K6LL/7	"	333,852	886	36	93
WB7OOW	"	148,614	567	30	63
W7MLJ	"	29,877	154	20	49
K7JCI	"	8,968	86	12	26
WA7GVM	**14**	**159,984**	**424**	**36**	**96**
K7UR	**7**	**53,922**	**293**	**20**	**46**
K7IM	"	3,861	59	13	20
K7WA	"	500	19	5	5
N7EA	**3.5**	**11,439**	**115**	**14**	**27**
WB7BFK	**1.8**	**407**	**28**	**6**	**5**
W8UA	**A**	**999,100**	**905**	**105**	**283**
K8MN	"	**901,845**	**853**	**115**	**294**
KB8JF	"	**669,282**	**737**	**92**	**245**
N8KK	"	626,560	618	96	260
WB8VPA	"	568,164	616	97	242
K8US	"	545,488	616	92	239
WD8ALG	"	529,163	754	68	189
K9NS/8	"	462,705	514	94	233
K8EF	"	403,968	568	78	178
W8WOJ	"	268,822	393	74	183
K8IC	"	245,157	345	69	184
K8SIA	"	238,525	384	62	173
AC8C	"	216,608	353	65	159
W8QP	"	170,112	310	58	134
K8TMK	"	166,992	304	58	138
K8IQQ	"	161,322	344	40	127
K8AC	"	153,882	269	58	148
K8CV	"	151,470	310	57	113
N8BJQ	"	133,470	327	37	111
WB8LFO	"	132,639	262	55	124
WB8ZJW	"	132,363	213	70	161
K8TSZ	"	132,254	258	54	124
AI8K	"	111,496	237	50	124
K8BTH	"	104,496	231	47	121
W8SQ	"	101,060	237	51	104
N8LA	"	90,600	208	43	107
WB8ZRL	"	88,788	165	59	137
N8AHK	"	87,115	282	40	92
WD8KXN	"	87,790	221	46	93
AI8N	"	64,306	181	53	105
WD8OHC	"	63,855	177	37	92
WD8MOV	"	61,308	165	37	94
W3IWG/8	"	50,512	220	26	62
K8PCZ	"	44,416	127	43	85
KB8EZ	"	44,014	143	37	81
WD8IPJ	"	42,971	158	24	73
WD8PBF	"	40,812	257	23	53
K8URE	"	37,878	129	38	69
		(Opr. N9AG)			
N8ARA	"	32,315	116	41	74
W8ANM	"	28,980	106	33	72
AI8W	"	27,878	112	40	66
N8ASM	"	22,568	89	29	62
WD8QMS	"	18,164	81	30	46
WB8TNN	"	16,146	110	18	36
K8HV	"	14,240	63	33	56
W8IJS	"	12,028	102	20	42
W8YGR	"	10,854	54	32	49
N8AXA	"	10,285	71	18	37
N8MK	"	10,150	73	20	38
K8RWL	"	10,166	80	11	35
N8AGU	"	6,840	55	12	33
WD8MKL	"	5,658	44	18	28
AA8U	**28**	**572,866**	**1234**	**36**	**130**
N8UM	"	**504,514**	**1217**	**35**	**114**
WA8TNO	"	219,100	556	35	105
AA8G	"	168,328	561	30	76
W8NWO	"	147,969	416	32	91
N8FU	"	103,500	404	27	73
N8BCD	"	76,896	281	26	70
WB8WMS	"	73,920	230	28	82
K8OT	"	50,868	214	24	57
K8IP	"	41,713	149	28	73
WA8COR	"	24,318	143	17	46
WD8OFP	"	20,435	123	16	45
WB8OYU	"	14,145	82	24	45
KB8JK	"	10,996	80	16	41
WD8LMU	"	4,104	44	12	24
WB8RYZ	"	1,464	26	11	13
KB8JD	"	901	18	5	12
K8SMC	**21**	**413,960**	**935**	**39**	**119**
N8TT	"	61,692	207	28	78
WB8QJL	"	7,866	71	10	28
K8HF	"	6,622	55	15	28
W8TWA	**14**	**194,814**	**505**	**36**	**101**
N8AKF	"	94,810	295	30	80
KB8IO	"	26,296	124	22	54
W8JWR	**7**	**28,548**	**155**	**20**	**58**
WD8CRY	"	5,355	48	13	32
W8EDU	**3.5**	**45,150**	**344**	**19**	**51**
		(Opr. WA3FET)			
K8XX	"	32,400	291	17	37
W8LRL	**1.8**	**2,945**	**71**	**10**	**21**
KB8AC	"	520	232	4	9
K8CFU	"	448	31	4	10
W9ZRX	**A**	**2,310,165**	**1644**	**135**	**360**
W9RE	"	**2,184,776**	**1613**	**131**	**353**
W9OP	"	**745,683**	**872**	**82**	**221**
K9HDE	"	676,940	676	108	266
K9QXY	"	519,090	566	100	230
N9AFY	"	444,470	605	73	190
K9XJ	"	378,508	533	72	179
N9RC	"	316,901	446	73	174
WB9BGJ	"	305,325	473	64	161
K9UR	"	295,256	472	58	163
W9EQP	"	274,290	428	67	156
WD9CPX	"	239,850	415	59	146
K9MDO	"	234,588	367	62	164
KB9AW	"	209,440	344	69	155
W9AMM	"	177,192	297	63	151
N9ER	"	151,312	274	56	140
K9IZT	"	81,241	217	41	96
W9RW	"	74,104	186	55	102
W9GXR	"	73,884	199	39	92
W9OWM	"	71,856	198	50	94
K9KVA	"	70,184	203	36	88
WB9NOV	"	67,340	200	43	87
W9OEJ	"	64,890	188	37	87
K9DAF	"	62,118	174	37	89
W9TNZ	"	51,729	153	43	86
N9AQT	"	51,240	151	42	80
W9ZM	"	50,400	132	52	98
WD9AEU	"	47,704	141	46	88
AF9C	"	44,928	149	33	71
K9DIN	"	32,806	119	30	64
WB9UTM	"	30,396	102	36	66
WA9JWL	"	30,282	107	30	68
W9NGD	"	28,458	121	30	63
W9GU	"	26,264	94	38	60
W9FBC	"	21,746	90	27	56
WD9HWY	"	21,386	102	25	49
WB9RNF	"	21,312	83	32	64
WB9QIZ	"	20,596	98	23	53
WD9GRI	"	19,488	87	40	56
K1TH/9	"	16,240	96	30	50
WB9ZBP	"	14,280	81	22	46
N9AOW	"	11,368	78	18	40
WB9SMU	"	10,304	70	16	40
WA9YRL	"	4,416	33	20	28
WD9DCL	**28**	**433,985**	**1031**	**34**	**111**
K9RX	"	**430,704**	**1025**	**35**	**109**
W9ZA	"	406,262	1011	34	108
W9LT	"	400,451	1032	35	102
K9RN	"	339,445	796	34	111
KB9HG	"	199,808	546	31	97
AI9F	"	159,000	557	25	75
KA9DOO	"	136,504	426	31	82
WD9DEE	"	133,812	371	29	97
K9CLO	"	114,777	382	31	78
KA9CQM	"	110,968	376	27	77
N9ACP	"	106,572	352	25	82
W9VA	"	93,528	305	31	77
W9LKI	"	44,625	213	18	57
WD9GSU	"	29,944	135	20	56
WD9GRL	"	24,960	140	20	44
K9UQN	"	14,634	99	17	37
K9BQL	"	5,203	47	16	27
K9DX	**21**	**591,527**	**1269**	**37**	**126**
WD9IIX	"	228,438	525	35	112
WA9VKN	"	194,766	474	36	107
WB9RGA	"	92,354	267	32	90
WA9EKA	"	69,104	213	25	87
K9JDV	"	6,808	50	15	31
K9RF	**14**	**274,762**	**608**	**39**	**119**
W9GIL	"	73,447	213	35	86
K9POO	"	40,764	165	22	64
WB9OBX	"	31,160	130	26	56
WB9QPN	**7**	**36,852**	**165**	**22**	**61**
W9NWE	"	32,144	144	20	62
W9LF	**3.5**	**17,385**	**155**	**17**	**44**
KØCS	**A**	**967,587**	**1003**	**116**	**263**
WAØTKJ	"	**798,225**	**795**	**110**	**257**
NØGA	"	**757,891**	**788**	**109**	**244**
KØLUZ	"	755,136	789	96	246
WØIUB	"	472,633	672	73	178
KØVUW	"	466,955	568	94	211
WØVX	"	413,386	542	81	197
KØVM	"	382,284	544	70	176
WAØECN	"	326,772	448	80	181
WØGNX	"	322,092	425	102	174
WBØISW	"	264,160	381	90	170
WØHUP	"	227,668	470	46	127
WØJU	"	199,804	33	64	145
WØRU	"	184,074	377	54	119
WØSR	"	156,123	276	70	139
KAØBCW	"	147,264	283	66	126
KØGT	"	140,400	245	70	146
KØAL	"	109,360	244	64	116
KØCF	"	86,625	195	56	109
ACØN	"	78,806	172	48	134
WBØCHS	"	56,048	167	42	82
WBØIEL	"	50,844	162	42	72
NØAFL	"	49,425	121	53	96
WØWUU	"	42,001	153	35	62
WAØDCB	"	38,874	127	40	74
WØMJN	"	34,884	129	39	63
K9BLY/Ø	"	23,644	91	37	55
KBØCJ	"	15,400	89	26	51
WAØWJX	"	14,697	80	28	41
WBØCGJ	"	12,628	59	30	47
WØCAQ	"	8,052	66	16	38
WBØWQZ	"	3,913	36	18	25
NØBHQ	"	2,432	33	15	23
WDØHWX	"	465	12	7	8
WØYK	**28**	**564,944**	**1546**	**33**	**108**
NØAIT	"	296,760	1010	31	85
WAØLKL	"	207,324	623	31	86
WBØYUI	"	108,192	351	28	84
WBØOTA	"	91,460	302	31	77
KBØAQ	"	82,460	304	24	71
WDØGXR	"	80,352	386	26	67
KØIFL	"	72,075	270	25	68
WDØAYT	"	45,969	220	23	54
KAØCKN	"	5,762	55	16	27
NØAT	**21**	**271,584**	**724**	**33**	**105**
KØILI	"	119,187	350	32	91
K5JZN/Ø	"	104,839	328	31	88
WØSML	"	79,810	244	29	86
KØKX	**14**	**335,041**	**732**	**38**	**123**
KØDD	"	248,976	565	39	113
WØMJ	**3.5**	**48,664**	**355**	**21**	**56**

ALASKA

KL7CQ	**A**	**309,881**	**772**	**52**	**91**
KL7ISO	"	132,640	676	31	49
KL7IWE	"	30,208	217	23	36
AL7O	**28**	**234,992**	**1281**	**24**	**52**
KL7EJ	"	88,350	682	17	33
KL7IBT	"	6,288	111	12	12
KL7AF	**21**	**163,560**	**671**	**30**	**64**

BAHAMAS

C6ACY	**A**	**3,010,700**	**3671**	**103**	**237**
C6ANR	28	29,052	250	20	34

BERMUDA

NIGL/VP9	**A**	**3,962,635**	**3723**	**119**	**324**
VP9EP	**28**	**352,143**	**1548**	**24**	**75**
VP9BO	**21**	**276,192**	**1042**	**29**	**83**

CANADA

VO1CM	**A**	**553,587**	**922**	**59**	**154**
VE3IQ/1	"	456,165	611	76	203
VE1CCC	"	320,364	689	51	147
VO1AW	"	131,378	306	41	122
VE1FH	"	122,244	287	52	131
VE1TG	**28**	**425,790**	**1165**	**30**	**104**
VO1FB	"	188,288	551	31	97
VE1BNN	"	28,552	161	24	62
VE1AI	**3.8**	**57,154**	**338**	**17**	**65**
VO2CW	**A**	**1,497,888**	**2099**	**85**	**203**
VE2AYU	"	742,653	952	77	226
VE2ANE	**28**	**56,842**	**225**	**23**	**74**
VC3GCO	**A**	**2,895,100**	**2424**	**120**	**322**
VX3EEW	"	**1,134,190**	**1580**	**85**	**205**
VE3HD	"	723,343	814	87	226
VE3DUS	"	526,578	592	83	231
VE3UOT	"	266,700	512	67	143
		(Opr. VE1BCZ)			
VE3JTQ	"	256,787	470	56	155
VE3JCV	"	81,719	169	60	127
VE3FEA	"	28,616	113	33	65
VE3EZU	"	19,847	95	31	58
VX3EDC	**28**	**750,240**	**1969**	**34**	**110**
VE3KZ	"	**608,751**	**1535**	**32**	**111**
VE3BVD	"	544,040	1392	33	107
VE3BBH	"	253,365	698	29	98
VE3HLP	"	200,868	630	29	85
VE3IKN	"	180,987	524	32	97
VE3KME	"	177,528	611	26	78
VE3IPR	"	120,300	437	28	72
VE3LNW	"	112,224	360	26	86
VX3JAU	"	35,748	257	16	38
VE3BMV	**21**	**1,072,176**	**2339**	**38**	**130**
VE3BSJ	**14**	**96,502**	**278**	**32**	**90**
VE3ECP	**3.8**	**64,496**	**565**	**14**	**44**
VX3JAY	"	**63,840**	**657**	**14**	**34**
VE3BBN	**1.8**	**4,818**	**229**	**4**	**7**
VE4EW	**A**	**915,776**	**1086**	**96**	**232**
VE4RP	"	411,750	876	59	124
VE4SK	"	80,256	261	48	84
VE4SW	**21**	**805,423**	**2371**	**36**	**101**
VE5DX	**28**	**998,576**	**2981**	**34**	**105**
VE5RA	"	543,368	1887	32	92
VE5AAD	"	14,415	227	13	18
CZ6KW	**A**	**3,493,340**	**3531**	**115**	**265**
CZ6OU	"	**3,426,655**	**4091**	**111**	**248**
VE6ABC	"	122,445	386	53	82
CZ6WQ	**28**	**1,182,315**	**3241**	**34**	**115**
CZ6MP	"	666,291	2226	32	91
VE6AGV	"	268,983	1150	28	71
VE6CND	"	18,312	326	12	16
VE6LU	**21**	**234,036**	**732**	**31**	**101**
VE6AQ	"	211,324	826	25	67
VE6CJR	"	10,659	74	14	37
VE7CC	**A**	**3,048,584**	**3203**	**120**	**272**
VE7IQ	"	10,353	93	23	28
VE7AZG	"	6,028	52	20	24
VE7CML	**21**	**1,111,776**	**2893**	**38**	**110**
VE3BS/7	"	381,558	1303	32	82
VE7FBI	"	45,612	207	27	57
VE7AZV	"	25,347	145	21	50
VE7IG	**14**	**802,872**	**1967**	**39**	**129**
VE7VX	"	192,402	571	26	100
VE7VP	**1.8**	**847**	**45**	**6**	**5**

CAYMEN IS

ZF2BB	**28**	**215,424**	**1006**	**23**	**65**
ZF2DA	21	63,855	699	14	31
ZF2BC	14	79,560	490	19	53
		(Opr. WD4AXM)			
ZF2BP	**7**	**38,732**	**405**	**12**	**34**

CUBA

CO2FRC	14	103,648	526	23	56
			(Opr. LZ1BY)		

DOMINICAN REPUBLIC

HI8LC	28	83,558	397	27	55

GUATEMALA

TG9GI	28	55,550	184	26	84

MEXICO

XE1LLS	A	948,150	1619	81	177
6E1VOZ	"	94,996	312	42	85
4B7J	28	573,804	1720	30	96
XE1EMC	7	6,290	72	13	21

MONTSERRAT

VP2ML	A	2,574,767	2720	107	296
VP2MBA	28	804,170	2740	28	90

PANAMA

H3ILR	21	1,448,848	3524	36	127

PUERTO RICO

KP4AM	A	718,116	1278	75	174
KP4O	28	1,164,360	3173	39	116

ST. LUCIA

J6LIR	A	609,760	1571	66	119

ST. MARTIN

FG7AR/FS7	A	40,656	196	31	57
			(Opr. K2DH)		

TURKS & CAICOS

VP5MRX	A	2,055,135	3290	93	192
			(Opr. K8MR)		

VIRGIN IS

KV4FZ	28	1,482,525	4079	39	126

AFRICA

CANARY ISLANDS

EA8TY	A	156,600	307	55	119
EA8VV	"	17,940	116	19	33
EA8RL	"	902	15	9	13
EA8AK	28	1,685,805	3399	39	126

CUETA

EA9GT	A	204,435	415	48	117

EGYPT

W5JMM/SU	A	120,474	297	52	86

KENYA

5Z4RM	A	99,695	220	61	96

MADIERA ISLAND

OH2MM/CT3	28	1,827,150	4068	37	113
CT3BZ	3.8	235,113	772	22	87

NAMIBIA

ZS3LK	28	1,421,164	3035	39	118

REPUBLIC OF SOUTH AFRICA

ZS6AF	A	1,045,608	1550	76	153
ZS6ABO	"	476,439	1130	60	81
ZS6FU	"	2,440	42	11	9
ZS1JD	28	282,166	1082	27	59

SICILY (AFRICAN)

IG9UN	28	1,129,120	2379	39	121
			(Opr. I8IJ)		
IT9SKO/IG9	7	190,008	746	19	68

ST. HELENA

ZD7BW	28	500,940	1284	32	100

ASIA

HONG KONG

VS6DO	A	1,020,672	1699	108	180
			(Opr. K1MM)		

INDIA

VU2HI	14	481,148	1137	38	110

ISRAEL

4X4VL	28	527,952	1330	34	102
4Z4WQ	"	102,690	392	25	65
4Z4XY	21	46,550	226	20	50

JAPAN

JR1AIB	A	2,553,005	2163	135	268
JH1EAQ	"	2,054,079	2163	103	218
JA1ELY	"	1,491,791	1388	125	246
JA0AXV	"	1,084,644	1245	95	202
JA2IVK	"	759,984	938	102	182
JA2FSM	"	593,676	977	76	131
JA6CNL	"	511,302	699	88	166
JA2SEK	"	460,436	683	81	155
JA4ZU	"	422,920	721	76	142
JA7AMK	"	335,530	788	55	90
JA1PCY	"	330,613	673	69	110
JA8SW	"	297,636	509	74	130
JR3XEX	"	261,545	501	73	108
JF3CCN	"	234,685	435	71	116
JA6BIF	"	216,152	452	68	96
JH2JUK	"	161,802	324	65	113
JA6BGA	"	161,734	291	74	119
JA1ALX	"	84,625	239	48	77
JA1IZ	"	77,312	208	50	78
JA6CM	"	71,832	206	45	78
JA3ZRT	"	52,170	470	48	63
JA0FMB	"	51,118	148	45	77
JA1JVN	"	50,102	170	49	67
JA1SGU	"	46,343	142	53	68
JR6BZK	"	45,186	160	44	58
JK1TLP	"	41,418	183	32	46
JF3CEC	"	40,306	188	35	38
JR1PUO	"	26,788	126	36	38
JA6AKV	"	25,641	117	32	45
JA7FMZ	"	23,577	97	35	52
JF2FLN	"	20,160	115	28	35
JA0ECZ	"	18,112	101	30	34
JH4UVU	"	17,199	93	26	37
JA1EF	"	16,530	68	38	49
JJ1SOE	"	16,284	94	25	34
JA0DBS	"	14,544	102	25	23
JA2OJ	"	13,912	296	19	28
JA0GTM	"	7,742	56	25	24
JA1PUK	"	6,156	42	26	31
JA2AHF	"	4,243	67	21	23
JA9JKL	"	2,460	32	15	15
JH2IJC	"	1,998	26	14	13
JA1RDP	"	1,140	26	8	7
JF1NCT	"	360	8	7	8
JH1JGX	28	1,035,464	2474	35	107
JH7DNO	"	841,290	1963	37	108
JH1ARJ	"	825,699	2041	36	111
JR1WHW	"	800,017	2076	37	94
JH1OJV	"	541,423	1418	35	96
JJ1NUB	"	456,096	1607	30	66
JA7BSK	"	442,434	1319	33	81
JH1AGU	"	434,350	1240	32	87
JA3XOG	"	417,204	1314	32	76
JA6YFS	"	334,544	1036	34	78
JA1NID	"	274,780	861	33	77
JH1VRQ	"	256,650	746	32	86
JH2CJW	"	191,008	694	29	65
JI1HHX	"	167,056	541	33	73
JE2PKD	"	143,486	656	25	49
JH7UJU	"	131,373	452	30	69
JE2KPM	"	118,625	617	22	43
JH4UTP/4	"	107,835	412	30	61
JA3PGV	"	101,380	463	25	49
JL1HOV	"	97,826	406	26	56
JA7JND	"	79,776	380	27	45
JA7EYB	"	74,534	309	30	53
JA1MYW	"	65,902	273	28	55
JR3CVO	"	63,753	270	27	52
JH1UUT	"	62,953	265	21	38
JA3BLN	"	57,228	251	29	47
JL1PAM	"	57,078	339	22	41
JH1LZC	"	55,080	279	24	44
JA3AQW	"	45,500	238	23	42
JA1JNM	"	41,060	223	23	42
JA3BBG	"	41,654	242	25	34
JL1QGB	"	39,345	225	23	38
JR7ICN	"	34,029	202	22	35
JA0EPV	"	31,059	212	20	31
JA4VWK	"	30,615	164	23	42
JF1EEK	"	25,110	311	12	15
JA0VBJ	"	24,748	183	18	28
JA1OHZ	"	23,985	181	17	28
JH2ORJ	"	19,006	152	16	27
JH7AJY	"	18,904	103	26	42
JH7BRG	"	17,874	115	19	35
JA1EMQ	"	17,460	137	16	29
JE3FUN	"	14,976	109	18	30
JA3IBU	"	12,452	98	14	30
JH7JDB	"	10,836	94	16	26
JH1MTR	"	10,496	100	16	25
JA3BLN	"	10,218	132	11	15
JF2FWS	"	9,720	92	15	25
JK1MRJ	"	8,697	78	16	23
JA6YAP	"	7,440	67	18	22
'A0TVA	"	4,214	34	17	26
JF2FHQ	"	4,209	63	11	12
JE2XZY	"	3,243	49	12	11
JH4KED	"	2,163	39	10	11
JR1OYL	"	1,802	36	8	9
JE1MCJ	"	1,288	32	8	6
JA3EQC	"	378	14	5	4
JF2LTH	"	42	3	3	3
JA6OKB	21	505,428	1182	38	116
JE3TBM	"	420,894	1062	38	96
JA9YAA	"	211,253	697	31	72
JA1SHC	"	80,799	396	26	43
JR3RIY	"	73,656	288	30	58
JA8DHI	"	70,152	309	27	52
JH2VNY	"	62,322	221	28	66
JI1QLB	"	50,094	258	22	44
JR3CVJ	"	46,992	188	29	59
JF2DQJ	"	45,084	210	24	46
JA6FIO	"	44,232	163	322	65
JF2IWL	"	41,503	195	27	50
JR4BVD	"	41,085	134	31	52
JL1MPW	"	32,294	168	26	41
JJ1ASO	"	24,898	148	23	31
JL1QNG	"	18,200	124	19	31
JH1BCY	"	15,344	97	24	32
JA6PL	"	12,190	82	24	29
JA6VZB	"	7,923	50	21	36
JA6XX	"	5,032	52	16	18
JA4PWH	"	4,092	44	15	18
JH4KMA	"	3,886	46	12	17
JA9UAD	"	3,128	35	16	18
JA1AAT	"	2,925	27	17	22
JH7OHN	"	1,911	31	9	12
JL1VHB	"	1,080	22	9	9
JH1XIT	"	646	12	7	12
JA1OP	"	616	20	6	5
JK1EXF	"	368	9	8	8
JR4DFR	"	45	3	2	3
JH6GHZ	"	6	1	1	1
JR1RCR	14	202,488	539	37	95
JA6BZI	"	184,737	494	37	96
JE1AYU	"	184,212	519	36	90
JR1RNC	"	179,214	519	33	86
JA1GSK	"	91,353	295	30	81
KA2BD	"	54,288	241	28	59
JA4VMU	"	30,877	146	25	52
JA7BAL	"	22,936	90	30	64
JA6YY	"	7,585	68	19	22
JA5AF	"	4,800	45	16	24
JA0GZ	"	4,070	44	19	18
JA8BVI	"	1,752	27	11	13
JR2BDG	"	741	15	8	10
JA2BAY	7.0	154,442	519	33	73
JA1BOK	"	441	63	4	3
JH4MTE	"	252	12	4	3
JA6LCJ	3.8	10,622	20	20	27
JR7AMZ	"	54	3	3	3

KOREA

HM1QD	28	96,806	389	31	66

KUWAIT

9K2FX	21	623,700	1649	38	112

THAILAND

HS1ABD	A	2,772,192	3092	116	286

ASIATIC U.S.S.R.

