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Amateur Radio

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JANUARY 1994



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on cover: John Brosnahan, W0UN, La Salle, CO

Test

RADIO AMATEUR'S JOURNAL

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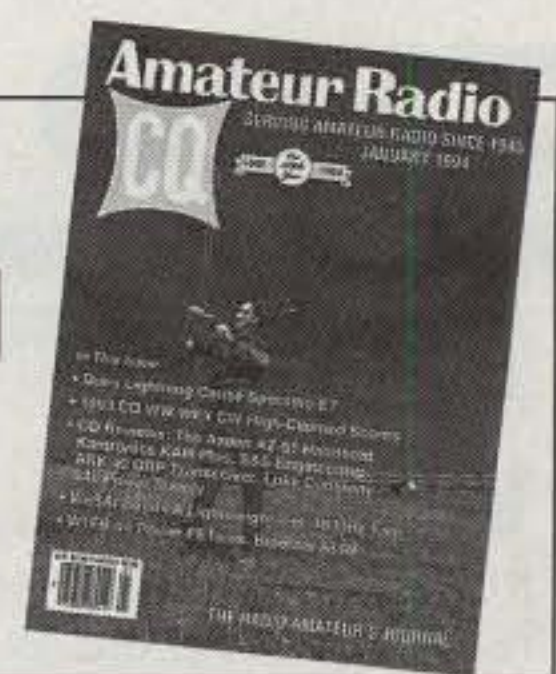


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The Radio Amateur's Journal



ON THE COVER: John Brosnahan, WØUN, tends to some light maintenance at his La Salle, Colorado antenna farm. Seems as though they grow those towers mighty tall in the Rockies. John also can be seen in the new CQ Amateur Radio Calendar for March 1994. Got yours yet? (Photo by Larry Mulvehill, WB2ZPI)

JANUARY 1994

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EDITORIAL

While it's a new year in a lot of ways, this issue is still being prepared in the remnants of the old. In reality there is still time for me to make some notable resolutions, and certainly there is still time enough left to break them. I dallied with one such resolution during our World-Wide DX Contest. Halfway through the contest I vowed to seek out the person or persons responsible for developing the digital voice processor and inflict grievous bodily harm upon them. While I am still in awe of the wonderment of our technology, some things do get out of hand every so often.

During the contest there were a couple of stations reasonably close to me who were trying to outdo each other in how many times they could repeat their calls without stopping to listen. Even when they tried (and I emphasize the word *tried*) to break a pile-up, you could hear, if not enjoy, the benefits of technology ten to fifteen times before their fingers apparently got tired. There was no gasp for air, no crack in their voices, no change in inflection, no note of anxiety. Neither one managed to break any pile-up that I heard, but everyone else got to memorize their calls. Then again, maybe I shouldn't hold the developer responsible for the actions of a few.

Shortly after the contest Dick, John, and I compared notes on what we had done and shared the experiences we had with amateurs who seemed to exhibit strange operating habits. We all chuckled at things we'd like to have done or things we'd like to do to them. I brought up my old idea of the RF-seeking missile, but that still seemed a bit extreme. We thought of compiling a list and having the committee scrutinize those logs down to the composition of the ink.

A week or so later I thought of two alternatives. One required that I remove some "extra" Gauss from certain incoming logs in order to make them safe to handle and a bit lighter to reship. The other simply required that a particular log go astray for a few years. After all, this is supposed to be a fun hobby.

Well, the moment of truth arrived one day when I noticed a certain log arrive bearing the call of one of the two people I heard. I held it up and looked at it while all sorts of things flashed through my mind. No, I thought, it is a hobby that attracts all sorts of people, some of whom even do dumb things. Rest easy, unnamed amateur. Your log is safely and securely packed with all the others with all of its Gauss intact.

Is It Cold Enough Yet?

With the CQ WW DX Contest over and the ARRL's Sweepstakes and 10 Meter Contest history for another year, there is a short reprieve and window until the CQ WW WPX Contest in March. Here in the east this gives the optimum arctic conditions to get out and finally do some last-minute work on our antenna systems. I'm looking forward to two months of wind, snow, and subfreezing temperatures to clear up a rat's nest of wiring where my antenna and rotor cables enter my house. I'm planning on finally using some of that "good stuff" I've brought home from several hundred hamfests over the years. That will leave some room for me to add some new "good stuff" from future hamfests. The only curious thing about collecting all this stuff is that there is always some part or widget that you still have to have in order to complete the project.

Most ham shacks are like airports, as I haven't yet seen one that's finished. There's always something to do or add or rebuild. Maybe that's our nature, but in a way it signifies or symbolizes our hopes and plans for the future. We always seem to see a brighter tomorrow when everything will be complete, yet we never seem to get there. I guess more of us tend to be optimistic than we think.

A Brighter Tomorrow

Speaking of a brighter future, read this month's installment of "Currents" by Ray Kowalski on page 15. Ray outlines how PCS probably will affect amateur radio and our treasured spectrum space. Technology, it would seem, is keeping up with demand, and what threatened us not too long ago has far less potential today. It's a holiday present for all of us—one size fits all. While we're unlikely to get more spectrum, we probably can look forward to a much longer life with what we have. It's a grand way to start a new year, full of hope and promise.

With our future looking brighter, what better way is there to celebrate than by co-celebrating our own 50th anniversary. This month *CQ* begins its 50th year of publication. In our first issue John Potts, the first editor of *CQ*, explained that even though this first issue was being published during World War II (January 1945), he was looking forward to a day five years after the war when there would be 200,000 licensed amateurs in this country. Keep in mind that at this point

the war was still raging and the total number of licensed amateurs just prior to the war was 60,000. John's optimistic outlook for amateur radio was well founded and I think ours is, too.

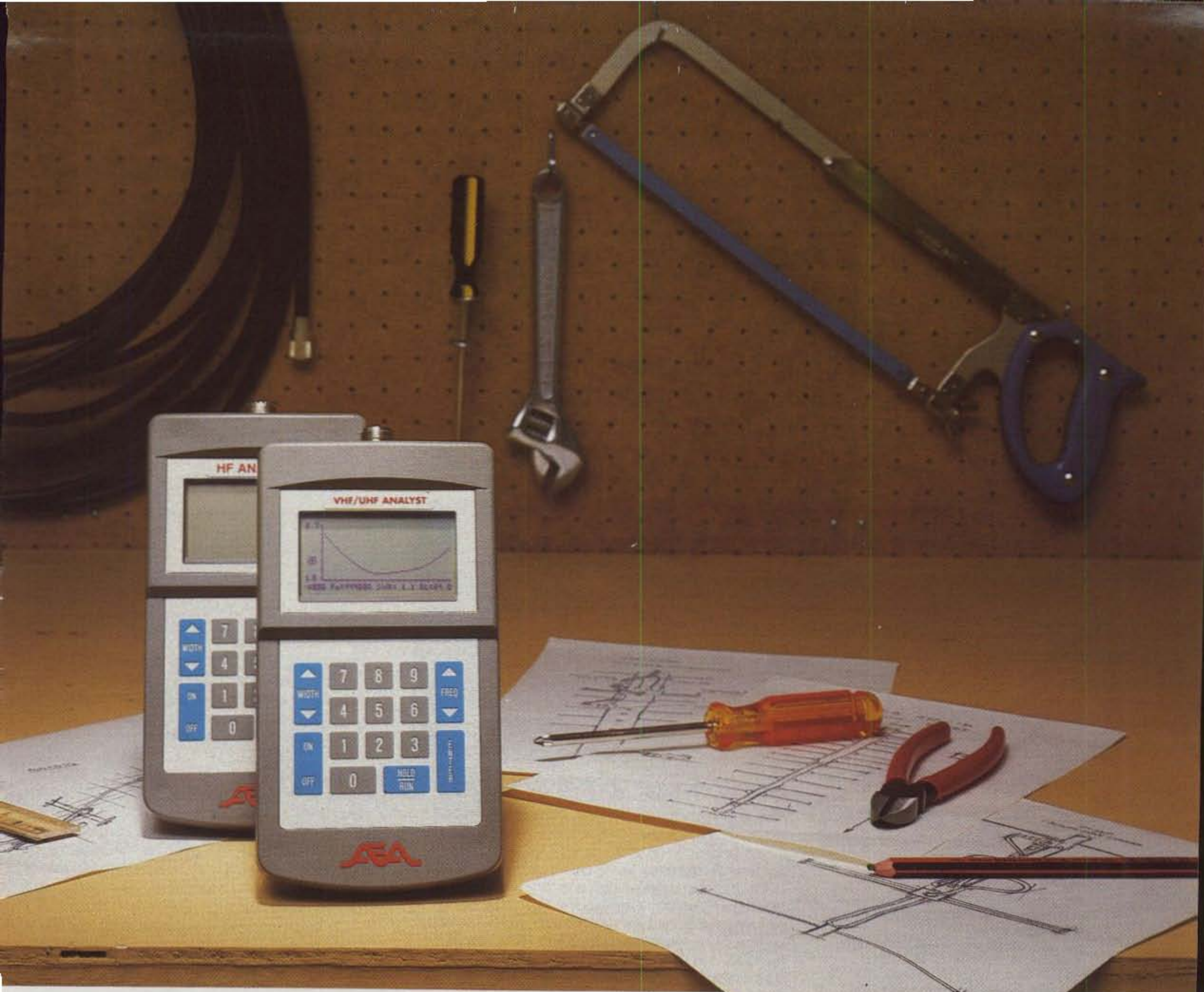
Holiday Gifts, Giving & Getting

I don't know about you, but this year I made absolutely certain that I got what I wanted for the holidays. I bought it myself, wrapped it, put my name on it, and put it aside. I will not be feigning delight and surprise when I eventually open my gift, as it is something I really want and can use. Not that I'm an ungrateful wretch and unappreciative of what people choose to give, but a little bit of wisdom and insight has proven to be invaluable to me. It goes along with realizing that my hobbies and pastimes are generally unknown quantities to most people I know.

Each interest I pursue has its own vernacular, equipment (you can substitute the word "toys" here), and enhancing accoutrement that becomes the fanciful magic that attracted me in the first place. So if I were naturally to ask for the "X15/A Multi-Zoomer," most people would just respond with a blank stare or maybe ask, "Why do you need that?" It's much easier and requires much less explanation to simply surprise yourself, unless your spouse, a relative, or a friend shares your interests. In fact, most people with whom you usually exchange gifts wouldn't even know where to get the best deal on an X15/A Multi-Zoomer, let alone buy one.

Keeping that in mind, we've included several additional *CQ* Reviews in this issue so that you can broaden your view of amateur products with which to surprise yourself. You still, however, will need a few hints or suggestions to give the others who know of your interest in amateur radio. In addition to the many fine advertisers who share our pages, this holiday season we are introducing two new calendars, a brand new video on contesting, and the ultimate tome for fact fiends—*The CQ 1994 Amateur Radio Almanac* (check out the ad in this issue). You will also note that our clever marketing department has included an order form so that anyone will know where to send for the items and how much to include (or how much to charge). Of course, you won't be penalized if you choose to order any of these items for yourself. And while we don't sell X15/A Multi-Zoomers, I'd hold out for a while, as we've heard that the model /B should be coming out around Dayton.

73, Alan, K2EEK



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OUR READERS SAY

There's Nobody Here... Sometimes

Editor, CQ:

The September "Our Readers Say" had a letter headed "Is Anybody Out There" by W3GXX of Maryland, who felt that hams in KH6-land won't talk to mainlanders. He gave examples of how, on the mainland, hams give directions, advice on restaurants, etc. This is not the same thing as asking for an ordinary

QSO by saying simply "W3GXX listening."

He can be sure that if he had asked for help he would have gotten it—that is, if somebody really was out there. There are hours in the day when there really is nobody out there, on the small rock called Hawaii—not even other mainlanders!

There are reasons for not getting any response, even on the mainland, and these are explained in a very good article on the subject in the October QST on page 63, entitled "No-

body Talks To Me," by WB8IMY. But the problem is not limited to KH6-land.

Ted Chernin, KH6GI
Honolulu, HI

Aloha, W3GXX

Editor, CQ:

(This letter is addressed to Mayer, W3GXX, who in the September issue in the "Our Readers Say" column felt that KH6ers did not respond to his on-the-air attempts to contact them.)

First of all, let me apologize for all of us. But please allow me to make a few observations, not by way of excuse, but by way of explanation.

The ham population in the entire state runs around 2,900. And just a small percentage is active on 2 meters. I know that there are more than that number on many single repeaters on the mainland (and sometimes all at once, it might seem). Considering that most of this number work, the daytime finds the spectrum rather silent. Two meters gets a workout on the going-to-work and going-home hours and just a modicum of activity at other times.

But you are right. There is some kind of reticence to be found in most of the local hams. Part of it (I believe) comes from an inherent shyness. Contrary to the tourist advertising, we do not fling ourselves bodily onto tourists. However, I also believe that there is some *small* reluctance to talk to mainlanders. I do not understand the reason for this. Perhaps it comes from living on a small group of islands. I experienced it when I first moved here 28 years ago. After a brief period of time we became part of the community and the family has been more than content living (and retiring) here.

On your next visit—and please do visit many more times—look for some of us old retired coots on 146.88 on Diamond Head. We will be happy to provide you with our own biased opinions of good restaurants, hotels, beer joints, and tourist traps. I hope this helps. And again, Aloha.

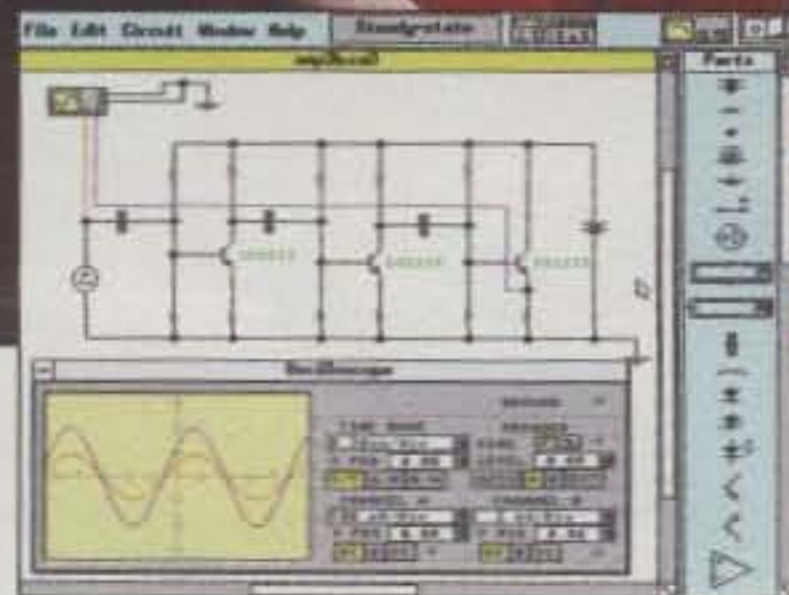
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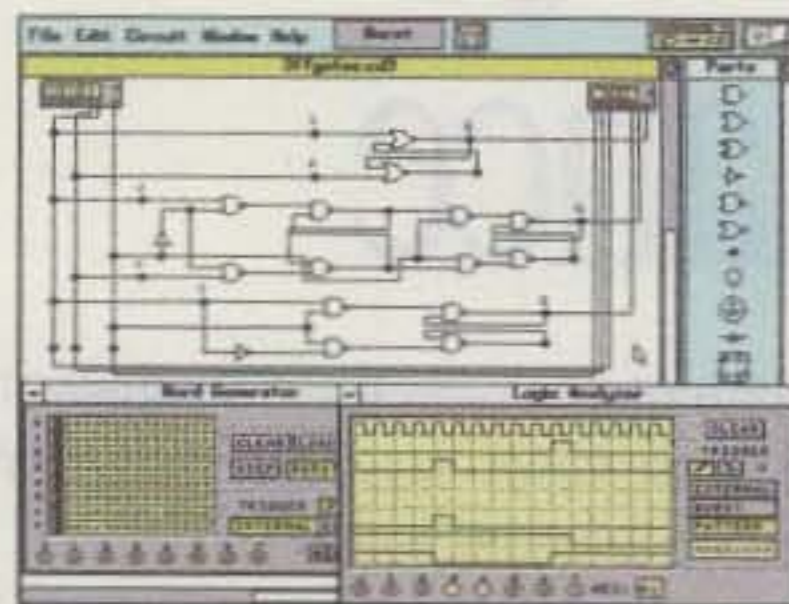
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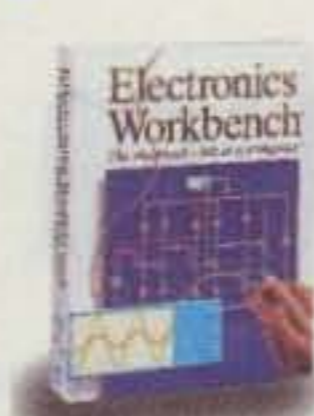
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POW Communication Research

Editor, CQ:

As part of a project for the Air Force Museum at AFB Ysterplaat, I am researching the communication channels used by the prisoners of war during the 1939-45 World War, with special emphasis on the various "homebrew" radio receivers built and used by the POWs to keep up to date with the latest news on the war front. These radios ranged from simple crystal sets to even radios making use of vehicle lightbulbs as diodes, etc.

There must have been as many radio sets made by the POWs as there were escape plans, although the many books written merely mention the radios but do not give specific details.