ARMENIA

UK6GAO	A	114,310	366	34	81
UG6JJ	"	111,381	296	40	97
UG6GAF	7	66,723	359	14	55

ASIATIC RUSSIA

UA9MR	A	1,049,883	1321	102	237
UA9OO	"	352,298	542	78	176
UA9UTF	"	191,706	407	55	123
UA9UAR	"	53,788	109	16	39
UA9WDK	"	15,180	298	38	75
UW9VD	"	1,914	20	14	19
RA9CIU	28	156,660	576	31	74
UA9YE	"	125,540	626	28	67
RA9OEU	"	112,714	510	23	60
RA9CGC	"	90,612	320	29	79
UA9CFO	"	89,760	400	18	62
UA9FAT	"	89,052	381	19	63
UA9UUD	"	59,556	261	23	61
UA9CMS	"	27,054	134	24	57
UA9XDV	"	27,022	181	16	43
RA9UOF	"	24,843	201	12	37
UA9MAZ	"	13,771	109	17	30
UA9KAM	"	3,420	53	9	21
UA9SBP	21	168,858	595	29	77
UW9CL	"	25,833	120	22	57
UA9LAC	"	23,697	155	17	36
UV9WF	"	13,805	95	16	39
UW9CR	"	2,425	33	7	18
UA9AED	14	109,981	407	32	77
UA9CIH	"	17,150	134	14	35
UA9OS	"	4,104	41	15	23
UA9FCI	7	32,256	226	12	44
UW9SG	"	12,054	109	11	30
UA9WS	3.8	8,260	89	9	26
UA8CCR	A	120,285	344	58	77
UA8SGL	28	181,917	950	25	62
UA0SKC	"	166,175	926	25	60
UW0LI	"	153,900	613	28	62
UW0AF	"	130,950	525	29	68
UA0KBO	"	126,940	1183	21	23
RA0CCM	"	74,664	453	24	44
UA0KAJ	"	31,837	430	15	16
UA0AAZ	"	31,424	206	18	46
UA0CDM	"	10,164	91	17	27
UA0SJY	"	4,700	75	5	20
UA0LEO	21	14,792	121	20	23
UA8QDH	14	502,112	1309	36	106
UA0SAU	"	492,123	1511	34	89
UA0QWB	"	174,119	586	31	91
UA0PJ	"	83,600	402	27	53
UA0ABC	"	7,336	48	22	34

AZERBAIJAN

UD6DER	A	168,245	263	89	164
UD6DGX	"	12,036	78	17	42
UD6DLJ	28	126,071	659	18	55
UD6DFV	21	99,968	451	28	60
UD6DFD	1.8	200	10	5	5

GEORGIA

UF6VAG	A	2,639,636	2457	94	289
UF6QAC	28	82,214	419	22	52
UF6HS	21	120,244	475	26	66
UF6FCZ	"	22,148	158	16	33
UF6CR	14	759,000	1684	38	112
UF6RB	"	4,477	46	12	25

KAZAKHISTAN

UL7PBY	A	609,966	883	85	197
UK7LAF	"	304,000	644	58	142
		(Opr. UL7-026-304)			
UK7CAA	"	1,771	32	9	14
UL7LAW	28	212,744	668	31	85
UK7BAZ	"	40,100	276	12	38
UL7EAF	"	31,552	200	17	47
UL7GBP	"	21,060	112	19	46
UL7CBS	"	15,824	146	9	34
UL7QF	21	10,0567	514	24	55
UL7JAW	14	24,569	145	27	52

KIRGHIZ

UM8NNN	A	319,696	605	70	138
UM8MAO	"	74,178	247	39	78

TADZIK

UJ8JCQ	28	259,109	895	31	82
RJ8JBQ	"	212,220	741	32	76
RJ8JCF	"	84,249	448	17	52
UJ8JGJ	7	55,420	326	17	50

TURKOMAN

UH8HAI	28	130,935	584	26	61
RH8BAG	"	675	27	3	6

UZBEK

UI8LAG	A	2,430,846	1980	123	336
UI8AEK	"	47,508	212	36	71
UI8ADC	28	34045	231	15	40
UI8LAK	"	19,360	128	16	39

EUROPE

AALAND ISLANDS

SM5KIO/OH8	28	226,860	857	32	82

AUSTRIA

OE5CWL	A	1,745,884	2178	83	239
OE5DZL	"	50,546	229	39	88
OE6XRG	"	770	15	11	11
OE3NPW	28	436,392	1207	36	96
OE1LPW	14	32,619	227	21	62

BALAERIC ISLANDS

EA6GP	A	8,556	86	21	48

BELGIUM

ON6GB	A	384,714	820	53	145
ON6BE	"	309,876	1428	55	217
ON8WD	"	92,430	288	48	110
ON5UM	21	545,804	1462	35	101
ON4XG	"	110,346	411	29	77
ON6JG	3.8	31,784	495	10	48

BULGARIA

LZ1QR	A	15,928	101	31	57
LZ2KRS	28	225,620	913	33	83
LZ1CW	"	142,572	652	29	80
LZ2RF	"	35,916	232	22	60
LZ2FZ	21	6,171	61	15	36
LZ1YF	14	117,302	543	25	64

CZECHOSLOVAKIA

OK2BLG	A	588,786	905	94	269
OK2PDL	"	540,652	1026	74	208
OK2JK	"	294,984	744	55	149
OK3CJC	"	273,150	560	65	160
OK1KZ	"	266,760	688	60	168
OK3IAG	"	189,880	440	61	127
OK3CKY	"	129,220	439	43	139
OK1MSN	"	101,000	372	26	99
OK1MAW	"	73,661	411	28	91
OK3YCA	"	71,284	254	53	99
OK1IBL	"	48,600	180	45	90
OK1DA	"	45,120	128	51	90
OK1CIJ	"	42,672	137	50	77
OK2SWD	"	29,592	120	35	73
OK1EP	"	27,352	113	40	69
OK1MAC	"	16,872	203	19	57
OK1KYS	"	13,790	73	27	43
OK2KJT	"	13,588	115	21	68
OK3KJJ	"	12,990	155	20	56
OK3RMW	"	12,470	145	32	54
OK2BSA	"	9,660	57	24	36
OK2BEC	"	6,615	64	17	31
OK1KRQ	"	5,027	64	19	30
OK2KWI	"	4,080	40	17	34
OK2PBG	"	2,520	30	17	18
OK1FCA	"	1,798	42	2	20
OK1ADU	"	1,036	20	13	15
OK2BTI	28	382,680	1200	31	89
OK1IQ	"	226,187	699	31	96
OK1MPP	"	104,728	390	30	74
OK3EE	"	83,520	370	29	61
OK3CFA	"	76,921	352	27	70
OK1MP	"	47,150	161	31	84
OK1AVE	"	42,630	180	30	57
OK3TOA	"	22,165	183	19	36
OK1AYQ	"	21,060	182	19	35
OK3KBB	"	17,910	191	17	28
OK3CFP	"	16,188	170	20	37
OK1AZI	"	8,775	85	13	26
OK1VE	"	8,229	122	16	23
OK1NH	"	5,724	62	16	37
OK1JBL	"	4,800	103	9	7
OK1TW	"	3,565	43	15	16
OK1OZ	"	1,836	40	12	17
OK1AVU	21	623,337	1628	38	105
OK2ABU	"	134,748	723	30	46
OK2QX	"	20,590	137	19	39
OK3CFS	"	16,276	127	17	35
OK1ASQ	"	11,713	83	18	35
OK1AIA	"	1,794	41	9	17
OK1JVT	"	36	9	2	2
OK1FV	14	281,859	826	36	105
OK3YK	"	48,720	359	19	68
OK2SPS	"	43,351	346	17	60
OK2BQL	"	36,369	218	20	61
OK2PFQ	"	32,186	197	21	56
OK3ZFB	"	21,710	259	17	48
OK1AJY	"	14,573	191	14	45
OK1AOJ	"	9,600	157	11	39
OK1JZZ	"	6,030	72	13	32
OK1HCH	"	3,876	60	18	20
OK1FBH	"	349	404	9	
OK2BPK	"	330	10	4	7
OK1DAC	"	168	10	5	7
OK2BBJ	"	15	3	2	3
OK3OM	7	104,625	698	22	71
OK2YAX	"	21,516	281	12	54
OK1AGN	"	15,680	214	11	53
OK2BFN	"	9,177	117	11	46
OK2HI	3.8	19,604	322	10	47
OK3YCZ	"	16,380	314	12	40
OK1FAE	"	7,680	180	11	29
OK1ARD	"	5,460	100	21	39
OK3KFO	"	4,256	147	4	28
OK3CXW	"	3,240	108	9	21
OK1DGZ	"	2,856	108	5	23
OK3TAJ	"	1,836	70	4	23
OK2SBJ	"	240	10	3	8
OK1KTW	"	192	64	2	5
OK1MGW	1.8	3,648	115	5	27
OK1DUC	"	1,088	32	2	17
OK1DOS/P	"	1,008	46	3	18
OL0CLD	"	546	45	4	8

DENMARK

OZ7MP	A	127,652	295	57	131
OZ7BS	"	120,340	269	61	159
OZ4HW	"	41,760	218	39	106
OZ1ZE	"	40,740	133	49	91
OZ1FAO	"	25,680	129	36	84
OZ7GW	"	22,644	150	31	80
OZ1DJF	"	5,16[illegible]	54	14	16
OZ6OG	"	2,430	30	16	29
OZ5EV	28	252,280	831	33	73
OZ4VW	"	2,516	76	9	8
OZ3KE	"	2,485	39	14	21
OZ1EEB	21	180,549	1130	26	55
OZ8KU	14	7,998	140	8	43
OZ9OI	"	2,322	27	14	29
OZ6XR	38	9,996	236	6	36

ENGLAND

G3FXB	A	4,708,014	3710	116	341
G3XTT	"	614,304	871	77	239
G4CVZ	"	527,094	1203	57	170
G3YBH	"	331,134	643	62	167
G3VAO	"	131,425	321	54	121
G4ENM	"	113,190	365	49	105
G2FNK	"	99,792	275	49	127
G3MXJ	28	1,296,826	2905	38	119
G3ZQW	"	1,209,359	2820	38	113
G3XBY	"	494,006	1280	35	103
G3XKV	"	16,276	149	18	34
G2VJ	"	7,701	59	18	33
G3NFV	21	190,008	620	34	92
G3NT	"	25,773	363	13	58
G4CNY	14	706,080	1750	37	123
G3VPW	14	605,324	1563	39	125
G3KKJ	"	126,217	719	26	65
G4HLN	"	19,136	256	9	43
G3SZA	1.8	3,895	82	7	34
G3XWZ/A	"	1,760	55	5	27

FINLAND

OH6JW	A	4,389,460	3546	134	371
OH1VR	"	4,182,000	3316	132	368
OH1BR	"	3,415,080	3031	114	333
OH6DX	"	3,388,694	3263	103	283
OH2PM	"	1,626,900	1817	99	275
OH2KP	"	139,968	374	55	161
OH7NW	"	112,682	316	59	147
OH6NG	"	98,826	262	46	136
OH2VZ	"	82,296	220	53	109
OH1HS	"	69,552	208	54	135
OH3HY	"	59,840	261	27	53
OH6HI	"	41,616	240	16	41
OH2BEJ	"	26,199	170	26	45
OH5PA	"	21,828	90	36	66
OH3BX	"	14,328	118	20	52
OH1EH	"	6,364	50	15	28
OH2CZ	"	3,888	35	17	31
OH7TV	"	960	30	10	22
OH7JW	"	297	15	6	5
OH3TY	"	150	5	5	5
OH5YX	"	2	1	1	1
OH3XZ	28	1,228,205	3140	39	124
OH5NW	"	1,021,348	2563	37	111
OH2YY	"	703,480	1877	39	116
OH3PB	"	170,257	717	27	62
OH3DX	"	101,528	421	26	72
OH5LU	"	53,492	243	24	62
OH1CQ	"	44,460	320	21	55
OH3JR	"	33,812	124	30	77
OH1EB	"	27,060	189	23	59
OH4PW	"	1,520	40	11	27
OH1MA	21	870,500	2503	34	91
OH1HB	"	257,740	748	37	103
OH1PU	"	19,936	96	31	58
OH8VG	"	18,492	160	20	49
OH2JQ	"	16,884	137	19	48
OH1OR	"	12,584	102	13	31
OH3GD	"	6,004	109	10	28
OH1ED	"	4,716	86	11	25
OH1LU	"	2,280	34	9	29
OH2AU	"	2,278	25	13	21
OH8OS	14	834,536	2224	39	107
			(Opr. OH8UT)		
OH8PF	"	724,190	2117	37	102
OH6FQ/3	"	72,692	418	26	66
OH3CN	"	7,105	134	14	21
OH8SR	7	135,360	663	21	89
OH1IJ	"	100,320	616	28	82
OH2BO	1.8	2,010	71	6	24
OH5NG	"	1,104	39	5	19

FRANCE

F9GL	A	976,836	1154	100	248
F8WE	"	495,128	1119	62	172
F6EXQ	"	283,346	541	70	189
F6BVB	"	235,060	599	54	107
F8QB	"	55,473	211	43	80
F6FHA	"	42,930	177	37	69
F6DLM	"	38,912	124	55	97
F6FVY	"	29,900	102	46	84
F6FSX	"	17,170	111	30	71
F6DRP	"	5,152	57	18	38
F8DP	"	4,464	50	19	29
F6KBU	"	266	9	7	7
F2SI	21	783,126	2118	35	104
F6CLM	"	10,476	69	18	36
F6FNA	"	5,694	69	13	26

GERMANY (FRG)

DJ4PT	A	4,577,100	4146	119	319
DL8UI	"	3,288,740	2933	123	332
DK8NG	"	2,673,056	2506	104	308
DJ3HJ	"	2,171,398	2154	94	205

DJ6QT	''	1,827,000	1642	114	336
DK3SN	''	1,246,780	1429	82	241
DJ8JY	''	1,115,050	1520	76	214
DK8AX	''	580,492	947	80	236
DJ7XB	''	344,399	681	72	167
DK3KD	''	312,868	597	61	150
DJØRJ	''	307,008	750	61	131
DJØUP	''	222,761	407	69	194
DF2RG	''	193,248	431	62	136
DK5WQ	''	162,288	328	74	178
DL1MD	''	140,805	325	60	129
DJ2UU	''	110,838	255	63	140
DL2JO	''	108,487	333	46	111
DJ1TC	''	101,592	249	62	142
DF8EA	''	91,776	372	30	98
DK8KC	''	88,091	324	41	96
DJ9MH	''	83,104	219	69	127
DL7YS	''	65,286	248	32	61
DA1UO	''	44,100	192	30	70
DJ6EX	''	24,750	120	38	72
DK6EX	''	22,825	118	36	47
DF8MB	''	487	9	6	5
DK3GI	**28**	**1,248,072**	**2694**	**39**	**122**
DK6NN	''	723,985	1742	37	109
DJ5JH	''	434,562	1122	35	103
DL7AA	''	387,120	1146	35	85
DL3ZI	''	174,375	664	29	64
DK4IO	''	52,752	628	29	55
DK8JB	''	39,780	200	24	54
DL2RM	''	12,852	113	17	26
DJØUJ	**21**	**781,371**	**2984**	**39**	**114**
DJ9LI	''	145,656	467	33	86
DJ4ZR	''	140,970	479	31	88
DF8EA	''	32,065	142	16	39
DLØSP	''	8,906	64	21	47
DL8PC	**14**	**901,992**	**2056**	**39**	**138**
DJ2YE	''	1,080	24	6	9
DK3FB	*7*	*92,520*	*613*	*21*	*69*
DA1QO	*3.8*	*19,642*	*289*	*11*	*50*
DM2CUO	**A**	**806,267**	**1464**	**69**	**195**
DM2BJJ	''	456,170	770	73	169
DM2CIL	''	316,824	716	66	192
DM4REE	''	249,864	683	67	165
DM3BE	''	240,620	531	65	147
DM3PFF	''	220,416	515	52	140
DM2AUB	''	196,474	526	63	131
DM3NKF	''	195,227	654	51	146
DM4XCE	''	185,752	418	61	151
DM2DIF	''	114,276	402	51	127
DM4YSN	''	110,357	443	47	122
DM5TGL	''	97,812	351	39	104
DM2BRK	''	64,020	313	32	104
DM3OML	''	58,682	299	30	44
DM3XI	''	55,104	169	56	112
DM2DNO/A	''	51,852	236	27	60
DM3WMJ	''	45,120	120	55	86
DM3UH	''	41,630	167	42	73
DM2BWD	''	37,544	266	23	81
DM3IM	''	27,744	143	28	68
DM3HDA	''	23,750	106	38	57
DM4QWL	''	19,575	144	26	49
DM3TYF	''	16,720	129	23	43
DM4ZTH	''	15,198	155	15	36
DM4ZFM	''	14,210	84	25	42
DM3EA	''	11,736	59	26	46
DM2DZG	''	8,742	75	18	44
DM5JL	**28**	**540,800**	**1532**	**36**	**92**
DM4KF	''	152,366	712	24	50
DM3UA	''	70,308	329	27	54
DM2GGL/A	''	44,960	234	23	57
DM4PGF	''	43,180	253	23	45
DM2EFG	''	42,250	248	24	51
DM3UE	''	37,931	191	24	59
DM3KCe	''	19,728	186	19	29
DM2BTO	''	13,454	80	20	42
DM3CF	''	8,000	122	10	15
DM3NL	''	4,983	75	12	21
DM5QG	''	4,514	60	14	23
DM2CPD	''	4,340	66	11	17
DM3XUE	''	3,145	33	13	24
DM5ZLG	''	790	27	4	6
DM2CEE	**21**	**19,656**	**156**	**18**	**45**
DM3LE	''	15,930	133	14	45
DM4MSM	**14**	**48,535**	**298**	**23**	**62**
DM2BSA	''	28,656	376	17	55
DM3ZG	''	28,560	305	18	52
DM3FJ	''	17,199	212	15	98
DM2GJJ	''	10,738	116	14	45
DM3UVO	''	7,332	112	13	34
DM3ZLC	''	5,124	79	12	30
DM2EBL	''	357	9	8	9
DM2CMF/A	**7**	**163,068**	**779**	**20**	**87**
DM2BOO	''	946	47	2	20
DM4SOG	**38**	**19,980**	**300**	**8**	**52**
DM2AQC	''	740	38	4	16
DM2GHL	''	312	25	3	10

GREECE

SVØAE	**A**	**248,136**	**927**	**40**	**107**

GREENLAND

OX5AP	**A**	**259,554**	**589**	**63**	**119**
OX3ZM	''	95,250	316	35	92

GUERNSEY IS.

GU3YIZ	**7**	**49,324**	**367**	**14**	**62**

HUNGARY

HA5MK	**A**	**3,046,728**	**2670**	**118**	**326**
HA9RE	''	578,230	1097	74	191
HA5KKN	''	241,800	643	66	100
		(Opr. HA5KN)			
HA5NK	''	204,376	469	67	169
HA1ZD	''	126,973	385	55	132
HAØIG	''	81,396	308	46	107
HA5NG	''	76,818	215	56	121
HAØHW	''	41,580	268	28	71
HA5BA	''	27,816	224	24	52
HA5VA	''	10,260	148	13	47
HA8KUA	''	2,484	45	13	33
HAØDU/9	**28**	**438,128**	**1162**	**35**	**104**
HA8KQX	''	102,742	46	25	69
		(Opr. HA8-781)			
HA7KPL	''	35,380	240	17	41
HA5LX	''	24,820	164	20	48
HA2KMB	21	5,248	70	11	21
HA4XH	**14**	**411,370**	**1241**	**39**	**116**
HA6NW	''	152,064	876	25	74
HAØLJ/P	''	83,600	569	24	71
HA3GO	''	55,890	370	20	49
HA4XA	''	1,829	62	6	25

ICELAND

TF3AC	**28**	**29,172**	**215**	**18**	**48**

IRELAND

EI7CC	**28**	**334,848**	**1349**	**32**	**77**
EI2BB	**14**	**518,836**	**1507**	**37**	**114**

ISLE OF MAN

GD4GWD	**A**	**56,180**	**320**	**26**	**80**

ITALY

I5JHW	**A**	**1,297,035**	**1741**	**87**	**198**
IY6NOA	''	913,545	1353	83	220
IY3QBR	''	235,132	468	72	167
IV3GQL	''	100,566	370	48	103
I8UGL	''	99,704	420	41	80
I4CSP	''	62,640	211	43	101
I1ZYR	''	12,775	119	22	51
I5XKQ	**28**	**788,359**	**1620**	**39**	**110**
I5MPN	''	755,090	1720	38	117
I5VXG	''	718,466	1958	31	102
I1YBM	''	460,046	1620	34	103
I2SLA	''	394,692	1133	36	88
I4WDF	''	343,584	1332	31	65
I3IFT	''	122,153	459	33	80
I2ARC	''	109,125	475	28	69
I4DLS	**21**	**688,644**	**1730**	**37**	**111**
I4AVG	''	561,312	1451	37	107
I1BAF	**14**	**434,838**	**1201**	**36**	**102**
I4AFQ	''	333,905	1001	36	107
I8KPV	''	311,518	1124	33	98
I5JFG	''	126,246	567	29	77
I4EVQ	''	28,925	209	26	93
I5NPH	**7**	**273,144**	**1073**	**28**	**86**
I2VRN	''	115,900	716	23	72
I3BBZ	''	60,384	421	21	75

JERSEY ISLAND

GJ3XZE	**28**	**34,719**	**181**	**18**	**53**

LUXEMBURG

LX1MK	**A**	**189,228**	**541**	**48**	**108**
LX1FN	''	181,596	623	40	71
PAØINE/LX	''	111,706	394	43	115
PAØKHS/LX	''	108,704	418	45	113
PA3ABA/LX	''	53,200	244	41	98
GM3WBZ/LX	**14**	**226,912**	**930**	**33**	**79**

MALTA

9H1EV	**14**	**504,284**	**1599**	**37**	**109**

NETHERLANDS

PA52TMS	**A**	**4,413,952**	**3499**	**128**	**384**
PA5ØIJM	''	201,129	687	54	133
PI1GOE	''	114,699	600	39	134
PAØLIE	''	34,845	160	15	66
PAØLSK	''	6,856	65	21	33
PA53AEB	**28**	**134,123**	**589**	**39**	**60**
PAØAWI	''	31,872	155	25	58
PAØHTR	''	26,100	111	21	30
PA3AJA	''	4,640	57	12	21
PA3AJA	''	4,640	57	12	21
PA5ØRBA	''	3,315	32	19	20
PAØRRS	**21**	**35,211**	**155**	**26**	**71**
PA53AHO	''	13,408	87	18	35
PAØCLC	14	35,112	303	17	60
PA5ØHIP	**1.8**	**7,644**	**171**	**7**	**35**

NORWAY

LJ2Z	**A**	**496,548**	**1143**	**59**	**175**
LA4HW	''	225,435	366	71	214
LA1NG	''	123,462	327	49	122
LA5QK	''	82,440	335	47	113
LA6UL	''	64,713	193	35	124
LA7FD	''	57,456	152	50	118
LA3JT	''	18,177	102	21	52
LA2GN	''	17,568	135	27	69
LA3FE	''	12,934	80	22	36
LA4HH	''	8,815	48	31	45
LA9HW	''	8,448	114	17	49
LA2Q	''	8,034	100	20	58
LA5KK	''	4,068	50	14	18
LA7QI	''	2,829	25	19	22
LA2YT	''	1,456	24	12	14
LA9ML	**28**	**107,500**	**563**	**24**	**62**
LA5OQ	''	15,420	96	21	39
LA7KW	''	5,664	50	13	19
LA3EX	''	4,329	27	8	31
LJ2N	''	3,108	36	15	26
LA5WN	''	1,500	20	8	17
LA1SN	**21**	**42,375**	**261**	**21**	**54**
		(Opr. LA9HW)			
LA2ZN	**14**	**50,713**	**341**	**25**	**50**
LA6VM	''	18,126	172	15	38
LA3IX	''	5,040	90	15	20

POLAND

SP5XM	**A**	**356,694**	**607**	**77**	**192**
SP2KAE	''	270,765	773	49	116
SP6IHE	''	180,873	520	53	150
SP5ALP	''	149,886	470	57	141
SP9BDQ	''	116,334	312	61	146
SP9AKD	''	99,250	300	52	123
SP1PBW	''	86,184	490	30	103
SP5BSG	''	53,110	333	29	84
SP6DVP	''	44,400	397	24	87
SP9BRP	''	44,304	228	28	76
SP6ECA	''	28,767	102	50	79
SP9LJD	''	11,480	148	18	52
SP3KBW	''	11,457	134	16	51
SP9DFH	''	10,560	80	25	63
SP2HGJ	''	4,399	68	16	37
SP6FRQ	''	1,885	27	13	16
SP6KBR	''	279	11	4	5
SP3DOI	**28**	**1,061,012**	**2467**	**35**	**113**
SP9AI	''	530,190	1542	35	94
SP9BPF	''	215,025	616	38	103
SP9HWN	''	148,604	655	25	72
SP7CTY	''	95,060	390	26	71
SP9KZ	''	81,984	344	30	66
SP9FSH	''	35,632	217	21	47
SP9CTW	''	34,443	167	27	62
SP3DAH	''	21,489	168	18	39
SP2JUU	''	12,240	98	19	32
SP9ZD	''	10,350	94	16	29
SP1EUS	''	3,150	45	14	16
SP5DIR	''	2,912	42	12	16
SP7FTP	''	2,820	40	11	19
SP9AOA	''	1,827	24	10	19
SP6DNS	**21**	**94,620**	**340**	**30**	**84**
SP5ENA	''	68,478	359	26	75
SP5BR	''	60,775	401	26	59
SP9HVV/9	''	41,516	206	33	64
SP7PGO	''	3,680	115	11	21
SP4DGN	**14**	**192,675**	**847**	**30**	**75**
SP6DXG	''	173,484	621	34	88
SP5EAQ	''	144,000	640	35	90
SP6IXF	''	34,866	274	19	59
SP6COZ	''	32,287	272	22	61
SP2JGW	''	30,056	249	23	81
SP6BXZ	''	17,358	180	16	50
SP6BNG	''	8,084	110	15	28
SP3XR	''	3,751	94	7	24
SP9EMU	''	3,649	62	10	31
SP3JWG	''	3,570	77	10	24
SP6JZL	''	1,421	20	9	20
SP9EMI	7	5,500	94	10	36
SP3IBS	**3.8**	**25,125**	**345**	**13**	**54**
SP4DDS	''	2,976	96	4	28
SP3ZAH	''	2,328	97	4	20
SQ5KGT	''	2,052	85	4	23
SP6UK	''	1,290	42	4	26
SP9DH	''	987	53	3	18
SP3ADZ	**1.8**	**2,781**	**102**	**4**	**23**
SP7ICE	''	165	16	2	9

PORTUGAL

CT1AFW	**28**	**218,250**	**1039**	**27**	**70**
CT4NH	''	144,210	714	24	71
CT4MS	**21**	**35,720**	**206**	**22**	**54**
CT5UA	**14**	**86,840**	**586**	**20**	**32**
		(Opr. CT1UA)			
CT4SL	''	68,145	374	22	55

ROMANIA

YO9VI	**A**	**492,073**	**929**	**70**	**193**
YO8FZ	''	71,331	185	57	120
YO4AYE	''	52,326	193	53	100
YO7APA	''	20,900	101	40	55
YO3CZ	''	16,038	107	31	50
YO2BEH	''	13,596	238	16	28
YO5AVP	''	12,765	141	20	49
YO6VZ	**28**	**12,642**	**148**	**10**	**32**
YO9KAG	''	4,440	81	17	20
YO8ATT	''	2,680	37	11	29
YO8FR	**14**	**57,630**	**476**	**24**	**61**
YO3BEJ/9	''	31,680	269	20	60
YO3JW	**3.8**	**11,340**	**140**	**9**	**26**
YO6KEB	''	9,240	210	7	37
YO6LV	''	3,318	70	8	34
YO3ABL	''	1,643	48	8	23
YO6KED	''	350	26	4	10

SARDINIA

ISØVMB	**A**	**2,205,312**	**2286**	**82**	**302**
ISØWON	**28**	**84,065**	**446**	**27**	**58**
ISØMVE	''	24,592	206	16	42
ISØQDV	**14**	**67,222**	**1159**	**16**	**42**

SCOTLAND

GM3BCL	**A**	**356,775**	**704**	**60**	**141**
GM4FSA	''	81,366	573	50	92
GM4GRC	**28**	**607,230**	**1747**	**33**	**97**
		(Opr. GM3YQR)			
GM3XNJ	''	85,968	686	16	35
GM4CHX	''	62,144	428	19	45
GM3ZSP	**1.8**	**6,068**	**159**	**6**	**31**

SHETLAND IS

GM4GPN	**A**	**1,081,380**	**1560**	**78**	**190**

SICILY

IT9VQC	28	274,907	1150	30	73

SPAIN

EA3ADW	**A**	**2,415,068**	**2543**	**98**	**260**
EA2IA	''	1,954,080	1870	111	303
EE1QH	''	781,140	1716	57	131
ED1ABT	''	405,356	841	53	164
EA7AKQ	''	35,510	156	36	70
EA3NA	**28**	**215,717**	**762**	**34**	**79**
EA1QJ	''	31,296	220	22	42
EA3LA	''	18,003	150	16	35
EA7ABV	''	7,355	54	17	54
EA3ARX	''	1,708	31	11	17
EA5NT	**21**	**16,218**	**176**	**12**	**39**
EA2XX	14	814	26	6	16
EA1DM	''	154	6	5	6

SWEDEN

SM3BIZ	**A**	**915,386**	**1119**	**90**	**258**
SMØAJU	''	477,664	467	125	381
SMØDJZ	''	195,440	450	73	207
SM2BFH	''	138,768	376	49	98
SM7ABL	''	91,134	266	53	113
SM7AIO	''	66,304	234	42	86
SM5IKQ	''	55,809	286	36	81
SMØCHA	''	46,920	296	25	35
SMØCGO	''	34,892	192	33	89
SM7FYM	''	14,440	80	29	47
SM7TV	''	7,780	107	14	45
SM5BDV	''	7,371	50	25	38
SM5AAY	''	3,294	44	14	13
SM5FBL	''	1,944	26	13	14
SM6EOC	**28**	**737,100**	**2211**	**35**	**82**
SM5CMP	''	**623,346**	**1825**	**35**	**103**
SM5HPB	''	536,000	1471	35	99
SM3DNI	''	357,890	1066	36	94
SM2GET	''	312,144	1027	30	82
SM3HUA	''	138,898	890	25	49
SM5GYO	''	121,770	475	31	68
SM5IMO	''	107,666	400	25	76
SM6FAX	''	70,824	374	24	54
SM6ADW	''	63,864	318	24	48
SM6HAB	''	48,895	245	23	53
SMØJOQ	''	44,030	278	20	50
SM7IMK	''	41,563	210	28	61
SM5JKM	''	34,272	179	15	36
SM2BUW	''	19,588	180	16	40
SM5IMJ	''	17,395	138	18	31
SM5RE	''	16,700	134	19	31
SM7EML	''	16,685	135	19	28
SM5DYC	''	12,495	144	12	23
SM5EUF	''	11,748	106	18	26
SM7KJG	''	6,727	108	12	19
SM7DBA	''	4,440	45	18	22
SMØFM	''	1,224	27	11	13
SM7DMN	**21**	**379,786**	**1229**	**31**	**91**
SM4CNN	''	193,602	750	33	90
SM2JUR	''	164,220	709	29	73
SMØBDS	''	145,260	543	30	78
SMØKV/Ø	''	42,230	208	30	73
SM7GGK	''	8,190	62	20	43
SM4BNZ	**7**	**49,980**	**333**	**16**	**69**
SM5CAK	''	45,236	334	20	66

TURKEY

TA1ZB	**A**	**283,020**	**731**	**62**	**150**

SWITZERLAND

HB7AGH	**A**	**327,788**	**603**	**66**	**161**
HB7Z	28	14,735	154	15	20
HB9DX	21	25,410	97	32	89
HB7UD	14	3,069	44	10	23

YUGOSLAVIA

YU3ZV	**A**	**4,067,774**	**3299**	**115**	**324**
6U2OB	''	115,836	273	64	133
YU2OM	''	68,244	259	39	82
YU1OBA	**28**	**526,176**	**1558**	**33**	**93**
YU2CCB	''	372,520	983	36	103
YU3AE/X	''	261,352	910	32	72
YU2EZA	''	201,136	704	32	72
YU3TRJ	''	128,570	443	32	83
YU1NSX	''	42,247	201	25	58
YU2CCJ	''	31,786	367	16	20
YU3DJR	''	19,926	160	17	37
YU2RVL	''	19,057	130	23	36
YU7NZR	''	12,264	86	21	35
YU5XAF	''	5,060	61	14	30
YU8PGC	''	1,674	40	9	18
YU2RTC	**21**	**639,212**	**1634**	**36**	**112**
YU3TAN	''	107,140	469	29	81
YU7SF	''	17,880	180	18	42
YU7GMN	**14**	**800,100**	**2241**	**39**	**111**
YU1AST	''	46,410	338	24	67
YU3TOJ	''	7,050	141	13	37
YU1EXY	**7**	**96,859**	**600**	**23**	**78**
YU4VBR	**3.8**	**34,224**	**376**	**13**	**56**
YU3DM	1.8	272	13	5	12

European U.S.S.R.