Any information such as circuit diagrams, construction details, or how these radios were concealed (e.g. hidden in a picture frame, etc.) will be most welcome, as the ultimate object of

(CONTINUED ON P. 152)

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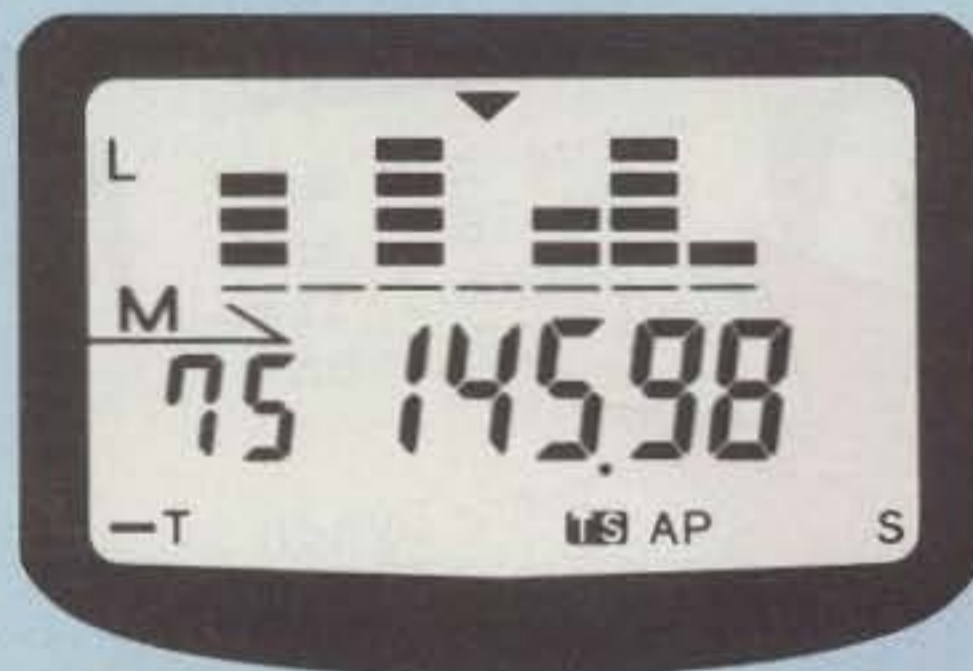
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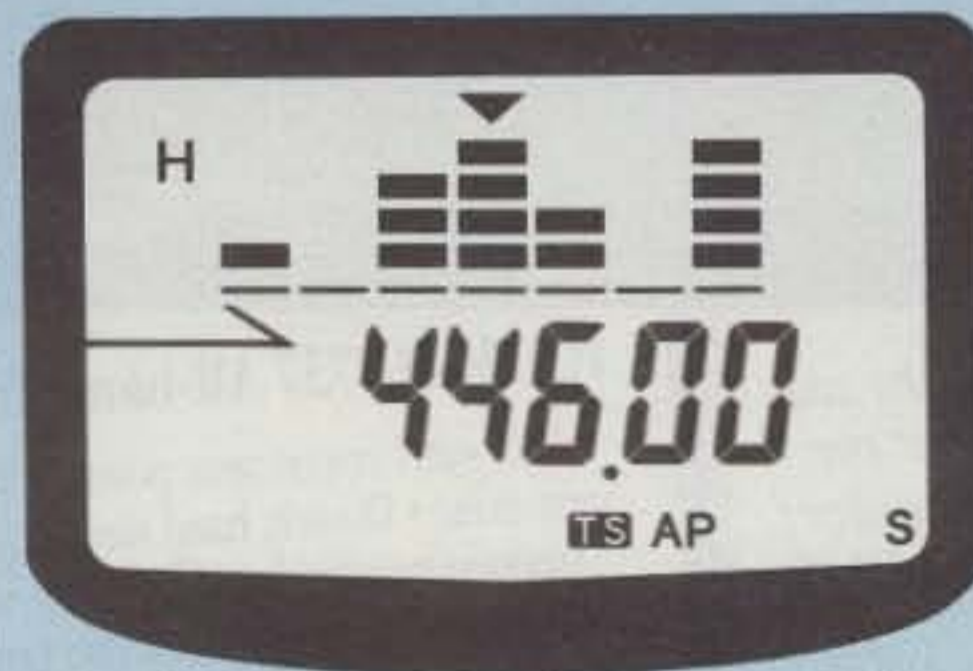
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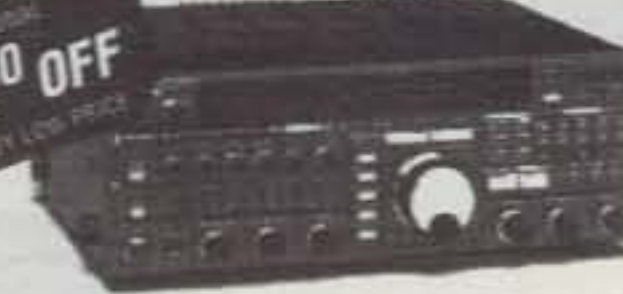
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Currents

A Look At PCS and Amateur Radio

BY RAY KOWALSKI*

In my very first article in this series (November 1992) we talked about the coming displacement of first-generation telecommunications technologies from their radio spectrum allocations to make room for the new generation of emerging technologies. Well, in September 1993 a major displacement of this very sort took place. But before I tell you about it, let me set the stage with a true-life story that illustrates how far and how fast the FCC has come in its thinking.

In 1988 I had only been in private practice for a few months, after 19 years with the FCC. In the fall of the year I received a telephone call from an old friend—an amateur, by the way—with whom I had worked at the FCC. Several years earlier he too had left the FCC to go into consulting. His travels had taken him to Europe and he had lived and worked for some time in London.

In Europe my friend had become aware of several different communications technologies that were being developed. The common denominator was that these were personal communications technologies—that is, communications technologies that would be linked to the specific user and not to a device that was installed in a home, office, or automobile. With personal communications systems it would not matter whether you were at the office, at home, in your vehicle, in a restaurant, or simply walking down the street. With your personal communications device you would be able to access the worldwide telecommunications network; conversely, anyone in the world could contact you, regardless of where you were. The concept was revolutionary.

**Ray Kowalski is a partner in the Washington, D.C. law firm of Keller and Heckman, where he practices telecommunications law. For 19 years Ray was an official of the Federal Communications Commission. He was responsible for the Amateur Radio Service from 1980 to 1988, after which he left the FCC for the private practice of law. Ray can be reached at 202-434-4230.*



The first of these new personal communications technologies to be rolled out was CT-2, the second generation of digital, cordless telephones. Late in 1988 the United Kingdom was in the process of awarding licenses to provide CT-2 service in Britain. That was when my friend returned to the United States, hoping to be in a favorable position when CT-2 and the other personal communications technologies made their appearance here. I remember spending much of the Thanksgiving weekend reading all about CT-2 and the other personal communications technologies that soon would follow.

We realized early on that someone had to tell the FCC what lay ahead. Bear in mind that at that time the words "personal communications" were dirty words at the FCC. At that time the Personal Radio Services, regulated under Part 95 of the FCC's rules, included the unruly Citizens Band Radio Service, a little-known but pesky UHF service called the General Mobile Radio Service, and the Radio Control Radio Service. The FCC still had a bad taste in its mouth from the licensing and enforcement nightmare that was CB and from an abortive attempt to create a "poor man's cellular" service, to be known as the Personal Radio Communications Service, in the 900 MHz band.

We succeeded in arranging a meeting

early in 1989 with high-level staff of the FCC's Office of Engineering and Technology. This is the office of the FCC that handles spectrum allocation matters. They listened attentively as we described the personal communications technologies that were being developed in Europe and fostered by the governments of the European Community. When we concluded our presentation their response was "that's fine for Europe, but it will not happen here; there is no spectrum on which to do it."

Fast forward to 1993. Personal Communications Systems, now commonly known as PCSs, are all the rage. Over the intervening four years the FCC has been deluged with experimental license applications to do some form of PCS in some market, together with a concomitant flood of Pioneer's Preference requests for PCS licenses, when and if they ever become available. Just before Labor Day the FCC concluded a fast-track rule-making proceeding in ET Docket 92-9, in which the FCC voted to move point-to-point microwave licensees out of the 2 GHz band by rejuggling the 4, 6, 10, and 11 GHz bands to accommodate them. That created spectrum on which to do PCS.

On September 23, 1993 the FCC officially created PCS, to be licensed in the 2 GHz band being vacated by the point-

to-point microwave licensees. In GEN Docket 90-314 the FCC allocated 160 MHz—that's four times the spectrum that is allocated for cellular radiotelephone service—to PCS. On September 23, 1993 a scant 4 years after a skeptical FCC staff first heard about it, PCS could and did happen here.

It would be nice to think that this lightning-fast (by bureaucratic standards) progression from concept to licenses illustrates the power and irresistibility of an idea whose time has come. I am sure that it does, at least in part, but there is more to the story.

On the same agenda, September 23, 1993, the FCC also opened a rule making in PP Docket 93-253. In this proceeding the FCC will develop the rules for spectrum auctions. You see, in the Omnibus Budget Reconciliation Act of 1993, Congress, looking for ways to raise non-tax revenues, ordered the FCC to start auctioning off radio spectrum to the highest bidder. As they might say on the television program "The Price is Right," the first items up for bid are PCS licenses. So it was the combination of an irresistible idea and the prospect of billions of dollars in revenues that broke through the "it won't happen here" mentality.

PCS technology is developing so fast that we are now far beyond the CT-2 concept. CT-2 was essentially a cordless telephone that you could take with you when you left the house. When you were home you would have used a CT-2 handset exactly as you use any cordless telephone. But away from home, you would have been able to use it to make calls any time you were within range of a "public base station." The concept called for public base stations to be installed in restaurants, shopping malls, on telephone poles—anywhere that people might commonly want to use a telephone. There would be an extra charge for the use of the public base station link to the public switched telephone network.

The CT-2 rollout in the U.K. has not been a success due to a variety of factors, and we probably will not see it here in that form. The slow start of CT-2, however, has not dampened enthusiasm for PCS, which will be so much more than untethered telephones. In fact, there is no firm definition of PCS, and that is deliberate. The FCC calls it a combination of voice, data, and imaging wireless technologies.

If you want to get an idea of what PCS will be, pay attention to advertisements now running for things such as personal digital assistants. These palm-size computers that you write on with a special stylus will soon offer built-in wireless modems, enabling you to be connected to the host system of your choice through the public switched telephone network.

You could be sitting on a park bench and upload a spreadsheet to your office or download your appointment calendar.

Better still, pay attention to some marvelous ads now being run by AT&T. Each ad asks, "Have you ever . . . ?" and describes activities such as paying highway tolls without stopping at the toll booth, or carrying your entire medical history with you on a credit card. Each ad concludes, ". . . you will." This series of ads gives us a glimpse of the communications technologies of the near future, many of which will fall under the banner of PCS.

If you want to get into the PCS business, you will have plenty of opportunity and plenty of competition. The FCC will be auctioning off 2,562 PCS licenses. And do not think that you could never possibly compete with big guys such as AT&T, the Regional Bell Operating Companies, and cellular companies. The FCC is very conscious of the need to enable small businesses, rural telephone companies, public safety, and also minority and women applicants to successfully acquire licenses.

To carve up the country for the purpose of issuing PCS licenses, the FCC has chosen to use market areas that have already been defined by the *Rand McNally Atlas*. There are two kinds of market areas: Major Trading Areas (MTAs) and Basic Trading Areas (BTAs).

There are 51 MTAs. An MTA is roughly the size of a state, but it is not bounded by state borders. The FCC is going to auction off two licenses in each MTA. Each license will encompass a 30 MHz block of spectrum.

There are 492 BTAs. A BTA is much smaller than an MTA, defining a very local market. The FCC is going to auction off five licenses in each BTA. Four of the licenses will encompass 10 MHz blocks of spectrum; one will encompass a 20 MHz block of spectrum.

A 40 MHz block of spectrum will be allocated for unlicensed devices. Here is where we will almost immediately begin to see wireless PBXs (switchboards), wireless LANs (Local Area Networks), and pico-cellular telephone systems within buildings and on campuses. Remember our description of CT-2 above? Cellular companies are already talking about wireless telephones or data terminals that can access in-building and campus coverage systems without charge and then shift to tariffed service when the unit is taken out of range of its home network. It is exactly analogous to CT-2, although cellular companies plan to offer such service on their existing cellular spectrum.

So has "auction-mania" now set in? Can we expect to see other major spectrum dislocations so as to create additional auctionable spectrum? Just a few

months ago I thought it was virtually certain that the absence of usable, vacant spectrum meant that the answer had to be "yes." In the June 1993 issue I warned that the Amateur Radio Service was likely to feel the pressure to justify the size of its spectrum allocation in order to avoid having some of it taken away and auctioned off. Now I am not so sure, especially over the long term.

The operative words here are "usable" and "vacant." The conventional wisdom long has been that spectrum is like land: it's all full and they ain't makin' any more of it. But recently an argument has surfaced that gives the lie to this proposition. The argument is that the technology now exists to enable us to benefit from the capabilities of broadband communications. In other words, we are on the verge of a spectrum glut!

The secret lies in the development of high-speed microprocessors coupled with digital signal processors. This marriage of technologies gives us the capability to use vacant spectrum in the microwave region to support millions of wireless devices. To continue our real estate simile, it is like saying we have now developed the ability to live and work on the surface of the oceans. Suddenly the scarcity of land is irrelevant.

Rather than my trying to explain or even summarize the argument, let me refer you to the article "George Gilder's Telecosm, 'The New Rule of Wireless,'" *Forbes ASAP-A Technology Supplement to Forbes Magazine*, March 29, 1993. The article contends that the narrowband FM model of radio communications, which is the basis for current commercial band planning and radio design, can now give way to a broadband model for which there is abundant spectrum, thanks to the ever-increasing computing power of microprocessors. The theory has been around since 1948; only now has the technology caught up to it.

This theory, of course, is bad news for the regulators, who are counting on revenues derived from spectrum auctions to reduce the federal deficit. Who would pay a high price for spectrum, when there is plenty available? The theory is also bad news for spectrum speculators, who acquire licenses for the sole purpose of "flipping" them at a later time for many times their initial investment. In short, the intrinsic value of the spectrum itself may soon be greatly reduced. The value of any particular FCC license will reside in the service offered on the spectrum.

It is too late for those microwave licensees in the 2 GHz band who now have to move to new bands to accommodate PCS. However, amateur radio may be able to hold out against commercial pressures if the concept of broadband communications finally catches on. ■



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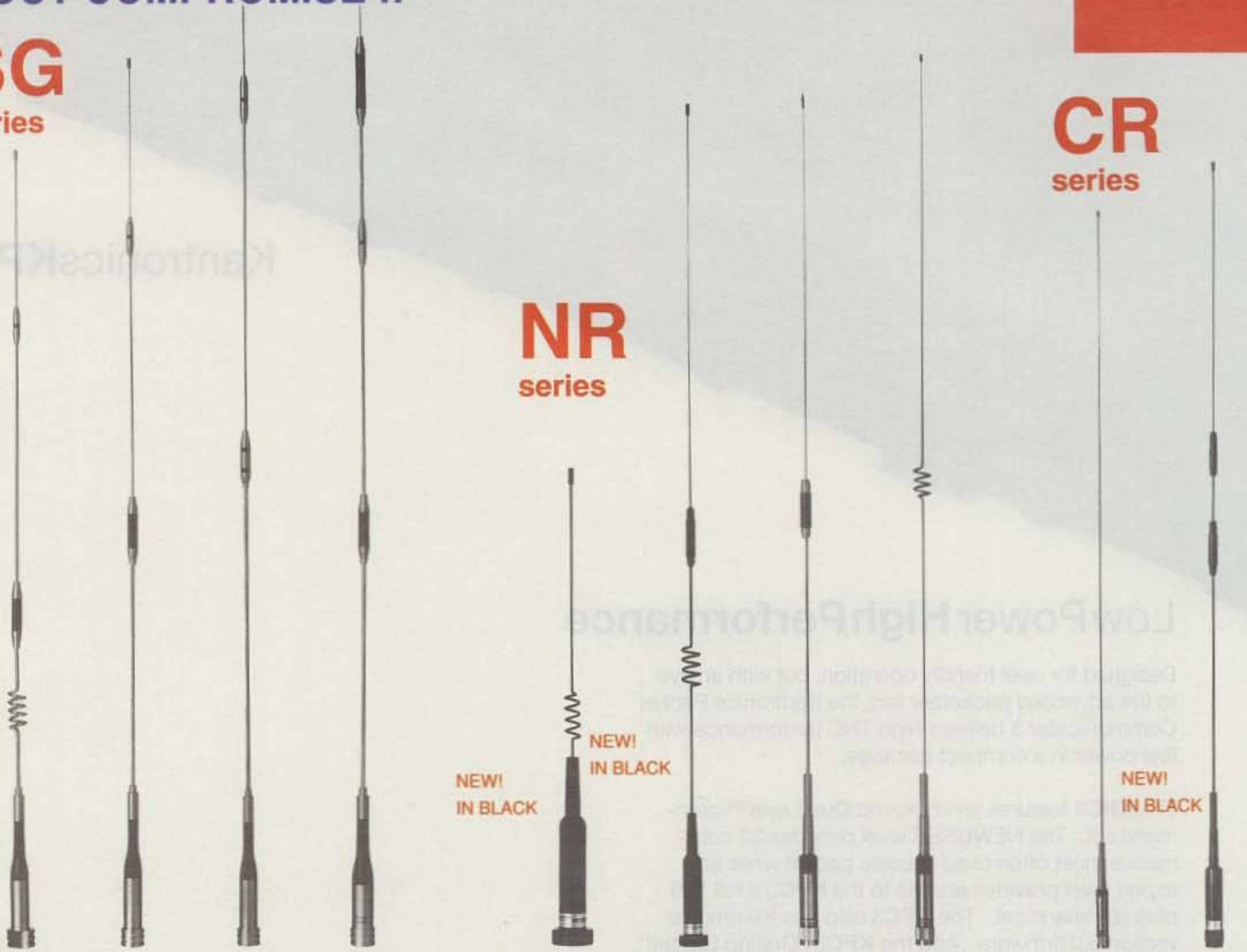
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NR-770HA	2m/70cm	3.0/5.5	200	UHF	40.2	1/2 λ, 2-5/8 λ
NR-770HNMO	2m/70cm	3.0/5.5	200	NMO	38.2	1/2 λ, 2-5/8 λ
NR-770RA	2m/70cm	3.0/5.5	200	UHF	38.6	1/2 λ, 2-5/8 λ
NR-790A	2m/70cm	4.5/7.2	120	UHF	57.5	6/8 λ, 3-5/8 λ
SG-7000	2m/70cm	2.15/3.8	100	UHF	18.5	1/4 λ, 6/8 λ
SG-7200NMO	2m/70cm	3.2/5.7	150	NMO	36.6	1/2 λ, 2-5/8 λ
SG-7500A	2m/70cm	3.5/6.0	150	UHF	40.6	1/2 λ, 2-5/8 λ

MODEL	BAND	GAIN(dBd)	POWER (w)	MOUNT	HT (IN)	ELEMENT PHASING
SG-7900	2m/70cm	5.0/7.6	150	UHF	62.2	7/8 λ, 3-5/8 λ
SG-2000	2m	5.2	150	UHF	62.6	7/8 λ
NR-140A	1-1/4m	3.8	100	UHF	36.2	5/8 λ
NR-124	23cm	8.4	100	N	25	4-5/8 λ
CR-214S	2m/1-1/4m	2.15/3.4	120	UHF	37	1/2 λ, 5/8 λ
CR-224A	2m/1-1/4m	5.0/6.0	150	UHF	68.5	7/8 λ, 2-5/8 λ
CR-320A	2m/1-1/4m/70cm	2.15/3.8/5.5	200/200/100	UHF	37.4	1/4 λ, 1/2 λ, 2-5/8 λ
NR-2000NA	2m/70cm/23cm	3.15/6.3/9.7	100	N	39	1/2 λ, 2-5/8 λ, 5-5/8 λ

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CQ REVIEWS:

The AZDEN AZ-61 50 MHz FM Handheld Transceiver

BY JOE LYNCH*, N6CL

My friend Ken Decker, WA6OSB, in San Diego, California, first alerted me to the growing interest in 6 meter FM operation in May 1990 when he told me about the increasing number of people who were purchasing surplus California Highway Patrol radios and converting them to 6 meter operation.