BYELORUSSIA

UC2ACA	**A**	**2,818,200**	**2597**	**119**	**343**
UC2AFA	''	7,070	69	22	48
UC2ACD	**28**	**113,176**	**512**	**28**	**66**
UC2OAZ	''	53,058	332	22	52
UC2CEK	''	16,569	126	20	43
UC2WAZ	''	3,080	52	7	28
UC2ODA	**7**	**14,612**	**191**	**11**	**41**
UC2OBA	3.5	3,007	79	7	24

ESTONIA

UR2QD	**A**	**4,658,155**	**3725**	**118**	**369**
UR2HB	''	**21,528**	**181**	**24**	**80**
UR2TAB	**28**	**401,926**	**1175**	**34**	**99**
UR2TAX	''	322,640	921	36	112
UR2RAM	''	281,790	1160	32	69
UR2RL	''	104,967	388	30	79
UR2OI	''	101,555	470	27	68
UR2RBM	''	24,455	152	20	53
UR2RII	''	17,280	172	14	26
UR2QA	''	13,250	120	15	35
UR2FU	''	2,184	39	10	18
UR2QI	**21**	**962,850**	**2851**	**35**	**96**
UR2REC	''	1782	26	12	15
UR2MG	**3.5**	**13,905**	**268**	**10**	**35**
UR2RFK	**1.8**	**4,110**	**123**	**6**	**24**

EUROPEAN RUSSIA

UA1DZ	**A**	**2,992,671**	**3064**	**121**	**286**
UA3SAQ	''	**2,218,890**	**2457**	**106**	**264**
UA6LBQ	''	1,012,986	1226	94	257
UA6LBC	''	984,064	1642	76	180
UV3DN	''	530,173	1076	73	186
UA4NAA	''	309,048	580	86	230
UA3TN	''	237,244	514	76	183
UA6YAB	''	151,872	690	35	78
UW1BM	''	132,825	466	54	111
UA3ST	''	130,390	420	49	121
UA4CDC	''	100,000	273	59	101
UA4ZA	''	78,364	260	42	95
UA4CBO	''	66,150	148	63	112
UA4CK	''	58,968	288	34	74
UA4CM	''	52,080	154	49	75
UA4IU	''	37,224	124	50.	82
UA1AET	''	36,942	384	28	66
UA4CO	''	28,884	122	41	46
UA4ACD	''	23,300	157	26	74
UV3CS	''	20,828	173	21	61
UA3XP	''	7,803	77	18	33
UA6AJF	''	2,419	33	15	26
RA3ABE	**28**	**394,848**	**1504**	**33**	**75**
UA1AWO	''	**353,682**	**1175**	**36**	**90**
UA6WAL	''	182,068	897	26	66
UA4WPF	''	158,756	789	26	60
UA3SBW	''	117,523	580	28	75
UA6LGX	''	98,634	564	32	70
UA3PDA	''	79,236	549	21	50
UA6LMT	''	66,198	563	17	49
UA4WBC	''	59,688	345	27	69
UA3DAT	''	58,117	323	23	66
RA3LAL	''	43,845	273	25	54
RA3DKE	''	41,309	409	27	74
UA4HAD	''	33,390	247	20	50
UA3DPH	''	32,452	287	19	42
UA4CEG	''	31,185	297	20	44
UA3PBY	''	30,476	198	23	53
UA3TAM	''	20,313	235	17	44
UA3ALE	''	18,720	119	21	57
UV3MM	''	17,298	130	18	44
RA3DQP	''	14,036	143	16	42
UA3AGF	''	13,365	139	14	31
RA4CAC	''	13,018	172	11	35
UV3AP	''	8,729	96	12	31
UA6AKK	''	7,332	152	8	31
UA3AAJ	''	6,407	67	13	30
UA6LDX	''	4,826	67	11	27
UA4CCF	''	920	16	7	13
UV3GM	**21**	**533,673**	**1786**	**35**	**94**
UA3DFK	''	**194,064**	**889**	**29**	**75**
UA3ZBZ	''	169,495	699	31	78
UW3EH	''	147,660	615	30	77
UA3DCY	''	12,326	601	29	80
UW3RR	''	97,119	538	28	71
UA1MU	''	96,942	39	28	79
UV3GW	''	96,515	473	24	73
UW6LC	''	92,220	443	30	76
UW3HY	''	83,428	445	26	58
UA4CZ	''	19,532	208	20	56
UA3BR	''	19,276	150	20	41
UA6LLT	''	11,567	130	9	34
UA3VAS	''	195	11	4	9
UA6HZ	**14**	**1,020,181**	**2296**	**38**	**135**
UW1AE	''	399,026	1302	35	96
UA3QAQ	''	236,948	770	37	111
UA1CAI	''	158,652	607	31	86
UA3DEA	''	105,364	512	30	76
UA6HDO	''	55,468	266	23	75
UA6HAC	''	45,900	280	23	37
UA1DJ	''	43,788	342	22	60
UA3DR	''	38,622	197	25	57
UW4CI	''	24,495	257	18	51
UA6WS	''	19,971	181	16	47
UW3DH	''	13,790	115	20	50
UA4LM	''	10,032	98	19	38
UA6ALV	''	3,696	99	7	21
UA1QBM	**1.8**	**1,449**	**49**	**5**	**18**
UA3AFQ	''	656	37	4'	12
UA3QGO	''	80	24	5	11

LATVIA

UQ2GFN	**A**	**1,890,672**	**2115**	**109**	**299**
UQ2GBW	**28**	**280,476**	**859**	**37**	**110**
RQ2GAI	''	128,790	709	25	56
UQ2HO	''	43,706	255	20	56
UQ2PM	**1.8**	**6,210**	**195**	**5**	**25**
UQ2GBU	''	3,078	107	5	22

LITHUANIA

UP2NK	**A**	**2,601,860**	**2587**	**114**	**296**
UP2OM	''	1,733,388	2264	82	211
UP2OU	''	807,120	1249	88	266
UP2BAO	''	678,987	1077	83	250
UP2PAP	''	560,970	1025	84	212
UP2PCI	''	491,810	1172	79	184
UP2NA	''	191,092	472	60	112
UP2BBF	''	142,800	549	48	127
UP2BCD	''	115,097	347	51	128
UP2PBW	''	70,160	377	34	114
UP2PCK	''	11,178	124	18	63
UP2NO	''	8,300	135	11	39
UP2PAQ	**28**	**367,224**	**1076**	**35**	**97**
UP2PAD	''	309,168	1038	30	84
UP2DM	''	266,310	1059	30	69
UP2BAR	**21**	**527,445**	**1660**	**35**	**100**
UP2BAT	''	107,205	431	31	74
UP2AV	''	19,154	211	19	42
UP2BF	14	4,914	62	12	30
UP2OQ	**3.5**	**2,241**	**80**	**6**	**21**
UP2BDO	''	1,836	70	5	21
UP2WH	''	540	38	6	12
UP2BFE	**1.8**	**3,162**	**86**	**7**	**27**

MOLDAVIA

UO5OGX	**28**	**38,544**	**267**	**19**	**47**
UO5OAK	**21**	**50,244**	**294**	**26**	**53**
UO5GR	**14**	**37,128**	**178**	**26**	**76**
UO5OWN	''	1,386	55	6	16

UKRAINE

UB5MCS	**A**	**3,310,323**	**2981**	**112**	**307**
UB5LAW	''	1,998,384	2180	106	266
UY5OO	''	1,770,831	1904	95	275

UB5HDX	"	380,860	977	72	206
UB5MAV	"	155,929	457	53	211
UB5MEB	"	146,264	487	45	113
UB5MFY	"	120,802	380	54	133
UT5HP	"	114,624	383	54	145
UB5ML	"	35,420	286	22	70
UB5UBI	"	18,270	131	28	59
UB5MDI	"	15,744	102	33	66
UB5QFS	"	11,948	169	14	44
UB5MDP	"	6,350	127	18	32
RB5IVJ	**28**	**459,697**	**1759**	**33**	**86**
UB5ILD	**"**	**457,387**	**1404**	**37**	**96**
UB5VAZ	"	414,700	1496	33	83
UB5LAN	"	337,426	1327	28	74
UB5FDF	"	294,376	1244	33	91
UB5IIA	"	223,901	760	30	97
RB5TBA	"	201,825	713	30	85
UB5CDF	"	168,020	610	31	93
UB5TAZ	"	151,470	803	24	57
UB5WCB	"	82,668	439	24	59
RB5IWF	"	81,410	265	32	91
UB5KAW	"	81,189	353	27	66
UB5EKG	"	56,625	428	19	56
UB5NCF	"	22,020	182	20	40
UB5JKW	"	18,428	119	22	40
UB5QCL	"	15,006	100	24	38
UB5AAL	"	12,045	97	18	37
UB5GBN	"	4,290	74	9	30
UK5QAD	"	810	20	6	9
		(Opr. UB5-064-997)			
UB5EDU	**21**	**312,340**	**952**	**35**	**105**
UB5ABK	"	243,417	908	33	90
UK5WBJ	14	18,550	151	20	50
UB5MGV	"	9,027	117	15	36
UB5IFN	**7**	**35,325**	**342**	**19**	**56**
UB5MFR	"	12,876	180	11	42
UB5UBJ	**3.8**	**16,954**	**258**	**12**	**40**
UB5UWG	"	15,500	300	11	39
UB5OFE	"	1,288	49	6	17

OCEANIA

AUSTRALIA

VK5MF	**A**	**347,126**	**704**	**65**	**104**
VK6NE	"	160,608	331	59	109
VK2AOI	"	46,956	200	34	50
VK2VCU	"	24,566	120	30	41
VK6FS	"	11,834	66	18	43
VK6RG	"	6,318	63	16	23
VK1LF	"	1,078	19	11	11
VK4QK	**28**	**859,011**	**2238**	**34**	**95**
VK2VAA	"	108,066	449	29	54
VK5NLC	"	1,144	20	4	18
VK4VU	**21**	**1,079,335**	**2609**	**35**	**104**
VK2AXM	"	49,560	395	13	29
VK3SM	"	28,420	140	24	46
VK5OU	**14**	**116,955**	**362**	**33**	**80**
VK4XJ	"	10,584	70	22	34
VK5BW	7	4,920	86	10	10

GUAM

KG6JIQ	**A**	**1,964,505**	**2186**	**19**	**186**
AH2E	"	1,231,752	2047	86	118
KG6JKS	**28**	**440,943**	**1441**	**34**	**69**

HAWAII

KH6BZF	**21**	**351,526**	**1216**	**27**	**71**
KH6HGL	14	5,335	40	22	33
KH6CC	**1.8**	**2,975**	**63**	**9**	**8**

INDONESIA

YC1BZ	**21**	**90,156**	**685**	**18**	**26**
YB8ADI	**14**	**660,960**	**1411**	**39**	**121**

MARSHALL ISLANDS

KX6PP	**A**	**1,633,620**	**2492**	**90**	**138**
KX6PI	**14**	**231,858**	**791**	**30**	**69**

NEW ZEALAND

ZL1AZV	**14**	**640,134**	**1371**	**39**	**120**
ZL4BO	"	482,300	1277	36	94
ZL1BIL	**3.8**	**9,324**	**100**	**17**	**19**

OGASAWARA ISLAND

JD1ALM	**A**	**50,784**	**288**	**39**	**57**
JA7ST/JD1	**28**	**91,356**	**510**	**26**	**43**

PHILIPPINES

DU1GF	**28**	**22,396**	**342**	**11**	**11**
KSFSS/DU2	**21**	**413,820**	**1466**	**33**	**62**
W7UPF/DU2	"	99,428	1186	13	15

WESTERN SAMOA

5W1BZ	A	18,240	94	34	46

SOUTH AMERICA

ARGENTINA

LU4MEE	**A**	**996,798**	**1431**	**83**	**159**
LU8FAO	**21**	**292,149**	**1210**	**30**	**69**

BOLIVIA

CP6EL	**A**	**1,038,240**	**1473**	**71**	**169**
CP1AT	"	101,787	280	47	84
CP1BP	"	51,353	204	33	56

BRAZIL

PY1NEZ	**A**	**240,597**	**616**	**42**	**91**
PY8HP	"	140,524	566	29	57
ZX4BW	"	51,972	155	47	75
PY2XX	"	51,200	145	48	80
PY1BST	"	26,960	237	19	21
PY7FAL	"	9,882	70	23	31
PY2FND	"	8,533	62	21	32
PY2ED	"	6,018	37	24	35
PY2ALY	"	3,528	28	16	26
PY2FNB	"	693	11	10	11
PY2CPU	**28**	**482,895**	**1213**	**36**	**99**
PY2FRW	"	9,234	87	16	22
PY1BOL	"	4,978	45	15	23
PY1ESA	"	2,450	33	12	18
PY7DD	**21**	**150,766**	**596**	**23**	**66**
PY1BKA	14	4,972	44	16	28

CHILE

CE5CN	**A**	**814,056**	**1327**	**73**	**141**
CE3OE	"	273,258	558	62	109
CE3AEZ	28	5,215	53	16	19
CE3NR	**21**	**92,112**	**420**	**22**	**54**

COLOMBIA

HK3DMC	21	42,050	287	16	34

ECUADOR

HC1EE	**A**	**122,404**	**297**	**51**	**91**
KA6CNS/ HC1	"	90,300	215	51	99
HC1HV	"	53,106	115	53	114
HC2BW	"	42,273	152	33	66
HC1NII	3.5	6,707	120	8	11

GUYANA

K9EF/8R1	**A**	**508,560**	**1111**	**50**	**106**

PERU

OA4PQ	**A**	**455,840**	**1054**	**662**	**86**
OA4AOP	"	2,709	31	20	23
OA8CG	**28**	**228,060**	**1810**	**30**	**96**

SURINAM

JA1PIG/ PZ	**28**	**847,340**	**2213**	**33**	**97**

TRINIDAD

9Y4VT	**A**	**6,682,185**	**4632**	**130**	**359**
		(Opr. N6AA)			

URUGUAY

CX9CO	**A**	**1,686,276**	**2057**	**82**	**197**
CX7BY	**21**	**130,644**	**677**	**26**	**50**

VENEZUELA

YV5EED	**A**	**218,457**	**325**	**74**	**169**
OA4CIK/ YV5	28	156,862	505	29	78
4M3OS	**21**	**856,925**	**1907**	**38**	**113**
YW1AVO	**14**	**908,208**	**2255**	**31**	**105**
YV2IF	"	248,336	628	33	103
YV5AMW	**3.5**	**62,172**	**356**	**12**	**32**

MULTI-OPERATOR SINGLE TRANSMITTER NORTH AMERICA

UNITED STATES

N1TZ	**2,290,946**	**1667**	**123**	**359**
K1RU	2,063,390	1489	120	370
K1UO	1,661,716	1241	118	358
W1YN	1,591,320	1269	115	332
K1RO	1,415,730	1259	114	296
K1GW	1,006,675	1065	91	244
N1MM	894,792	1144	75	201
K1IK	694,899	664	99	274
W1BK	363,656	506	74	188
N1ACJ	89,199	236	44	109
AE1D	13,185	101	17	28
W2VJN	**1,761,264**	**1367**	**127**	**359**
WB2ITR	1,309,430	1271	104	266
K2FL	1,181,496	926	115	341
K2BK	991,332	866	103	299
WB2YOF	774,480	985	74	206
W2HG	570,409	600	93	250
K2CC	566,700	669	72	228
W2UI	547,519	639	82	219
K2GBH	430,430	543	77	224
K2TD	302,496	413	76	198
WA2JAS	217,230	419	54	141
KB2GJ	207,336	468	48	115
K3LR	**2,950,944**	**1976**	**131**	**390**
N3UN	**1,663,176**	**1140**	**132**	**392**
K3RA	1,268,752	1021	119	324
WA3EKL	1,221,944	941	122	336
N3GB	1,221,248	1153	106	270
W3GU	1,159,080	1077	108	282
K3KNH	1,156,554	1000	114	297
K3PA	1,114,724	1056	100	288
K3UC	1,033,357	989	100	277
W3GG	800,046	858	91	247
WB3EKV	670,320	778	82	222
W3GNQ	656,445	734	84	237
W3DHM	596,625	566	104	271
W3HYJ	548,512	687	77	204
K3QMR	519,480	647	79	217
K2ITG/3	496,045	550	93	226
W3TV	322,278	528	64	145
WA3JVG	305,210	483	67	163
W3EVW	240,584	382	66	166
WB3CZK	194,312	341	64	150
K4VX	**3,811,563**	**2228**	**149**	**454**
W4QAW	**3,564,304**	**2037**	**150**	**457**
N4ZC	2,769,120	1826	138	402
N4HB	2,253,478	1583	129	373
KB4GX	1,577,511	1330	111	306
KI4M	1,530,012	1623	101	245
KC4B	1,159,916	1356	96	218
WA4QQV	735,142	997	80	194
W4FRU	633,341	727	87	220
AA4FF	600,390	686	88	227
N4UF	587,537	667	90	233
WD4FIG	540,876	699	75	199
N4IB	374,139	443	87	192
W4MGY	362,016	449	87	201
N4OE	302,560	443	74	174
W5WMU	**3,057,780**	**2063**	**148**	**417**
W5VX	1,794,510	1333	136	335
K5QY	1,537,551	1503	120	267
K5KG	1,240,862	1053	116	311
KA5C	326,774	514	70	168
AA5DX	**1,624,140**	**1802**	**104**	**211**
W6VLD	1,127,568	1293	105	233
N6AV	900,812	919	107	240
N6VR	689,220	843	99	216
K6TZ	622,468	873	99	202
W6BIP	357,469	508	74	155
W6GO	217,238	813	94	169
W6YRA	82,960	255	53	83
WA6GFY	52,750	190	43	82
WA7NIN	**3,546,282**	**2571**	**140**	**338**
K7SP	2,224,625	1647	133	348
W7IVX	1,541,292	1657	112	236
W7FG	592,065	729	89	206
WB7RUV	98,670	261	56	87
N7BJA	77,281	365	41	68
K8NA	**3,550,728**	**2128**	**145**	**446**
N8RA	**2,750,895**	**1992**	**122**	**375**
W8CNL	1,210,812	1022	123	305
K8XR	1,066,780	1037	105	268
K8JLB	849,000	852	101	274
W8CEF	761,852	808	99	239
W8NGO	566,060	639	87	223
AI8V	358,344	538	67	185
K8YVT	306,656	484	60	164
N8BKX	152,137	321	52	115
WD8PNF	138,768	316	48	120
AA8N	78,608	211	44	92
KA8Y	59,892	163	41	97
W9DUB	**2,109,930**	**1442**	**144**	**386**
AI9J	1,814,274	1388	120	342
W9OFV	1,153,327	1001	117	310
K9SD	861,068	836	107	270
W9RX	857,338	761	115	286
WB9ZBE	829,464	897	90	231
AA9D	615,228	734	88	219
W9YT	507,640	638	81	215
N9LE	268,192	461	73	159
AB0I	**3,457,531**	**2368**	**143**	**398**
KØJSY	1,702,330	1446	113	302
AKØA	867,200	1037	74	246
KØBJW	641,896	675	99	229
WBØUFL	376,740	499	79	194
WØYC	301,300	448	84	178
WØEEE	275,587	473	74	147

ALASKA

KL7HR	**2,124,105**	**3279**	**77**	**180**
KL7USA	56,050	433	25	34

ANGUILA

VP2E	**3,332,420**	**3467**	**96**	**268**

BAHAMAS

W4SS/C6A	**1,605,032**	**2909**	**77**	**176**

BERMUDA

VP9DX	**1,469,550**	**2186**	**82**	**209**

CANADA

VE1DXA	**3,273,410**	**2934**	**125**	**338**
VE2CAR	**1,966,602**	**2010**	**107**	**252**
VE2DU	1,945,820	2744	97	198
VO2WL	826,398	1853	52	134
VE3DOP	**1,129,436**	**1486**	**87**	**221**
VE3KKB	986,013	1020	88	245
VE4XK	**2,482,164**	**3364**	**103**	**223**
VE5CHS	**9,156**	**218**	**29**	**13**
VE7AV	**972,840**	**1561**	**90**	**178**
VE7CFB	482,870	838	80	138

COLUMBIA

HK3AXT	**2,755,662**	**2721**	**96**	**247**
HK4RCA	1,038,016	1982	94	237

DOMINICAN REPUBLIC

HI8XWP	**9,872,267**	**7603**	**134**	**417**

GUATEMALA

TD4NX	**2,966,166**	**3761**	**101**	**253**

HAITI

HH2MC	**6,730,278**	**4886**	**131**	**390**

JAMAICA

W8TN/6Y5	**1,115,107**	**1975**	**64**	**177**

ST. VINCENT

VP2SAX	**1,213,792**	**2027**	**74**	**190**

VIRGIN ISLANDS

VP2VFK	**5,375,625**	**5800**	**93**	**282**

AFRICA

CANARY ISLANDS

EA8ND	**933,660**	**1191**	**74**	**192**

CHAGOS ISLAND

VQ9CI	**1,546,896**	**1947**	**90**	**178**

SAINT HELENA

ZD7DX	3,024	39	15	13

SOUTH AFRICA

ZS6BPL	**1,798,202**	**2009**	**96**	**215**

ZAIRE

9Q5WH	**1,154,475**	**1723**	**69**	**156**

ASIA

ISRAEL

4Z4SG	**290,785**	**543**	**52**	**135**

JAPAN

JA2YKA	**2,239,140**	**1933**	**132**	**270**
JA4YFH	1,700,392	1739	118	226
JA7YAA	536,988	650	107	185
JA6YDH	324,138	639	64	119
JA4YPE	42,966	229	28	38
JA3YFI	33,634	204	22	40

SAUDI ARABIA

HZ1AB	**2,119,881**	**2661**	**84**	**193**

Asiatic U.S.S.R.

ASIATIC RUSSIA

UK9AAN	**7,584,440**	**4131**	**158**	**477**
UØY	3,738,580	3795	122	306
UK9ADY	2,242,773	2140	97	280
UKØLAK	639,312	964	96	208
UK9SAD	396,756	731	59	155
UK9UAC	393,588	1081	56	118
UKØSAW	360,810	1025	68	122
UK9HAD	247,808	539	58	118
UKØCAA	224,672	1488	48	70
UKØUAZ	203,136	598	48	90
UKØIAI	58,242	380	36	66

GEORGIA

R6F	**9,029,396**	**5643**	**137**	**411**
UK6VAF	344,655	1067	31	80

KAZAKH

UK7GAA	**1,018,564**	**1589**	**89**	**209**
UK7NAQ	842,240	1376	61	174

KIRGHIZ

UK8MAF	**516,258**	**986**	**66**	**151**

TADJIK

UK8JAA	**812,160**	**1435**	**89**	**193**

EUROPE

AALAND ISLAND

OH2BP/OH0	**2,632,280**	**3089**	**110**	**285**

AUSTRIA

OE4SZW	**2,150,792**	**2394**	**104**	**294**

BALAERIC ISLAND

EA6ET	**5,381,390**	**5187**	**106**	**307**

BELGIUM

ON5KH	**1,630,409**	**2081**	**83**	**236**

BULGARIA

LZ1KPS	**121,270**	**548**	**35**	**99**
LZ1KWS	63,588	426	35	49

CZECHOSLOVAKIA

OK3VSZ	**1,654,260**	**1996**	**94**	**255**
OK3KAG	1,620,185	1798	91	298
OK1KPU	1,248,480	1826	82	188
OK2KTY	864,216	1705	54	162
OK1KUR	252,000	600	66	158
OK2KNP	86,976	292	47	97
OK2KMR	48,334	144	46	47
OK1KIR	6,480	53	22	32
OK1KCF	972	29	10	17

ENGLAND

G3HTA	**3,924,600**	**3172**	**120**	**345**
G6UW	3,894,728	3119	117	371
G8JC	2,786,370	2723	99	294
G6CW	2,386,800	2968	87	225
G3RRS	544,765	1570	36	109

FAEROS ISLAND

OY9R	**1,096,802**	**1651**	**81**	**233**

FINLAND

OH2AA	**5,620,200**	**4552**	**130**	**363**
OH4TO	1,127,611	1411	90	217
OH7UE	1,000,620	1452	81	246

FRANCE

F3TV	**5,652,304**	**4450**	**116**	**347**
HW6LY	3,066,054	2948	108	294
F79WARC	1,775,340	2817	76	176

GERMANY (FRG)

DLØWU	**7,213,895**	**4586**	**132**	**427**
DJ6TK	3,589,058	3394	118	333
DLØJK	3,289,784	3100	102	280
DF3GY	3,075,707	3051	104	262
DLØTP	2,685,828	2495	111	301
DLØUE	1,880,874	2078	102	264
DKØKU	644,448	872	76	218
DA2CF	47,232	253	27	45

GERMANY (GDR)

DM2CDL	2,450,392	2613	103	273
DM3GC	293,192	907	59	167
DM3RF	136,136	396	60	122
DM5IG	86,984	324	52	118

HUNGARY

HG6V	**3,149,793**	**3572**	**100**	**287**
HA5KFL	2,262,876	2575	163	269
HA5KKC/7	2,262,876	2527	163	269
HA4KYH	1,393,285	1965	77	218
HA3KNA	917,350	1292	88	262
HA8KVB	847,016	1604	63	176
HA3KHC	631,040	1195	74	198
HA7KSV	215,002	569	55	138
HA2KMR	114,336	409	45	99
HA6KVC	80,956	372	37	111

ICELAND

TF3IRA	**2,310,304**	**3385**	**87**	**281**

ITALY

IZ3MAU	**7,600,745**	**5072**	**143**	**392**
I1KN	6,408,472	4351	122	410
I1DIE	4,691,632	4076	103	315
IY1PHX	2,174,880	2318	103	291
IV3VXU	1,320,616	1505	108	241
I7WL	881,640	1500	54	126
I3EJ	264,208	585	54	144

LIECHTENSTEIN

DL7RT/HB0	**2,395,010**	**2722**	**85**	**285**

LUXEMBURG

DK9WB/LX	**1,358,640**	**1804**	**71**	**184**

NETHERLANDS

PA5BGN	**1,835,728**	**2546**	**77**	**195**
PI51ARS	229,320	630	51	96

NORTHERN IRELAND

GI6YM	**1,910,544**	**2566**	**83**	**235**

NORWAY

LA5X	**3,613,752**	**3043**	**108**	**316**
LA7JO	2,875,581	2876	107	286
LA7A	1,247,864	1844	86	216

POLAND

SP2PDI	**3,365,910**	**2724**	**125**	**377**
SP9KRT	1,698,928	1893	106	288
SP6PZB	1,685,720	1877	100	270
SP9PDF	575,735	935	87	236
SP9PRO	73,870	257	54	112
SP9KCB	72,898	276	42	104
SP8KAF	42,630	335	29	69

ROMANIA

YO6KBM	**53,055**	**307**	**39**	**96**
YO5KAD	29,040	203	28	82
YO3KWA	25,544	202	29	74
YO3KSC	4,995	117	9	28

SARDINIA

IMØARI	**747,545**	**1166**	**84**	**223**

SPAIN

EA3BFR	**96,390**	**400**	**26**	**79**

SWEDEN

SM5AOE	**2,632,448**	**2434**	**120**	**332**
SK6AW	1,648,088	1844	89	249
SK3LH	876,744	1462	67	176
SK2GJ	459,340	718	71	167
SK4EA	447,888	700	66	151
SMØMC	351,268	550	73	201
SK6HA	19,497	143	20	47

WALES

GW6GW	**6,054,540**	**4797**	**111**	**359**

YUGOSLAVIA

YZ4Z	**4,256,460**	**3479**	**121**	**347**
YU7AJD	138,768	373	46	131
YU3FOP	47,475	528	13	62

European U.S.S.R.