Last May I was exposed to just how much growth has taken place when I visited with Gracie Hastings, KK6CG, and other members of the Southern California Six Meter Club. They excitedly told me of all the activity taking place throughout southern California and in other parts of the state, as well. (For your information, if you live in the southern California area, you might want to get acquainted with this fine organization. It has monthly meetings and maintains a repeater on 52.86 MHz, minus 500 kHz offset. They also operate a net on the repeater on Thursdays at 8:00 PM PT.)

This growth is also evidenced by the sheer number of 6 meter repeaters, especially in southern California. According to Karl Pagel, N6BVU, record keeper for the SCSMC, there are in excess of 60 repeaters in that area.

This growth is evident up and down the east coast. With the recent addition of a repeater atop the World Trade Center, more opportunities to operate 6 meter FM have become available. In fact, efforts are currently underway (if not already accomplished by the time of the printing of this review) to link repeaters from the New York area to Florida. This growth has come, especially in these large metropolitan areas, principally because the higher bands are becoming saturated.

An additional attraction of 6 meters is its ability to occasionally produce DX contacts. Regularly, twice a year, in the summer and in the winter, sporadic-E propagation opens the band to contacts as far as 1300 miles in distance. With the occasional exception of 2 meters, other VHF bands do not present these operating

possibilities. Additionally, ground-wave contacts can be made in excess of 200 miles.

Seeing an opportunity to enter this niche market, AZDEN last year introduced the AZ-61 handheld FM transceiver. In a movement away from compactness, this unit measures 7" x 2⁵/₈" x 1¹/₂" in size. Attesting to its ruggedness, it weighs in at nearly one pound! It comes with a wall charger that plugs into either the battery or a charger stand. It also comes with an 8¹/₄ inch long flexible helical whip antenna.

The AZ-61 is part of a family of handhelds that includes a model for 2 meters (AZ-21) and one for 10 meters (AZ-11). It features 40 channels of memory (divided into two sections, A and B); built in PLL tones; a momentary backlit readout; high and low power through a switch on top of the radio (I like this convenience!); a keyboard lockout, also through a switch on top of the radio; a programmable battery saving mode; and compatibility with other brands of external speaker/mics through corresponding jacks, also located on top of the radio. It also comes with a user-installed belt clip and hand strap (also user installed). And for those of you who must operate those weird split frequencies, you can program it for practically any split you want.

The memory of the radio is kept by a built-in lithium battery. Typical life expectancy of these batteries is five years. However, when it is time to replace this battery, you will have to contact AZDEN.

Other optional accessories include an extra battery back, a soft carrying case, a commercial-grade waterproof speaker/microphone, a 4 foot long telescoping whip antenna, and a DC cord for plugging the unit into the cigarette lighter in the car.

Out of the box the radio is programmed for 51.000 MHz, which is the Japanese calling frequency. Because of this, the new owner is required to immediately learn how to reprogram it in order to operate on the American calling frequency of 52.525 MHz. This brings me to my only contrary comments about the radio.



The AZDEN AZ-61 is an excellent handheld for 6 meter FM operation. With its many features you will never run out of neat things to discover about this radio.

As a writer, one of my strong interests in reviewing a product is examining its documentation. Unfortunately, I have to say that regarding the AZ-61, the documentation is not good. And it is disappointing to see this from a company that prides itself on a quality product, which the AZ-61 definitely is.

However, here are the criticisms. The manual supplied with the AZ-61 is for the AZ-21, a 2 meter model. When I opened the box and saw the manual, I thought that the wrong one was shipped with the unit. I called AZDEN and was advised that the correct manual had been shipped. I told them that having the wrong manual presented some problem in understanding how to use the radio because of the

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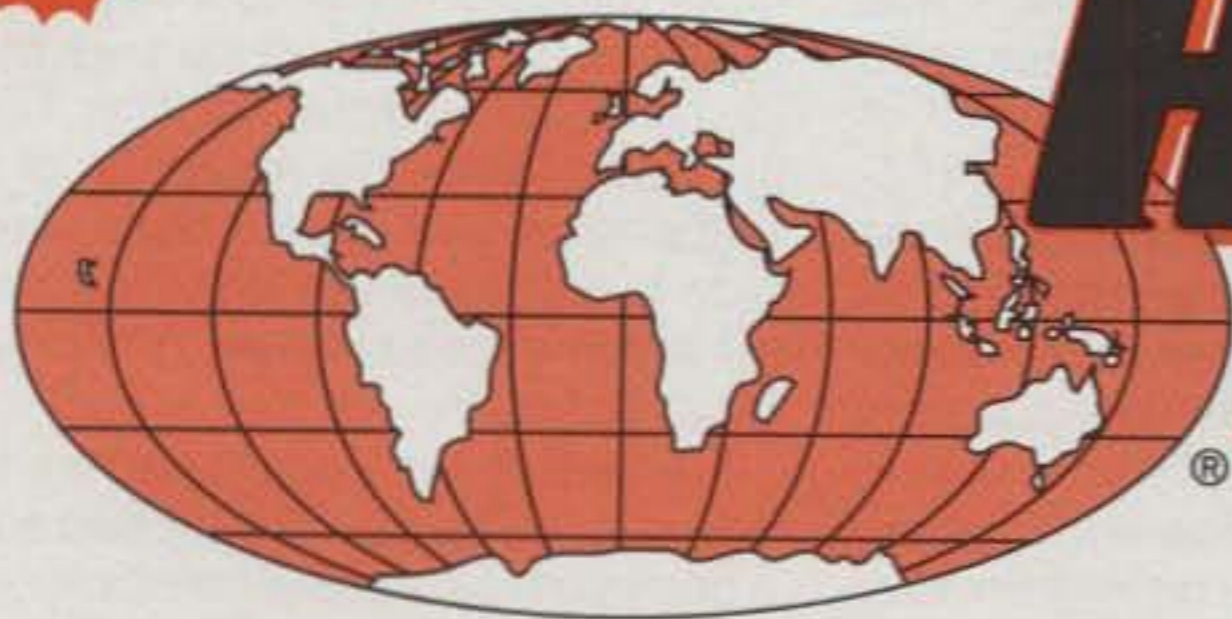
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dissimilarity between the two radios. They advised me that they were aware of the problem and had apprised the home company in Japan.

As stated, because the two radios are not the same, programming them is also not the same. Therefore, AZDEN supplies an addendum in order to use the 2 meter manual for the 6 meter radio. (According to the addendum, the 2 meter manual is to be used for the 6 meter radio and the 10 meter radio!) They also supply a fact sheet that is entitled "How to Program AZDEN Handhelds in Memory Mode."

Neither item, however, replaces the need for a separate manual for the other radios. The illustrations throughout the manual are for the 2 meter radio, and the reader must interpolate them for his or her radio, which is confusing, at the least. Because of these problems, I rarely looked at the manual during my review of the radio. And even when I did, I found the information disorganized and hard to follow, principally because of this interpolation problem.

Nevertheless, having made these criticisms of the manual, I must say that most of us usually pay little regard to it. We open the box, grab the radio, put it together, and see how quickly we can make a contact with it. There is probably nothing wrong with that approach to this radio, because there is little that you can do to get into trouble with it.

How does the radio play? Once you master the programming of it, the radio becomes fun and very versatile. I have come to expect tinny, over-modulated sounds from handhelds. However, I was pleasantly surprised to hear just how good it sounds, both on receive and to the other operator on transmit. The ability to program so many different aspects of the radio also makes it quite attractive. You can change the way it scans the memories by alternating between memory banks. You can change the time setting for the automatic power off and the battery saving timer. And you can do much more.

As mentioned, the radio's size is a departure from the trend of super compactness. This is a pleasant surprise to those of us who need a bigger radio in order to see all those tiny buttons and the microscopic readouts.

Here are a couple of hints in using the radio. Occasionally, one of those SSB operators will want to try out his radio on FM. He will get on the calling frequency and start making some noise. You, as a handheld operator, can certainly work him. However, you might find yourself cross-polarized. Therefore, hold the radio so that the antenna is horizontal with respect to the earth. Then turn around in a small circle until the signal of the station peaks. You now have optimized your antenna for direction and polarization.

Propagation of the signal of a DX sta-

tion may take on peculiar characteristics. Often signals propagated via sporadic-E will come in at unusual angles and polarization. Tropospheric propagation, on the other hand, tends to hold its polarization. However, you may not be sure of the polarization of the distant station. Therefore, in order to improve reception of the distant station, you should tilt the radio from side to side until the signal peaks, thereby again optimizing the antenna for the best reception.

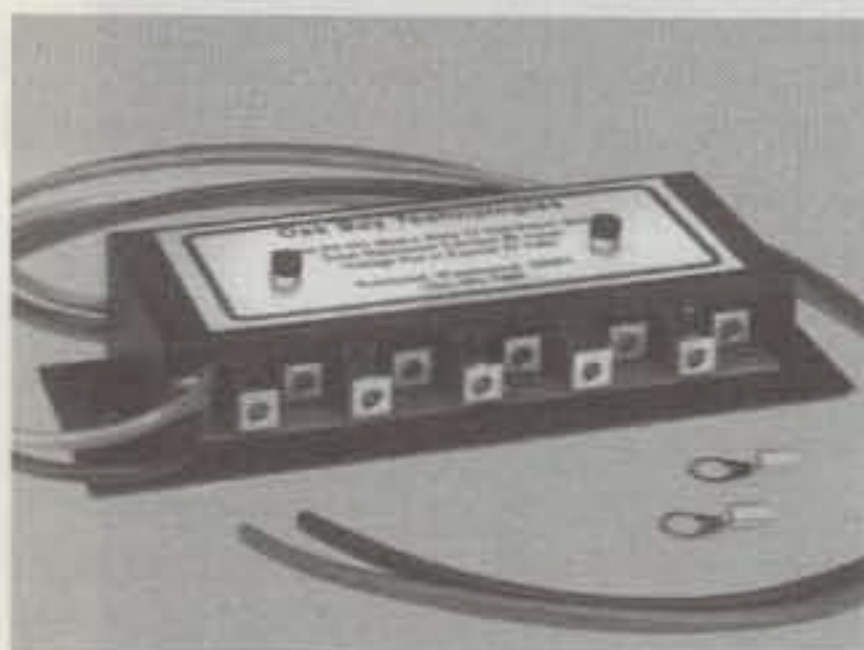
Regarding working DX and the supplied antenna, because the supplied antenna is a compromise in size and efficiency, if you are serious about working DX, you might want to connect the radio to a base antenna, or at the least, to the optional telescoping whip antenna. When the band is open via sporadic-E, the 5 watts in the radio plus a base antenna is more than adequate to work 1300 miles or so.

Did I say that I enjoy using the radio? I certainly do! You will also enjoy owning one of them. Who knows? When the band is open, I may just be talking with you via this radio.

The AZ-61 is available directly from AZDEN, 147 New Hyde Park Rd., Franklin Square, NY 11010 (phone 516-328-7500, FAX 516-328-7506). The price is \$379.00, plus shipping. The unit is also available from a small (but growing) number of dealers. Contact AZDEN to find out if a dealer near you carries it.

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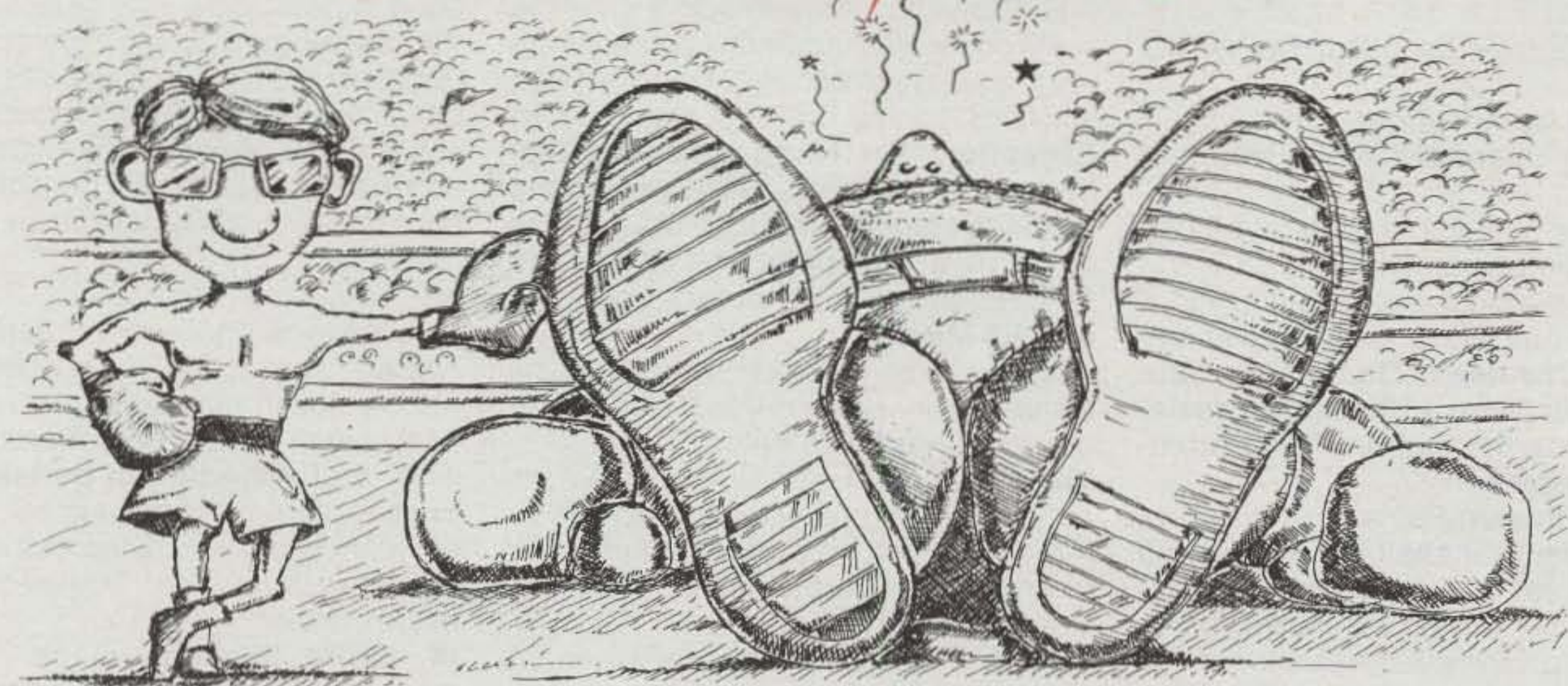
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SSB: March 26–27, 1994

CW: May 28–29, 1994

Starts: 0000 GMT Saturday Ends: 2400 GMT Sunday

I. Contest Period: Only 36 hours of the 48 hour contest period permitted for Single Operator stations. **Off periods must be a minimum of 60 minutes in length and clearly marked in the log.** Multi-operator stations may operate the full 48 hours.

II. Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 1.8, 3.5, 7, 14, 21, and 28 MHz bands may be used. No WARC bands.

IV. Type of Competition:

1. Single Operator (Single Band and All Band)

(a) Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. **Only one signal is allowed at any one time. The use of DX spotting nets or any other form of DX alerting assistance places the station in the multi-single category.**

(b) **Low Power:** Same as 1(a) except that **output power shall not exceed 100 watts.** Stations in this category will compete with other low-power stations only.

(c) **QRP/p:** Same as 1(a) except that **output power shall not exceed 5 watts.** Stations in this category will compete with other QRP/p stations only.

(d) **Assisted:** Same as 1(a) except **the use of DX spotting nets or other forms of DX alerting is permitted.** Stations in this category will compete with other Assisted stations only.

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).

(b) **Multi-Transmitter:** No limit to transmitters, but only one signal and running station allowed per band. *Note:* All transmitters must be located within a 500 meter diameter or within property limits of the station licensee's address, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers.

V. Exchange: RS(T) report plus a progressive three-digit contact number starting with 001 for the first contact. (Continue to four digits if past 1000.) Multi-transmitter stations use separate numbers for each band.

VI. Points:

A. Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz and six (6) points on 7, 3.5, and 1.8 MHz.

B. Contacts between stations on the same continent but different countries are worth one (1) point on 28, 21, and 14 MHz, and two (2) points on 7, 3.5, and 1.8 MHz.

Exception: For North American stations only—contacts between stations within the North American boundaries count as two (2) points on 28, 21, and 14 MHz and four (4) points on 7, 3.5, and 1.8 MHz.

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

VII. Multiplier: The multiplier is the number of different prefixes worked. A "PREFIX" is counted only once regardless of the number of times the same prefix is worked.

A. The letter/numeral combinations which form the first part of the amateur call will be considered the prefix. Examples: N8, W8, Y22, Y23, WD8, HG1, HG19, WB2, WB200, KC2, KC200, OE2, OE25, U3, GB75, ZS66, NG84, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign portable. The portable prefix must be an authorized prefix of the country or call area of operation. In cases of portable operation, the portable designator would then become the prefix. Example N8BJQ operating from Wake Is. would sign N8BJQ/KH9 or KH9/N8BJQ, and KH6XXX operating from Ohio would not sign /KH8 which is normally assigned to American Samoa, but could sign /W8, /N8, /K8, etc., or any other prefix authorized for use in the US 8th district. Portable designators without numbers will be assigned a zero (Ø) after

the second letter of the designator to form the prefix. Example: N8BJQ/PA would become PAØ. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ, RAEM would count as RAØ, etc. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

B. Special event, commemorative, and other unique prefix stations are encouraged to participate.

VIII. Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on the band multiplied by number of different Prefixes worked. (See VII.)

2. Multi-Operated stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

3. A station may be worked once on each band for QSO point credit. However, **prefix credit can be taken only once** regardless of the number of different bands on which the same station and/or prefix has been worked during the entire contest.

IX. QRPp Section: (Single Operator only). Output power must not exceed 5 watts. **You must denote QRPp on the summary sheet and state the actual maximum output power used for all claimed contacts.** Results will be listed in a separate QRPp section and certificates will be awarded to each top scoring QRPp station in the order indicated in Section XI. These certificates will be marked QRPp and will show your power output. QRPp stations will be competing only with other QRPp stations for awards. All other information contained in these rules is applicable to this section.

X. Low Power Section (Single Operator only). Output power must not exceed 100 watts. **You must indicate low power on the summary sheet and state the actual maximum output power used for all claimed contacts.**

XI. Awards: Certificates will be awarded to the highest scoring station in each category listed under Section IV.

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All scores will be published. However, to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single award **only**. If a log contains more than one band, it will be judged as an all band entry, unless specified otherwise. However, a 12 hour minimum is required on the single band.