BYELORUSSIA

UK2AAB	**1,263,942**	**1637**	**109**	**278**
UK2AAP	184,888	619	50	141
UK2ABC	109,968	453	33	83
UK2AAG	95,190	317	55	135
UK2IAJ	35,211	363	23	74

ESTONIA

UK2RDX	**2,288,433**	**2215**	**103**	**310**
UK2RAE	553,108	1038	58	154
UK2RAQ	302,280	718	65	165

EUROPEAN RUSSIA

EM6A	**8,120,574**	**5497**	**136**	**431**
UK4WAR	4,027,688	3188	130	367
UK3AAC	2,922,426	2844	106	254
UK6LAZ	2,358,720	2018	145	422
UK4WAB	1,747,944	1663	103	293
UK3AAH	1,643,688	2162	94	239
UK3QBM	1,564,662	1872	124	347
UK3DAU	758,670	1057	85	245
UK4FAD	540,898	963	66	163
UK4ABZ	536,406	904	96	242
UK4WAA	475,605	997	75	196
UK4ABW	404,248	792	80	219
UK4CBL	385,236	909	62	184
UK6HCZ	323,285	737	60	145
UK6LWA	274,725	709	64	161
UK4AAN	118,712	418	46	106
UK3WAC	43,306	240	30	88
UK6HAR	35,114	213	26	71

LITHUANIA

UK2BBB	**5,175,102**	**3589**	**146**	**433**
UK2BAS	**5,044,010**	**3519**	**126**	**404**
UK2PAP	4,780,916	3587	129	382
UK2PCR	3,508,028	2821	131	378
UK2BAG	1,391,220	1730	93	261
UK2PAO	825,792	1215	91	261
UK2BBF	179,496	624	46	116
UK2BCC	171,306	607	51	135
UK2BCG	136,880	744	32	113
UK2PAT	108,216	435	41	126
UK2PAD	67,770	429	24	106
UK2PAR	57,318	435	22	101
UK2PRC	43,384	224	36	100
UK2BBE	18,887	157	24	77

UKRAINE

UK5IAZ	**4,066,551**	**3272**	**131**	**382**
UK5IBB	2,241,555	2304	112	323
UK5GBE	877,652	1261	80	313
UK5ECN	345,408	799	61	163
UK5VBE	331,279	777	66	155
UK5MBQ	323,154	897	67	167
UK5FBA	277,800	624	62	138
UK5MCO	159,477	639	44	133
UK5MDI	153,636	504	48	129
UK5CAA	105,264	476	37	99
UK5FAA	73,248	434	27	85
UK5MAG	57,281	183	56	117

OCEANIA

HAWAII

KH6N	**1,825,752**	**2467**	**100**	**154**

NEW ZEALAND

ZL2AH	**1,715,668**	**2527**	**79**	**150**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES

N2AA	**13,299,750**	**6079**	**176**	**595**
K8LX	**7,508,970**	**4378**	**150**	**459**
W2YV	**7,405,846**	**4104**	**151**	**478**
KØRF	**6,290,136**	**3908**	**157**	**414**
W3MM	**6,229,350**	**3354**	**155**	**499**
K2UA	6,002,866	3274	152	495
W3LPL	5,584,150	3076	156	494
W6RDF	**4,882,944**	**3157**	**148**	**413**
K3WW	4,813,900	2744	153	491
N3RD	3,947,284	2458	137	429
KØUK	3,396,568	2239	150	374
W3RJ	3,271,744	2135	131	405
K1VR	**3,030,511**	**2315**	**115**	**358**
K1RX	2,888,235	1968	123	396
N7RO	**2,680,534**	**2172**	**128**	**311**
W2RR	2,607,908	1786	135	391
N6SV	2,530,077	1865	138	335
N3EG	2,517,840	1595	143	442
AA4S	**1,767,759**	**1481**	**121**	**336**
N3AW	1,749,627	1295	121	352
N3LR	1,508,661	1190	114	327
W3KWH	1,436,456	1312	129	323
K5MEP	1,196,556	1232	111	237
K8GL	1,058,400	957	108	292
W2IQZ/7	383,040	493	95	185

ALASKA

KL7D	**10,928,280**	**8914**	**141**	**346**
KL7IRT	**10,033,212**	**9316**	**124**	**310**

BELIZE

VP1RX	**1,810,669**	**3236**	**78**	**181**

JAMAICA

N2RM/6Y5	**12,474,700**	**10681**	**129**	**373**

MEXICO

XE2MX	**4,195,554**	**4936**	**111**	**252**

ST. KITTS

VP2KC	**37,770,012**	**17767**	**175**	**677**

ASIA

ISRAEL

4X6A	**11,365,540**	**7068**	**141**	**424**

JAPAN

JA7YRR	**5,717,354**	**4217**	**145**	**321**
JA3YKC	5,242,560	3526	153	355
JA3YBF	4,081,345	3069	151	312
JA2YXV	3,592,908	3125	119	277
JA1YXP	2,251,200	2207	116	234
JA2YEF	2,103,114	2062	116	238
JH1YDT	1,221,778	1645	91	166
JA4ZU	422,920	721	76	142
JA2YDC	336,281	562	75	134
JAØYAK	311,980	579	73	117

EUROPE

CZECHOSLAVAKIA

OK2KET	**184,368**	**613**	**50**	**184**

GERMANY (FRG)

DLØPG	**10,566,654**	**7365**	**140**	**426**
DLØWW	4,525,824	3885	136	362

ITU GENEVA

4U1ITU	**2,931,594**	**3561**	**84**	**275**

NORWAY

LA9K	**1,905,093**	**2721**	**86**	**247**
LH2A	**308,752**	**834**	**53**	**131**

POLAND

SP3KEY	**260,236**	**355**	**91**	**265**

SCOTLAND

GM3MBP	**1,452,880**	**1902**	**82**	**204**

SWEDEN

SK2KW	**14,675,871**	**10051**	**153**	**466**

SWITZERLAND

HB7H	**7,120,179**	**6006**	**132**	**399**

YUGOSLAVIA

YU3EY	**16,646,364**	**9562**	**153**	**528**
YU7BPQ	1,639,430	1985	120	312
YU7KWX	885,684	1993	79	197

OCEANA

HAWAII

KH6XX	**21,990,252**	**10989**	**184**	**494**

SOUTH AMERICA

BOLIVIA

CP1AA	**139,606**	**352**	**54**	**112**

BRAZIL

ZZ5EG	**7,447,971**	**5286**	**131**	**348**

CHILE

CE2AA	**1,539,402**	**1651**	**98**	**224**

TRINIDAD

9Y4FRC	**24,035,925**	**12549**	**148**	**497**

QRPp

W6PQZ	**A**	**168,156**	**374**	**56**	**106**
WA2JOC	**"**	**155,700**	**311**	**44**	**136**
N2GC	"	121,992	258	53	131
JK1GDD	**"**	**114,400**	**318**	**40**	**90**
WB2RWW	"	105,000	253	41	109
G3FTQ	**"**	**90,985**	**472**	**33**	**122**
WA4FHQ	**"**	**89,262**	**200**	**44**	**118**
OK1DKS	**"**	**83,937**	**305**	**44**	**103**
NØAJZ	**"**	**77,220**	**215**	**38**	**94**
WB8HCV	**"**	**53,436**	**184**	**46**	**76**
WD8JSC	"	44,965	196	41	104
K1BH		61,004	162	42	109
W6YVK	"	38,420	202	29	39
VE3GVH	**"**	**25,432**	**128**	**59**	**29**
PA5COR	**"**	**15,789**	**115**	**24**	**33**
OE1BSA	**"**	**12,788**	**139**	**25**	**67**
UA6AKT	**"**	**8,216**	**108**	**14**	**38**
N6PE	"	7,250	64	25	25
DM2DTG	"	3,479	62	11	38
WA8WLO	"	2,394	26	14	24
WA2KIR	"	1,161	23	13	14
VE1AUT	**28**	**87,584**	**315**	**22**	**70**
K1CGJ	**"**	**84,590**	**285**	**28**	**82**
VE5JQ	**"**	**40,356**	**315**	**18**	**41**
UB5MLP	**"**	**30,504**	**284**	**15**	**47**
K2QQA	**"**	**29,309**	**131**	**21**	**58**
PAØUO	**"**	**18,200**	**117**	**16**	**40**
UA6UDB	**"**	**17,984**	**156**	**16**	**48**
N6QR	**"**	**13,988**	**100**	**20**	**32**
WB2IPX	"	6,321	55	14	29
WD5CMB	"	3,915	52	7	22
K1LOM	"	2,772	45	11	22
KA5N	"	2,112	40	10	14
K2SWZ	"	1,000	20	6	14
UA3PAZ	**21**	**132,250**	**717**	**32**	**83**
OK1PCL	**"**	**19,648**	**127**	**20**	**44**
JH8DEH	**"**	**3,537**	**46**	**12**	**15**
JA7HYS/I	"	2,627	29	18	19
LA7NS	"	2,360	14	7	11
UB5KBF	**14**	**30,800**	**259**	**21**	**59**
UA3JD	**"**	**7,290**	**98**	**13**	**32**
K2RF	**"**	**7,008**	**58**	**14**	**34**
DM2CRO	**"**	**4,485**	**117**	**6**	**33**
TA1MD	"	1,078	29	7	15
OK1DKW/P	**3.8**	**4,125**	**129**	**4**	**29**
DM2FRM	"	132	11	2	10
UA2FCW	**1.8**	**1,518**	**66**	**5**	**17**
UA3AGL	**"**	**1,403**	**50**	**5**	**18**
UQ2PM	"	495	34	3	12

CHECK LOGS

DM2AYC, DM2EHL, DM2GWL, DM3FZN, DM3SBM, DM3TKL, DM3WPL, DM4NDJ, DM4VUG, DM4WZA, WA4UAZ/HCI, I8ZLW, JA2AHF, JA2CGC, K2MFY, KA2CGV, K3HWT, K6FM, LA4TG, N4CCJ, OH1XX, OH2BAG, OH2BFJ, OH2BLD, OH2BSS, OH2XA, OH3UJ, OH6GQ, OH6JD, OH2PR/OHØ, OK1AYD, OK1DDS/P, OK1JBL, OK2BJR, OK2BJU, OK2BNK, OK2BSG, OK2KPS, OK3CFP, OK3EQ, PT7AW, RA3YCR, RB5ADF, SP1DTG, SP2KJH, SP3AGE, SP3BIP, SP3EKY, SP4GHT, SP5CFD, SP5GMM, SP6PCL, SP9DH, SP9-3354, UA3ABP, UA3DAK, UA3DDC, UA3DGI, UA3DHR, UA3DID, UA3DL, UA3DLD, UA3DOC, UA3EAL, UA3IDT, UA3QJC, UA3TCI, UA3XAW, UA4AGN, UA4CCB, UA4FCL, UA4FCZ, UA4HFG, UA4HFR, UA4LBN, UA4YAC, UA6HFT, UA6LXZ, UA9SDB, UA9TS, UA9UF, UAØACM, UAØJDD, UAØSFN, UAØSGJ, UAØSJS, UB5AAF, UB5ABJ, UB5HBT, UB5HDM, UB5UAL, UB5UCH, UB5VEO, UI8LAK, UK1OAP, UK1TAR, UK3DAH, UK3RAD, UK5ECV, UK5FAB, UK5QCI, UK5VAA, UK6AJS, UK6HBK, UK6LTG, UK9JAD, UL7DBA, UM8MAU, UP2BEL, UP2BV, UQ2GDQ, UQ2MU, UV3GZ, UW3EQ, UW3EX, UW6CF, VE1AI, VC3IZH, VE7AJ, VE7DEW, VE7KB, W2HAZ, W3CV, W4KOQ, W4UG, W6ZUM, WA3INA, WB2MCB, WB4BBH, WB6HGH, WD4FJP, WD8DKU/5, YO3JX, YO4WU, YO5NU, YO8KAN, YO9HP, YU3TRI, YU7NZR, YO7ORS, 4M6ARV.

Disqualifications: N7UU (Unverifiable QSO's); UW9AF (Excessive Duplicates, Unverifiable QSO's).

Announcing:

The 1980 CQ World-Wide DX Contest

Phone: October 25-26 & C.W.: November 29-30
Starts 0000 GMT Sat. Ends 2400 GMT Sunday

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 thru 28 MHz.

III. TYPE OF COMPETITION:

1. Single Operator (Single band, and all band). Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. The use of DX spotting nets or any other form of DX alerting assistance places the station in the Multi-Operator category.

2. Multi-Operator (all band operation only).

a. Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception:* One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier. *Logs found in violation of the ten-minute rule will be automatically reclassified as multi-multi to reflect their actual status.*

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

c. *All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must be physically connected by wires to the transmitter.*

3. QRPp (single operator only) Power must not exceed 5 watts output. Stations in this category will be competing only with other QRPp stations for awards.

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e. 5705). C.W.: RST report plus zone (i.e.: 57905).

A station in a zone or country different than that indicated by its call sign is required to sign portable.

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only,* contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, and Asiatic USSR.

All scores will be published. To be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only.* If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates and plaques will be issued to the licensee of the station used.

In the QRPp category certificates will be awarded for single operator only.

IX. TROPHIES & PLAQUES (Donors)

PHONE

Single Operator, All Band

World - Bill Leonard, W2SKE
World - QRPp - Adrian Weiss, K8EEG/0
U.S.A. - Potomac Valley Radio Club
*Canada - Jack Baldwin, VE3BS
Carib./C.A. - Jim Neiger, N6TJ
Europe - W4BVV Operators
Africa - Gordon Marshall, W6RR
*Asia - Japan CQ Magazine
*Japan - Palm Garden Contest Club
Oceania - No. California DX Club

Single Operator, Single Band

World - K2HLB Memorial, No. Jersey DX Assoc.
*World - 21 MHz - Lee Wical, KH6BZF
World - 3.8 MHz - Fred Capossela, K6SSS
U.S.A. - 3.8 MHz - Arnold Tamchin, W2HCW

U.S.A. - So. California DX Club
*Canada - Gene Krehbiel, VE7KB
Carib./C.A. - Pedro Piza, Jr., KP4RF
Oceania - 14 MHz - VK3JW Memorial, Pacific DX Net
*So. America - Rafael Ponce de Leon, CX3BR

Multi-Operator, Single Transmitter
World - Don Wallace, W6AM
*Canada - Calgary Amateur Radio Assoc.

Multi-Operator, Multi-Transmitter
World - Radio Club Venezolano
U.S.A. - Dale Hoppee, K6UA
Europe - Bob Cox, K3EST

Contest Expeditions
World - Single Opr. - Stuart Meyer, W2GHK
World - Multi-Opr. - Bill Schneider, K2TT

Special - Single Operator, All Band
World - Phone/C.W. - John Knight, W6YY

C.W.

Single Operator, All Band
World - W2AB Memorial (Albert Kahn, K4FW)
World - QRPp - Gene Walsh, N2AA
U.S.A. - Frankford Radio Club
*Canada - Canadian DX Association
Carib./C.A. - Jim Neiger, N6TJ
Europe - W3AU Operators
Africa - Gordon Marshall, W6RR
*Asia - Japan CQ Magazine
*Japan - Palm Garden Contest Club
Oceania - Maui Amateur Radio Club

Single Operator, Single Band
World - W2JT Memorial, No. Jersey DX Assoc.
World - 3.5 MHz - Fred Capossela, K6SSS
U.S.A. - No. Illinois DX Association
*Canada - Canadian Amateur Radio Federation
Carib./C.A. - DX Club of Puerto Rico
*Europe - 14 MHz - G2LB Memorial (From Friends)
Oceania - 21 MHz - Pacific R.A.T.S.
*So. America - Rafael Ponce de Leon, CX3BR

Multi-Operator, Single Transmitter
World - Anthony Susen, W3AOH

Multi-Operator, Multi-Transmitter
World - Hazard Reeves, K2GL
U.S.A. - Rush Drake, W7RM

Contest Expeditions
World - Single-Opr. - Yankee Clipper Contest Club
World - Multi-Opr. - Bill Schneider, K2TT

Clubs
World - Phone/C.W. - CQ Magazine
*Special - Phone/C.W. - Southeastern DX Club

**Trophy supplied by Donor.*

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the Club or *CQ* Special Awards.)

A station winning a World Trophy will not be considered for a sub-area award. That Trophy will be awarded to the runner-up of that area.

The Canadian, Carib./C.A. and the African awards are for residents *only*. A resident is defined as one living in that country with an established Post Office address.

X. CLUB COMPETITION:

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area (except for DXpeditions especially organized for operation in the contest and manned by members).

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

XI. LOG INSTRUCTIONS:

1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers. The original log must be sent in. Recopied logs must be accompanied by a photocopy or the original log.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

6. Sample log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRC's must accompany your request.

If official forms are not available, make up your own 80 contacts to the page on 8½" × 11" paper.

7. All entrants are required to submit cross-check sheets for each band on which 200 or more QSO's were made. All other entrants are encouraged to submit cross-check sheets.

8. For each duplicate contact that is removed from a log by the committee, a penalty of three additional contacts will be exacted.

9. QRPp stations must indicate same on their summary sheets and state the actual maximum power output used, with a signed declaration.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct; taking credit for excessive duplicate contacts; unverifiable QSO's or unverifiable multipliers will be deemed sufficient cause for disqualification. (Incorrectly logged calls will be counted as unverifiable contacts.)

Disqualification can also result in the disqualified operator(s) being barred from competition in all *CQ* contests for a period of up to three years.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1980 for the Phone section and January 15, 1981 for the C.W. section. Indicate phone or c.w. on envelope.

Phone logs go to: Bob Cox, K3EST, 5801 Huntland Drive, Temple Hills, MD 20031.

C.W. logs go to: Larry Brockman, N6AR, 7164 Rock Ridge Terrace, Canoga Park, CA 91307

Logs may also be sent to CQ magazine, 76 North Broadway, Hicksville, NY 11801. However, we prefer that they be sent directly to either Bob Cox, K3EST or Larry Brockman, N6AR at the above addresses.

a regular feature by

THEODORE J. COHEN, N4XX

dateline... Washington, D.C.

THE INS AND OUTS OF THE WASHINGTON SCENE

RFI Complaints Involving Amateurs Increase Significantly

According to Jeffrey Young, Chief, Investigations Branch (Field Operations Bureau), RFI complaints to the Commission in the period January-March, 1980, inclusive, were up 45% over the number of complaints reported in the same period last year. This correlates well with year-to-year comparisons for the periods October-December, 1978 and 1979, which also showed a similar increase (43%). Moreover, the number of complaints in the January-March period is over 15% higher than the number of complaints in the October-December, 1979, period.

Young noted that over 53% of the complaints filed with the Commission in the first three months of 1980 involved alleged interference to electronic home entertainment equipment by amateurs. However, he emphasized that most of this so-called "interference" was related to r.f. overload conditions in the home entertainment equipment, and not to problems such as harmonic radiation. Still, amateurs are being blamed by their neighbors for causing the alleged interference.

While the figures reported by the Commission suggest that amateur-related RFI problems are increasing at an alarming rate, there is reason to believe that the flood of complaints is related to seasonal factors. First, the use of electronic home entertainment equipment increases during the winter months; thus more of these devices were in use during the October-March period. Compounding the RFI problem, too, was the fact that with the recent peak in the 11-year sunspot cycle, use of the 10 and 6 meter bands probably reached levels last seen in 1969.

It is hoped that in the coming months, amateur-related RFI complaints will fall significantly, thereby alleviating one of amateur radio's biggest headaches. In the long run, however, the solution to most RFI problems rests with the manufacturers of electronic home entertainment devices...manufacturers who continue to market equipment which incorporates design deficiencies that render their products susceptible to r.f. fields.

*8603 Conover Place, Alexandria, VA 22308

Jamming of Amateur Operations Continues

At this writing, jamming of WESCARS operations on the West Coast; of EASCARS, the HHH Net, and the Connecticut Phone Net on the East Coast; and of VHF repeaters country-wide, continue. Accordingly, the Commission has mounted a major effort to identify operators whose jamming constitutes violations of Federal law.

On the West Coast, for example, the Commission has caught and cited two v.h.f. operators who were intentionally interfering with the operation of the Grizzly Peak repeater in San Francisco, CA; the operations of 13 other amateurs are under investigation in this matter.

Meanwhile, on the East Coast, the Belfast, MN, monitoring station, in cooperation with the Commission's Boston office, has located one of the area's principal jammers of h.f. operations. This individual and others who have been identified are currently under investigation by Federal authorities.

Roberts Reports on Radio Activities in China (PRC)

Carlos Roberts, Chief, Private Radio Bureau (see May 1980 *CQ*) recently returned from an 11-day trip through the Peoples Republic of China. While he reports seeing no amateur activity, Roberts noted that any activity which does develop will probably be regulated by the China Sports Federation. This observation is based, in part, on the high level of interest in radio-controlled model boats which is exhibited by many Chinese.

Roberts also noted that radio equipment is available for sale in department stores, where numerous components of Chinese manufacture (e.g., transmitter tubes, solid state devices and integrated circuits [ICs]) are on display. The fact that the Chinese have the capability to produce ICs, in fact, suggests that their nation is more technically oriented than heretofore thought.

Shortwave radios are also popular in the Peoples Republic of China, and displays of such equipment are always thronged with people. Interestingly, the radios available for sale are made both in China (PRC) and in Japan.

As a final note, Roberts said that he would not be surprised to see a PRC amateur station on the air within a few years.

Amateurs Receive Anti-Semitic Literature

The Federal Communication Commission has received numerous complaints from amateurs who have received anti-semitic literature following contacts they have made with stations in Israel (4X4). The material is being sent by a "Radio Monitoring Station for the Texas Palestine Committee, P.O. Box 7046, Houston, TX 77008, or P.O. Box 145-168, Beirut, Lebanon." Observations of contacts between amateurs in the U.S. and Israel are apparently being made on the ship "Liberty II".

The anti-semitic literature, which is also an insult to Christians, apparently violates no Federal or international laws. Operators receiving such material, however, are encouraged to turn it over to their local FBI office. Copies should also be sent to the Postmaster General, Washington, D.C.

IEEE Society Refuses to Support Shockley for Medal of Honor

As reported in this column for July, 1980, the 1980 Medal of Honor was presented to Dr. William Shockley by the IEEE "for the invention of the junction transistor, the analog and junction field-effect transistors, and the theory underlying their operation."

Following the presentation, the IEEE Acoustics, Speech, and Signal Processing Society disassociated itself from the award to Shockley; the Communications Society is now considering a similar action.

The Acoustics, Speech, and Signal Processing Society took this action because Shockley "...has used (his) vast recognition to further a program of improving the genetic stock of mankind and because...this program is contrary to the basic principles of human rights."

Del Norte Technology Presses for Use of 420-450 MHz Band

The Commission currently is considering RM-3378, in which Del Norte Technology, Inc., is petitioning the Commission to delete the present 1 January 1981 cut-off date for non-government use of the 420-450 MHz band. Del Norte contends that there is a pressing need for continued radiolocation usage of this band and that the state of the art in radiolocation techniques has advanced sufficiently to permit compatible operations by primary users and by radiolocation users on a secondary basis.

Specifically, Del Norte seeks to operate a spread-spectrum ("chirp") radiolocation system in the 420 MHz band. According tests run by that corporation, the degree of isolation between radiolocation and voice communications systems is so high using spread-spectrum techniques that radiolocation and communications systems can coexist without causing interference to one another.

According to sources in Washington, one of the Del Norte spread-spectrum systems is now being tested by the ARRL. Presumably, the results of these tests formed the bases for the League's comments on RM-3378.

Amateurs should recognize that as the specturm becomes more crowded, sharing will become "the order of the day." However, sharing is a two-way street, and the development of spread-spectrum techniques and systems for amateur use should someday see bands now allocated to other services opened on a shared basis to amateurs.

Use of HF Radar Increases

In addition to the Russian "Woodpecker" and other over-the-horizon radar systems which operate in the high-frequency bands, similar radar systems may soon come on-stream for the purpose of determining sea conditions in areas where gas and oil exploration is being conducted. According to *Ocean Industry* magazine, a group of French institutions is examining the use of HF radar for determining wave height, surface current parameters, and wind direction. The method used, named OREME, involves the transmission of pulses of a given frequency towards the sea zone of interest, and the analysis of the Doppler shifts induced by the movement of the waves on the backscattered signal.

At this time, the maximum range of the OREME radar is from 60 to 90 miles. A number of companies are said to be interested in offering this HF radar service on a commercial basis.

The staff of CQ magazine joins your Washington editor in congratulating Mr. John J. (Jack) Kelleher, W4ZC, on his election to Fellow by the IEEE. Jack earned this award for his "contributions to international radio regulations."

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a monthly feature by
A. EDWARD HOPPER, W2GT

Awards

NEWS OF CERTIFICATE AND AWARD COLLECTING

At last, here is the September "Story of the Month" as told by Bob.

Robert Fuss, W4OWY
All Counties -211 1-12-79

"Born in Buffalo, New York, I was first licensed as a Novice in 1954. As a youngster I had plenty of radio parts to experiment with. My father was a ham in the early 1900s, the good old spark gap days. I spent several years as a child winding coils and building crystal sets and one-tube receivers. Finally at the age of 12 I got a local ham, W2VFV, to give me my Novice test. I received the call KN2MLH and later upgraded to K2MLH.

"In 1969 my wife Barbara, sons Dave and Steve, and I moved to Manassas, Virginia where I received the call K4DIS. At that location I was relatively inactive, as a ham, as my job in Washington, D.C. kept me rather busy.

"In 1973 we again moved, this time to Rochester, New York. Here I received the call W2HIH. In the spring of 1975 I decided to get active again and went to the local Heathkit store and bought an HW-101. After getting it working I decided to go mobile. At the time, I was covering 5 counties around Rochester with my job. Never having heard of County Hunting, I ran across WA6MAR and the net on 20 meters one day. After having listened for a couple of days and working a few mobiles, I decided to run a county. I soon found out that some of the counties around me were somewhat rare. After a week or so of running counties, I decided to collect them as well, so in August 1975 I really started collecting counties.

"In 1977 we again moved. This time to Marietta, Georgia, outside of Atlanta. Here I became W4OWY and worked my last county on December 31, 1978. I was returning home from one of my deer hunting trips to Butts County when I heard N9ER running N4UF in a Georgia county on the Alabama border. At that time my last county was Henry County, Alabama. From my mobile rig I broke Gary and asked him to ask Billy about Henry as a last county. Billy said no, as he was in a hurry to get back to Jacksonville. I asked Gary to explain that Henry was *the last* one and Billy said he would be there in 3 hours. I went home and fired up the home station. In 3 hours Billy arrived. At about that time he broke in to say he was there, the Spanish QRM started. So, we went to 40 meters where we easily made contact.

Robert Fuss, W4OWY and nice setup.

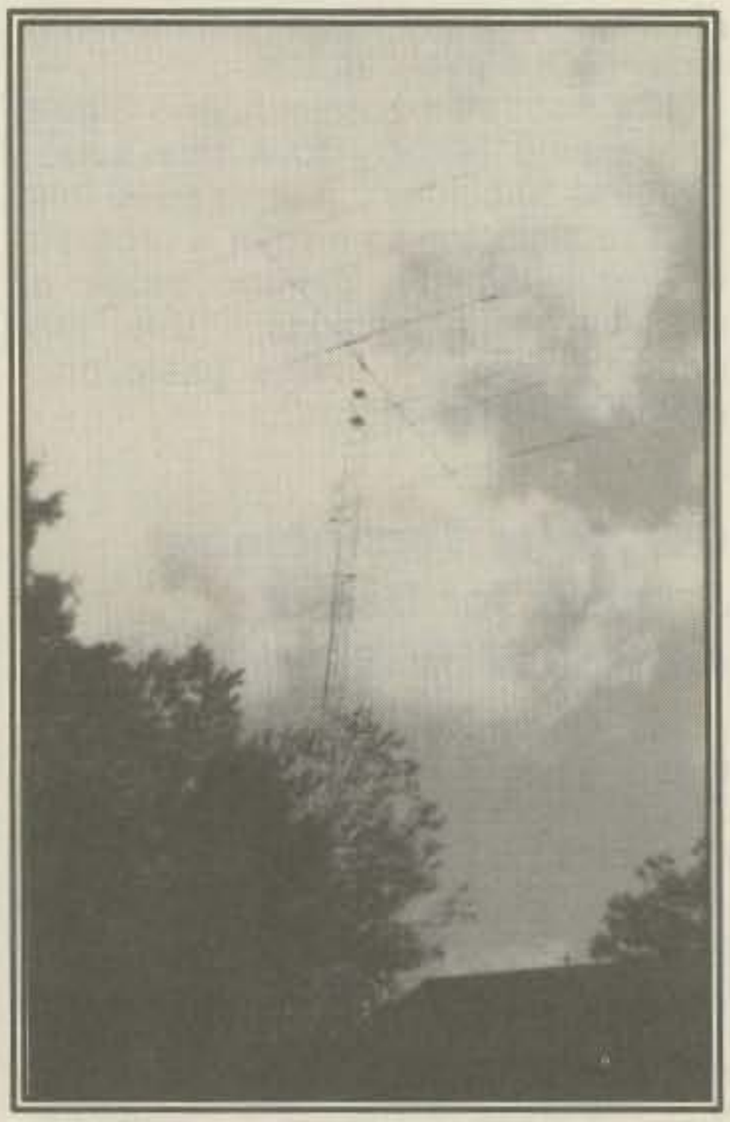
"Probably my most memorable experience as a County Hunter was running a county in Kentucky. At the convention in Rochester, Minnesota in 1977, I made a schedule to get Jackson County, Kentucky for K1UNM on my way home. When we arrived there I discovered I could run the Tri-County point of Jackson, Madison and Rockcastle. We worked Ben, K1UNM and started working the pile. What I had not noticed was about 200 feet down the road sat three gentlemen in the front yard of a home. All at once my wife exclaimed that one of the men had just gone into the house and came back out with a rifle and sat down with it across his lap to watch us. I guess that they thought we were revenuers with my red Chevrolet Suburban and my Hustler antenna with a double take on it. My wife became very anxious to leave, and I hadn't begun to put a dent in the pileup. My neighbor, W4HR, was net control and running me at the time. I explained to Bob what was going on down the road and that the gentleman with the rifle was looking at me rather funny. Bob said, "They would look at you funny no matter where you were; keep running the county." So we finished the run and left with my wife trying to hide under the front seat of the car.