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

XII. Trophies, Plaques and Donors: SSB

Single Operator, All Band

WORLD - Stanley Cohen, WD8QDQ
U.S.A. - Atilano de Oms, PY5EG
EUROPE - Jim Hoffman, N5FA
SO. AMERICA - Ron Moorefield, W8ILC
OCEANIA - Phillip Fraizer, K6ZM Memorial
AFRICA - Peter Sprengel, PY5CC
* JAPAN - The DX Family Foundation
WORLD QRPp - Dayton A.R.A.
USA QRPp - Doug Zwiebel, KR2Q

Single Operator, Single Band

WORLD - John N. Reichert, N4RV
WORLD 7 MHz - William D. Johnson, KV0Q
EUROPE - Myron E. Crofoot, WB4VQO
OCEANIA - D. Craig Boyer, AH9B
U.S.A. 3.7 MHz - Lance Johnson Engineering
U.S.A. 7 MHz - Lewis W. Sayre, N7AVK
U.S.A. 21 MHz - Bernie Welch, W8IMZ Memorial
U.S.A. 28 MHz - Novice/Tech. only - Jon Engelhardt, KA0ZFX

Multi-Operator, Single Xmtr.

U.S.A. - Oklahoma Comm Center

Multi-Operator, Multi-Xmtr.

WORLD - Prince Georges Zulu Radio Club
NORTH AMERICA - James Dixon, NL7HI (Burt Curwen, KL7IRT Memorial)
U.S.A. - Glenn Tracey, KC3EK

Contest Expedition

WORLD - Kansas City DX Club

...

CW

Single Operator, All Band

WORLD - Terry Baxter, N6CW
U.S.A. - Steve Bolia, N8BJQ
OCEANIA - Tom Morton, KT6V
CANADA - Canadian Amateur Radio Federation (C.A.R.F.)
* JAPAN - The DX Family Foundation

Single Operator, Single Band

WORLD - Pedro Piza, Jr., NP4A
(Pedro Piza, Sr., KP4ES Memorial)
WORLD 7 MHz - William D. Johnson, KV0Q
WORLD 3.5 MHz - Lance Johnson Eng.
OCEANIA - D. Craig Boyer, AH9B
U.S.A. - Kansas City DX Club
U.S.A. 28 MHz - Walt Smith, K1DWQ
(Bernie Welch, W8IMZ Memorial)
U.S.A. 21 MHz - Wayne Carroll, W4MPY

Multi-Operator, Single Xmtr.

WORLD - Ron Blake, N4KE
U.S.A. - Austin Regal, N4WW

Multi-Operator, Multi-Xmtr.

WORLD - Roger Burt, N4ZC

Contest Expedition

WORLD - Ed Roller, K4IA

...

Combined SSB/CW

WORLD - SINGLE OP, ALL BAND - Al Slater, G3FXB Memorial
EUROPE - SINGLE OP, ALL BAND - Les Nouvelles DX Group
U.S.A. - SINGLE OP, ALL BAND - Oklahoma Comm Center

Club (SSB & CW)

WORLD - CQ Magazine
U.S.A. - Oklahoma DX Assn.

* Donor is responsible for this trophy.

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

XIII. Club Competition: A trophy will be awarded each year to the club or group that has the highest aggregate score from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area. **(Exception: DXpeditions especially organized for operation in the contest and manned by members.)** Indicate your club affiliation. To be eligible for an award, a minimum of three logs must be received from a club.

XIV. Log Instructions: 1. All times must be in GMT. All breaks must be clearly marked. Single operator and multi-single logs must be submitted in chronological order. Multi-multi logs must be submitted chronologically by band.

2. Prefix multipliers should be entered only the FIRST TIME they are contacted.

3. Logs must be checked for duplicate contacts, correct points, and prefix multipliers. Duplicate contacts must be clearly shown. Computerized logs must be checked for typing accuracy. Original logs may be requested if further cross-checking is required.

4. An alpha/numeric check list of claimed PREFIX multipliers must be submitted with your log.

5. Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition, and the contestant's name and mailing address in BLOCK LETTERS.

Also submit a signed declaration that all contest rules and regulations for amateur radio in the country of the contestant have been observed.

6. Official log and sample summary sheets are available from CQ. A large self-addressed envelope with sufficient

postage or IRCs must accompany your request.

If official forms are not available, you can make your own.

7. Contest logs may be submitted on disk. Logs submitted on disk must contain all required information (Time, Band, Call, RST & NR Sent, RST & NR Rcvd, Multiplier, and QSO Points). Files must be in ASCII format and in chronological order for single operator and multi-single entrants. Multi-multi entrants should submit logs chronologically by band. Other file formats (.bin, .res, .dbf, .wks) are acceptable. A sorted multiplier file is also required. Only MS-DOS compatible disks will be accepted (either 5 1/4 or 3 1/2 inch). A written summary sheet must accompany the disk, showing all required scoring information, the category of competition, off times, and the normal signed declaration, as well as your name, address, and a phone or FAX number where you can be reached. The original log may be requested for cross-checking.

XV. 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 QSOs or multipliers will be deemed sufficient cause for disqualification. (Incorrectly logged calls will be counted as unverifiable contacts.) An entrant whose log is deemed by the WPX Contest Committee to contain a large number of errors may be disqualified as a participant operator or station for a period of one year. If within a 5 year period the operator is disqualified a second time, he will be declared ineligible for any CQ contest awards for a 3 year period. The use of non-amateur means to solicit contacts during the contest period is considered unsportsmanlike and will result in disqualification of the entry. Actions and decisions of the CQ WPX Contest Committee are official and final.

XVI. Deadline: All entries must be postmarked no later than **May 10, 1994** for the SSB section and **July 10, 1994** for the CW section. **Indicate SSB or CW on the envelope. One extension of up to 30 days, for legitimate reasons, may be granted if requested from the contest director. Logs postmarked after the deadline or extension deadline, if granted, may be listed in the results, but will be ineligible for any awards.**

All logs go to: CQ Magazine, WPX Contest, 76 N. Broadway, Hicksville, NY 11801 U.S.A.

Questions pertaining to the WPX Contest can be sent to: WPX Contest Director, Steve Bolia, N8BJQ, 4121 Gardenvue Dr., Beavercreek, OH 45431 U.S.A., or via packet to: N8BJQ@N8ACV.OH.U.S.A.NA.

Please remember to send in early for the WPX Contest Logs and Summary Sheets.

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CQ Reviews:

The Kantronics KAM Plus

BY BUCK ROGERS*, K4ABT

Initially, what I expected and wanted from the KAM Plus was for it to give me the benefit of an active cross-band gateway between 10 and 2 meters. Well, after several months of use I can tell you that it's a lot more than that and a lot of fun.

The first indication of what the plus meant came when I noticed that the old 27C512 (500 kByte) EPROM had been replaced in this version by a one-million byte (27C1001) EPROM. This singular addition meant there was enough room now to double the existing available features, and these are new features.

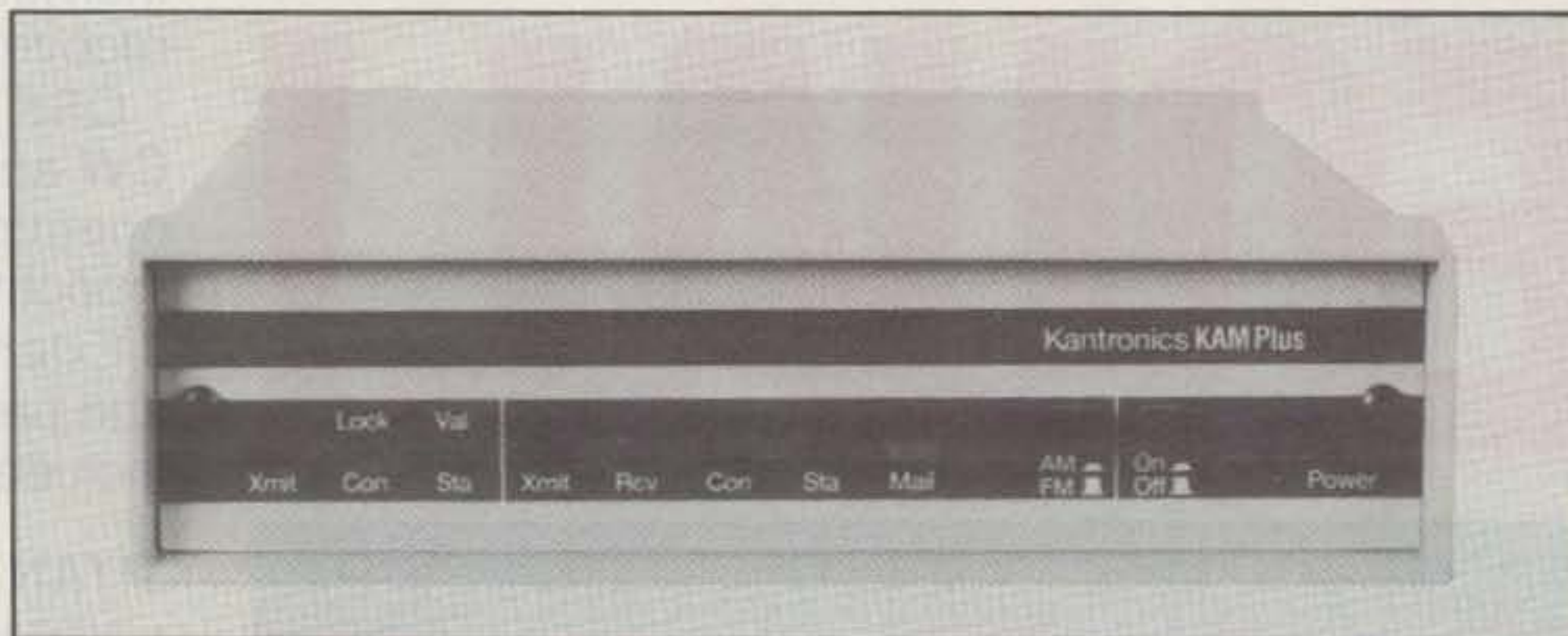
As many readers of this column know, I am enthralled with PACTOR. I really enjoy operating HF digital modes more than ever now since we have PACTOR. It has opened up HF to a new kind of digital communications that allows us to operate in an environment that is far and away more liberal than HF packet ever was. I no longer experience retry-link drops as I once did with 300 baud packet. Even collision problems are now minimized, and in general, my PACTOR QSOs are able to pass more text and graphics in a much shorter time than possible with 300 baud packet.

When I begin talking about PACTOR I sometimes forget that there are other digital modes we can use. I also know that some of you staunch HF packet users may not be too comfortable with the idea of PACTOR, as was I some time ago. All I can say to that is broaden your horizons; that's where the future is taking us.

The KAM Plus is not just another TNC. This small box is a veritable warehouse of digital controllers that is able to support the following modes: CW, RTTY, ASCII, NAVTEX/AMTEX, AMTOR (ARQ, FEC, SELFEC, CCIR 476 & 625), PACTOR, and packet.

The KAM Plus allows me to operate PACTOR on HF, and at the same time I can have a QSO on VHF packet. When we are discussing the KAM Plus and making reference to dual ports, we are not talking about the "in-use" port. We are referring to two entirely independent ports that can operate either as single addressed ports, or in concert as a gateway port from one band to another. In addition, we can use the VHF port at 1200 baud and gateway through to an HF frequency at 300 baud.

*211 Luenburg Drive, Evington, VA 24550



The KAM Plus from Kantronics.

If you are using a PC compatible with the Kantronics "Host Master" software, you may operate simultaneous multimodes, such as RTTY on HF and packet on VHF.

That Was Just For Openers

With the KAM Plus we now have a much larger mailbox (PBBS). The mailbox is user selected to over 100,000 bytes. The KAM Plus mailbox can be accessed on HF or VHF and in packet, PACTOR, or AMTOR modes. The KAM Plus as supplied now has 128,000 bytes of RAM. If you really want to have a Local Area mailbox, or just want to have lots of KANODE, and mailbox room, the RAM can be expanded to 512,000 bytes of RAM.

Remember the days when we had to set the on-board clock of our TNC every time we turned it on? That too is a thing of the past. The KAM Plus has an on-

board clock which has an internal socketed lithium battery that maintains the clock setting for the life of the battery. I'm not sure how long these lithium batteries last, but the lithium battery in my KPC-3 is still keeping the parameters and clock setting after more than a year of use. The KPC-3 uses the same kind of clock as the KAM Plus.

New User or Expert

Remember several years ago how I complained and grumbled because the command list was so long that a new user of packet was often confused by the large number of commands in his/her TNC? We can forget that problem because the KAM Plus supports all of the above. Like the KPC-3, the KAM Plus opens up with the NEWUSER command set. This is a basic set of commands that enables the new user to begin operating packet with only

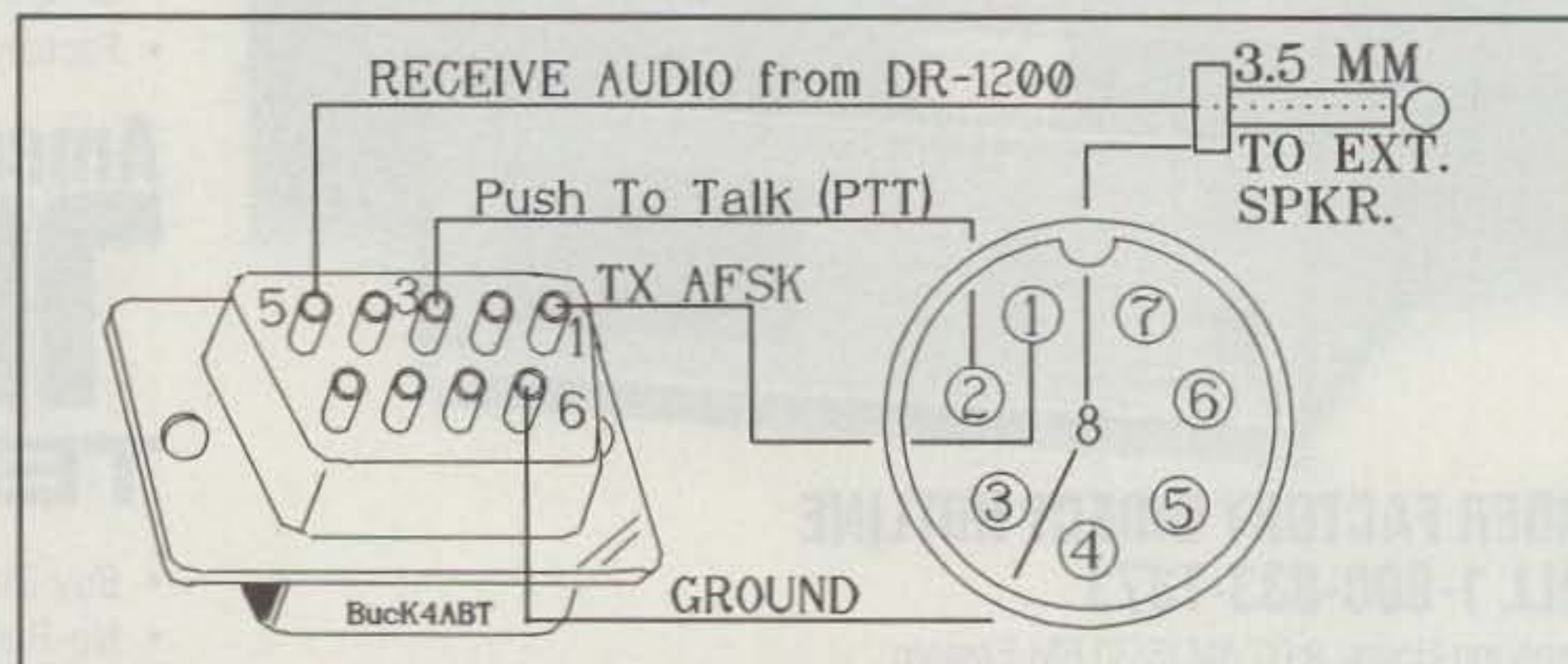


Fig. 1—Kantronics KAM/KPCs with DE-9 radio port connectors to Alinco DR-110 and DR-112.

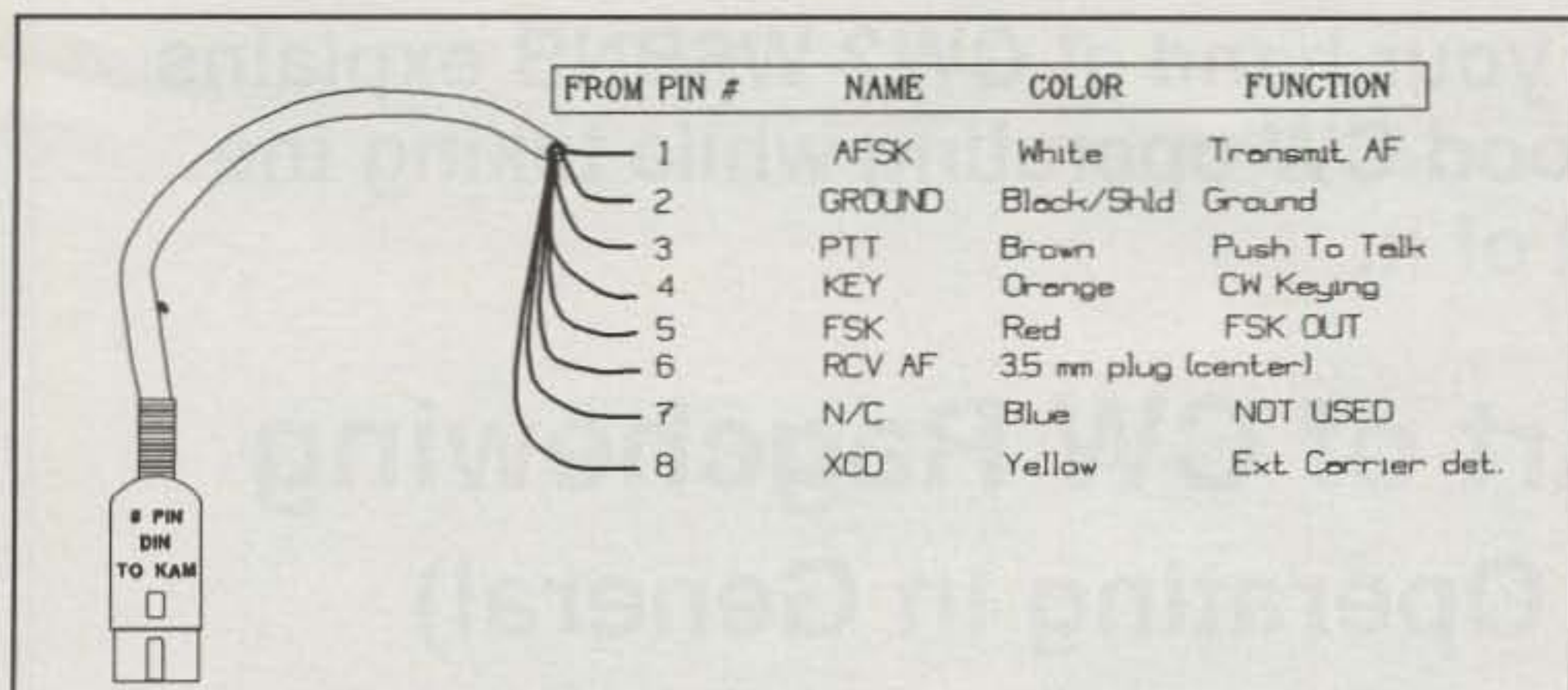


Fig. 2—Prewired HF port connector and cable supplied with the KAM Plus. User supplies connector for transceiver end of cable. See transceiver manual for "MIC" or "AUX" I/O and PTT connections. Note the colors identify the signal or function of the Kantronics supplied cable.