"I am currently employed by I.B.M. Corp. and they are the reason for my moves around the country.

"My wife, Barbara, has no interest in ham radio but she enjoys meeting all the ham folks at the conventions and puts up with all my radio activities.

"We have two sons, one 13 and the other 17. The older boy is a Novice, WD4KQN, and is about to enter Georgia Tech in September. My younger boy is not interested in ham radio but likes radio controlled cars, boats, and planes, so we do a little of that as well.

"Currently my ham activities include chasing DX, trying to upgrade my license to Extra, and County Hunting for the second time around. I would have to say I enjoy County Hunting the most and also going to the conventions and meeting all those fine people."



The W4OWY big antenna.

P.O. Box 73, Rochelle Park, N.J. 07662

Special Honor Roll
All Counties

#283 William J. Driml, W6NAT 5-2-80.
#284 John A. Butler, WB2NFB 5-16-80.

Awards Issued

Jim Driml, W6NAT, who had received USA-CA-500 back in April 1964, rekindled his interest and applied for USA-CA-1000 through All Counties endorsed Mixed.

John Butler, WB2NFB waited until he had them All and collected USA-CA-500 through All Counties endorsed All S.S.B.

Jim Emerson, WB6GMM acquired USA-CA-500 through USA-CA-2000 endorsed All 2 × SSB, All Mobiles, All 14 MHz.

Cal Weyant, WA2PFF keeps plugging away and added USA-CA-1500 and 2000, endorsed Mixed, to his collection.

Ray Reynolds, AF2A (ex WA2TPC) obtained USA-CA-500, 1000 and 1500 endorsed All S.S.B., All Mobiles, All 14 MHz.

Jerry Burkhead, N6QA qualified for USA-CA-1000 endorsed All 2 × C.W.

A USA-CA-500 Certificate endorsed Mixed went to:

Mario Lumbau, IS0LYN, #1 to Sardinia.

USA-CA-500 Certificates endorsed All A-1 were claimed by:

Jay Geraden, WD9IFG.

Tauno Marvala, OH2TM.

Jacob Casal, HB9BCY, #2 to Switzerland.

USA-CA-500 Certificates endorsed All S.S.B. were won by:

Julio Guigou Rosello, EA8OZ, #1 to EA8.

James Grandinetti, WA2SRM.

Kazuo Ohkoshi, JH8DSC, #2 to the 8th call area.

USA-CA Honor Roll

3000		1500		500	
W6NAT	309	W6NAT	477	IS0LYN	1470
WB2NFB	310	WB6GMM	478	WD9IFG	1471
2500		WA2PFF	479	WB6GMM	1472
W6NAT	371	AF2A	480	AF2A	1473
WB2NFB	372	WB2NFB	481	EA8OZ	1474
2000		**1000**		WB2NFB	1475
W6NAT	424	W6NAT	598	OH2TM	1476
WB6GMM	425	WB6GMM	599	HB9BCY	1477
WA2PFF	426	AF2A	600	WA2SRM	1478
WB2NFB	427	WB2NFB	601	JH8DSC	1479
		N6QA	602		

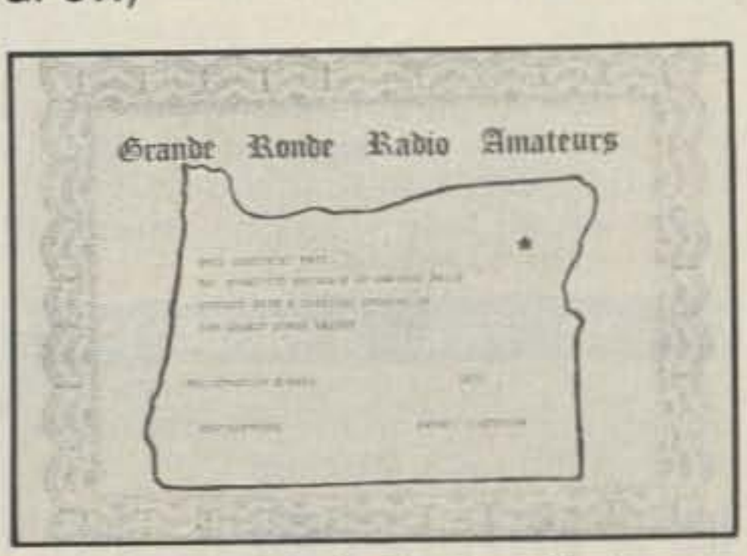
Awards

Ohio Valley Amateur Radio Association Award (OVA): Th Ohio Valley ARA is reinstating its OVA after a lapse of some 20 years. It can be obtained (free at this time) by working ten members of the OVARA and sending a GCR (General Certification Rule) list with log data to: Awards Manager, Ed Gleason, W8DVY, 7096 Pickway Drive, Cincinnati, Ohio 45238. It can be endorsed for any modes or frequencies, as confirmed. Active OVA Members are: AA8Z; K8 AQ, BA, CXM, FL, HBN, HEY, LEE, PSG, SW, YSD; N8 DX, FU; W8 AYB, BO, BVF, BZ, CEG, CSK, DQC, DVY, GOC, GS, HO, HQK, II, JAQ, KZT, MEL, MVN, NMB, PBU, RSW, SLB; WA8 AJI, BCG, CDP, NYB, PNS; WB8 AOE, BPI, EFB, MUA, NBA, PTP, QIS, SSI; K4FU; W4FU; N9 NB, NC; W9OEH.

Ohio Valley ARS Award.

Grande Ronde Radio Amateurs Certificate: The Grande Ronde Radio Amateurs, a small club located in Union County, eastern Oregon, offers an award to any foreign or domestic amateur who submits evidence of two-way communications with three amateur radio stations in the Grande Ronde Valley. Any band or mode may be used, and no QSLs need be sent. The fee is $1.00 or 3 IRCs, and it will be sent postpaid upon receipt and verification of the application. Your letter application should include the call signs, dates, and times of contacts (and fee) and should be sent to: June Campbell, WB7FDB, Rt. 2, Box 2486, La Grande, Oregon 97850.

Brazilian Coast Award (CCB-Certificado Costa Brasileira): This is a new release sponsored by GPCW—amateur radio group of Brazil. Requirements: Available to all licensed amateurs and s.w.l.s who can submit proof of contacts with different call areas of the Brazilian coast. Brazilian Stations need 12 different call areas. Foreign Stations need 8 different call areas.
1. All contacts since September 30, 1978 are okay. (5th anniversary of GPCW)



Grande Ronde Ra Certificate.

Brazilian Coast Award.

2. Contacts may be made in any frequencies, but only in c.w. mode; minimum report (RST) 338.
3. Applicants must send a certified list, checked and signed by a recognized amateur radio association, addressed to GRUPO PRAIANO DE CW-GPCW, P. O. Box 556, 11100 Santos, S.P., BRAZIL.
4. For return postage (air mail) 10 IRCs should be sent.

Call Areas of Brazilian Coast: PP1, PP5, PP6, PP7, PR7, PR8, PS7, PS8, PU8, PY1, PY2, PY3, PY5, PY6, PY7, PY9, PY0 (F. Noronha Is.), PY0 (S. Peter & S. Paul Rocks), PY0 (Trindade & Martin Vaz Is.).

Ski Canada Award: Available to all amateurs. Requirements: Work two (2) stations from each major skiing province of British Coumbia, Alberta, Ontario, and Quebec. A total of eight contacts is required. All contacts must be made after January 1, 1978. There are no band or mode limitations. The major ski areas from each province are:

VE2 · Quebec	VE3 · Ontario
Montreal	Collingwood
Quebec City	Thunder Bay
Saint Jerome	Ottawa
Ste. Adele	London
Ste. Jovite	Kitchener-Waterloo
Sutton	Barrie
	Huntsville
VE7 · British Columbia	
Vancouver	Orillia
Vernon	Bracebridge
Kamloops	Owen Sound
Penticton	Flesherton
Kelowna	Sault Ste. Marie
Kimberley	Meaford
Princeton	VE6 - Alberta
Revelstoke	Calgary
Nelson	Edmonton
Prince George	Banff
Pt. Alberni	

Send log data and $2.00 to VE3HLL, Eric S. Walden, R.R. 1, Gowanstown, Ontario, Canada, N0G 1Y0.

NOTE: You probably remember that Eric, VE3HLL and Garry, VE3GCO put out a fine 75-page booklet of over 65 different Canadian Awards, containing complete details, check lists, application forms, QSL Bureaus, etc. The NEW cost is $3.00 Canadian and USA (Cash, check, or money order) and $5.00 for DX. Send to Eric at above listed QTH. Eric's hobbies are skiing and amateur radio, thus the beautiful Award.

Ski Canada Award.

Notes

Sad to note the loss of Jim Fisk, W1HR (ex W1DTY), Editor of *Ham Radio.* He received USA-CA-500-#1373 8-8-79 endorsed All S.S.B.

Also sad to hear about Robert Potter, K9WSL, who received his USA-CA-500 Award March 9, 1965 and got up to USA-CA-2500 in January 1970.

Although the Mobiles are doing a *great job,* kindly do NOT run wet County Lines. Please do not waste time with all the letters from different state highway special rules that would take two lawyers to figure out. I would hate to go back to some old K6BX rules and refuse all county lines. I also remember reading about some County Hunter grabbing a County via a phone-patch. That is not a genuine QSO and do not use repeaters on satellite contacts for USA-CA. Although the original and present rules do mention Reservations, some of them run for many, many miles and touch several states, which makes it rather ridiculous to claim a county that you are many miles from. Please, let us NOT reduce the value of the Award.

Due to all the heavy traffic on the regular 14336 net, Steve, W5LXG and Arnie, K9DCJ have started a bi-monthly session for all holders of All Counties Awards to enable them to give out their numbers for those working for the Cliff Corne, Jr. Memorial Award. They meet on the 1st and 3rd Monday of each month at 2359 GMT (Universal Time) somewhere between 14.340 and 14.345 MHz. This idea was originally suggested by Bertha, WA4BMC some years ago.

Good Hunting, keep it clean.

73, Ed, W2GT

K8RI "talks" us through the process of just how an antenna works.

A Verbal Graphic Description Of Antenna Operation

BY ROGER HALSTEAD*, K8RI

Most of us have wondered at one time or another how all that educated aluminum above the house really sends the signal in the direction we want it to.

One look at some of the textbooks on antenna theory leaves most convinced that all those numbers, formulas, and symbols are really incantations recited by the design engineers over each neatly packaged system before it leaves the factory so it will do what they say it will when you put it up.

There are also those of us who look up a set of dimensions in the antenna handbook that should work, if adhered to, and then find out what the price of aluminum tubing is, so we buy the kit anyway.

Neglecting all the math and construction work just how does an antenna work?

The following is a very generalized description of antenna operation. No! You won't be able to build a super DX getter from the explanation, but it should help in understanding how directive antennas work.

To begin with, what are directivity and gain? Well, for one thing they are inseparable. You cannot have gain without directivity or directivity without gain, although some mighty inefficient systems kind of make you wonder.

To get gain, the antenna has to take some of the signal from the undesired directions and add it to the signal in the desired direction. Therefore, the more gain the narrower the beam width.

So how do we get them? By algebraically adding the signals of antennas (plural) in a common near field.

How's that again?

It's simply putting a number of antennas close enough to each other so their signals will add in the desired direction and cancel or at least be reduced in the undesired direction.

In the case where all elements are driven, such as with a "phased" vertical array, the directivity and gain are derived from both the spacing between the antennas and the feed line lengths. Changing either will change the phasing and thus the gain and directivity.

What about parasitic arrays such as the Yagi or quad designs? Same thing! Except, the phasing is done by varying the element spacing and length to get the desired effect.

Start with the driven element and also the assumption that the element is resonant and has an s.w.r. of 1:1.

With the arrival of the first cycle of r.f. energy at the feed point, the current will flow toward the outer ends of the element; at the same time the magnetic field generated by the current will radiate out toward the other elements at about the same speed as the current traveling toward the ends of the element.

Most of the magnetic field will be coupled to the elements in front and back of the driven element rather than being radiated out into space. When this field reaches these elements it will in turn induce a current in them.

Upon arrival at the ends of the driven element the current changes its phase by 180 degrees. It also would be correct to say the instantaneous polarity of the current has reversed at that point.

The current then travels back to the feed point and arrives in phase with the next cycle from the feed line.

Meanwhile, the currents which were induced in the other elements have created their own magnetic fields which radiate back to the driven element. The field from the director will be more or less out of phase when it reaches the driven element and that from the reflector will be more or less in phase at that point. This will cause the signal radiated toward the rear of the antenna to be reduced in strength and that toward the front to be increased in strength.

As the field from the next cycle radiates from the driven element it will arrive more or less in phase with the current at the first director and out of phase at the reflector. This again will result as an increase in signal strength toward the front of the antenna and a reduction toward the back of the antenna.

In the case of the directors, being shorter than the resonant length will cause an advance in phase. Also, progressively shortening them toward the front of the antenna will tend to give better performance across a wider frequency range with only a small sacrifice in gain at the design frequency.

Using multiple driven elements and making them slightly different lengths will also allow the antenna to operate over a wider frequency range.

This is not a precise explanation, but then neither is the performance of the antennas perfect or there wouldn't be any side lobes and the front to back ratios would be much greater than some of the larger figures we see for some of the big antennas today.

All of the antennas I know of today can be visualized as operating on this principle.

A long wire can be viewed as a number of individual antennas in series, also the helix, or even the big dish type used for microwave frequencies.

So, even if you can't build a big antenna directly from this explanation, I hope it has at least helped in understanding how they work.

*6240 Jackson Rd., Breckenridge, MI 48615

a monthly feature by
FRANK ANZALONE, W1WY

Contest Calendar

NEWS/VIEWS OF ON-THE-AIR COMPETITION

This is a rather crowded month of contest activity, therefore space for any comments is limited.

However, I call your attention to the World-Wide Contest rules in this issue. Basically, they are the same as they have been these many years. However, several clarifications have been spelled out.

Physical location of multi-multi transmitter operation, treatment of computerized logs and an updated list of Trophy and Plaque donors are a few of the topics covered.

Therefore, it would be advised to check the 1980 rules closely.

73 for now, Frank, W1WY

FOUR Land QSO Party

Two Periods (GMT)

1800 Sat. Aug. 30 to 0600 Sun. Aug. 31
1300 Sun. Aug. 31 to 0100 Mon. Sept. 1

This year the 10th annual QSO party is sponsored by the Brightleaf A.R.C. of Greenville, N.C.

The same station may be worked on each band and mode, and again if operating portable or mobile from each county change. Stations in the 4th area may work each other for QSO and multiplier credit.

Exchange: RS(T) and QTH. County and state for the 4th district, state, province or country for all others.

Scoring: *4th call area*—One point per QSO; multiply total by number of states, provinces and countries worked (counted once only).

All others—Two points for each 4th area station worked times the total 4th area states and counties worked (also counted once only).

Frequencies: C.W.—3575, 7055, 14070, 21070, 28090. Phone—3940, 7260, 14340, 21360, 28,600. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to the top scorers in each state, VE province and DX country, 2nd and 3rd place when warranted. Also county awards to 4th call area states. Special awards to Novices.

Mail logs within 30 days to: Contest Chairman, Bob Knapp, W4OMW, 105 Dupont Circle, Greenville, NC 27834. Include a large s.a.s.e. for results.

14 Sherwood Road, Stamford, CT 06905

Calendar of Events

	Aug. 30-31	FOUR Land QSO Party
	Sept. 7	Bulgarian C.W. Contest
	Sept. 10-12	YLRL "Howdy Days"
†	Sept. 13-14	European Phone Contest
	Sept. 13-14	CAN-AM Phone Contest
	Sept. 13-14	Pennsylvania QSO Party
	Sept. 13-14	Wash. State QSO Party
	Sept. 13-14	Cray Valley S.W.L.
	Sept. 14	North American Sprint
	Sept. 20-21	MD/DC QSO Party
	Sept. 20-21	Scandinavian C.W.
	Sept. 27-28	Scandinavian Phone
	Sept. 27-28	CAN-AM C.W. Contest
	Sept. 27-28	Delta QSO Party
	Sept. 28-29	Classic Radio Exchange
	Oct. 4-5	California QSO Party
	Oct. 4-5	VK/ZL/Oceania Phone
	Oct. 11-12	VK/ZL/Oceania C.W.
	Oct. 15-16	YLRL Anniv. C.W. Party
	Oct. 18-19	CLARA AC-DC Contest
	Oct. 18-19	WADM Contest
	Oct. 18-19	Boy Scouts Jamboree
	Oct. 18-20	ARCI QRP QSO Party
	Oct. 25-26	**CQ WW DX Phone**
	Nov. 5-6	YLRL Anniv. Phone Party
	Nov. 8-9	European RTTY Contest
	Nov. 8-9	Inter. Police Contest
	Nov. 9	Czech. Contest
	Nov. 15	DARC 10 Meter Contest
	Nov. 29-30	**CQ WW DX C.W.**

†Covered last month.

Bulgarian C.W. Contest

0000-2400 GMT Sunday, September 7

Organized by the Bulgarian Federation of Radio Amateurs, this contest is open to amateurs throughout the world.

Bands: C.W. portion of each band, 3.5 through 28 MHz.

Classes: Single operator, multi-operator/club stations and s.w.l.

Exchange: RST plus ITU zone.

Scoring: QSOs with LZ stations 6 points. One point with stations in the same continent. Three points for all other areas. (S.w.l. score 3 points for reporting both calls in an exchange, 1 point if only one call.)

Multiplier: Sum of ITU zones worked on each band.

Final Score: Total QSO points multiplied by sum of ITU zones worked on each band.

Awards: Trophies and medals in each class to the top three world leaders, top three continental and top three on each band. (S.w.l. top three in world.)

Separate log is required for each band. A summary sheet showing the scoring and zones worked on each band, and the usual signed declaration.

Contest contacts may be used for the many Bulgarian awards. BFRA diploma, W-100-LZ, 5 Band LZ, W-28 Z/ITU, and Black Sea Sofia Award. Send application with your contest entry.

Mailing deadline is 30 days after end of contest to: BFRA Contest, P.O. Box 830, Sofia, BULGARIA 1000.

YLRL "Howdy Days"

Starts: 1800 GMT Wed. September 10
Ends: 1800 GMT Fri. September 12

This activity is for YL's and scores will be based on contacts between YL's only. All bands and modes may be used. However, crossband and Net contacts do not count, and only one contact with the same station is permitted regardless of the band.

Score 2 points for each YLRL member worked, and 1 point if it's with a non-member. There is no multiplier, just add the QSO points.

The top scoring YLRL member will receive her choice of a YLRL pin, a charm, or stationery. The highest scoring non-member receives a one year membership in the YLRL.

Logs must be received by October 13th and go to: Ione O'Donnell, WA2DMK, Newcomb, NY 12852.

Canadian-American Contest

Phone: Sept. 13/14 C.W.: Sept. 27/28
Starts: 1800Z Sat. Ends: 1800Z Sun.

This is the fourth running of this contest sponsored by the Ontario Contest Club and the Canadian DX Assoc.

Contacts may be made on all bands, 1.8 through 28 MHz. It is recommended that operation be confined to the General portion of each U.S. band. QSO exchange will be between the two countries as well as within each country.

Multi-operator stations can operate the full 24 hour period. Single operator is limited to 20 hours, with a maximum of two rest periods totaling 4 hours.

Catagories: Single operator, multi-operator single transmitter and club competition.

Exchange: RS(T), QSO no., and multiplier area. Postal abbreviations for the 50 U.S. states. "CN" for U.S. possessions in the Caribbean. "PC" for Pacific possessions. And provinces for Canada. (59001 CT, 599001 PQ, etc.)

Points: W/K to W/K and VE to VE QSOs, 2 points. W/K to VE QSOs, 3 points.

Multiplier: 50 U.S. states, 2 U.S. possessions (Carib. and Pacific areas), 10 Canadian provinces, 2 Can. territories (NWT and Yukon), 1 Can. Island (Sable, St. Paul). Total of 65 per band, max. of 390 from all bands.

Final Score: Total QSO points from all bands multiplied by the sum of multipliers from each band.

The same station may be worked on each band for QSO and multiplier credit. Stations operating outside their own area must identify their location.

Multi-operator stations must stay on the same band at least 10 minutes before switching to another band.

Phone and c.w. are separate contests. However, combined phone and c.w. scores will be used for overall competition.

Awards: Certificates to single operator station winners in each multiplier area, and the top five combined phone and c.w. scores for multi-operator stations.

There are 8 Trophies and Plaques.

Phone: Canadian and American Champion.

C.W.: Canadian and American Champion.

Phone & C.W.: Candian and American Champion.

Multi-Operator Champion (Combined).

Highest aggregate Club score.

And a one year subscription to "Long Skip," the CANADX monthly bulletin, to the top 5 U.S. scorers.

A disqualification clause will be strictly observed. Violation of amateur regulations, rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification, so check your log carefully before submitting it.

Do not use separate log sheets for each band. Indicate the multiplier only the first time it is worked on each band. A summary sheet must accompany each entry, showing the scoring and other pertinent information. Entries with over 200 contacts must also include a check sheet for each band.

Sample log forms, summary and check sheets are available from the contest chairman. A large s.a.s.e. will bring you sample. (Do not glue U.S. stamps to the envelope.)

Mailing deadline for all entries is 30 days after end of contest to: CAN-AM Contest, VE3BMV, P.O. Box 292, Don Mills, Ont., Canada M3C 2S2.

Pennsylvania QSO Party

1700Z-0400Z Sat./Sun. Sept. 13/14
1300Z-2200Z Sun. Sept. 14

This is the 23rd annual party sponsored by the Nittany A.R.C. The same station may be worked on each band

No - 73 - 74

and mode for QSO points. Penn. stations may also work other in-state stations for QSO and multiplier credit. Mobiles may be worked in each county change.

Exchange: RS(T), 3 digit sequential QSO number and QTH County for Penn., ARRL section for others.

Scoring: One point for s.s.b. contacts, 1.5 points for c.w., and 2 points for 80 meter c.w. contacts.

Penn. stations multiply total by ARRL sections and Penn. counties worked. Others use Penn. counties worked for their multiplier (max. of 67).

Penn. mobiles calculate total score for each county then add county totals for final score.

Frequencies: C.W.—50 kHz up from bottom of each c.w. band. S.S.B.—3980, 7280, 14280, 21380, 28580.

Awards: Certificates for section winners and to the top 10 Penn. entries (min. of 10 QSOs). Plaques to the top Penn. and top out-of-state winners. An engraved gavel donated by W1PL goes to the Penn. club scoring the highest aggregate score.

Include a summary sheet with your entry showing the scoring, a check list of counties or sections worked and any interesting comments. A dupe sheet is required if you make 100 or more contacts. Also include a large s.a.s.e. for a copy of the results.

Mailing deadline is October 15th to: Douglas R. Maddox, W3HDH, 1187 S. Garner Street, State College, PA 16801.

Washington State QSO Party

Three Periods GMT

0100 to 0700 Saturday, September 13
1300 to 0700 Sat./Sun. Sept. 13/14
1300 to 0100 Sun./Mon. Sept. 14/15

This is the 15th annual party sponsored by the Boeing Employees A.R.S. (BEARS). The same station may be worked on each band and mode for QSO and multiplier credit. Wash. stations may work other Wash. stations for QSO points.

Exchange: QSO no., RS(T) and QTH. County for Wash. state, province or country for others.

Scoring: Phone contacts are worth 2 points, c.w. 3 points. Wash. stations multiply total QSO points by number of states, VE provinces and DX countries worked. Others use Wash. counties for their multiplier (max. of 39).

There is an additional multiplier of 1 for each group of 8 contacts with the same Wash. county for non-Wash. stations.

Frequencies: C.W.—1805, 3560, 7060, 14060, 21060, 28160. Phone—1815, 3925, 7260, 14280, 21380, 28580. Novice—3725, 7125, 21150, 28160.

Awards: Certificates to the top scorers, both single and multi-operator, in each state, VE province, DX country and Wash. county. Additional awards where warranted.

The Worked Five Bears Award is available to anyone working 5 club members before, during or after the party. The Worked Three Cubs Award is available for working 3 Novice members.

Include a check sheet with your entry if you have 100 or more contacts. Results will be mailed to all entries, no s.a.s.e. required.

Mailing deadline is October 15th to: Boeing Employees A.R.S., Contest Committee, Att: Willis D. Propst, K7RS, 18415 38th Ave. S., Seattle, WA 98188.

Cray Valley S.W.L. Contest

Starts: 1800Z Sat. September 13
Ends: 1800Z Sun. September 14

We often receive complaints from s.w.l.'s that we do not list activities in which they can participate. That's because very few contests have an s.w.l. category.

Well here's one organized just for you. You can use up to 18 hours during this period; multi-operator groups may log during the entire contest.

There are two sections, phone and c.w., all bands 1.8 through 28 MHz.

Scores should be compiled as follows: One point for each station heard on each band multiplied by the number of different countries heard on each band. Add the scores from each band for your final score.

If points are claimed for both working stations, the call signs of each must appear in the heard column. The practice of logging a series of contacts made by one station is not permitted. The same station may be logged later but not more than 20 times on the same band.

Countries will be determined by the official R.S.G.B. list (same as ARRL) with call areas of the USA, Canada and Australia counting as separate multipliers.

Certificates of merit will be awarded by the Cray Valley Committee. Neatness of logging is a must, up to 100 bonus points will be awarded for a neat log.

Although not required, it is desireable to use the official log forms. A large s.a.s.e. to the Contest Manager, G4DFI, will get you a supply.

Entries should be sent to: Mr. Owen Cross, G4DFI, 28 Garden Avenue, Bex-

leyhearth, Kent, DA7 4LF, England. They must be received not later than November 3rd.

North American Sprint Contest

0100 to 0500 GMT Sun., September 14

There are two "Sprints" held each year, one in February and the other in September. As the name implies, it's a real shorty—four hours only.

North American stations will be working stations on other continents as well as other North Americans. Single operator, c.w. only.

Exchange: Call, QSO no., name and QTH. (State, province or country.)

Scoring: Multiply total QSOs by sum of states, VE provinces and N. American countries worked. USA and VE not countries, KH6 not a state. There are 8 VE provinces, Maritime plus VE2–VE8.

Frequencies: Three bands only, 3530-3550, 7030-7050, 14030-14050. Same station may be worked once on each band.

Awards: A Trophy to the top scorer. Certificates to the winners in each U.S.A. call district, Canada and each country, and also to the top ten scores, the winning team and each operating member.

Club competition is limited to a total of 10 members as a single unit. A club may enter more than one unit. To qualify each member in the unit must be registered with the contest coordinator, N6SF, at least 24 hours before the contest.

Special QSO Rule: Any station calling CQ or soliciting contacts is permitted only one QSO as a result of that call. He must thereafter move at least 1 kHz before working another station, or at least 5 kHz before again soliciting other calls.

Use a separate log for each band, indicate the multiplier the first time it is worked and include a summary and check sheet with your entry.