30 commands. After the new packeteer becomes familiar with the KAM Plus or operating packet mode, he or she may implement the extended command set of the KAM Plus.

The **INTface** command allows the user to change the initial KAM Plus setting from **NEWUSER** to **TERM** set. The **TERM** command set opens a set of over 200 commands, modes, and features. See! I told you this box is packed full of goodies.

PBBS Forwarding

The mailbox can even forward to other full-service BBSes. If you are into BBS type operation and you leave your KAM on the BBS forwarding frequency, the KAM Plus has the capability of forwarding to and receiving from other BBSes. There is a proviso that you make arrangements with the SYSOP of the local BBS to forward to and receive mail from your PBBS. This function could be a handy vehicle to receive mail from the BBS system into your mailbox after hours. The **PBFORWRD** command is used to configure your PBBS to forward to another BBS or PBBS. I usually set the PBBS call of my KAM plus to K4ABT-1. The "dash one" is the SSID that is used by most packeteers to define their mailbox and separate it from the "connect" callsign.

KANODE

Yes, the KAM Plus can perform as a node that other users may use to reach another station or node. This feature is so powerful that it can provide an entry on a VHF port and allow the user to exit into an HF frequency. The **NUMNODES** command is used to set the number of KANODE port users allowed. The number of node channels is governed by the amount of memory that is available at the time you set the **NUMNODES** command. With 128,000 bytes of RAM, that can be a bunch!

In addition to having an ALIAS or digi call, the KANODE can have a callsign separate from that entered at the MYCALL command. Usually the KANODES use an SSID of -7. The dash seven is in fact the default SSID that is applied by the KAM Plus firmware. If I enter my callsign with the MYCALL command, the KAM Plus will automatically apply the -7 to my call for use with the KANODE channels. Thus, my KANODE call would be K4ABT-7.

Gateway

I've already touched on the gateway feature of the KAM Plus, and how it enables the KANODE user to enter from a VHF frequency and exit into an HF frequency (or vice-versa). The gateway of the KAM Plus also has its own access callsign. A gateway callsign may be set to an SSID of -3

to keep it separated from the KANODE or the PBBS callsign.

To access the gateway, the user simply uses the gateway call as he or she would the call of a digipeater. Even adding it in a connect path will send the user from one frequency through the gateway into another port/frequency. The gateway can be disabled simply by typing the command **MYGATE%**. The percent sign disables or removes the callsign and renders the gateway out of service.

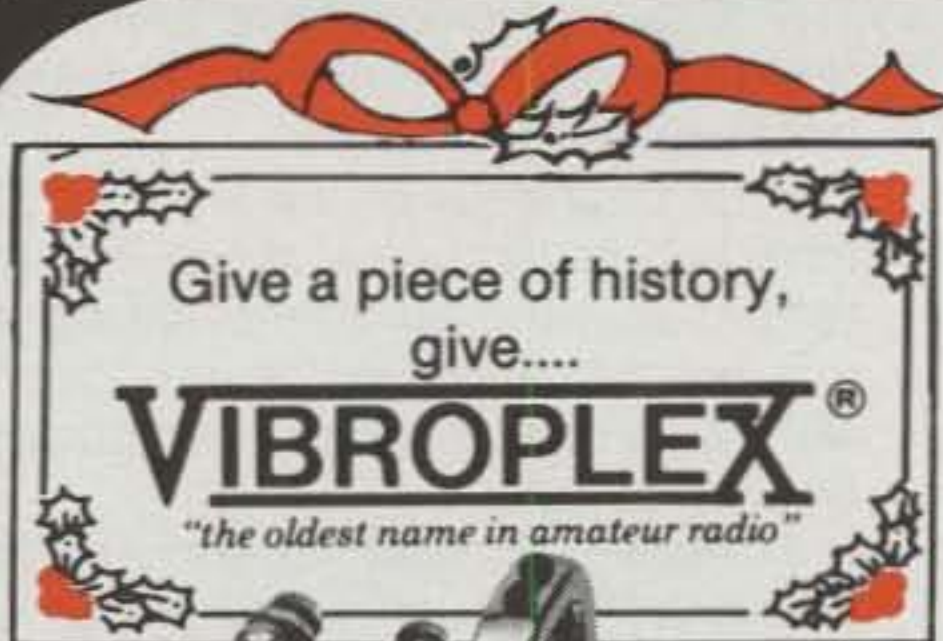
RS232 or TTL

Short and to the point, the KAM Plus, like the other Kantronics Packet Controllers, supports either standard RS232 or the not-so-standard TTL. The latter continues to support the C-64 and other TTL port computers.

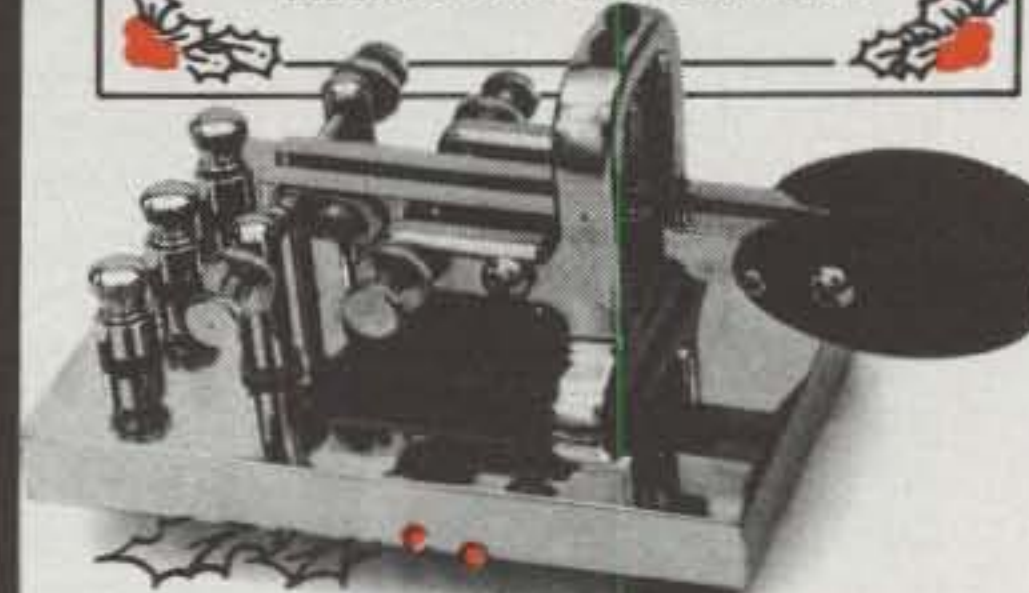
Finally . . .

The KAM Plus allows the user to configure or program the Mark and Space tones and reset the CW bandwidth and center frequency. Adding to the selectivity of the HF port is a twelve-pole, switched capacitance filter. Utilizing CMOS and other current conserving devices in the new KAM Plus, Kantronics has brought the total current consumption below 200 milliamps at 12 volts DC.

For more information about the KAM Plus, contact Kantronics RF Data Communications at 1202 E. 23rd Street, Lawrence, KS 66046 (phone 913-842-7745; FAX 913-842-2021; BBS 913-842-4678). The KAM Plus has an amateur list price of \$339.95. Kantronics also has provision for updating your present KAM to KAM Plus; write to them for details.



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Would you like to try your hand at CW? W6BNB explains the ins and outs of good CW operating while taking the mystery and pain out of it.

The Fine Art of CW Ragchewing (And CW Operating In General)

BY BOB SHRADER*, W6BNB

The advent of "no-code" amateur licensing has produced a most interesting result. Many of these new amateurs, having engineering or near-engineering training plus good computer comprehension, find that they can easily upgrade to become "know-code" amateurs. After all, as it has been said, learning code is really just developing the necessary software program in the head to properly operate the internal hardware, the brain. Then they find out what so many of us have learned over the years: code operating and communicating, when done properly, can really be FUN! Actually, ragchewing on CW by those who can handle code reasonably well is probably as satisfying an activity as any in which we amateurs can participate on the air. But you only get there by doing a lot of it. Because of the influx of other modes of communication on the amateur bands today, it begins to look like the CW ragchewer is in danger of becoming an endangered species! That would be a real pity.

HF CW ragchewing from the 160 through 30 meter bands can be really great when operators follow some simple, common-sense procedures. (Our 20 to 10 meter bands do produce some great ragchews, but these bands are mostly used for DX contacts.) These procedures apply to our new know-coders, to our relatively late comers who obtained their licenses since the FCC made real proof of code operating proficiency unnecessary, and to some of us who have been on the bands for 20 to over 60 years, but who unfortunately may have picked up some undesirable CW operating habits. The results can produce some improper, and some actually illegal, operations.

What are some of the things that we amateurs can do to qualify ourselves as

"good CW operators"? Knowledgeable old timers will agree that some basics of good CW operating and ragchewing are:

1. Make all of your calls only as long as necessary to do the job.

2. Consider how the other operator may be receiving your signals. Are they going to be weak, strong, QRMed, broken up by QRN?

3. Consider the strength of your signals as heard at the other end. Assuming a modern HF CW station will usually be running about 100 watts output, if you are running only 10 watts, then you should expect your signal to be 10 times weaker in power at the receiving end, or down 10 dB, which should be about two S-units lower than the signal you are receiving from the other station.

4. Send no faster than you can accurately receive, never faster than the other operator can receive, and always slower when signals are weak, or fading, or static crashes are loud.

5. Make sure your dots are not too "light" (short in relation to the space between them).

6. Be courteous on the air. If we treat other amateurs as we would like them to treat us, at the same time making sure that our transmissions do not interfere with other stations, then everybody will be a lot happier.

7. Above all, learn to copy code in your head! It's much more fun than having to write down everything that is sent to you. Only write enough to give you some notes on subjects to talk about.

If we want to develop a good ragchew, we must find a subject, or subjects, to discuss that interest the other operator. The first thing after the RST, QTH, name, and possibly the weather is to tell the other operator something you have done lately that should interest him or her. Then ask a question that requires some kind of an answer, such as, "What have you been doing lately that you found interesting?" After you

get the other person talking to you, try to find a common subject of interest. Some possibilities are antennas, rigs, keys used, sports, RVs, animals, birds, computers, your home, vacations taken, ham club activities, history of your location, some of your own history and experiences, service you were in, what you do or did for a living, what you are planning on doing, kids, grandkids, spouses activities, and so on. But how you first make the contact with the other operator and the first impression you give is important.

Have you ever thought about some of the on-the-air things we all may do at times and which might put us into a more or less "poor operator," or "lid," category and might prevent the development of a good ragchew? Most of these things are quite simple to correct if we are willing to make the effort. Good operating techniques will go a long way toward getting a good ragchew QSO going and producing an interesting interchange of ideas. As examples, how do you stack up on these CW operating questions?

Are my keying contacts always clean and set properly? Nasty, scratchy sounding transmitted characters will go a long way toward discouraging any QSO. The simplest method of cleaning up, or "burnishing," key contacts is to put a piece of paper between them. While they are being held together lightly, pull the paper out. Dots should be just a trifle longer than the spaces between them if watched on an oscilloscope. A bug's dots can be checked by connecting an analog ohmmeter across the leads and holding down the dot paddle. The meter needle should read slightly higher than mid-scale while the dots are being made.

Do I check my RIT before transmitting? "Receiver Incremental Tuning," if your transceiver has it, allows you to follow a drifting received signal without changing your own transmitter's frequency. If you happen to leave your RIT

*11911 Barnett Valley Rd., Sebastopol, CA 95472

control detuned several hundred Hertz from its "off" or "zero" position, when you call CQ you will be transmitting on a frequency other than that shown on your dial's readout. Any answering stations calling you on your transmitting frequency will wonder why you do not hear them. Also, if you have your RIT detuned and you answer someone's CQ, you may not be transmitting near the other station's frequency and your answer may not be heard.

Do I listen on the frequency before tuning up? As we all know from experience, when someone tunes up on the frequency of a station you are trying to copy, it is most annoying. Be sure you always move to a clear frequency when you tune up, preferably at least 3 kHz away from any signal you can hear.

Do I use a dummy load when tuning up? If possible, always tune a transmitter into a resistive "dummy" load before switching to your transmitting antenna. (Many so-called non-radiating dummy loads will transmit readable signals many miles, so don't tune up on a busy frequency.) If your antenna requires an antenna tuning device to lower the SWR, you must tune up on the air rather than into a dummy load. The use of minimum power while tuning can be doubly important—less chance of interfering with anyone and it's much easier on your transmitter.

Do I send "QRL?" before calling CQ? "QRL?" means "Is this frequency in use?" "QRL" without the question mark means "This frequency is in use; you will be interfering if you use it." You may sometimes hear old-time sea-going operators send "didit dit," which is the landline Morse letter "C," meaning "Clear?" Many past shipboard operators were landline telegraph men who eventually became amateurs and brought their very efficient and time-tested operating procedures with them to the amateur bands. You will do well to emulate most of their operating methods.

Do I ID after all on-the-air tests and tune-ups? Everyone should know that this is the law: no unidentified transmissions of RF, regardless of their length (always ID) so sayeth the FCC! (It may surprise you how often you may be called after a tune-up and an ID.)

Do I answer CQs properly? Usually it is best to have your transmitter "zero-beat" (exactly on) with a CQing station's frequency. Otherwise you and the other station will be using two frequencies and a wider portion of the band than necessary. Under normal circumstances, to answer a station calling CQ (assuming no pile-ups on DX stations), try sending the other station's callsign just once and sign your call only twice (well, maybe three times). Everyone can

recognize their own callsign quite easily through noise and QRM, but they may have trouble copying, or being sure of, an unknown call, even under fairly good conditions. (An abbreviated calling method being used by DXers is to zero-beat a CQ, and at the station's sign-over, transmit their answering callsign only once. This can sometimes cause confusion, however.) If you hear several people answering a CQing station at the same time, try moving about 300 Hz up or down in frequency. You may be the one who is most readable and will make the contact. However, once contact is made, unless it is just a short DX contact, zero-beat your transmitter to the other station's frequency.

Do I send unnecessarily long CQs? Have you ever given up on a CQing station who never seems to get around to signing? Don't do that! It's good practice to always start calling CQ with short calls—"CQ" a couple of times "DE" and your callsign twice, ending with a "K" (see below). If you receive no answer to a short call, try CQ four times DE and your call once, CQs again and sign once, CQs again, sign twice, and end with K. Also after tuning up on a clear frequency and sending your ID, it might be worthwhile to send "QRL?" and if no answer send "CQ DE" and your callsign twice. You may be surprised how many times some other station is sitting wait-

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ing on that clear frequency. Don't be afraid to call CQ. If no one called CQ, there wouldn't be any QSOs or ragchews other than schedules and nets.

Do I always use full break-in, or "QSK" if I have it? There are many times when another operator may want to break you during a ragchew: to ask a question; to tell you to stand-by while he or she is answering an incoming telephone call; to tell you to move because of QRM; to advise you of a necessary quick trip to the sand box; to say something that must be said right then; to break you while you are sending a long CQ; and so on. The Q-signal, "QSK" alone,

means "I can hear you between my sending of letters or words." But "QSK?" with the question mark means "Can you hear me while you are sending your letters or words?" If you break an operator during a QSO, don't waste time sending call signs; just send what you want to say and then send K. If you hear a CQ with "QSK" sent after the station's call sign, followed by more CQs, it means break at any time; otherwise the CQs may continue for a long time. To break a sending station send "BK" or just hold your key down for half a second. If the transmitting station stops, immediately say why you are breaking. To check if a CQing station is using QSK, send a BK

during his CQ and see if he stops or immediately signs over. Take a tip from an old-time CQ op: For best QSK reception, experiment with your receiver AF gain at about one-quarter max, and then control the received signal with your RF gain control using either fast AGC or none at all.

Do I always send some form of "K" when I sign over? Some operators will jump into operation if you hesitate at the end of a sentence. If QSK is not being used, the other station's whole following transmission may be unheard by you, and the rest of your transmission may not be heard by him. Sending "K" to the other operator says "Go ahead; start transmitting." Some operators will use "AR K," but the AR character really means "end of message." This is properly used only after the signature at the end of an actual message and is not required except when handling traffic. "KN" indicates that you are in QSO with someone and your sign-over is not the end of a CQ call. When you make what you believe will be your last transmission of a QSO, end it with the sign. This is called an "SK" just as the single character is said to be an "SOS." It is usually smart to wait for some kind of a "K" signal from the other station before you answer anyone.

Do I set my receiver at too narrow a bandwidth when calling CQ? Because many amateurs today seem not to know how to set their transmitters to zero-beat with a CQing station, set your receiver to at least 2 or 3 kHz bandwidth before you start CQing. If you hear no answers, tune your RIT control a couple of kilohertz up and down to see if someone is answering far off of your frequency. Once a station is tuned in, if you have the capability, switch to 500 Hz or less bandwidth for your QSO. Some transceivers, QRP types in particular, may not allow zero beating a CQing station. Their operators must retune each time they transmit and again when they listen if they want to make sure they are operating on or near the other station's frequency.

Do I correct all of my errors when using a key or keyboard? This is probably the worst failure of CW operators! The expectation (well, hope) is that you will be sending all of your code letters correctly. However, if you make a mistake and do not correct it properly it is most discouraging to the listening operator! If you are using a keyboard, all letters will be sent perfectly. On the other hand, if you hit incorrect letter keys and do not correct your errors, the receiving operator begins to wonder if his or her code copying ability is decaying. What a touch typist sends when the hands move off of "home" position shouldn't

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happen to a dog! If you are sending in real time on a keyboard and cannot correct your copy before it is transmitted, the best thing is to hit the space bar twice, then send an error sign (XX, or ??), and then repeat the whole word in which you made the mistake. Please, please, don't just stop after making a mistake and send the improperly made letter correctly and go on. Or if you miss putting on the last dot of a letter such as "F," sending an "R," don't just add the dot and go on as if you had not made an error! The copying operator receives your supposed-to-be "F" as "RE" which really fouls the copy. If you make an error sending the first letter of a word—make an error sign—then go back and retransmit the whole last correctly sent word before continuing. These are the only ways to correct errors to be sure you do not confuse the receiving operator. This is particularly important when handling traffic, but certainly also helps ragchews.