Entries must be received no later than 30 days after the contest and go to: Rusty Epps, N6SF, 1030 Bush Street, Apt. #6, San Francisco, CA 94109.

Maryland/D.C. QSO Party

Starts: 1900 GMT Sat., September 20
Ends: 1900 GMT Sun., September 21

This is the 15th annual party sponsored by the Maydale A.R.S. The same station may be worked on each band and mode for QSO points as well as band multipliers.

Exchange: QSO no., RS(T) and QTH. County for MD/D.C. (Baltimore and Wash. are independent cities) and

ARRL section or country for others.

Scoring: Two points for each QSO.

MD/D.C. use ARRL sections and countries worked on each band for their multiplier. Others use Maryland counties and independent cities worked on each band (max. of 26 per band).

Frequencies: Use all bands including Oscar. On c.w. 75 kHz up from low end of each band on even hours. On s.s.b. 25 kHz in from low end of each phone section on odd hours. Try 10 and 15 on the half hour.

Awards: Certificates to the top scorers in each ARRL section, Maryland county, independent cities and each country, both on phone and c.w. A minimum of 1000 points required for MD/D.C., and 250 points for all others.

Plaques for top combined phone/c.w. score in MD/D.C., and outside the MD/D.C. area, and to the top Mobile providing he has a minimum of 10 contacts from each county and independent city.

Use a separate log for each band and mode, include a summary sheet showing the scoring, name and address in block letters and a signed declaration that all rules and regulations have been observed.

Mailing deadline is October 15th to: Maydale A.R.S., c/o E. Andersen, W3XE, 14601 Claude Lane, Silver Spring, MD 20904.

Scandinavian Activity Contest

C.W.—Sept. 20-21 S.S.B.—Sept. 27-28

Starts: 1500 GMT Saturday
Ends: 1800 GMT Sunday

It's the world working the Scandinavians in this, the 22nd running of the S.A.C. Phone and c.w. are separate contests. The same station may be worked once on each band, 3.5 through 28 MHz, for QSO and multiplier credit.

It is suggested that the following sections of the bands be used. C.W.: 3505-3575, 7005-7040, 14010-14075, 21010-21125, 28010-28125. S.S.B.: 3600-3650, 3700-3790, 7050-7100, 14150-14300, 21200-21350, 28400-28700.

The prefixes used in Scandinavia are: LA/LB/LG/LJ Norway, JW Svalbard & Bear Is., JX Jan Mayen, OF/OG/OH.OI Finland, OH0 Aaland Is., OJ0 Market Reef, OX Greenland, OY Faroe Is., OZ Denmark, SJ/SK/SL/SM Sweden, TF Iceland.

Classes: Single operator, and multi-operator both single and multi-transmitter. Multi-transmitter stations must use a separate series of serial numbers for each band. Club stations are considered as multi-operator.

Exchange: RS(T) plus a QSO number starting with 001.

Points: European QSOs count 1 point on any band. DX contacts are 1 point on 14, 21 and 28 MHz, 3 points if on 7 or 3.5 MHz.

Multiplier: Each *call area* in the above list of Scandinavian countries worked on each band (LA1, LB1, LJ1 are in the same call area, as are SM3, SK3, SL3). Portable stations in Denmark or Norway count as the 10th area. OH0 is the 10th area for Finland, OJ0 is also separate, and SJ9 is the 9th area for Sweden.

Final Score: The sum of QSO points from all bands times the sum of the multiplier from each band.

Awards: Certificates to the highest scoring station in each class, both s.s.b. and c.w., in each country and each U.S. call area. Additional awards depending on the returns. Plaques will be awarded to the top scoring stations in each continent, both on s.s.b. and c.w.

Use a separate log sheet for each band. Include a summary sheet showing the scoring, your name and address in block letters and a signed

declaration that all rules and regulations have been observed.

The usual disqualification criteria will be observed and strictly enforced.

Mailing deadline for all entries is October 15th. This year logs go to: SSA Contest Manager, Peter Arninge, SMØGMZ, Granovagen 20, 7, S-151 64 Sodertalje, SWEDEN.

Delta QSO Party

Starts: 1800 GMT Sat. September 27
Ends: 2400 GMT Sun. September 28

This is the 11th annual QSO Party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) may work stations both in and outside their boundaries, others only Delta stations. The same station may be worked on each band and mode, and portable and mobiles in each county change.

Exchange: QSO no., RS(T) and QTH. County and state for Delta stations, ARRL section for all others.

Scoring: *For Delta*—Total number of QSOs multiplied by ARRL sections worked (max. of 75).

Outside Delta—Total QSOs multiplied by the Delta counties worked (max. of 316). DX stations may be worked but for QSO points only. They have no multiplier value.

Frequencies: C.W.—3550, 7050, 14050, 21050, 28050. S.S.B.—3990, 7290, 14290, 21390, 28590. Novice—3725, 7125, 21125, 28125.

Certificate Awards:

A. Achievement: To all stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 Delta states, 4th and 5th place awards if warranted.

C. Others: To the highest scoring station in each ARRL section, and in each country, 2nd and 3rd place awards if warranted.

D. Plaques: To the top scorers in and outside the Delta division. Top portable and mobile Delta stations. Highest scoring Delta Club station.

Mailing deadline for logs is October 21st to: Malcolm P. Keown, W5XX, 213 Moonmist, Vicksburg, MS 39180.

Classic Radio Exchange

Starts: 2000Z Sunday, September 28
Ends: 0300Z Monday, September 29

This is the fall edition of this unusual activity sponsored by the Southeast A.R.C. of Cleveland, Ohio.

Object is to restore, operate and enjoy older equipment with like-minded hams.

A classic radio is defined as any gear built since 1945 but which is at least 10 years old, an advantage in the contest but not required in the exchange.

The same station may be worked on each band and mode and with different equipment combinations. Non-contestants may be worked for credit.

Exchange: Name, RS(T), state, province or DX country, and receiver and transmitter type (i.e., home brew, 807 final, etc.). Also any other interesting information.

Scoring: Multiply total QSOs by number of different receivers, transmitters, states, provinces and DX countries worked on each band. Multiply that total by your Classic multiplier—total years old of all receivers and transmitters used. (Three QSOs minimum per unit.) If equipment is a transceiver, multiply age by two.

Frequencies: C.W.—60 kHz from low edge of each band. Phone—3910, 7280, 14280, 21380, 28580. Novice/Tech—3720, 7120, 21120, 28120. Listen to 10 on the quarter hour, 20 on the half hour and 15 on the three quarter hour.

Awards: Certificates will be awarded for the highest scores, longest DX and "unusual achievements."

Send logs with comments, pictures, anecdotes, etc. to: Stu Stephens, K8SJ, 1407 Hollyrood Rd., Sandusky, OH 44870. A s.a.s.e. will get you a copy of the newsletter with the results.

a monthly feature by
BILL WELSH, W6DDB

Novice

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Potpourri

One dictionary definition of *potpourri* is "a miscellaneous collection." That describes this month's column very well. The longer articles use up all the available space, leaving no room for short items. Here are several good things that should be of interest to you.

QSL Service

One of the most pleasurable things related to amateur radio is the receipt of QSL (confirmation) cards from amateur operators we have contacted on the air. One of the worst parts of amateur radio is addressing and mailing QSL cards. As the January through March 1979 Novice article on QSL states, there are QSL service organizations that handle incoming and/or outgoing domestic (U.S.A.) and/or foreign (DX) QSL cards. Since the majority of Novice band contacts in America are between two American amateurs, this item introduces you to an organization that handles cards being exchanged between American amateurs. The U.S. QSL Service (USQS) also handles cards being exchanged between Canadian and American amateurs, as well as cards being exchanged between Canadian amateurs.

USQS is run by Laryl Myers, N7BMY, and Pat Berry, KB7JW. Laryl has extensive experience in filing system management and she is the general manager. Laryl and Pat are both ardent code operators and you may work them on the Novice bands. Paid clerks sort the cards and prepare mailings. Emphasis is placed on hiring disabled people for this work, since mobility requirements are low.

This is how to use their service. Make sure all of your cards are filled out completely, so that they will be useful to those who receive them. Do not bother to write the name and address on each card; just print the callsign clearly in the address space.

2814 Empire Ave., Burbank, CA 91520

Fourteen-year-old John DeRicco, KA2EOO, of Moriches, Long Island, New York, built his Heath HW-101 Transceiver, which he uses with a ground-plane antenna installed 35 feet above ground. John is active on the Novice 10, 15 and 40 meter bands. I recently had the pleasure of working him on the air. He upgraded from Novice to Technician in December 1979 and his good code proficiency makes me believe that he may have upgraded to General by the time you read this item.

Pre-sort your cards going to Canadian and American (only) amateurs. Pre-sort in accordance with the callsign areas (one through zero), followed by any Hawaiian (AH6, KH6, WH6, etc.) and Alaskan (AL7, KL7, WL7, etc.) cards plus Canadian (VE1 through VEØ) cards. Address a suitable envelope to USQS, P.O. Box 814, Mulino, Oregon 97042. When using USQS for the first time, enclose two or three legal size ($4^1/_8$" × $9^1/_2$") self-addressed and stamped envelopes (SASE's). These SASE's will be used to return received cards to you from other amateurs you have contacted, who also use USQS. When you receive an SASE, send a replacement SASE to USQS. Print your callsign clearly in the upper left corner on the front (address) side of the SASE, above the USQS return address. Also, print your callsign on the rear flap of the SASE. As the SASE is addressed to yourself, include your name (first and last) and complete mailing address, including the postal zip number. Since QSL card stock varies in weight and cards vary in size, you should determine how many of your cards total one ounce in weight. Experience has shown me that 5 to 7 cards usually weigh one ounce. Record how many of your cards total one ounce so that you will know how many stamps to use on future shipments. Put your pre-sorted cards and any SASE's in the envelope addressed to USQS after making sure that you have added your return address to the envelope. Enclose 25 cents to cover handling charges for one to 20 cards. Enclose an additional quarter for each group (or portion of a group) of 20 additional cards. Payment should be by check or money order. An amateur can send cards to USQS as often, or as seldom, as he or she wishes. Seal the envelope securely and be positive that the correct amount of first-class postage is attached before mailing it. At the present time, we pay 15 cents fo the first ounce and 13 cents for each additional ounce of first-class mail. USQS (like most other businesses) will not accept postage-due mail.

Sending a card to each station contacted for the first time is the final courtesy extended to other amateurs we work on the air. The use of QSL services eliminates the need to purchase callbooks and to look up the name and address of each amateur when addressing cards. It is faster, easier, and less expensive to send cards via a QSL service than to send them directly.

USQS was registered 12 February 1980 as a subsidiary of Pat's company, B2 Systems. Laryl was surprised to learn that no simple system existed for exchanging cards between Canadian and American amateurs. She discussed this need with Pat and helped him work out the details to establish an efficient but low-cost bureau. USQS was established to reduce the work and expense associated with exchanging cards between American and Canadian ama-

teurs. This service should improve the QSL exchange ratio and increase operating time. I am giving it a try and I hope you will do the same.

If you want more information about USQS, you can request it from USQS, P.O. Box 814, Mulino, Oregon 97042. As always, enclose the usual SASE when requesting anything.

If you decide to participate in the USQS system, you should advise your on-the-air contacts that they can QSL you via USQS and you can refer them to this article for an explanation.

You are advised to read the QSL articles (January through March 1979 *CQ*) previously printed in these Novice columns. There is a lot more to good QSL practices than is immediately apparent to a beginner. Exchanging QSL cards is important to most amateurs and it is worth some time and effort to learn about QSL cards and their proper usage.

Postage-Due Mail

The QSL cards coverage in the January through March 1979 Novice columns included a statement that the U.S. Post Office does not deliver postage-due mail. Reg Tibbetts, W6ITH, informed me that this is incorrect and postal regulations support his statement. The 30 July 1979 domestic mail manual covers the handling of prepayment and postage-due mail in section 146. Item 146.121 states that matter without any postage attached is returned to the sender or disposed of if no return address exists or if the return address is the same as the delivery address. This means that the Post Office will not deliver mail that has no postage attached. However, item 146.131 states that matter with insufficient postage attached will be delivered to the addressee upon payment of the charges marked on the mail. This latter rule is of particular importance to amateurs, since we receive most of the DX QSL cards via the ARRL Incoming DX QSL Bureau. This means that envelopes may be mailed to us even though insufficent postage is attached, with the postage rate increased again. Despite this, it is advisable for every amateur to submit at least one self-addressed envelope with first-class postage attached. While you are at it, forward supplementary stamps to be attached to any envelopes you already have on file at your bureau. The addresses of ARRL Incoming DX QSL Bureau groups are frequently printed in *QST*. If you want a copy of this information, simply request it from myself (or ARRL, 225 Main Street, Newington, Connecticut 06111) and enclose the usual self-addressed and stamped envelope.

Jim McCormack, KA4IAY, of North Miami, Florida, obtained the Novice license in April 1979 and immediately started operating. By July, I had issued a Ten American Districts (TAD) award to him and he earned a Rag Chewer's Certificate (RCC). His station includes a Yaesu FT-101-ZD with c.w. and s.s.b. filters, a ham keyer with Bencher chrome paddle, a transmatch, a ground plane for 10 meters, a drooping dipole, and a tri-band Hy-Gain TH6DXX beam for 10, 15, and 20 meters. Jim upgraded to General in December 1979 and is studying to obtain an Advanced license. He lives in a very small apartment and is pleased that his operating activities cause no interference to his fine neighbors. The station installation tips covered in a previous series of Novice articles provide the information needed to put a good initial station on the air.

Reducing Electricity Bills

If you want to reduce electric power bills where you live and/or work, you should consider installing power factor control devices in appliances that include alternating current (ac) induction motors. These devices have been developed and patented by the National Aeronautics and Space Administration (NASA). Electrical power consumption is reduced as much as almost 40 percent in these motors, which reduces the electricity bill. In addition to reducing electric power consumption, these power factor controllers cause a.c. induction motors to operate cooler and quieter. Variable speed devices, such as mixers, normally use d.c. motors. Most other motor-driven units use a.c. induction motors that can be made to operate more efficiently by installing power factor control devices. Typical units that normally include a.c. induction motors are can openers, clothes washers, dish washers, duplicators, fans, garbage disposals, pencil sharpeners, power tools, pumps, refrigerators, sewing machines, trash compactors, and typewriters. If you are interested in these devices, you should contact one or more of the

following licensed manufacturers, either directly or by using the reader service coupon:

Adelet—PLM Division
Scott and Felzer Company
Maw. H. Lee
4801 West 150th Street
Cleveland, Ohio 44135
216-267-9000
Circle 121 on the Reader Service Card.

Clinton Industries, Inc.
Angelo Pirrello
700 Washington Avenue
Carlstadt, New Jersey 07072
201-935-4242
Circle 122 on the Reader Service Card.

Controlled Power Corporation
Fred A. Meyer, Jr.
2542 237th Street
Torrance, California 90505
213-539-5440
Circle 123 on the Reader Service Card.

Electronic Assemblies Company
Gerald F. Wilkinson
1601 Hull Street
Richmond, Virginia 23224
804-231-0132
Circle 124 on the Reader Service Card.

Electronic Relays, Inc.
Joseph Pacente
1438 Brook Drive
Downers Grove, Illinois 65015
312-620-4646
Circle 125 on the Reader Service Card.

Energy Masters, Inc.
Palmer B. Ford
3188 Airway Avenue, Building F
Costa Mesa, California 92626
714-556-4921
Circle 126 on the Reader Service Card.

Energy Vent, Inc.
John Prikkel
423 Rita Street
Dayton, Ohio 45404
513-222-7749
Circle 127 on the Reader Service Card.

Iveco
Edward Yrissari
17402 Coronado Lane
Huntington Beach, California 92647
714-842-2925
Circle 128 on the Reader Service Card.

N.R.G. Products, Inc.
Fred L. Hurban
P.O. Box 512
Vineland, New Jersey 08360
609-691-6699
Circle 129 on the Reader Service Card.

W.J. Purcell Company
Desmond J. Neville
4315 Myrtle Avenue
Cincinnati, Ohio 43236
513-791-1131
Circle 130 on the Reader Service Card.

QSL Cards

Earl Turner, Jr., KA2DLK, urges all amateurs to have their county printed on their QSL cards to enhance the value of these cards to those who receive them. When you are having cards printed, I advise you to go one step further and have the country (U.S.A.) printed on your cards. The January through March 1979 issues of *CQ* include an excellent article on QSL cards. If you are a relatively new amateur, I strongly advise you to read that article. It takes time, money, and effort to send QSL cards; one may as well send cards that are correct and complete. It has been my experience that about five percent of the cards I receive have one or more of the following items missing: (1) date and/or time of contact, (2) frequency/-band, (3) mode/emission, (4) report, or (5) station worked. Many amateurs make their cards out to themselves, instead of to the stations worked.

Geography

Brian A. Jones, G8ASO, sends the following information to provide a better understanding of the indicated terms:

British Isles. This is an island group located Northwest of continental Europe. It includes Great Britain, Ireland, and adjacent islands.

Great Britain. The countries of England, Scotland, and Wales.

United Kingdom. The countries of the Bailiwick of Guernsey and Dependencies, Bailiwick of Jersey, England, Isle of Man, Northern Ireland, Scotland, and Wales.

The associated amateur radio callsign prefixes are:

G	England
GA-GZ	United Kingdom
GB	United Kingdom (Special)
GD	Isle of Man
GI	Northern Ireland
GJ	Bailiwick of Jersey
GM	Scotland
GU	Bailiwick of Guernsey and Dependencies
GW	Wales
G5/GD5	United Kingdom Reciprocal Licensees
G8/GD8	United Kingdom VHF only

The January 1980 Novice column contains a useful list of radio callsign prefixes used by amateurs all over the world.

Stu Heering, WB5ULD, issues the Mississippi, Old Man River, The Old South, and other operating awards.

Beginning Operating Certificates

As you may know, this magazine features an excellent monthly column about available operating awards. However, some of the awards are not easily within the operating capability of a beginning amateur. Here are a few awards one can earn without major effort:

Colonial America. Work amateurs in all 13 of the original states. These states are Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Virginia. A couple of these states are not often heard, but you should be able to work them and earn this fine certificate.

El Gulfo de Mexico. Work amateurs in

all 5 American states bordering on the Gulf of Mexico (Golfo Mexicano), plus one amateur in Mexico. These American states are Alabama, Florida, Louisiana, Mississippi, and Texas. I have seldom heard a Mexican amateur operating code in the Novice bands but I have worked a few of our friends from south of the border.

Mississippi. Work ten contacts with Mississippi amateurs. The award shows the state outline and a few facts about Mississippi.

Old Man River. Work amateurs in all ten states bordering on the Mississippi River. These states are Arkansas, Illinois, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Tennessee, and Wisconsin. The award shows these states and describes the river.

The Old South. Work amateurs in all eleven of the old Southern states. These states are Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. The award shows a scroll listing these states.

All five of the preceding awards are available from Stu Heering, WB5ULD, Route 2, Box 72, Fulton, Mississippi 38843. Except for repeater use, there are no operating restrictions related to these awards. One can use any mode and all bands. Awards are custom printed and suitable for framing. Do not send QSL cards. Provide a list showing the required contacts, have another amateur check your log to ascertain the accuracy of your list, and have that amateur sign the list to verify that it is correct. Enclose one dollar with each award request; cash, check, or international reply coupons (IRCs) are acceptable.

Ten American Districts. The TAD award is available to amateurs who provide proof of two-way contacts with other amateurs in each of the ten American callsign areas. A data sheet is available to anyone requesting it from the Lockheed Amateur Radio Club (W6LS), 2814 Empire, Burbank, California, 91504. The usual SASE is appreciated.

Anyone with similar easily earned awards is urged to send complete details to W6DDB for possible inclusion in a future Novice column.

One of the toughest awards I ever worked for is Stu Heering's Capitols of the United States certificate. To earn it, you must have a two-way radio contact with amateurs in the capitols of all 50 states, plus one in the capitol of the United States (Washington, D.C.). You will be dismayed at some of the seldom-heard small cities that are the capitols of some states. This award is a real challenge!

Help Available

A recent Novice column pointed out that newcomers to amateur radio need the help that an active member can provide. If you are willing to help, please send a note to W6DDB stating your name, callsign, mailing address, and telephone number. Here is the first group of people who have offered to help people in their areas:

California
Bob Craig–K6XZ
4950 Sunshine Avenue
Santa Rosa,
Calif. 95405
707-539-1007

Bill Welsh–W6DDB
2814 Empire Avenue
Burbank, Calif. 91504
213-842-1863

Illinois
Larry Cotariu–KA6GVI
8041 N. Hamlin Avenue
Skokie, Illinois 60076

Paula Franke–WB9TBU
Box 51-A, R.R. 2
Beecher, Illinois 60401
312-946-2198

Indiana
Rick Dittmer–WD9IRI
1635 Norton Avenue
Grissom AFB,
Indiana 46971
317-689-8457

Missouri
Stephen Smay–KA0DIL
1917 S. Westwood
Springfield,
Missouri 65807

New York
Bud Gagnon–WA2REM
77 Dean Drive
N. Tonawanda,
N.Y. 14120
692-7978

Ohio
Ralph McDonough–K8AN
Box 240, R.D. 2
Adena, Ohio 43901
614-546-3930

Rick Todd–KA8AKL
14470 Basslake Road
Newberry, Ohio 44005
216-564-7767

Virginia
Margaret Williams–KI4W
965 Redwood Circle
Virginia Beach,
Va. 23464
804-420-6207

Wisconsin
Richard Kulaga–KA9EDX
295 14th Street
Fond du Lac,
Wisconsin 54935
414-923-2067

Novices are urged to submit good black-and-white pictures of themselves at their operating positions. If your photograph is printed in a future Novice column, you will receive a one year subscription (or renewal) to *CQ*. A brief description of operating activities and some personal backround information are needed with your picture.

73, Bill, W6DDB

a monthly feature by
IRWIN MATH, WA2NDM

Math's Notes

A LOOK AT THE TECHNICAL SIDE OF THINGS

From time-to-time in this column, we describe new semiconductors and integrated circuiting that we feel would be of interest to our readers, and the letters that we get in return are usually quite encouraging.

This month we have a new integrated circuit family that is so ideally suited for amateur applications that we think you will be quite excited with its possibilities.

Intersil Corporation has announced the availability of a new line of frequency counters-on-a-chip that are really just that—complete units. All that is necessary in addition to a single chip is a readout, a handful of inexpensive components, and a few switches. Add those and you wind up with a d.c. to 10 MHz counter that offers features normally only available from expensive industrial counters.

There are two (2) basic units in this family: the ICM7216/26 A & B which is a complete universal counter offering frequency measurements, period measurements, ratio of two (2) frequencies, and time interval measurement, and the ICM7216/26 C & D which are frequency counters alone. Both are intended to drive 8 digit readouts and offer resolutions of 1 Hz at 10 MHz or 0.1 microseconds when used as a timer.

Fig. 1 shows a functional schematic of the typical counter circuit and hookup is really not much more complicated.

Once you have the basic counter working, a prescaler can easily be added to extend the frequency range to essentially anything you wish. In addition, BCD output pins are available for interfacing the counter with a minicomputer. Since the ICM7216/26 is also a CMOS device utilizing multiplexed drive signals for the readouts, current drain is very small and battery operation is certainly feasible.

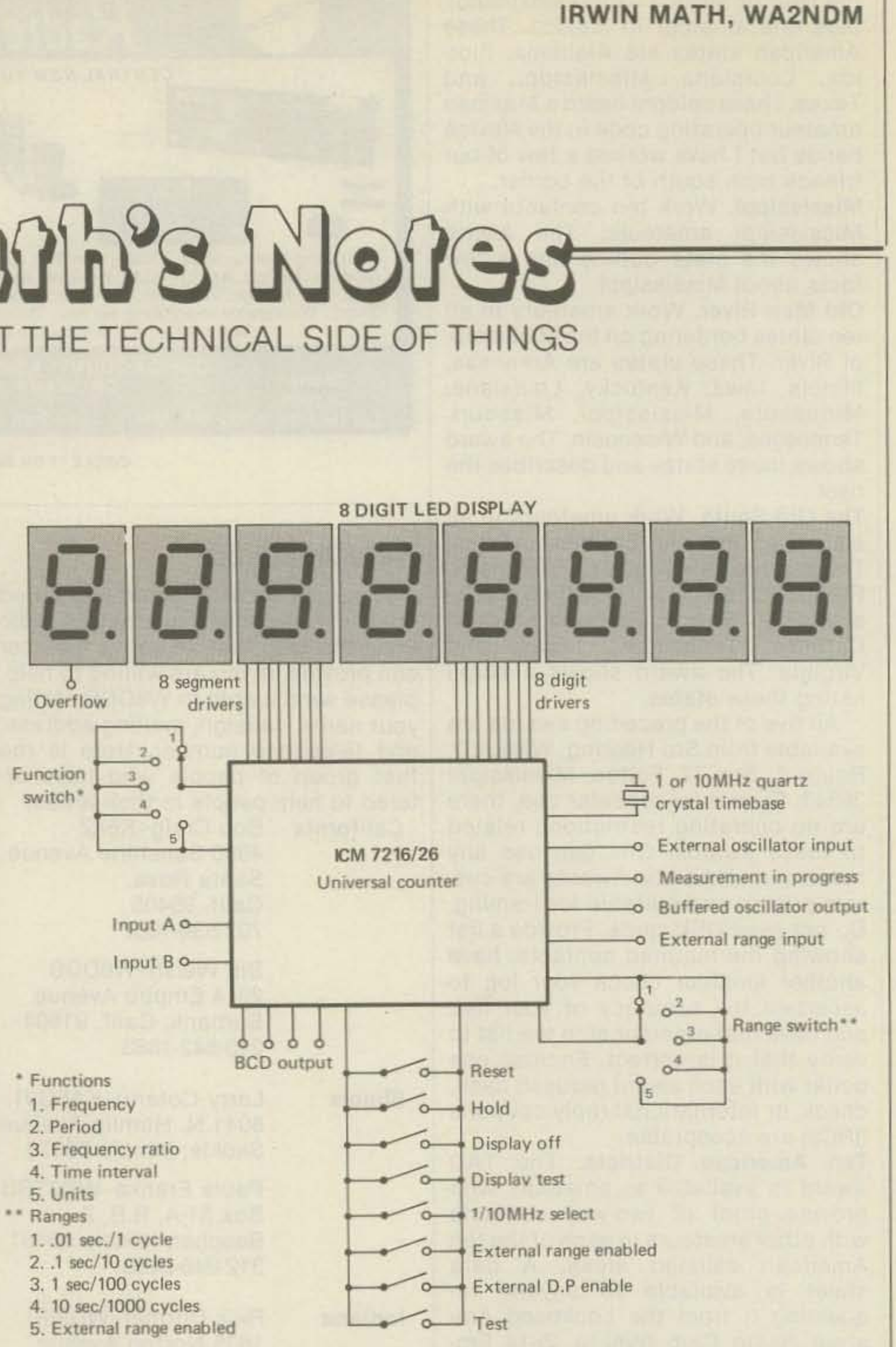


Fig. 1- Functional schematic of the ICM7216/26 counter.

Cost for the chips alone range from $20 or so for the frequency counter versions to $25 or so for the universal counter. Best of all if you wish, you can order a complete evaluation kit from Intersil that contains all parts including readout, P/C board, switches, etc., that will allow you to build the whole unit. Cost is $74.95 and the kit should be ideal as the basis for a "digital dial" or a complete frequency counter.

If this type of product seems to arouse your interest I would suggest that you write to Intersil Analog Products, 10710 North Tantan Avenue, Cupertino, Ca. 95014 and ask for data sheets and application notes for the ICM7216/26 family of 8 digit universal counters.

Please let us know how projects such as this one work out for you if you actually do build them. As previously stated, our readers do seem interested, and we would like to follow up such interest with descriptions of actual applications.

See you next month.