Do I space properly between letters and words? The letter Q should not be sent as MA, nor should MA come out Q; L should not be sent AI, nor should AI be sent as L; 6 should not sound like TH, and TH makes a very bad 6. Also, breaking up a longer word into two or three partial words can be very confusing to a listening operator. Almost all hand senders are guilty of many of these "combinations" and "word-splits" when sending CW! Be careful of your sending. Running words together in a sentence often makes it impossible for the receiving operator to decipher the message, particularly if you use a lot of homebrew abbreviations.

Do I set my bug or keyer dots too fast? Fast dots may sound impressive to you as the sender, but they may result in bad sending as well as copy. Dots made too fast on a bug result in poorly formed letters (dashes too long) and produce hard to read sending. If electronic keyers are set with the dots too fast, then the dashes are also too fast, and unskilled operators make horribly spaced letters and words. Any time an operator tries to use dots that are too fast, letter spacing and word spacing are going to be bad—the sign of a lid operator, and usually the end of a ragchew.

Do I leave a 1 second space before coming back? Sometimes if you don't have your QSK turned on, the other operator, if also not using QSK, may jump in and make a transmission at the same time that you resume transmitting your comments (this is "doubling"). It really louses up everything. However, had you left a 1 second space, you might have heard the jump-in station start his or her transmission and you

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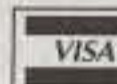
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would not have doubled.

Do I use simple words and Q-signals with foreign amateurs? Many foreign amateurs may know some English, but if you use either highly erudite words or local slang terms, they may not understand. What might have been an interesting QSO becomes just a rapidly ending contact. Ragchews with foreign amateurs are really great. Q-signals are international in meaning and can often be used to good advantage in QSOs with foreign amateurs. But be careful, as all amateurs are not familiar with too many of the 85 different Q-signals. Those which might be used in normal ragchewing are QRG, QRK, QRL, QRM, QRN, QRO, QRP, QRQ, QRS, QRT, QRU, QRX, QSA, QSB, QSK, QSL, QSO, QSV, QSY, and QTH. If you handle traffic, you should know the meanings of QSP, QSW, QSX, QSZ, QTA, QTB, and QTC. Radio textbooks will usually list the meanings of all Q-signals.

Do I use my call letters too often? You rarely have to send your call more than two or three times when answering a CQ. If the other operator can't read your call after a couple of times, it probably won't be much of a ragchew QSO! (Of course, DXers may use more calls.) Did you know that after making a contact you are required to send your call only once every 10 minutes? A wind-up timer rubber-cemented to the operating desk is a simple means of timing. Turn it to 10 minutes each time you sign your call at the end of a transmission. Sign again as soon as you see it is about to run out, or as soon as you can after it goes off. The best time to send your ID is probably when you sign over to the other station. Don't bother to ID again if a transmission takes only a couple of minutes. In such a case just send "K" (or maybe "BK," used by many operators after a question to tell you to answer). Just send your answer, assuming there is minimal QRM on the frequency. Sending the other station's callsign is not required during the whole QSO except at the sign-off, when you must send his or her call, "DE," and your call. Just be sure you ID once every 10 minutes unless the other station transmits for longer than that. Keep it simple, but legal!

Do I send unusual words only once? Things such as QTHs, names, streets, numbers, etc., should normally be repeated. Very well-known city names such as New York, Chicago, or San Francisco usually need no repeating if signals are good. (I almost always have to repeat my "Sebastopol" QTH to any first-time contact!) If repeating anything for any reason, a half-second pause may be used after the unusual word, address, or phone number, after which it can be repeated. Or, you might send

an error signal and then repeat your word.

Do I use the correct numeral 0 character? If you think it takes too much time to make the proper series of 5 dashes for a zero with a hand key, bug, or side-swiper, use the internationally recognized abbreviation for a 0—a long dash (twice as long as a "T"), which is the old-time landline Morse zero. Of course, if you are using an electronic keyer or a keyboard, you will have to send the 5 dashes, but that is no chore. After all, the difference in time between 3 and 5 dashes is only a tiny fraction of a second. To use the letter O in place of the numeral 0 can be very confusing. It is particularly unacceptable when handling traffic; it takes more time than a long dash, and it gets you into a bad habit. The O for 0 error has only developed since the advent of keyboarded CW, because on a keyboard both number 0 and the letter O look the same on the keys and it's easier to hit the O!

Do I use weird or too many abbreviations? Amateurs usually follow the plan of dropping vowel letters inside of words to make readable CW abbreviations—as examples, "oprn" for operation, "oprng" for operating, "wrds" or "wds" for words, "cm" for come or came, "hr" for here or hear, "rcvr" for receiver, "xmtr" for transmitter (x infers "trans"), "xstr" for transistor, etc. Note that abbreviations may lead to confusion if double meanings occur. Other well-recognized abbreviations are "ant" for antenna, "gnd" for ground, "VT" for vacuum tube, "em" for them, etc. Experienced operators should be sure that the receiving operator is familiar with any old-time Morse landline "Phillips Code" abbreviations that you may use before you use any of them, or there may be little comprehension on the receiving operator's part and a ragchew may end rapidly. Actually, there is not much time saved by sending a whole lot of abbreviations, and you may thoroughly confuse listening operators if you use too many. Be sure to space well before and after any abbreviations you send. Don't waste time on foreign amenities such as "DR OM" on local ragchews; just use the other operator's name, which honors him or her.

Am I ashamed to use "QRS"? The Q-signal "QRS" means "Send slower." There are many reasons why transmissions may be too fast for the other operator to copy: QRM; QRN bursts; rapid fading causing short duration dropouts; the receiving operator not able to copy at the other operator's sending speed (all too often because the sending operator has a lousy fist). No one wants to waste time sending information that is not being copied at the other end,

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-AMPLIFIERS

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<u>6-METER- 50-54 MHz</u>		
A-1015G	10	150
*A-1035G	10	350
<u>2-METER- 144-148 MHz</u>		
B-23	2	30w/o preamp
B-23G	2	30w/preamp
B108G	10	80
B-215G	2	150
B-1016G	10	160
B-2516G	25	160
B-5016G	50	160
B-1030G	10	300
B-2530G	25	300
B-5030G	50	300
*B-1060	10	600
*B-2560G	25	600
*B-5060G.	50	600

*Requires 28 Volts

REPEATER AMPLIFIERS

<u>2-METER - 144-148 MHz</u>		
B-215R	1	110
B-1016R	3-4	120
B-2516R	10-12	120
<u>1-1/4-METER - 223-225</u>		
C-211R	.3-.6	80
C-1012R	5	90
C-2512R	13-15	90

Model#	Pwr. In(W)	Pwr. Out(W)
<u>1-1/4 METER -223-225 MHz</u>		
C-22	2	20 w/o preamp
C-22G	2	20 w/preamp
C-106G	10	60
C-211G	2	110
C-1012G	10	120
C-2512G	25	120
C-5012G	50	120
C-1022G	10	220
C-2522G	25	220
C-5022G	50	220

70cm 420-450 MHz

D-15N	1	15
D-26N	2	60
D-1010N	10	100
D-3010N	30	100
D-1010ATVN	10	100 For ATV
D-100ATVN	1	52 For ATV

70 cm 420-450 MHz

D1010RN	2-4	80
D3010RN	10-12	80
D100ATVRN	.5-1	40 For ATV
D1010ATVRN	2-4	80 For ATV

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MP-3	420 to 450	5 Watts	5.50 & 150 Watts	.Functions: Power Forward
MP-4	1260-1300	1 Watt	1.10 & 100 Watts	Peak/Average and SWR

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MIRAGE Communications Equipment

so don't hesitate to request a reduction of sending speed if you are not making reasonably solid copy. When conditions are really bad, the best way to get through, even for good high-speed operators, may be to send at 10 to 15 wpm. Remember, hot-shot senders, if you won't slow down for the other guy, then YOU are the lid!

Do I use "QRZ?" properly? The Q signal "QRZ?" means "What station is calling me?" If you cannot read the callsign of a station calling you, as after you have called a CQ, then you can send "QRZ?" If you send "QRZ?" on a clear frequency instead of "QRL" a listening operator may assume you are querying some station not heard by the listening operator and you probably will get no

response. If you want another QSO after you sign off from a first, just send "CQ de" and your call once or twice, then "K." With no question mark, "QRZ W6ECU" says "You are being called by W6ECU."

Do I use too low power? If a CQing station is being received only S4 or S5, assume it is using the usual 100 watts. Try to use at least that amount of power if you can, or at least the most you possibly can when answering. If you use 1 watt to answer a 100 watt station, your signal will be down 20 dB at the other end, or about four S-units, and possibly well below the other station's receiving noise level, making copy extremely difficult or impossible. If you only have a QRP rig, be kind to other amateurs; only answer CQ calls that are being received

reasonably well unless you know the other station is also using QRP. It may be fun to make a contact with 1 watt, but it may be a real strain on the other operator's ears! Don't expect much of a ragchew in such a case—at best just a contact. However, it is interesting to reduce power output during a QSO to see how low you can go and still maintain good, solid copy. Low-power transmissions do not hold a frequency very well, however. Other stations will often pile in on top of a very weak signal. In general, stronger signals tend to make better ragchews. Of course there are places, times, and good reasons for QRP operations, but low power does not often produce the best ragchews.

Do I give useful S-meter reports? The S-meter report you give the other station may determine how much power will be used by him or her, or the sending speed used. If you always give S9 reports, the other station may reduce power and disappear on you! Always give peak S-meter readings. All signals fade at least 2 S-units, and usually 3 or 4. If the received signal has a rough tone, don't say it is a T9. It should be a T8 or T7, or if really rough, a T2! Do the other station a favor by advising when signals are not what they should be. If you are having trouble copying the other station for any reason at all, don't give an R5 report. Make it R4 at least, or even R3. A really poor sender does not deserve an R5 report!

Have I checked my sending lately? In this day and age there is really no reason why everyone doesn't know how good or bad his or her sending is. All you have to do is turn on a tape recorder with its microphone near your receiver's loudspeaker while you are talking to someone on CW and then play it back to yourself some time later. Recording a test transmission while you are thinking about your sending is not the same as when you are only thinking about what you are saying to someone else. You may not believe that it is really you doing the sending! It will pay to give this a try.

Want an interesting tip from an OT? Many "Old-Timer" operators place their earphones somewhat forward of their ears, so the phones only partially cover the front part of the ears. With the mouth closed there will be little sound heard. As the mouth is opened, the movement of the jaw bones allows a better sound path to be formed between earphones and the ear canal and more sound is heard. This forms a very useful hands-off volume control for fading on-the-air CW copying. How far your mouth is open controls how much sound can get to your eardrums. So who cares that you look like a fish out of water. Give it a try!

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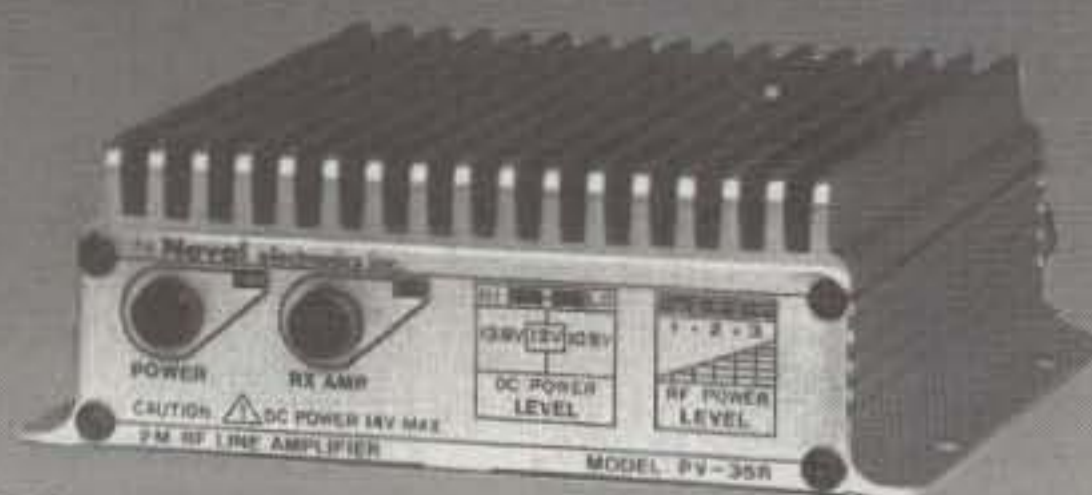
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- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES



• LOW PROFILE POWER SUPPLY

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
SL-11A	•	•	7	11	2 $\frac{5}{8}$ x 7 $\frac{5}{8}$ x 9 $\frac{3}{4}$	12
SL-11R	•	•	7	11	2 $\frac{5}{8}$ x 7 x 9 $\frac{3}{4}$	12
SL-11S	•	•	7	11	2 $\frac{5}{8}$ x 7 $\frac{5}{8}$ x 9 $\frac{3}{4}$	12
SL-11R-RA	•	•	7	11	4 $\frac{3}{4}$ x 7 x 9 $\frac{3}{4}$	13

RS-L SERIES



• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L	3	4	3 $\frac{1}{2}$ x 6 $\frac{1}{8}$ x 7 $\frac{1}{4}$	6
RS-5L	4	5	3 $\frac{1}{2}$ x 6 $\frac{1}{8}$ x 7 $\frac{1}{4}$	7

RM SERIES



MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 $\frac{1}{4}$ x 19 x 8 $\frac{1}{4}$	16
RM-35A	25	35	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	38
RM-50A	37	50	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	50
RM-60A	50	55	7 x 19 x 12 $\frac{1}{2}$	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5 $\frac{1}{4}$ x 19 x 8 $\frac{1}{4}$	16
RM-35M	25	35	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	38
RM-50M	37	50	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	50
RM-60M	50	55	7 x 19 x 12 $\frac{1}{2}$	60

RS-A SERIES



MODEL RS-7A

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-3A	•	•	2.5	3	3 x 4 $\frac{3}{4}$ x 5 $\frac{3}{4}$	4
RS-4A	•	•	3	4	3 $\frac{3}{4}$ x 6 $\frac{1}{2}$ x 9	5
RS-5A	•	•	4	5	3 $\frac{1}{2}$ x 6 $\frac{1}{8}$ x 7 $\frac{1}{4}$	7
RS-7A	•	•	5	7	3 $\frac{3}{4}$ x 6 $\frac{1}{2}$ x 9	9
RS-7B	•	•	5	7	4 x 7 $\frac{1}{2}$ x 10 $\frac{3}{4}$	10
RS-10A	•	•	7.5	10	4 x 7 $\frac{1}{2}$ x 10 $\frac{3}{4}$	11
RS-12A	•	•	9	12	4 $\frac{1}{2}$ x 8 x 9	13
RS-12B	•	•	9	12	4 x 7 $\frac{1}{2}$ x 10 $\frac{3}{4}$	13
RS-20A	•	•	16	20	5 x 9 x 10 $\frac{1}{2}$	18
RS-35A	•	•	25	35	5 x 11 x 11	27
RS-50A	•	•	37	50	6 x 13 $\frac{3}{4}$ x 11	46
RS-70A	•	•	57	70	6 x 13 $\frac{3}{4}$ x 12 $\frac{1}{2}$	48

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4 $\frac{1}{2}$ x 8 x 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 x 9 x 10 $\frac{1}{2}$	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 $\frac{3}{4}$ x 11	46
RS-70M	57	70	6 x 13 $\frac{3}{4}$ x 12 $\frac{1}{2}$	48

VS-M AND VRM-M SERIES



MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps)			ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 $\frac{1}{2}$ x 8 x 9	13
VS-20M	16	9	4	20	5 x 9 x 10 $\frac{1}{2}$	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 $\frac{3}{4}$ x 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	38
VRM-50M	37	22	10	50	5 $\frac{1}{4}$ x 19 x 12 $\frac{1}{2}$	50

RS-S SERIES



MODEL RS-12S

• Built in speaker

MODEL	Colors		Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-7S	•	•	5	7	4 x 7 $\frac{1}{2}$ x 10 $\frac{3}{4}$	10
RS-10S	•	•	7.5	10	4 x 7 $\frac{1}{2}$ x 10 $\frac{3}{4}$	12
RS-12S	•	•	9	12	4 $\frac{1}{2}$ x 8 x 9	13
RS-20S	•	•	16	20	5 x 9 x 10 $\frac{1}{2}$	18
SL-11S	•	•	7	11	2 $\frac{3}{4}$ x 7 $\frac{5}{8}$ x 9 $\frac{3}{4}$	12

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K5MR	3,803,805
K3ZO	3,734,250
N6TV	3,270,582
K3WW	2,741,200
AD5Q	2,591,172
AA5DX	2,587,154
W6EEN	2,580,768
W0AIH	2,305,200
AA3B	2,279,210
WZ4F	2,041,083
K2LE	2,018,410
K4XU	1,951,884
N7TT	1,907,308
N6EK	1,877,958
NU4Y	1,729,130
KE9I	1,559,160

28 MHz

WA2SYN	3,266
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21 MHz

KT0F	229,471
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14 MHz

KT3Y	2,285,954
K1TO	2,221,164
KE9A/4	1,735,356
W5FO	1,485,960
K2TW	1,360,320

7 MHz

KC1XX	1,507,280
W3BGN	1,309,608
KT7G	947,700
W3GH	926,544
NW6N	674,828
KT6V	641,282

3.5 MHz

K1ZM	419,340
WW2Y	352,692
WE3C	166,116
K2ONP	28,080
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K5RX	1,512,375
K2QMF	1,215,657
K9LJN	1,155,018
AB6FO	1,119,006
KG1D	722,240
NA1R	721,063
W6PYX	610,452
KN4QV	558,008

14 MHz

N8II	631,120
KN6M/5	591,408
W1WEF	540,930
K9KU	539,600
WA6UKI	534,560

7 MHz

AA6XX	248,800
NA5Q	225,250
W2UP	179,820
AA5B	124,440
AA7FK	97,384

DX

SINGLE OPERATOR ALL BAND

ZX0F	12,268,485
EA8EA	10,716,006
H28A	9,036,090
9Y4H	8,497,335
P40J	6,570,900
7Z2AB	6,282,758
VB3EJ	5,896,704
CR7M	5,670,090
4X/S59PR	5,549,112
S50L	4,849,538
5U7M	4,371,334
DK3GI	4,214,059
NH6T	4,119,024
9K2ZZ	3,837,644
G4BUO	3,827,349
LZ5W	3,737,580
7L1GVE	3,734,400
F6BEE	3,559,380
UB4OBL	2,989,425
ZL3GQ	2,952,950

28 MHz

PT0Z	162,692
OH6WZ	160,992
LY2OU	37,772
OK1BMW	24,426
VE3HX	5,969

21 MHz

US5I	2,022,828
9A1CCY	2,004,285
KG6DX	1,634,875
OH6RM	1,506,444
G4CNY	1,439,952
ER0F	1,050,776
YT9T	998,049
LZ6R	954,987
RB5IY	937,860
TU2MA	913,333