73, Irwin, WA2NDM

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CIRCLE 79 ON READER SERVICE CARD

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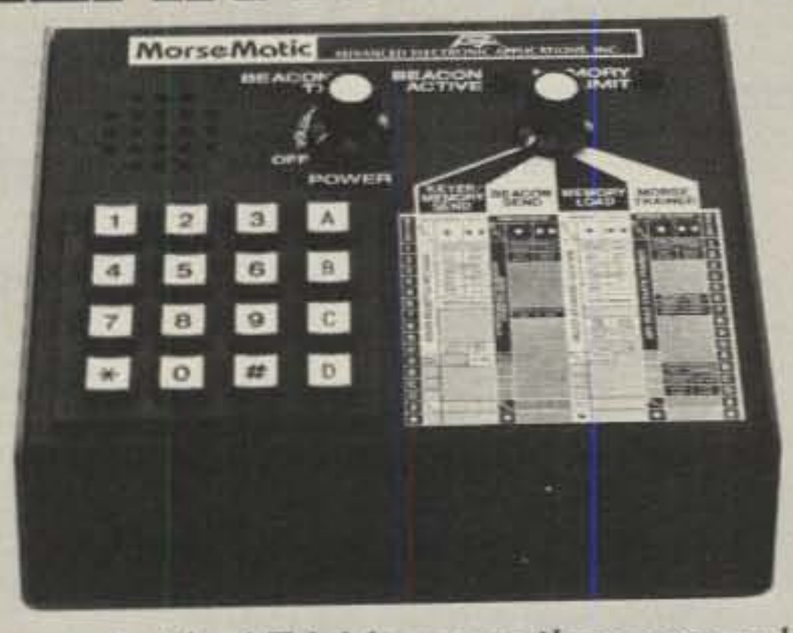

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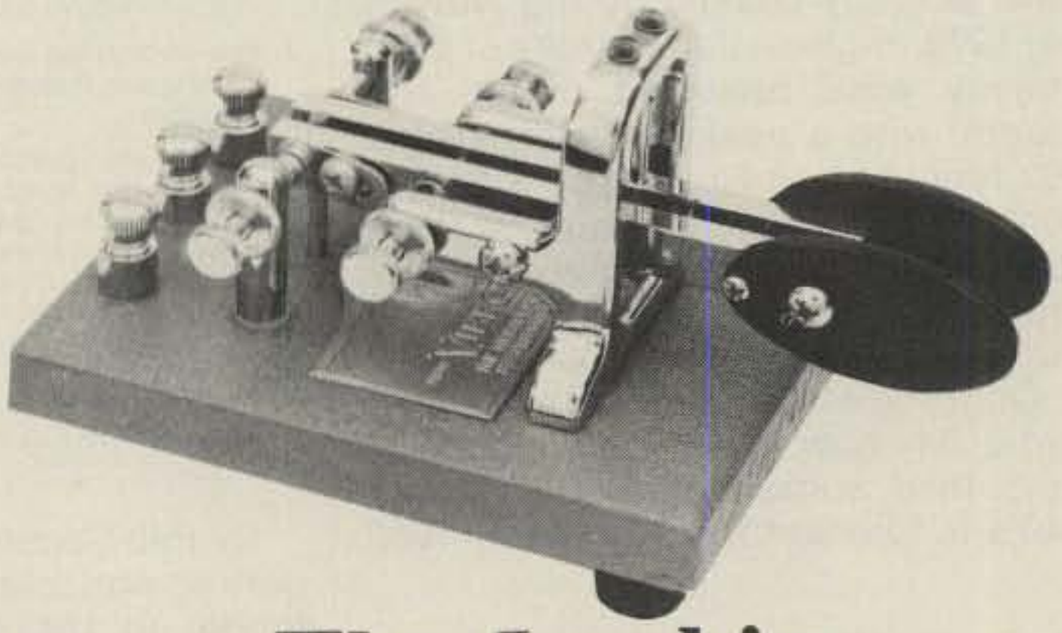


The Iambic Keyer Paddle.

Features include: adjustable jeweled bearings ("Deluxe" only) • tension and contact spacing fully adjustable • large, solid, coin silver contact points • 2½ lb. chrome plated steel base rests on non-skid feet • lifetime guarantee against manufacturing defects. "Standard" model with textured gray base: $49.50; "Deluxe" model with chrome plated base: $65.00. Available at dealers or through the factory. Send check, money order or use Master Charge or VISA. Vibroplex pays all shipping charges within the continental U.S.

VIBROPLEX

P.O. Box 7230, 476 Fore Street, Portland, Maine 04112

CIRCLE 74 ON READER SERVICE CARD

a monthly feature by
GEORGE JACOBS, W3ASK

Propagation

THE SCIENCE OF PREDICTING RADIO CONDITIONS

The in-progress sunspot cycle, Cycle 21, is now without question the second highest to be experienced since telescopic observations began during the mid 1700's.

The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 179.7 for May 1980. This results in a 12-month running *smoothed sunspot number* of 163.1 centered on November 1979. The progress of a solar cycle is measured by the level of smoothed sunspot activity.

Solar activity during Cycle 21 has now reached a level higher than recorded in any other cycle except for the record breaking Cycle 19, which peaked at 201 during March 1958.

Although it is not yet certain, there are indications that Cycle 21 may have actually peaked during November 1979. Highest daily values of solar activity were observed during this month, with a peak sunspot level of 302 recorded on November 10th. The 10.7 cm solar flux level, a more finely tuned indicator of solar activity, reached a peak mean level of 226.8 during the month.

On the assumption that the present cycle is now declining slowly, a smoothed sunspot level in the low 140's is forecast for September 1980.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for September 1980

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 7, 12	A	A	B	C
High Normal: 6, 8-11, 13-15, 20	A	B	C	C-D
Low Normal: 4-5, 16, 18-19, 21-22, 24, 30	A-B	B-C	C-D	D-E
Below Normal: 1-3, 17, 23, 25-26, 28-29	B-C	C-D	D-E	E
Disturbed: 27	C-E	D-E	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9 + 30 dB.

B—Good opening, moderately strong signals varying between S9 and S9 + 30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-poor (C-D) on September 1-3; good-fair (B-C) on the 4th and 5th; good (B) on the 6th; fair-poor (C-D) again on the 7th, etc.

For updated information, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 1714, Silver Spring, MD 20902.

September Conditions

September and early October represents a time of transition for h.f. propagation conditions. On some days conditions will seem to be much the same as during the summer months, and on other days the first signs of wintertime conditions should be noticeable. For this reason, this month's column contains both Short-Skip and DX Propagation Charts. The Short-Skip Charts are valid for the entire months of September and October, while the DX Charts are valid from mid-September through mid-October.

11307 Clara St., Silver Spring, MD 20902

By mid-September, days should be getting noticeably shorter and nights longer in the northern hemisphere. Static levels should be considerably lower and daytime absorption reduced from summer levels. This should result in a greater number of DX openings on *10, 15* and *20* meters during the hours of daylight, with somewhat stronger signals. Improved nighttime DX propagation conditions are also expected for the *40, 80* and *160* meter bands, with considerably lower static levels. A seasonal decline should be noticeable on *20* meters during the hours of darkness, but this is expected to remain a very good band for DX almost around-the-clock.

Another solar phenomenon that will have considerable influence on propagation conditions during this period is the *autumnal*, or *fall*, *equinox*. This will occur on September 22nd as the sun crosses the plane of the equator on its apparent travel from northern to southern skies. On this day the hours of daylight and darkness are equal in length throughout the world. The effect of the autumnal equinox will be felt on h.f. propagation conditions from about mid-September through early October. During this period, the characteristics of the ionosphere are similar over large areas of the world, and this is usually the best season for DX openings between the temperate regions of both the northern and southern hemispheres. A similar period occurs during the spring equinox, which is centered on March 21st. Equinoctial propagation conditions should produce a considerable improvement in inter-hemispheric DX openings, for example, from the USA to South America, to the South Pacific area and Australasia, to southern Asia, and to southern Africa and Antarctica. This improvement should be noticeable on all bands *10* through *160* meters. The best times for equinoctial-type DX openings should be the twilight periods around local sunrise and sunset, but they will occur at other times as well. Many of these interhemispheric openings may follow either the *long* or the *short* great circle path, or both, so be sure to check both directions.

V.h.f. Ionospheric Openings

The combination of continuing high solar activity and seasonally higher daytime useable frequencies should result in a considerable number of DX openings on *6* meters. Openings in the quadrant between northeast and south are most likely to take place between 9 a.m. and Noon, local daylight time. From Noon to approximately 4 p.m., expect conditions to peak towards the Caribbean, Central America and South America. Look for openings towards the southwest and west for an hour or two before sunset. These openings should result from F-2 layer reflection, and signals levels may be

relatively strong at times. Inter-hemispheric openings are also likely to occur on *6* meters as a result of the equinoctial propagation conditions.

Later in the evening check the *6* meter band for an expected improvement in trans-equatorial (TE) type openings. These are openings that cross the geomagnetic equator at an approximate right angle, and they usually peak during late September and early October. The best time for TE openings is between 8 and 11 p.m., local daylight time, but signals are usually weak and are often accompanied by flutter fading. TE openings towards South America from the USA favor locations in the southern tier states, although openings further north can also occur.

Although the seasonal peak for *6* meter sporadic-E openings has already passed, an occasional *6* meter short-skip opening may still be possible over distances ranging between 1000 and 1300 miles. The best time to check for sporadic-E openings is before noon and again during the early evening.

Auroral activity usually increases sharply during equinoctial periods. This should result in increased auroral-type short skip openings of both *6* and *2* meters during September and early October. The best possibilities for such openings should coincide with periods of expected radio storminess. Check the "Last Minute Forecast" at the beginning of this column for those days during September that are expected to be BELOW NORMAL or DISTURBED.

No major meteor showers are expected during September, but a minor one may permit meteor-scatter type openings on the v.h.f. bands between September 19th and 21st.

CQ DX Contest Special—1980

This year's *CQ* World Wide DX Contest will be held on the following dates:

October 25-26	Phone Section
November 29-30	C.W. Section

As during the past 29 years, next month's "Propagation" column will be devoted to a special, comprehensive forecast which will focus on both sections of the Contest.

Place your subscription for MAIL-A-PROP *before* October 1st to assure delivery of the special MAIL-A-PROP Contest issues containing the latest updated propagation information.

73, George, W3ASK

September 15 - October 15, 1980
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-16 (1) 09-11 (1)* *	08-09 (1) 09-11 (2) 11-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	02-04 (1) 04-06 (2) 06-10 (3) 10-12 (2) 12-15 (3) 15-17 (4) 17-21 (3) 21-02 (2)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European USSR	09-10 (1) 10-13 (2) 13-14 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-16 (1)	03-06 (1) 06-08 (2) 08-11 (3) 11-13 (2) 13-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-04 (2) 04-06 (1) 21-04 (1)*
Eastern Mediter-ranean & Middle East	09-10 (1) 10-12 (2) 12-14 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-09 (2) 09-15 (1) 15-17 (2) 17-21 (3) 21-23 (2) 23-01 (3) 01-03 (2) 03-07 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	09-12 (1) 12-14 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)* *	07-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-21 (4) 21-00 (3) 00-03 (2) 03-05 (1)	20-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
Eastern & Central Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)* *	08-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-20 (1)	12-14 (1) 14-17 (2) 17-22 (3) 22-02 (2) 02-03 (1)	20-02 (1) 00-01 (1)*
Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 14-15 (1) 10-12 (1)* *	08-11 (1) 11-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-15 (1) 15-16 (2) 16-19 (3) 19-00 (2) 00-03 (3) 03-04 (2) 04-06 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*

Central & South Asia	09-11 (1) 19-22 (1)	08-09 (1) 09-12 (2) 12-13 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	05-07 (1) 20-23 (1)
Southeast Asia	11-14 (1) 18-21 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-15 (2) 15-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-18 (1) 20-21 (1) 21-00 (2) 00-02 (1)	06-08 (1)
Far East	09-11 (1) 18-20 (1)	08-09 (1) 09-11 (2) 11-13 (1) 16-18 (1) 18-20 (2) 20-22 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (1) 18-20 (1) 20-22 (2) 22-00 (1) 00-03 (2) 03-04 (1)	05-08 (1) 18-19 (1) 05-07 (1)*
South Pacific & New Zealand	09-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 16-18 (1)**	08-09 (1) 09-11 (2) 11-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	12-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3) 04-08 (2) 08-10 (3) 10-12 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
Australasia	10-12 (1) 14-16 (2) 17-18 (3) 18-19 (2) 19-21 (1) 17-19 (1)**	08-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-17 (1) 17-18 (2) 18-20 (4) 20-21 (2) 21-23 (1)	07-09 (2) 09-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-21 (1) 04-05 (1)* 23-02 (3) 02-04 (2) 04-07 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 09-12 (1)**	06-07 (1) 07-08 (2) 08-11 (4) 11-13 (3) 13-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	03-05 (2) 05-07 (3) 07-10 (4) 10-14 (2) 14-16 (3) 16-23 (4) 23-03 (3)	19-20 (1) 20-21 (2) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile Argentina & Uruguay	08-09 (1) 09-12 (2) 12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-19 (2) 19-20 (1) 09-16 (1)**	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	11-16 (1) 16-17 (2) 17-20 (3) 20-01 (4) 01-04 (3) 04-06 (2) 06-08 (3) 08-11 (2)	21-00 (1) 00-05 (2) 05-07 (1) 01-06 (1)*
McMurdo Sound, Antarctica	16-19 (1)	12-15 (1) 15-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-04 (2) 04-08 (1) 08-10 (2) 10-11 (1)	23-01 (1) 01-05 (2) 05-07 (1) 05-07 (1)*

Time Zones: CDT & MDT (24-Hour Time) CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1) 11-13 (2) 13-14 (1) 10-11 (1)**	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-16 (4) 16-18 (3) 18-23 (2) 23-03 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern & Central Europe & European USSR	09-13 (1)	08-09 (1) 09-11 (2) 11-12 (3) 12-13 (2) 13-15 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-17 (3) 17-19 (2) 19-21 (1) 23-04 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)
Eastern Mediter-ranean & Middle East	10-13 (1)	08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-20 (3) 20-22 (2) 22-00 (3) 00-01 (2) 01-02 (1)	20-23 (1) 21-23 (1)*
Western Africa	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1) 09-11 (1)**	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	05-08 (2) 08-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-02 (2) 02-05 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	11-13 (1) 13-16 (2) 16-17 (1) 09-11 (1)**	09-10 (1) 10-13 (2) 13-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-23 (2) 23-00 (1) 07-09 (1)	21-00 (1)

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location, The Eastern USA Chart can be used in the 1, 2, 3, 4, 8 KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. wetc. Appropriate *daylight* time is used, *not* GMT. T convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10dB loss, it will lower by one level.

6. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado, 80302.

Southern Africa	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 13-15 (1) 10-13 (1)**	07-09 (1) 09-12 (2) 12-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-22 (2) 22-01 (3) 01-05 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 19-21 (1)	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	06-08 (1) 19-21 (1)
Southeast Asia	10-12 (1) 12-13 (2) 13-15 (1) 17-18 (1) 18-19 (2) 19-20 (1)	09-11 (1) 11-13 (2) 13-15 (1) 18-19 (1) 19-20 (2) 20-22 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-13 (1) 16-20 (1) 20-23 (2) 23-02 (1)	05-09 (1)
Far East	15-17 (1) 17-19 (2) 19-20 (1)	10-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-16 (1) 16-19 (2) 19-21 (1) 21-23 (2) 23-00 (3) 00-01 (2) 01-03 (1)	03-05 (1) 05-08 (2) 08-09 (1) 06-08 (1)
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 11-14 (1)** 16-18 (1)**	08-09 (1) 09-15 (2) 15-17 (3) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	04-08 (2) 08-11 (3) 11-13 (2) 13-18 (1) 18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3)	00-01 (1) 01-06 (3) 06-08 (4) 08-09 (2) 09-10 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 16-18 (1)**	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	06-08 (2) 08-11 (3) 11-13 (2) 13-16 (1) 16-18 (2) 18-20 (2) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-08 (1) 08-09 (2) 09-11 (4) 11-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-10 (4) 10-12 (3) 12-14 (2) 14-16 (3) 16-23 (4) 23-03 (3) 03-05 (2) 05-07 (3)	19-20 (1) 20-21 (2) 21-22 (3) 22-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-07 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Urguay	08-09 (1) 09-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 09-15 (1)**	06-07 (1) 07-08 (2) 08-11 (3) 11-15 (2) 15-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-23 (1)	10-16 (1) 16-17 (2) 17-18 (3) 18-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-10 (2)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-19 (1)	11-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-23 (1)	16-17 (1) 17-20 (2) 20-03 (3) 03-05 (2) 05-07 (1) 07-09 (2) 09-10 (1)	23-01 (1) 01-05 (2) 05-07 (1) 04-06 (1)*

* Indicates best time for eighty meter openings. Openings on 160 Meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2), or higher.

** Indicates best times to listen for F-2 layer openings on 6 meters.

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-15 (1) 22-00 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1) 23-01 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	09-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-17 (2) 17-18 (1) 21-23 (1)	20-21 (1) 21-22 (2) 22-23 (1)* 21-22 (1)*
Eastern Mediter-ranean & Middle East	09-11 (1)	08-09 (1) 09-10 (2) 10-11 (3) 11-12 (2) 12-13 (1) 20-22 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (3) 16-20 (1) 20-23 (2) 23-01 (1)	20-23 (1)
Western & Central Africa	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	08-10 (1) 10-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	01-07 (1) 07-09 (2) 09-14 (1) 14-15 (2) 15-16 (3) 16-20 (4) 20-23 (3) 23-01 (2)	21-00 (1)
Eastern Africa	11-13 (1) 13-15 (2) 15-16 (1)	09-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-09 (1) 12-15 (1) 15-17 (2) 17-19 (3) 19-21 (2) 21-23 (1)	20-23 (1)
Southern Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-09)1) 09-11 (2) 11-14 (3) 14-16 (2) 16-17 (1)	01-07 (1) 07-09 (2) 09-10 (1) 12-16 (2) 16-20 (3) 20-01 (2)	19-22 (1)
Central & South Asia	09-11 (1) 17-19 (1)	08-11 (1) 16-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-01 (1)	02-08 (2) 08-10 (3) 10-12 (2) 12-17 (1) 17-21 (2) 21-02 (1)	06-08 (1) 19-21 (1)
Southeast Asia	09-10 (1) 10-11 (2) 11-12 (2) 16-17 (1) 17-18 (2) 18-19 (1) 15-17 (1)**	07-10 (1) 10-13 (2) 13-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	03-07 (2) 07-09 (3) 09-12 (2) 12-13 (1) 21-22 (1) 22-01 (2) 01-03 (3)	01-03 (1) 03-06 (2) 06-08 (1)
Far East	15-16 (1) 16-17 (2) 17-18 (3) 18-19 (2) 19-20 (1) 14-16 (1)**	09-11 (1) 14-15 (1) 15-18 (2) 18-19 (3) 19-20 (4) 20-21 (2) 21-22 (1)	04-07 (2) 07-10 (4) 10-13 (3) 13-15 (2) 15-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3)	01-03 (1) 03-07 (2) 07-08 (3) 08-09 (1) 03-05 (1)* 05-07 (2)* 07-08 (1)*
South Pacific & New Zealand	10-12 (1) 12-13 (2) 13-14 (3) 14-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 10-13 (1)** 15-18 (1)**	07-09 (1) 09-10 (2) 10-12 (3) 12-14 (2) 14-16 (3) 16-21 (4) 21-23 (3) 23-01 (2) 01-02 (1)	14-17 (1) 17-19 (2) 19-21 (3) 21-02 (4) 02-04 (3) 04-08 (2) 08-09 (3) 09-11 (4) 11-12 (3) 12-14 (2)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Australasia	09-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-21 (2) 21-22 (1) 15-17 (1)**	07-08 (1) 08-11 (2) 11-14 (1) 14-15 (2) 15-17 (3) 17-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	08-10 (4) 10-12 (3) 12-13 (2) 13-15 (1) 15-18 (2) 18-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-04 (3) 04-08 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*

Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-12 (3) 12-15 (4) 15-17 (3) 17-18 (2) 18-19 (1) 09-12 (1)**	07-08 (1) 08-09 (3) 09-11 (4) 11-13 (3) 13-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (3) 07-09 (4) 09-11 (3) 11-14 (2) 14-16 (3) 16-23 (4) 23-02 (3) 02-06 (2)	19-20 (1) 20-21 (2) 21-22 (3) 22-04 (4) 04-05 (3) 05-06 (2) 06-08 (1) 20-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	07-08 (1) 08-09 (2) 09-12 (3) 12-16 (4) 16-17 (3) 17-18 (2) 18-19 (1) 09-14 (1)**	06-07 (1) 07-08 (2) 08-10 (3) 10-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-23 (1)	09-15 (1) 15-17 (2) 17-18 (3) 18-23 (4) 23-03 (3) 03-05 (2) 05-07 (3) 07-09 (1)	21-23 (1) 23-03 (2) 03-05 (1) 00-03 (1)*
McMurdo Sound, Antarctica	14-16 (1) 16-18 (2) 18-19 (1)	10-14 (1) 14-16 (2) 16-20 (3) 20-21 (2) 21-23 (1)	08-10 (1) 15-17 (1) 17-19 (2) 19-22 (3) 22-00 (4) 00-03 (3) 03-08 (2)	22-00 (1) 00-05 (2) 05-06 (1) 03-05 (1)*

CQ Short-Skip Propagation Chart
September & October, 1980
Local Daylight Time At Path Mid-Point
(24-Hour Time System)

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	*Nil*	10-19 (0-1)	08-10 (1) 10-12 (1-2) 12-14 (1-3) 14-15 (1-4) 15-17 (1-3) 17-19 (1-2) 19-22 (0-1)	08-09 (1-2) 09-10 (1-3) 10-12 (2-4)** 12-14 (3-4)** 14-15 (4) 15-17 (3) 17-19 (2) 19-20 (1-2) 20-22 (1)

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3). Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones *add* 2 hours in the PST zone; 4 hours in the MST zone; 3 hours in the CST zone, and 5 hours in the EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA *subtract* 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level, for each 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

15	*Nil*	08-10 (0-1) 10-14 (0-2) 14-15 (0-3) 15-17 (0-2) 17-21 (0-1)	08-10 (1-2) 10-14 (2-4) 14-15 (3-4) 15-17 (2-4) 17-20 (1-3) 20-22 (1-2) 22-08 (0-1)	08-09 (2) 09-10 (2-3) 10-17 (4) 17-20 (3) 20-22 (2-3) 22-23 (1-2) 23-01 (1) 01-08 (1-0)
20	12-14 (0-1) 14-17 (0-2) 17-22 (0-1)	08-10 (0-3) 10-12 (0-4) 12-14 (1-4) 14-17 (2-4) 17-18 (1-4) 18-22 (1-3) 22-03 (0-2) 03-08 (0-1)	06-08 (1-2) 08-10 (3-4) 10-18 (4) 18-22 (3-4) 22-01 (2-3) 01-03 (2) 03-06 (1)	06-08 (2) 08-10 (4) 10-14 (4-2) 14-16 (4-3) 16-22 (4) 22-00 (3-4) 00-01 (3) 01-03 (2) 03-06 (1-2)
40	08-10 (2-3) 10-12 (3-4) 12-18 (4) 18-20 (3-4) 20-23 (1-2) 23-06 (0-1) 06-08 (1-2)	08-10 (3-4) 10-12 (4-3) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-01 (1-4) 01-06 (1-3) 06-08 (2-3)	08-10 (4-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-01 (4) 01-04 (3-4) 04-06 (3) 06-08 (3-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-04 (4) 04-06 (3-4) 06-08 (4-3)
80	07-09 (3-4) 09-11 (4) 11-19 (4-3) 19-00 (4) 00-05 (3-4) 05-07 (2-4)	07-09 (4-2) 09-11 (4-1) 11-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-07 (4)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (4-3)	07-09 (1-0) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (4-2) 06-07 (3-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

HAWAII
September & October, 1980
Openings Given In Hawaiian Standard Time —

TO:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	06-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-16 (2) 16-18 (3) 18-20 (2) 20-22 (1)	11-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-23 (2) 23-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Central USA	06-08 (1) 08-11 (2) 11-14 (4) 14-16 (2) 16-17 (1) 12-14 (1)**	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-22 (1)	09-14 (1) 14-16 (2) 16-18 (3) 18-22 (4) 22-00 (3) 00-04 (2) 04-06 (3) 06-09 (2)	18-20 (1) 20-22 (2) 22-01 (3) 01-03 (2) 03-04 (1) 21-22 (1)* 22-00 (2)* 00-02 (1)*
Western USA	07-09 (1) 09-11 (2) 11-14 (4) 14-16 (3) 16-18 (2) 18-19 (1) 12-14 (1)**	06-07 (1) 07-09 (2) 09-14 (3) 14-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	10-15 (2) 15-17 (3) 17-19 (4) 19-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (4) 08-10 (3)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 21-22 (1)* 22-23 (2)* 23-02 (3)* 02-03 (2)* 03-04 (1)*

ALASKA
September & October, 1980
Openings Given in GMT —

TO:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	18-20 (1) 20-23 (2) 23-00 (1)	16-18 (1) 18-22 (2) 22-01 (3) 01-02 (2) 02-03 (1)	14-16 (1) 21-23 (1) 23-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	08-12 (1)
Central USA	19-21 (1) 21-00 (2) 00-02 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	15-17 (1) 21-23 (1) 23-00 (2) 00-04 (3) 04-05 (2) 05-07 (1)	08-11 (1) 11-13 (2) 13-14 (1) 11-13 (1)*
Western USA	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-23 (2) 23-02 (4) 02-03 (3) 03-05 (2) 05-06 (1)	16-18 (1) 18-20 (3) 20-00 (2) 00-02 (3) 02-04 (4) 04-05 (3) 05-06 (2) 06-10 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

a monthly feature by
ADRIAN WEISS, K8EEG

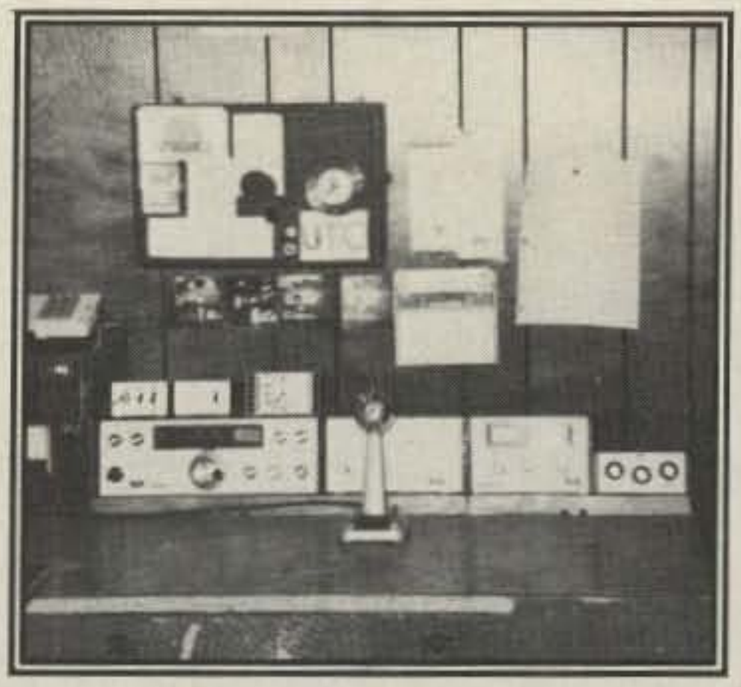
QRP

THE ART OF VERY LOW POWER OPERATING

QRPp Operating News & Reports

It seems about time to dig into the mailbag and share some of the really wonderful reports that have been flowing across my desk since my call for material in early 1979. In fact, I feel a bit guilty because the response has been so good, but I've been lagging just a bit on getting the material into print. If only I could talk the management into running two QRPp features each month, then we could get the reports in as well as letting me have some space. Maybe someday! At any rate, without further verbiage, let's let the fellows take over and share their experiences!

de. . .**WB3BBT, Bob Woish, 826 Mill Drive Rd., Audubon, PA 19407:** "I'd like to commend you on your QRPp column in *CQ*. I'm glad that it is a monthly feature. Material like yours is, unfortunately, a rarity since the discontinuation of *The Milliwatt*. I have two questions: 1) What is the difference between QRP and QRPp? 2) Is the QRP ARC I still operating, and if so, what is the address? (*Ed.*: Actually, QRP vs. QRPp is a personal preference. QRP and QRPp are generally taken to mean under five watt output operation. Secondly, the QRP ARC I is still operating, via Joseph Szempias W8JKB, 2359 Woodford St, Toledo, OH 43605. Also, the Michigan QRP Club, a genuine exclusively under five watt group, has been in operation for about three years, is growing rapidly, and has a program whereby local groups of five or more QRPp operators may form chapters. The club has a full list of QRPp awards, and has been working on an all-QRPp contest for the under-five watt gang. This is still in the planning stage, but hopefully, we'll have our own contest by December! QTH: Ralph L. Burch W8LCU, 281 Crescent Drive, Portland, MI 48875). I was recently running my homebrew QRP rig on 40 at 3 watts with KA2CEP on the other end, and we decided to see how low I could take my output power and still maintain solid copy. I hooked up a 9 volt transistor battery and series variable resistor, and down, down went my d.c. voltage until I got a 559 report from Skip at one milliwatt output! I just about hit the ceiling. From just outside Philadelphia to 40 miles west of N.Y.C. (113 miles) on I mw equals 113,000 miles per watt! By the way, my antenna is an apartment style quarter wave horizontal, and my output power measurement is traceable to the National Bureau of Standards. Thanks to Skip for a fine ear. It was the most exciting afternoon I've ever spent on the air! Thanks to you and *CQ* for keeping the QRP spirit growing."