14 MHz

YW1A	4,338,567
VB7SZ	3,272,592
9A7A	2,944,350
IB9T	2,743,440
ZD8LII	2,720,610
S50S	2,667,112
ZF2NE/ZF8	2,661,140
VE1ST	2,650,484
VB5MX	2,325,473
UX9C	2,242,700

7 MHz

C47W	3,002,472
EA9LZ	2,900,436
VB7SV	2,633,142
G3LNS	2,596,320
HK1KXA	2,365,440
V7A	2,253,750
S59AB	1,769,586
UA6LAM	1,707,048
VE2FU	1,641,600
VE2ZP	1,361,388

3.5 MHz

SP7GIQ	506,532
YT0T	453,908
VB7CC	416,880
LY3BS	352,688
LY1DS	344,967
YT2WW	338,368
UB7VA	244,944
LA9HW	235,586
RA3XO	170,568
UB5LCV	159,216

1.8 MHz

T99C	64,530
SP5GH	7,680

LOW POWER ALL BAND

HA3UU	4,157,288
9V1YC	3,350,204

5Z4TT	2,919,735
ZA2A	2,815,404
NP2I	2,615,943
YB6AVE	2,559,776
TM6GG	2,175,084
CK2C	1,686,501
FH/DK5WL	1,578,064
DL1IAO	1,520,500

28 MHz

DL1VJ/T5	410,550
LU1AEE	88,893
HA8EN	26,325
OM3TEG	18,816
DK2GZ	14,946

21 MHz

3Z0KN	1,719,852
LU6BEG	1,044,072
IT9AF	669,072
S53DZD	660,334
S59DJK	502,554
S57BU	487,160
LU4FD	450,216
G3SSO	431,552
HA6NW	326,688
UW9TM	325,470

14 MHz

VO3SF	1,243,515
SV5/K5BDX	1,186,928
S58MM	1,104,520
CH6BF	535,050
HA9SU	491,486
UB5PCU	461,736
4K4POL/A	396,435
RB5ESK	387,872
UB3IQ	379,808
OK1BLC	338,015

7 MHz

PA3AAV	708,400
T91ENS	479,184
OK1FPG	350,132
OH3NXW	343,434
HG8Q	338,116

3.5 MHz

SO2FCJ	257,240
ON4ON	222,740
HA4FV	147,000
4N7MOD	117,392
S53CAB	102,076

1.8 MHz

OH3RB	33,488
DL3JSW	20,424
HA4FB	14,400
UA3VVH	8,442
UB5ZME	2,030

MULTI-OPERATOR SINGLE TRANSMITTER UNITED STATES

KQ8M	5,397,886
KW8N	4,873,665
K5XI	4,779,808
AG6D	4,538,994
N3BB	3,802,890
W8FN	2,695,480
AD1S	1,911,888
AC8W	1,900,565
KK4JF	1,288,255

DX

P44V	11,788,062
RU1A	7,321,498
TM7C	6,887,880
UZ2FWA	6,618,560
TM9C	6,298,361
9H3XX	5,773,680
EA3KU	5,248,920
S55AA	4,850,240
4N5M	4,612,140
XE7X	4,532,220

MULTI-OPERATOR MULTI-TRANSMITTER UNITED STATES

WZ1R	8,289,850
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DX

KL7Y	10,893,247
US7I	10,691,904
PA6WPX	8,375,640
CZ7Z	6,393,161

QRP/p

UNITED STATES

W2GD	A	1,023,327
AA2U	A	892,749
KN1M	A	710,980
N7IR	A	409,792
WT3W	A	103,040
N5NMX	28	1,820

DX

UB4FXX	A	806,760
XA5T	A	427,905
SM3CCT	A	414,081
DL3KVR	A	411,060
GX5QK/P	A	227,800
OH2YL	21	52,440
4N5DR	21	24,174
VB5VA	14	36,424
DL4GBR	14	21,804
SM0DZH	7	119,232
OK2BXR	3.5	62,640

MFJ halfwave vertical Antenna

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

Operate 40, 20, 15, 10, 6, 2 Meters with this MFJ-1796 ground independent halfwave vertical antenna -- no radials or ground ever needed!

It's only 12 feet high and has a tiny 24 inch footprint! You can mount it anywhere from ground level to the top of a tower -- on apartments, condos, small lots, even on a motorhome. You can take it anywhere -- vacations, field day, DX-pedition, camping, nearly anywhere you go.

Frequency selection is fully automatic -- there are no moving parts, nothing to adjust -- all you do is transmit. It handles up to 1500 watts PEP. You'll work your share of DX because its low angle of radiation really reaches out and brings in DX.

During a contest, you'll love being able to quickly work one station after another from all directions because of its omni directional pattern.

It's so easy to put together that you can have it on the air in an afternoon.

How does MFJ achieve maximum efficiency in such a compact multiband antenna?

The key is end loading -- the most efficient form of loading known. The entire length of the antenna is always radiating power. There are no lossy traps to reduce effective length.

End loading provides multiband and full electrical half wavelength on each HF band. An optimum combination of capacitive hat and inductive end loading delivers a close 50 ohm match without a lossy impedance matching network.

Efficient high-Q loading coils are wound on low loss fiberglass forms. Large 1-inch diameter aluminum radiators are used to keep losses to a minimum.

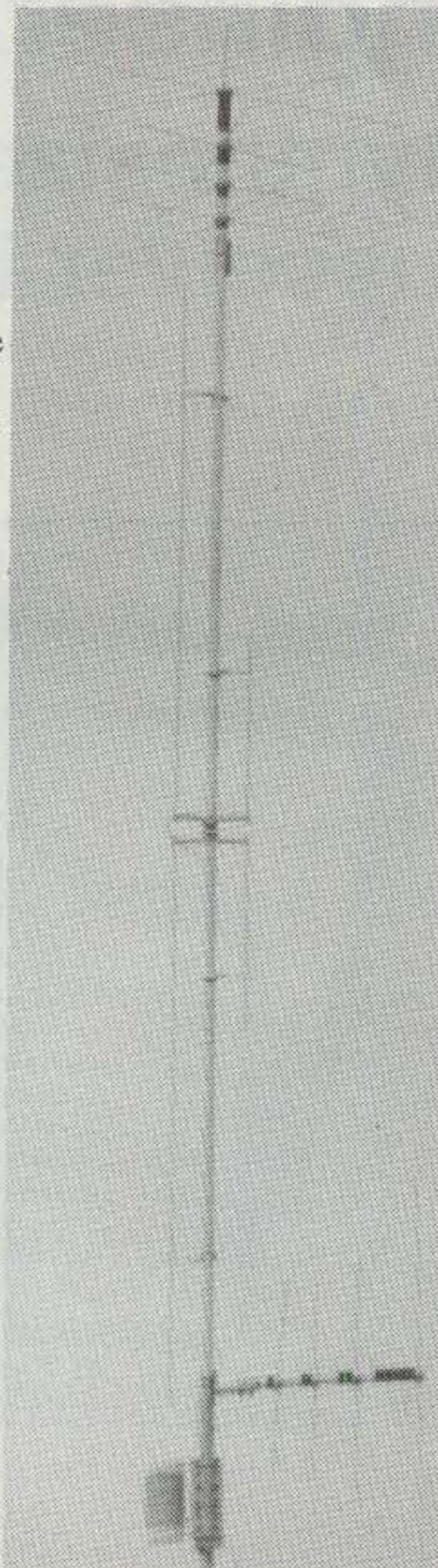
No Radials or Ground ever Needed!

The MFJ-1796 is balanced and center fed to totally eliminate the need for radials, counterpoises or a groundplane -- you don't have the kind of ground losses that's common with a quarter wave vertical.

No Feedline Radiation

There is no feedline radiation that causes pattern distortion and wastes power. The 50 ohm Teflon® coax feedline exits through the bottom radiator from a low impedance point -- the loading unit is mounted at right angles to decouple the feedline and to provide a low impedance point.

The feedline is further decoupled and isolated from



MFJ-1796
\$199⁹⁵

the antenna with a highly efficient air-wound choke balun. This attenuates RF on the outside of the coax and minimizes feedline radiation that waste power.

Easy to Adjust

It's very easy to optimize the MFJ-1796 for your favorite part of the band. Frequency adjustments are nearly independent -- adjusting one band has minimum effect on the resonant frequency of the other bands -- unlike most other multiband antennas.

Built to Last

You get an antenna built with heavy duty aluminum radiators, machined aluminum parts and stainless steel hardware.

The coils are wound on tough low loss fiberglass forms using durable Teflon® covered wire that's highly weather resistant.

Full halfwave on 2 and 6 Meters

On 2 Meters and 6 Meters, MFJ's unique stub decoupling and efficient full size halfwave elements really get you out with low angle radiation for lots of DX.

The most for your Money

For \$199.95, the MFJ-1796 gives you the most for your money--no other multiband, automatic band-switching, ground independent DX antenna even comes close.

No Matter What™ Guarantee

You get MFJ's famous one year No Matter What™ unconditional guarantee. That means we will repair or replace (at our option) your MFJ-1796 halfwave vertical antenna no matter what for a full year.

Continuing Service

MFJ Customer Service Technicians will help you keep your MFJ halfwave vertical performing flawlessly -- no matter how long you own it. Just call our toll-free help line 800-647-TECH (8324) -- an MFJ exclusive.

Made in USA

MFJ halfwave verticals are made in the USA. Help our fellow Americans by keeping our money here -- buy Made in USA.

Call Your Dealer for Your Best Price Today

Enjoy DXing and ragchewing on six bands from your apartment, condo or anywhere. Call your favorite dealer for your best price and order your MFJ halfwave vertical today!

Shortwave Regenerative Receiver Kit



Remember hunching over your regenerative receiver for hours with a pair of phones pressing uncomfortably against your ears?

You could hear just about anything that

MFJ-8100K fancy superhets could hear. Sure, you had to play around with the regeneration control just right and have a steady hand to tune but you could hear'em.

Don't you wish you could relive some of this fun and excitement of your youth -- share some of it with your kids and grandkids?

Well, you can -- with the MFJ-8100 World Band Shortwave Radio Kit.

Spend a fun evening with your child or grandchild and help him put this simple kit together. When you two finish, watch him glow with excitement as he tunes the world bands--just like you did--and remember for life.

This baby performs. An RF stage really picks up the weak ones and it goes into regeneration smoothly without pops or dead spots. Stations all over the world will come in loud and clear with just a 10 foot wire antenna.

Listen to international shortwave broadcasts, hams on SSB and CW, WWV, RTTY, packet and much more. Covers all or part of 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15, 13 Meters in five bands.

It has vernier reduction drive, bandswitch, volume and RF gain controls, uses a 9 volt battery and is built into a rugged aluminum cabinet.

Two earphone jacks let you and your child or grandchild listen together with your Walkman style earphones or plug-in speakers. 7x6x2 1/2 inches.

Order one as a gift for your child or grandchild . . . or for yourself. MFJ-8100K, \$59.95 kit; MFJ-8100W, \$79.95 wired and tested.

Teflon® is a registered trademark of Dupont.

300 KHz-200 MHz Active Antenna

Wish you could hear everything your expensive general coverage transceiver or receiver is capable of receiving?

Your ham band only antenna does great in the ham bands . . . but plug this new MFJ all band active antenna into your general coverage transceiver or receiver and you'll hear strong clear signals from all over the world from 300 KHz to 200 MHz --including low, medium, shortwave and VHF bands.

You'll enjoy up-to-the minute international shortwave newscast, ship-to-shore, airline, commercial RTTY and even military traffic. Use your data controller to receive FAX news photos, weather maps, Navtex and more.

Take it on trips and use it with your mobile or QRP rig to listen.

Also improves weak noisy scanner radio reception from low band to high band VHF -- hear signals you couldn't hear before.

A J-310 FET handles strong signals and a new noiseless feedback circuit gives you excellent low noise reception. A 4.5 GHz MRF-901 transistor lets you receive weak signals well into VHF.

Detachable 20 inch telescoping antenna. Uses 9 volt battery or 110 VAC with MFJ-1312B, \$12.95. 3 1/3 x 1 1/4 x 4 inches.

Nearest Dealer/Orders: 800-647-1800

Technical Help: 800-647-TECH(8324)

• 1 year unconditional guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • FREE catalog

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FAX: (601) 323-6551; Add s/h

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Prices and specifications subject to change © 1993 MFJ Enterprises, Inc.

MFJ-1022
\$39⁹⁵



CQ REVIEWS:

The S & S Engineering ARK 40

A 40 Meter Synthesized QRP CW Transceiver Kit

BY PAUL CARR*, N4PC

Some equipment is packaged in such a way as to provide maximum "eye appeal," and this is the case with S & S Engineering's entry into the QRP world. I had seen their ads in amateur radio publications, and I was anxious to get my hands on one of the units for review.

Circuit Description

The ARK 40 is a fully synthesized QRP CW transceiver. It is intended for mountaintopping, field day, on camping trips, or in a home station. It covers the CW portion of 40 meters and tunes in 100 Hz steps. It has RIT (receive incremental tuning) and a 200 Hz wide audio filter selectable from the front panel. The 1 watt audio output drives either a built-in 2 inch speaker or headphones, the operator's choice. The transmitter has 3 to 4 watts output, which is enough for plenty of contacts with simple antennas.

The Synthesizer

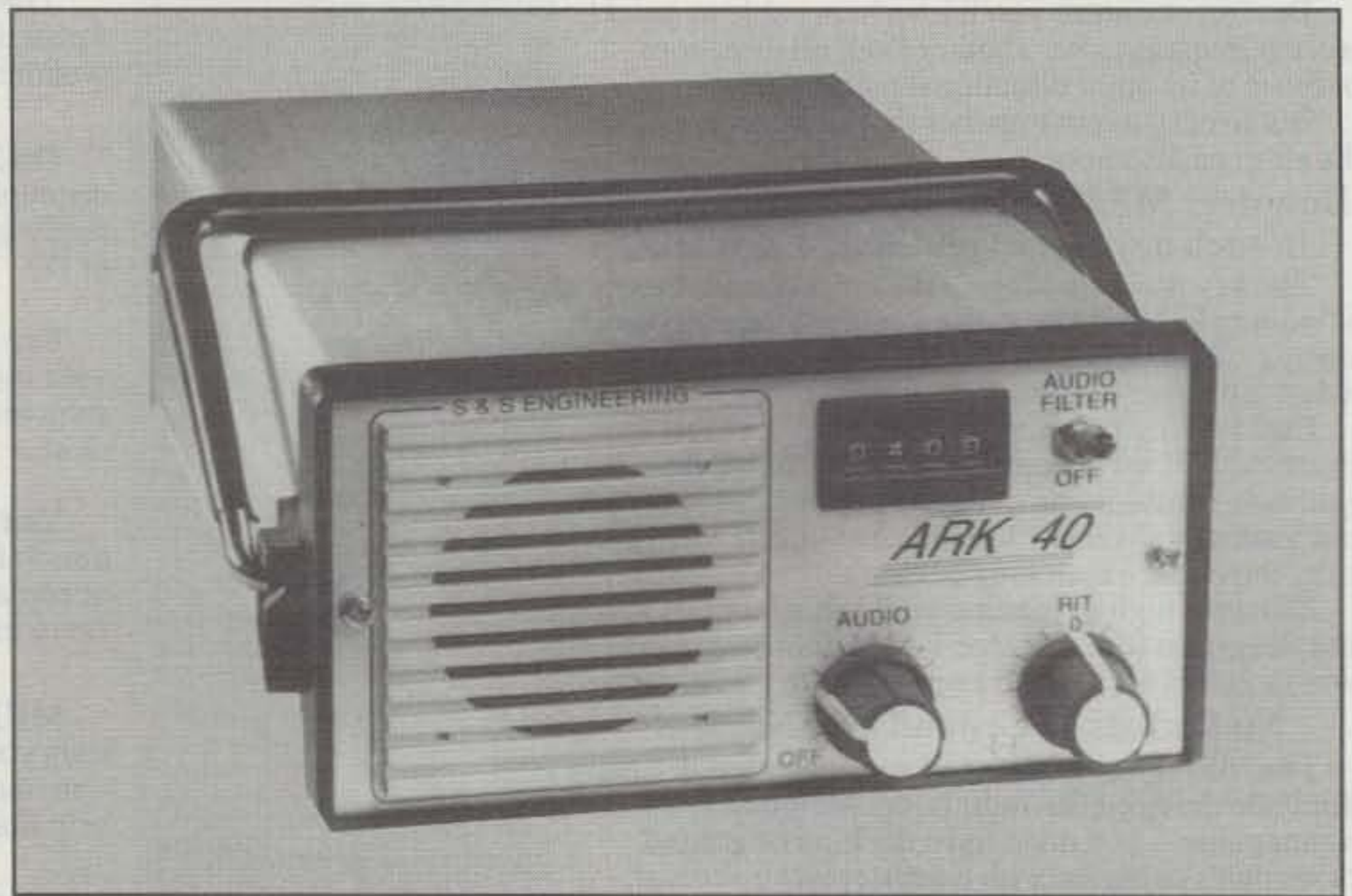
The synthesizer is the heart of the transceiver. It determines both the receive and transmit frequencies and occupies a full-size printed circuit board. The output of this board is 19.000–19.150 MHz and generates in this way. First a 4.096 crystal oscillator produces an output which is subsequently divided and processed until an output of .200 to .350 MHz results.

This signal is then mixed with an 18.8 MHz signal to produce the 19.000–19.150 MHz output. Synthesizers can be a source of noise, but not in this case. Careful attention to signal levels and filtering produces a very clean output with undesired products suppressed by 60 dB.

The Receiver

The purpose of a receiver seems simple. It takes an RF signal from the antenna and

*97 West Point Road, Jacksonville, AL 36365



Front view of the completed ARK 40 QRP transceiver.

converts that signal into audio. Then why does one receiver outperform another? In a word—design. The signals that appear on the antenna may range from kHz to GHz with widely varying levels. Additionally, there may be an undesired signal within a few kHz or so that is many times stronger than the desired signal. Now the problems begins to come into focus.

Careful attention to mixer products and gain distribution is necessary, and here is where the designers have done their homework.

The resulting signals are what you would hope for. They are clean and crisp, and the unwanted mixer products are not to be found. I found that if I encountered an unwanted signal, it was QRM.

The receiver has a four-pole crystal filter operating at 12 MHz and a bandwidth of about 600 Hz. After the crystal filter, the signal is routed to the IF amplifier. The gain of this stage is controlled by an audio-derived automatic gain control circuit.

This circuit can best be described as smooth. There are no noticeable overshoots or pops, which are common in other audio-generated feedback circuits I have used.

The signal is now routed to a multipurpose stage. Product detection and BFO generation are two functions of this stage. After the signal is converted to audio, the signal is amplified by an operational amplifier.

There is also a switch-selectable two-stage RC active filter. This filter has a bandwidth of about 200 Hz and is useful as another weapon to fight QRM.