Winner of this month's Neatest QRP Hamshack award. It belongs to WB1DKX and the TenTec gear can be seen atop an old desk. One nice thing about QRP setups is that they don't require much space!

de. . .**K8UOF, Frank Schloss, RR2 Box 3285, Hali, MI 48739:** "I have just recently purchased an MFJ-40T transmitter and have had a ball with it. I have been a ham for 22 years, and have not done much operating, but every year or so I get hot and build a small rig for c.w., usually a 6AQ5 or 6J6 tube rig with about 4-5 watts input. Lately I've been getting into transistors and have found they are as much fun as small power tubes. One of the big advantages of my 6AQ5 rig is that I can match a link tuned output directly to an antenna. On 40 meters this is an advantage because I can use a T.V. twinlead dipole, and feed it directly with no antenna tuner. The antenna is a half-wave with the ends of the twinlead shorted, and one side split at the center, with a feedline of the same twinlead inserted at that point. A 100 ft roll works out just right. Do you have any info on getting a 300 ohm feed for a transistor rig using toroid cores or whatever? Something that does not involve an elaborate matchbox? (*Ed.* See Fig. 1). QRP rigs work well with solar power—any info on that? I work at a college and the students enjoy seeing a QRP station at work! 73's."

de. . .**W9NAX, Douglas R. Magill, 304 N. State St., Mishawaka, IN 46544:** "I have been following your articles in *CQ* for quite a while now and thought I would drop you this note to tell you how much I enjoy them. Having been a ham for 25 years and a newcomer to QRP, I would like to tell you of my accomplishments. Approximately two years ago I purchased an HW-8 and started chasing DX. With the HW-8 and Mor-Gain multiband dipole, I worked a total of 72 countries. I recently purchased a new Argonaut and have increased my total country count to 87 with 46 confirmed. My goal, of course, is the **DXCC QRPp Trophy** which you offer. I know this is quite a challenge with dipole antennas, but I am sure I can do it. I plan on entering *CQ's* upcoming DX contests because I think your idea of including a separate QRP Class is what is needed for us QRPp'ers to be able to compete without being at a great score disadvantage. Again, thank you for the efforts and hope to see you on the air."

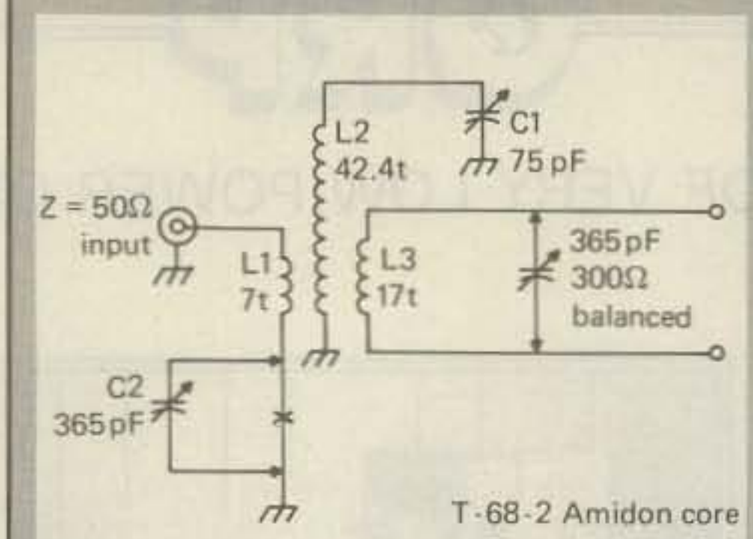
de. . .**VE3JHE/VP2EY, David Rees-Thomas, RR#1, Swastika, ONT P0K 1T0:** "I hadn't thought of mentioning anything about it until I had worked over a hundred, but, since you want to hear from anyone with 25+ countries worked/confirmed, here is another statistic. Since November, 1977, when Johan PA0KAO utterly astonished me by hearing my HW-8 (then feeding a 20 meter ground plane with a 15 meter signal), I've managed to work about 44, with 31 confirmed (as of July, 1979). The HW-8 has been modified to include RIT and QSK, neither of which I would care to do without, as well as a built-in s.w.r. meter and crystal calibrator. Digital

**83 Surburban Estates, Vermillion, SD 57069*

readout is supplied on occasion by a DSI counter, although signals generated by the counter tend toward the spurious! The rig now feeds a two element GemQuad at 40ft. Generally speaking, I seem to be able to work most of the DX that I can hear, if the competition isn't too fierce! Even then, patience and timing pay off, although one gets lots of opportunity to learn about bad manners in a pile-up. Happiest DX was 4X4FU, Isaac, handling a big one by call areas. May the gods always smile on the DX station who includes VE when he works by areas! I had a brief experience from the DX side back in May, when I operated for two weeks from Marina Cay, BVI, as VP2VEY. No pile-ups, though—closest I ever got was when two W's called me in succession. The HW-8 and 150ft of wire got me 19 countries, of which the best was an unsolicited call from EL2EV. With any luck, I'll be back next year to try for some more. Well, that looks like a heck of a lot of bragging, but then again, working DX with three watts when all about you are using kilowatts just might be something to brag about!"

de. . . **WB9VJD, Charles Henderson, 250 E. Bristol Apt G-66, Elkhart, IN 46514:** "Greetings from Charlie, WB9VJD, from mobile home city, Elkhart, IN. Think you might be interested in a special experience I had for your Totally Unique Awards (TURS) program. Went camping a few weeks ago into the wilds of central Michigan and worked QRP portable for the first time. I had never been able to do that before but finally worked it out—the XYL had the mistaken notion that my interest in amateur radio was an attempt to avoid her. She has even taken to learning the code so she too

Lo-Z to Hi-Z Antenna Coupler



The output impedance from solid state transmitters is usually designed for 50 ohms fixed. Some antennas, such as the folded dipole, constructed of 300 ohm TV twinlead, cannot be connected directly to such a transmitter, but some means of impedance transformation is required. The circuit shown here usually will do the job, provided the feedline does not present too high reactance. If the antenna is cut properly (½ wave) and the feedline is quarter-wave length (or multiple thereof), no problem should be encountered. For best results and least susceptibility to transmitter instability, a high Qu-Q_L (unloaded to loaded Q) ratio is best. Hence, L2 should be large, and C1 small. For QRP levels, Amidon T-50-2 and T-68-2 cores will work, and the largest gauge wire to fill the core gives the highest Qu. In the design example for 7 MHz, we will use a T-68-2 with an A_L (permeability factor = 10) of 57.

1)C1-L2 values chosen to resonate at f_o(7MHz) with high reactance value, about 400-600 ohms, or 450 ohms in this case. Find pf and uh values for 450 ohms at 7 MHz from reactance charts or calculate:

$$C\mu f = \frac{1}{2\pi f_{mH3} X_c} = \frac{1}{(6.28)(7)(450)}$$

$$= 0.00005\mu f = 50pf$$

$$L\mu h = \frac{X_L}{2\pi f_{mH3}} = \frac{450}{(6.28)(7)}$$

$$= 10.23\mu h$$

2) Calculate number of turns on T-68-2 core for 10.23 μh:

$$N_{turns} = 100\sqrt{L\mu h \div A_L} =$$

$$100\sqrt{(10.23) \div (57)} = 42.4 \text{ turns}$$

Chart provided by Amidon shows that #24 wire will fill the core at 47 turns. Use #24 wire.

3) Next, select Q_L for −3dB bandwidth desired:

$$-3dB\ BW = \frac{f_o}{Q_L}$$

Since the major function of the circuit is impedance transformation and not harmonic reduction, a wide bandwidth is tolerable, allowing a low Q_L. A Q_L = 4 will provide a −3dB BW of $^7/_4$ = 1.75 MHz.

4) Calculate the reactance of L2 if Q_L = 4 by $(Q_L)(X_{L2})$ = (450) (4) = 1800 ohms. L2 is then considered to have a reactance of 1800 ohms in the remaining calculations.

5) Calculate the number of turns required to transform the 300 antenna load to 1800 ohms with the formula:

$$\frac{N_{primary}}{N_{secondary}} = \sqrt{\frac{Z_{primary}}{Z_{secondary}}}$$

In this formula, *the winding from which power is taken, or to which power is delivered*, is considered the primary winding. Hence, L2 is the secondary, with an impedance of 1800 ohms and N = 42.4 turns, while L3 is terminated in 300 ohms (antenna), so:

$$\frac{N_{L3}}{42.4} = \sqrt{\frac{300}{1800}} = 0.4$$

The ratio between N_p/N_s is .4, hence N_p = (0.4) (42.4) = 16.96 turns. L3 will have 16.96 turns, spread out over the entire L2 winding, since it feeds a balanced load.

6) Calculate 50 ohms input winding, where L2 is again the secondary:

$$\frac{N_{L1}}{42.4} = \sqrt{\frac{50}{1800}} = 0.16;$$

$0.16 \times 42.4 = 7.0$ turns

The L1 winding should begin at the ground end of L2, and be wound between the first seven L2 turns, since it is terminated in an unbalanced load.

7) Any reactance presented to either input or output will be transformed by the same ratio as the resistive part of the 50 and 300 ohms impedances. If the reactance presented by the feedline is relatively small, C1 will tune it out, either by providing greater or lesser capacitance than at resonance to cancel either inductive or capacitive reactance. However, in cases where a large reactance is presented, it may be necessary to insert C2 or C3 as shown. Similarily, the size of the L1 and L3 windings can be experimented with to attain the best match. One final note: the addition of the L1 and L3 windings will shift the frequency of the L2-C1 tank away from 6_o. A larger capacitor at C1 may be needed to bring it back to 7 MHz.

A shot of Al, WDØHHM, working 40 meter c.w. during FD at Grandin, ND. The Argonaut is visible at the lower right corner. Operation resulted in 34 contacts.

can participate in the fun. My location in Central Michigan was the White Cloud State Park—no relation to White Cloud of toilet tissue fame, although my claim to a TURS might conjure up the association. The park officials were very cooperative and even offered to help me string some wire and get my inverted Vee up in a tree. Many of my camping neighbors wandered by and stood in awe of the rig and antennas. I hung a "J-Pole" in a tall tree and my first contact on 15 meters was Plymouth, England. . . but that's nothing compared to my crowning acheivement. I operated QRPp/Pp—that's portable/portable! Managed to work one contact from my portable location while making full use of my portable potty! Now I thought that would be a newsworthy item since few of us have station capabilities in our bathrooms. Thought you might drum up a special award for that contact! At any rate, the vacation was enjoyable and I did a little PR for amateur radio by recommending the local club in Grand Rapids to several CB'ers who expressed a sincere interest in getting into the world of amateur radio. Keep up the good work and fine articles and great projects that are so easy to follow. I still have hopes for more mods for the HW-8, especially the self-contained linear amplifier that you promised way back when."(*Ed.*: Ooops)

de. . .**W6PQZ, John K. Akiyama, 1161 N. Ridge Pl., Monterrey Park, CA 91754:** "Have been real busy here at work with trips to JA land in July and September. Not very active in *CQ* WPX Test. As soon as I get some time, I'll get my application in for 200 DXCC QRPp. As of now, I have 248 worked and 234 confirmed. I intend to try to DXCC QRPp and WAZ all over again with daylight solar power only! Will not use battery power or night contacts. Since last year, I've worked 68 countries solar power on SSB. No other activity to speak of." (*Ed.*: John's picture was on our August cover.)

de. . .**WDØCCL, Gary L. Portsche, 2826 Evergreen Rd., Fargo, ND 58102:** "Have been meaning to write and your articles have given me the opportunity to brag a little about my QRPp operation. On a visit to our old neighbors in Lincoln, NE, WDØFSV and I visited the local ham shop, whereupon I walked out the proud owner of an Argonaut 509. Now, I'd been playing around with low power operation since August of '78 when I converted an a.m. CB rig to 10 meters and worked coast to coast mobile and also had lowered the drive to my TS520S to 5 watts output and had good success on 20 meters. Anyway, we took the rig home to Marv's QTH, hooked it up to a storage battery, his TH3MK3 at 25ft., plugged in a mike, and worked KL7, KH6, SP, DL, and G. (This was during the ARRL DX Test.) When we returned to Fargo, my first goal was to work WAS on 40m phone. In a matter of two months I had worked all 50 and now have them confirmed. My antenna system here consists of the following: a coaxail inverted Vee for 40m, a HyGain 203BA at 42ft for 20m, and a 3

element Radio Shack yagi at 38ft for 10. I've worked about 45 countries in the last five months and this has been with little effort. I have every reason to believe that, if I put a lot of time into the project, DXCC would not be outside the realm of possibility. All of my 10m operation is QRPp and about 99% on 20 meters. During FD, we managed 34 QSO's on 40 using QRPp, and during the IARU contest I made 48 QSO's just in my spare time, as I was painting the house and occasionally would retire to the shack for R&R. Some of the contacts were HA4, OE5, UK2, DT7, UR2, ZL1, ZP2, KP4, and PJ2. This was on 20 s.s.b. A student in one of my radio classes, now WDØHHM, was so impressed with the Argonaut that he now has one and operates 100% QRPp. If you detect some enthusiasm for low power operation on my part, you are 100% correct. I've found that if I can hear them, I can work them and it's a ball to slip down on kw alley and get through a pile-up. It really sharpens your operating skills. So, keep up the good work with your articles. It'll be interesting to read letters and reports from other readers too!"

de. . .**KAØDGN, Nate Bushnell, 7175 S. Grant, Littleton, CO 80122:** "I have read your evaluation of the Argonaut and the transmitter in February, '79, *CQ*. Enjoyed them both. As articles on specific subjects, they are fine. May I suggest an article or series of articles on the overall picture so that the bits and pieces come into perspective more easily? My reasons for asking are these: I am a brand new Novice who is not only on a very limited budget, but who is aware of the fact that there is a lot to be learned and much fun to be had along the way before I get a General ticket and the money to buy a thousand dollars worth of 'Super Pushbutton All Band SSB Communicator!" I think you can see why I would like to see an article with a broad perspective about how a new Novice can get the most learning and enjoyment out of QRPp. Simple equipment from power supply to antenna, how to make it and operate it. Also, what equipment is not really needed etc., and how to get the most out of a homebrew rig. I have the *ARRL Handbook* and study it regularly. Much of it is over my head and I can't relate the bits and pieces to each other. What I need is a new Novice Handbook! Keep up the good work." (*Ed.*: We are currently working on a *QRPp Handbook* that will do just what you want Nate. Hopefully, we'll have it in print sometime in 1981.)

de. . .**WB1DKX, Michael Geschwindner, RFD #1 Box 236A, Newport, NH 03773:** "Just wanted to let you know how I'm doing since my last letter. My state totals are 20 worked with QSL's, all with low power, and my country total is 9/3. I have put up a longwire (about 350ft) that really helped to get those 20 states, including KL7 and W6—no KH6 yet, but I'm trying! I'd like to say that I don't think that DX stations listen for QRP signals as much as they should. Seems like they start with the first call area and then work thru Ø, after which they go to QRT. That sounds fair, but I don't think it is. Well, that's it for now."

Well gang, that's space for this month. Drop us a report and photo and share your experiences with the gang. Don't forget the DX contests coming up this fall with QRP sections!

In Memoriam
James R. Fisk, W1DTY/W1HR

I was pleased to find the latest issue of *ham radio* in my mailbox as I headed out for morning coffee at the Country Kitchen. When I opened the issue, meaning to check out an article on a phased vertical array, Jim's picture on one of the early pages caught my eye, and that seemed odd. I read the page and was stunned to discover that Jim had died on April 18, 1980, more than a month ago, and I'd gone on feeling that everything was as usual up in that beautiful southern corner of New Hampshire, remembering hours spent with Jim in his little cubby-hole office from which emerged the technical excellence of *ham radio*. In thinking about it now, I see that those memories crop up frequently. He made a very deep impression on me, with his handsome whitish beard and crop of hair, his soft but confident voice, his quick wit, and technical knowledge. I liked him a lot. I liked what he did with *ham radio*. But on second thought, I more than liked him, I admired him, maybe I even idolized him. He embodied my own ideals with respect to dedication, excellence, teaching. Personally, he was always at the fringe of the future with regard to curiosity and technical knowledge, always looking ahead, speculating on how this or that new development could advance amateur radio state-of-the-art. *Ham radio* reflected his personal principles. He set out to publish a magazine that would set the standard of technical excellence in the amateur radio field. He succeeded. But not without some cost in readership. In a recent editorial, he replied to the criticism that *ham radio* oftentimes publishes material that is too advanced and technical for the average reader. My urge was to write a letter supporting his policy. He was right. Material that contributes to the advancement of knowledge must be published. Readers must be challenged to learn new matters, must be challenged to become aware of advances, must be invited to become more sophisticated radio amateurs. Through *ham radio*, Jim did this. Hopefully, his standards will live on in that publication and in all of us who were affected by him. He was that kind of man who gives direction to others because he is so sure of his own principles, is so dedicated to his purpose. And he did so without arrogance. He had great impact on many of us. I always looked forward to the Dayton Hamvention because I got to exchange a handshake and a few words with him. I didn't make Dayton the last couple of years, so I never had the chance again to shake his hand and convey my admiration and appreciation for what he contributed to amateur radio. I never told him what that handshake meant. I figured that I would be able to—some day. Now he is gone and that day will never come. So, Farewell Jim, and thanks for what you've given me and amateur radio. I won't forget.

Ade, K8EEG/WØRSP

CQ SHOWCASE

Morse Code Trainer

Advanced Electronics Applications, Inc. has announced a new microcomputerized Morse code trainer product family. The MT-1 offers precisely calibrated speed control of characters from 1 to 99 w.p.m. in 1 w.p.m. increments. In addition, one character speed can be selected with another (slower) actual speed (Farnsworth mode). The internal computer determines the correct inter-character space requirement to send at the selected speed. The MT-1 offers an automatic increase of speed from a beginning speed to an ending speed over a selected duration of time from 0.1 minutes to 99.9 minutes. The automatic speed increase mode can be selected in the slow code or fast code (Farnsworth mode). A 24,000 character answer booklet is available for the MT-1 to enable the student to check his progress.

The MT-1P is a portable version of the MT-1. The Model KT-1 keyer/trainer offers all the features of the MT-1 trainer plus a full-feature computerized keyer within the same package. For more information contact AEA, Inc., P.O. Box 2160, Lynnwood, WA 98036, or circle number 105 on the reader service card.

Alliance Heavy-Duty Rotator HD-73

The HD-73 rotator incorporates features that contribute to strength, durability, and ease of installation without special tools or equipment as well as simple foolproof operation of the control box. It is constructed of heavy duty aluminum castings, contributing to ease of erection and resistance to severe wind and adverse weather conditions for antennas up to 10.7 sq. ft. of wind load area.

The mast support bracket design permits a centering procedure for in-tower application without shims or difficult trial-and-error adjustments, and the base design permits easy four-bolt in-tower action. The control unit features Dual-Speed rotation with one five-position switch. The rotator also has a readily accessible externally located fuse for total unit protection and an internally mounted automatic reset thermal protector for the motor and transformer. For more information contact The Alliance Manufacturing Co., Inc., 22790 Lake Park Blvd., Alliance, OH 44601, or circle number 109 on the reader service card.

Gilfer Shortwave NRD-515

Gilfer Associates has introduced in the U.S.A. the Japan Radio Company's NRD-515 communications receiver. The NRD-515 continuously tunes from 100 kHz to 30 MHz using a 100 Hz "step" photo-type encoder. Received frequencies are read to 100 Hz and the PLL-synthesized circuit can be locked to any frequency with assurance that the drift will be less than 50 Hz/hour. The r.f./i.f. circuit is a double conversion upverter (70.455 MHz first IF).

The "KHZ" tuning knob moves 10 kHz per revolution and a momentary UP/DOWN switch permits rapid frequency changes at 200 kHz/sec. There are no mechanical tuning stops and the all-electronic bandswitching circuit automatically tracks from MHz to MHz. Also featured in the NRD-515, priced at $1395, is passband tuning, AM broadcast preselection, noise blanker, 10 and 20 dB switchable attenuator, and more.

For more information contact Gilfer Shortwave, Box 239, Park Ridge, NJ 07656, or circle number 107 on the reader service card.

CRANIUM QUERIES

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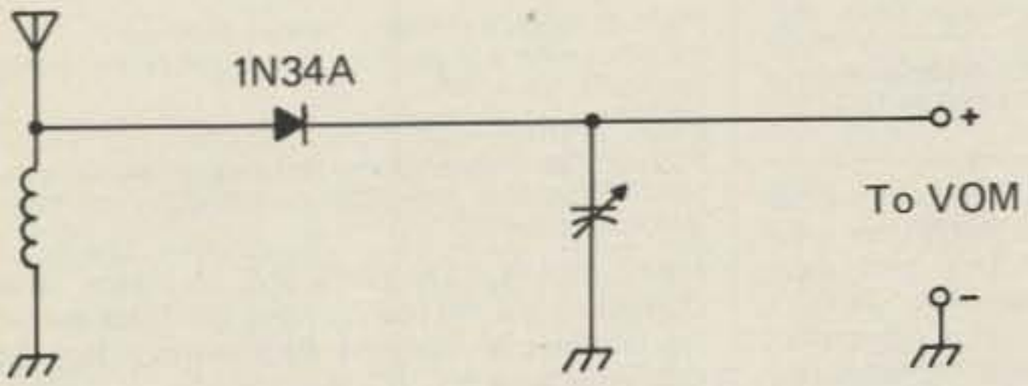
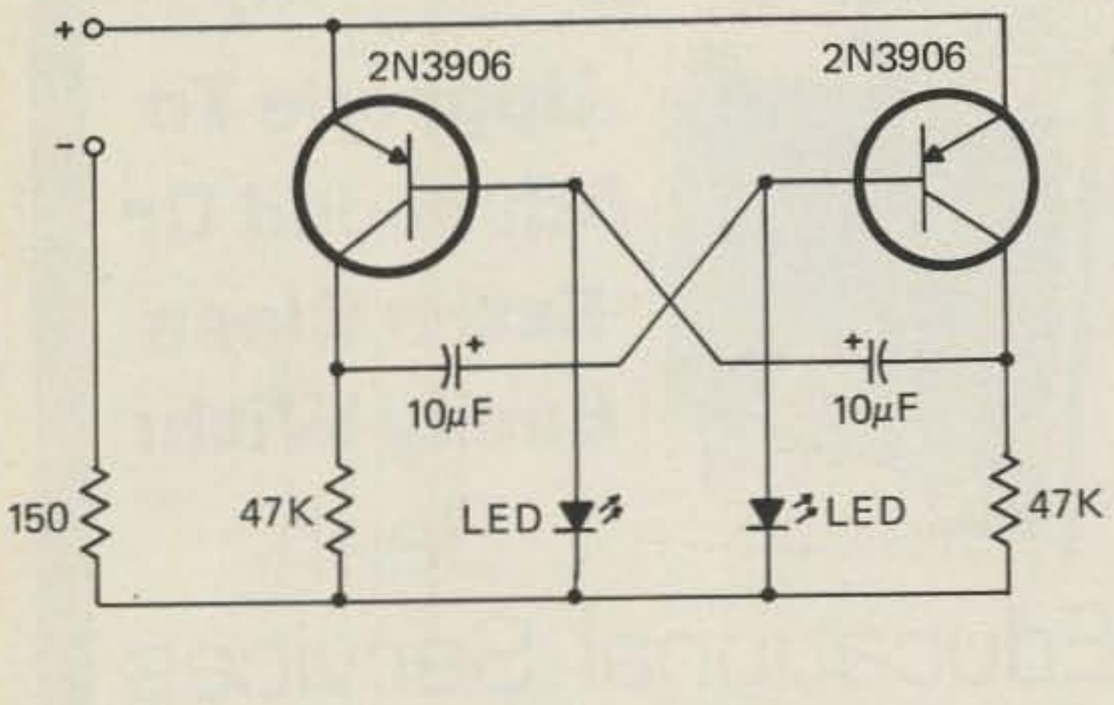
BY MARTIN BRADLEY WEINSTEIN, WB8LBV
c/o CQ



Here's What Was Wrong

We had our detector diode working as a shunt and our v.o.m. connected backwards. A twist of the diode and our field strength v.o.m. meter is in motion.



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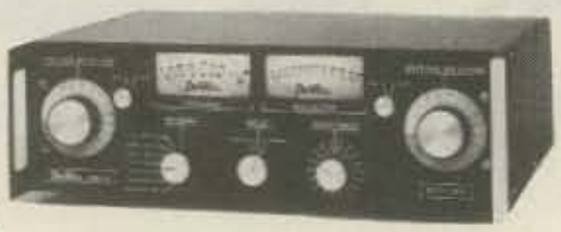

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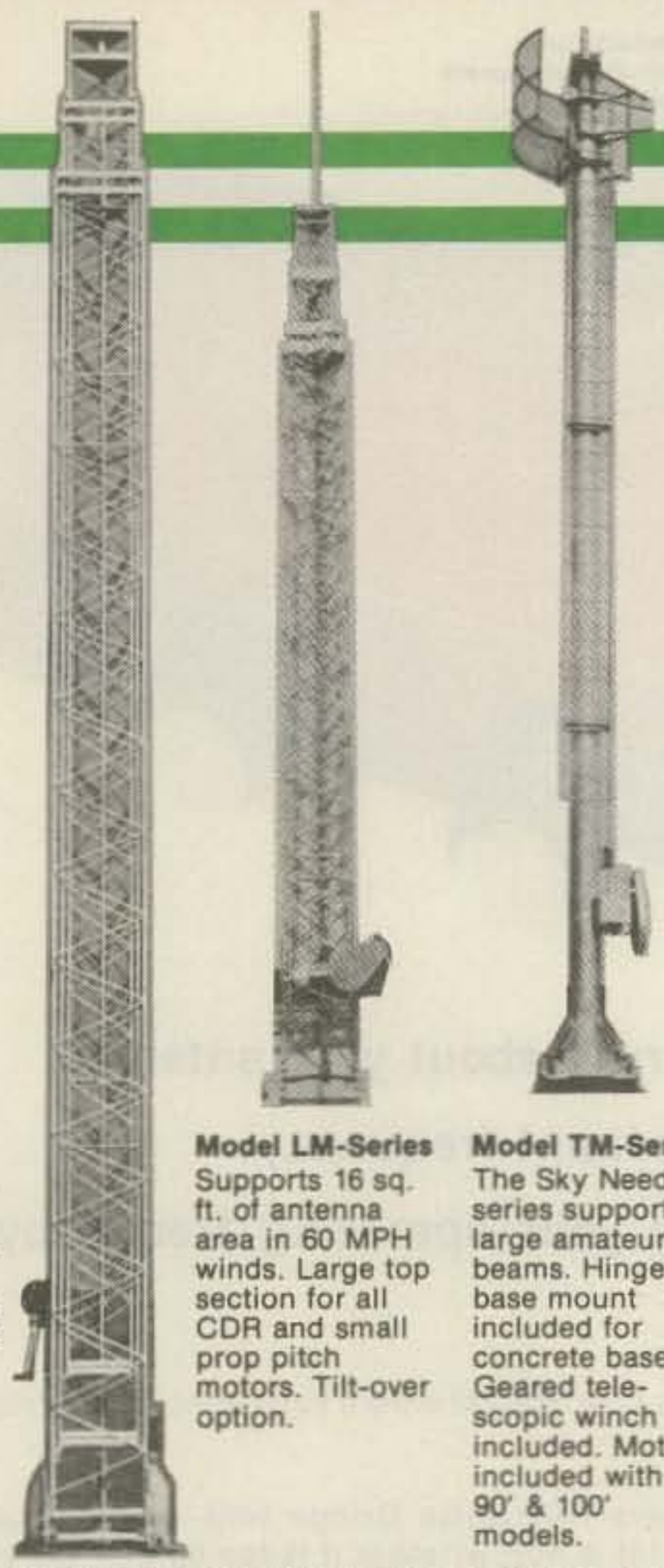

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MW 65**	21' 3"	65'	5.0 Sq. Ft.‡	913.00
W 36**	20' 6"	36'	9.0 Sq. Ft.	546.00
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25 watts	Power Output	10 watts
.32 uV for 20 dB quieting	Sensitivity	0.5 uV for 20 dB quieting
±6 kHz (—6dB) ±12 kHz (—60 dB)	Selectivity	±12 kHz (—6dB) ±24 kHz (—60 dB)

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