The last stage is the audio output. The audio output level is about 1 watt.

The Transmitter

The transmitter seems very simple when compared to the other circuits. The output is a clean 3 to 4 watts, and this again is a function of careful gain distribution and excellent filtering.

MFJ HF/VHF SWR Analyzer™

... covers 1.8-170 MHz continuously ... built-in 10 digit LCD frequency counter
 ... smooth vernier tuning ...



MFJ-249
\$199⁹⁵ MFJ's newest, most versatile SWR Analyzer™ covers more frequencies than any MFJ SWR Analyzer™ -- 1.8-170 MHz continuously. It has smooth vernier tuning and a built-in 10 digit, high accuracy, high contrast LCD frequency counter that makes reading SWR in the sun easy.

This wide range MFJ-249 covers all frequencies between 1.8-170 MHz including all ham bands from 160 Meters to 2 Meters, commercial 2-way radio, police, fire, FM broadcast, military, marine and shortwave.

A velvet smooth vernier reduction drive makes it easy to set frequency precisely.

It's battery powered and handheld size. You can take it right to your antenna and work on it until it's just the way you want it.

Here's what it does ...

The MFJ-249 SWR Analyzer™ gives you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or any other equipment!

Reading SWR is automatic. All you do is plug in your antenna, set your MFJ-249 SWR Analyzer™ to the frequency you want and read your SWR -- it couldn't be easier!

Here's what you can do ...

You can instantly find your antenna's true resonant frequency right at your feedline -- that's something a noise bridge just can't do.

You can shorten or lengthen your dipole or mobile whip and see the effect immediately.

You can monitor how SWR changes as you adjust your beam or vertical -- you'll know right away if you should lengthen or shorten it.

You can see how SWR varies over an entire band ... find 2:1 SWR bandwidths ... adjust mobile antennas in seconds ... find all resonant frequencies of multiband verticals, dipoles and beams ... tune up your antenna tuner without transmitting.

You get three instruments in one

You get three instruments in one ... an RF signal generator ... a sensitive high accuracy 170 MHz frequency counter ... an SWR Analyzer™.

Has BNC connector for use as high accuracy frequency counter. Counter has four gate times, .1 Hz resolution, 1 ppm 10 MHz crystal time base with adjustable calibration.

Use 8 AA cells or 110 VAC with MFJ-1312B, \$12.95 4x2 1/2x6 3/4 inches.

MFJ-29, \$19.95, Padded carrying case with strap for MFJ-249 and MFJ-209.

1.8-170 MHz SWR Analyzer™

MFJ-209
\$109⁹⁵ If you don't need a built-in frequency counter but want 1.8-170 MHz continuous coverage and smooth vernier tuning, choose the MFJ-209.

It'll help get your antennas in tip-top shape.

Same as MFJ-249 without LCD frequency counter. Has jack for external frequency

counter. Use 8 AA cells or 110 VAC with MFJ-1312B, \$12.95. 4x2 1/2x6 3/4 inches.

MFJ Bandswitched Dip Meter™

MFJ-203
\$99⁹⁵ The MFJ-203 is a sensitive Bandswitched Dip Meter™ that covers all hams bands

from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

It's the easiest dip meter you'll ever use -- just tune for a dip. There's no sensitivity control to constantly adjust.

Saves time and takes guesswork out of winding coils, measuring inductance and

capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits. Measure Q of coils. Also use as signal generator.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B, \$12.95. 7 1/2x2 1/2x2 1/4 inches.

10-160 Meter HF SWR Analyzer™

MFJ-207
\$79⁹⁵ If you're an HF man, this compact MFJ-207 HF SWR Analyzer™ will help you build antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312B, \$12.95. 7 1/2x2 1/2x2 1/4 inches.

MFJ Antenna Resistance Analyzer™

MFJ-205
\$89⁹⁵ Need to measure the feedpoint resistance of your antenna at its resonant frequency?

Simply plug your coax into the MFJ-205 Antenna Resistance Analyzer™, find your antenna's resonant frequency by tuning the frequency control for minimum or maximum meter reading depending on your antenna. Then read your feedpoint resistance directly from its calibrated resistance meter.

It's great for designing impedance matching networks for your antenna.

Reads up to 500 ohms RF resistance and covers all ham bands 160-10 Meters.

With a conventional antenna bridge you have to constantly alternate between adjusting the null and frequency controls until you find the best null.

Jack for frequency counter. Use as signal generator. 7 1/2x2 1/2x2 1/4 inches. Use 9 volt battery or 110 VAC with MFJ-1312B, \$12.95.

2 Meter VHF SWR Analyzer™

MFJ-208
\$79⁹⁵ MFJ-208 2 Meter VHF SWR Analyzer™ finds the SWR of any antenna from 138-156 MHz.

Jack for external frequency counter. Use 9 volt battery or 110 VAC with MFJ-1312 B, \$12.95. 7 1/2x2 1/2x2 1/4 inches.

For Commercial VHF Radio Same as MFJ-208 but for commercial VHF. MFJ-217, \$79.95, covers 30-50 MHz and

MFJ-218, \$79.95, covers 150-170 MHz.

600 MHz 10 Digit LCD Counter

MFJ-346
\$189⁹⁵ Add this handy MFJ-346 frequency counter to your station and get high accuracy frequency measurements to 600 MHz with 10 digit precision. Easy-to-read 1/4 inch LCD digits don't wash out in bright sunlight like LEDs.

Compatible with MFJ SWR Analyzers™, Dip Meter™, Antenna Resistance Meter™ and Antenna Bridge™.

Four gate times, .1 Hz resolution, high accuracy 1 ppm 10 MHz crystal time base.

Use 9 volt battery or 110 VAC with MFJ-1312B, \$12.95. 4x1 1/2x5 1/4 inches.

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CIRCLE 158 ON READER SERVICE CARD

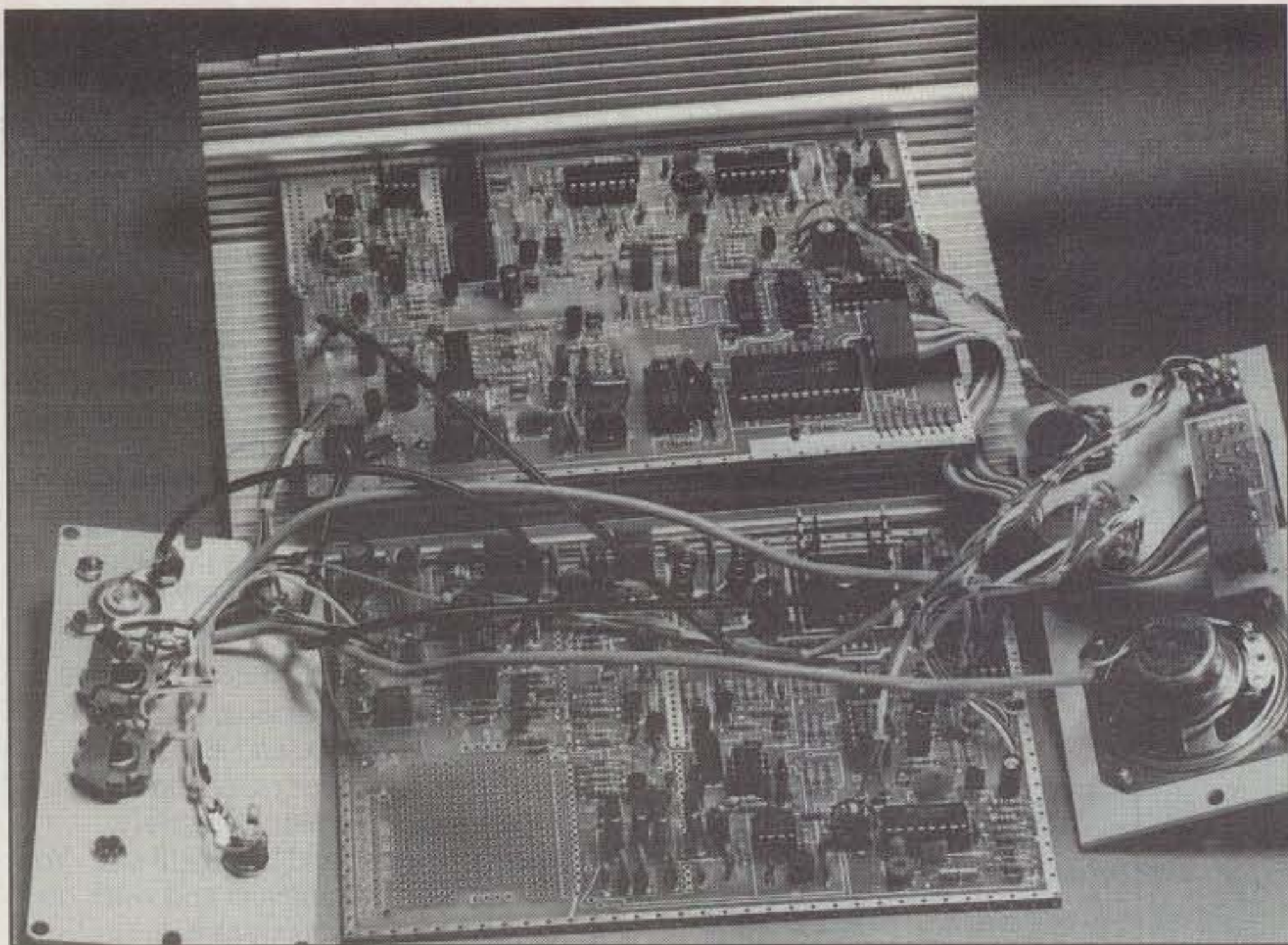
Materials

I was impressed by the quality of the printed circuit boards. These boards are G-10 epoxy with plated-through connectors, and it looks as if they could pass military specifications. The remainder of the components are very high quality, too.

It may seem strange to classify a transceiver manual as material, but your success depends on the quality of the manual. Nothing is lacking here. There are four large drawings showing parts placement. There are large, easy-to-read schematics of the synthesizer and transceiver boards. Also included are sections on circuit design philosophy.

Construction

The construction success is dependent on the manual and your understanding of it. The entire unit has more than 1000 solder connections, so a very logical procedure is required. There are two drawings which cover the installation of most of the components. The first drawing lists all the components by value, and the second drawing lists the components by where they appear on the board (R1, R2, etc.). I found it helpful to use the first drawing for inventory and the second drawing for actual component installation. As a double-check, I verified the value of each resistor with an ohmmeter prior to place-



This view shows the completed kit with all boards assembled. The author estimates about 35 hours for construction.

ment of the parts. (It's easier to get it right the first time!)

The synthesizer board is built first, followed by the transceiver board. In each case, when I completed a board, I verified each part as to value and placement. There is a second check box on the drawing beside each component value for verification.

The transceiver board is wired next using the same technique for construction and verification. This board is less complicated than the synthesizer board and requires less construction time. Be sure to verify your work.

Chassis wiring comes next. It is refreshing to connect wires after hours of stuffing components into holes on a printed circuit board. The procedure is straightforward and well documented. Again, follow the manual.

I work slowly, and my total construction time was about 35 hours.

Alignment and Testing

Alignment and testing are very straightforward. The test equipment required is a 30 MHz dual-trace oscilloscope, a VOM, a 30 MHz frequency counter with 10 Hz resolution, and a 7-7.15 MHz signal source. (A synthesized transceiver with a general-coverage receiver can be substituted for the last two items.)

The synthesizer board is aligned first. The alignment consists of adjusting various stages until the output is on the proper frequency and at the proper level.

The receiver section is next. Again, this

requires setting the BFO frequency and adjusting the various stages for proper output.

The transmitter alignment is very easy and consists of verifying that the output is at the proper level and that it has a clean sine wave output.

The alignment procedure is very easy, but the test equipment indicated earlier is required.

Test Results

I found no condition where the performance specifications were not met or exceeded. The receiver output is clean and a pleasure to hear. I received many unsolicited comments on the great keying characteristics. It is not uncommon for someone to remark that the signal sounds as if it is much more than 4 watts.

If I had any criticism, it would be about the thumb-wheel switches used for frequency selection. I am a "knob turner" myself, and this technique requires time to become comfortable. I realize that engineering is a series of compromises, and this is no exception. After a bit of use, I have adapted. On the plus side, you get direct-digital readout accurate to 100 Hz.

This unit is very rugged and very well built. I am sure it will give years of trouble-free service.

The transceiver is available from S & S Engineering, 14102 Brown Rd., Smithsburg, MD 21783. The price is \$269.95. There is an optional adjustable speed keyer available for \$39.95. A 20 meter version is also available for \$269.95.

NEC/Wires 1.0

*Why Fool Around With MININEC
When You Can Have The Real Thing?*

NEC/Wires 1.0 is the first general implementation for amateurs of the powerful and sophisticated Numerical Electromagnetics Code. NEC is more accurate than MININEC, runs faster, and handles much larger models. Only NEC can accurately predict the performance of antennas close to earth by modeling true ground losses. NEC can tell you how many elevated radials you need and how high to put them. Analyze delta loops and wire beams. Find optimal height for NVIS arrays. NEC has no frequency-offset error like MININEC, nor does it require tapered segmentation for complex models with bent wires or multiwire junctions. NEC can take advantage of left/right antenna symmetry over ground and two planes of symmetry in free space to greatly reduce calculation time. NEC can quickly and accurately model huge, interlaced, multiband, cubical quads. It automatically detects and converts tapered, telescoping Yagi elements to uniform-diameter conductors. NEC can model transmission lines in log periodics without using any segments. With 1000 segments available, it's likely you can model every antenna and conductor in your antenna farm to analyze all interactions. (NEC provides 2000 segments for free-space models with left/right symmetry.)

NEC/Wires reads AO/MN antenna files so it's easy to analyze existing models. The program features automatic wire segmentation, symbolic dimensions, symbolic expressions, transcendental functions, voltage or current sources, RLC, Laplace transform, and impedance loads, transmission lines, and skin-effect modeling. NEC/Wires plots azimuth and elevation patterns in polar or rectangular coordinates with overlays.

NEC/Wires 1.0 is \$100 for amateur use only. Visa, MasterCard, U.S. check, cash, or money order. Add \$5 overseas. NEC/Wires requires a 386+387 or 486DX, a hard disk, and VGA.

Brian Beezley, K6STI
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MFJ ACCESSORIES

Compact Speaker/Mics

Here's a Compact Speaker/Mic that fits comfortably in your hand and has a full size speaker for crystal clear audio.

No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio on transmit and receive. Earphone jack, PTT, lightweight retractable cord. Gray. 1 1/4x2x3 in.

MFJ-284 fits Icom and Yaesu.
MFJ-286 fits Kenwood.



MFJ-284 or MFJ-286
\$24⁹⁵

Mini Speaker/Mics

These tiny MFJ Speaker/Mics are so small and so lightweight you'll forget they're there -- until you get a call.

Excellent audio from electret mic element and speaker. Has swiveling lapel/pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. Tiny 2x1 1/4x1/4 in.

Order MFJ-285/MFJ-285L for ICOM, Yaesu, Alinco; MFJ-287/MFJ-287L for Kenwood; MFJ-283 for split plug Alinco; MFJ-285W for IC-W2A.



MFJ-283, MFJ-285, MFJ-285L, MFJ-285W, MFJ-287 or MFJ-287L
\$24⁹⁵

L Connector also available - order L model.

MFJ Artificial RF Ground

MFJ-931
\$79⁹⁵

Creates artificial RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020
\$179⁹⁵

Throw this tiny MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. Free manual. See free MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna...quiet...excellent dynamic range...good gain... low noise...broad frequency coverage... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, \$12.95.

\$29⁹⁵ MFJ-1024

Cross-Needle SWR Meter

MFJ-815B
\$69⁹⁵

Peak/Average Cross-Needle SWR/Wattmeter. Shows SWR, forward/reflected power in 2000/500 & 200/50 watt ranges. 1.8-60 MHz. Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

"Teflon® is a registered trademark of Dupont"

MFJ Coax Antenna Switches



\$34⁹⁵ MFJ-1701



\$21⁹⁵ MFJ-1702B



\$59⁹⁵ MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. One year unconditional guarantee.

MFJ-1701, \$34.95. 6 position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. 10x3x1 1/2 in. DC-60 MHz.

MFJ-1702B, \$21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in. MFJ-1702BN, \$31.95, N connectors, DC-1.1 GHz.

MFJ-1704, \$59.95. 4 position cavity switch with lightning/surge protection. Center ground. 2.5 KW PEP, 1 KW CW. 50 dB isolation at 500 MHz. 50 ohm. 6 1/4x4 1/4x1 1/4 in. MFJ-1704N, \$69.95, N connectors.

Dry Dummy Loads for HF/VHF/UHF

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

MFJ-260B, \$29.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 150 MHz. 2 1/2x2 1/2x7 in. MFJ-260BN, \$34.95, N connectors.

MFJ-264, \$59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. MFJ-264N, \$69.95, N connector. MFJ-5803, \$4.95, 3 ft. coax/PL-259.



\$29⁹⁵ MFJ-260B



\$59⁹⁵ MFJ-264

MFJ Low Pass Filter

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive Teflon® Dielectric Technology™ capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/RFI protection. Full legal power 1.8-30 MHz. Mounting tabs.

MFJ-704
\$39⁹⁵



MFJ Iambic Paddles

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers.

MFJ-564
\$49⁹⁵



MFJ/Bencher Keyer

The best of all CW worlds -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

MFJ-422B
\$134⁹⁵



Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4 1/8x2 5/8x5 1/2 in.

MFJ-422BX, \$79.95, keyer only for mounting on your Bencher paddle.

12/24 Hour LCD Clocks



\$19⁹⁵ MFJ-108B

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to-see. Brushed aluminum frame.

MFJ-112 shows hour/minute/second, day, month, date, year at any QTH on world map. 12 or 24 hour display. Daylight saving time feature.



\$24⁹⁵ MFJ-112

VHF SWR/Wattmeter

MFJ-812B covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4 1/2x2 1/4x3 in.

MFJ-812B
\$29⁹⁵



Code Practice Oscillator

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable. 9-volt battery or 110 VAC with MFJ-1305, \$12.95.



MFJ-557
\$24⁹⁵

Earphone jack for private practice, tone and volume controls for a wide range of sound. Speaker. Adjustable key. Can be hooked to transmitter. Sturdy. 8 1/2x2 1/4x3 3/4 in.

MFJ Multiple DC Outlet

Use your rig's 12 VDC power supply to power two HF/VHF rigs and six or more accessories with this MFJ high current multiple DC outlet.

2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 guage power cable. See free MFJ catalog for more DC outlets.



MFJ-1118
\$64⁹⁵

Write or call... 800-647-1800

Free MFJ Catalog

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FAX: (601)323-6551; Add \$6 s/h

MFJ... making quality affordable
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CIRCLE 1 ON READER SERVICE CARD

CQ REVIEWS:

The Luke Company S40 13.8 Volt Power Supply

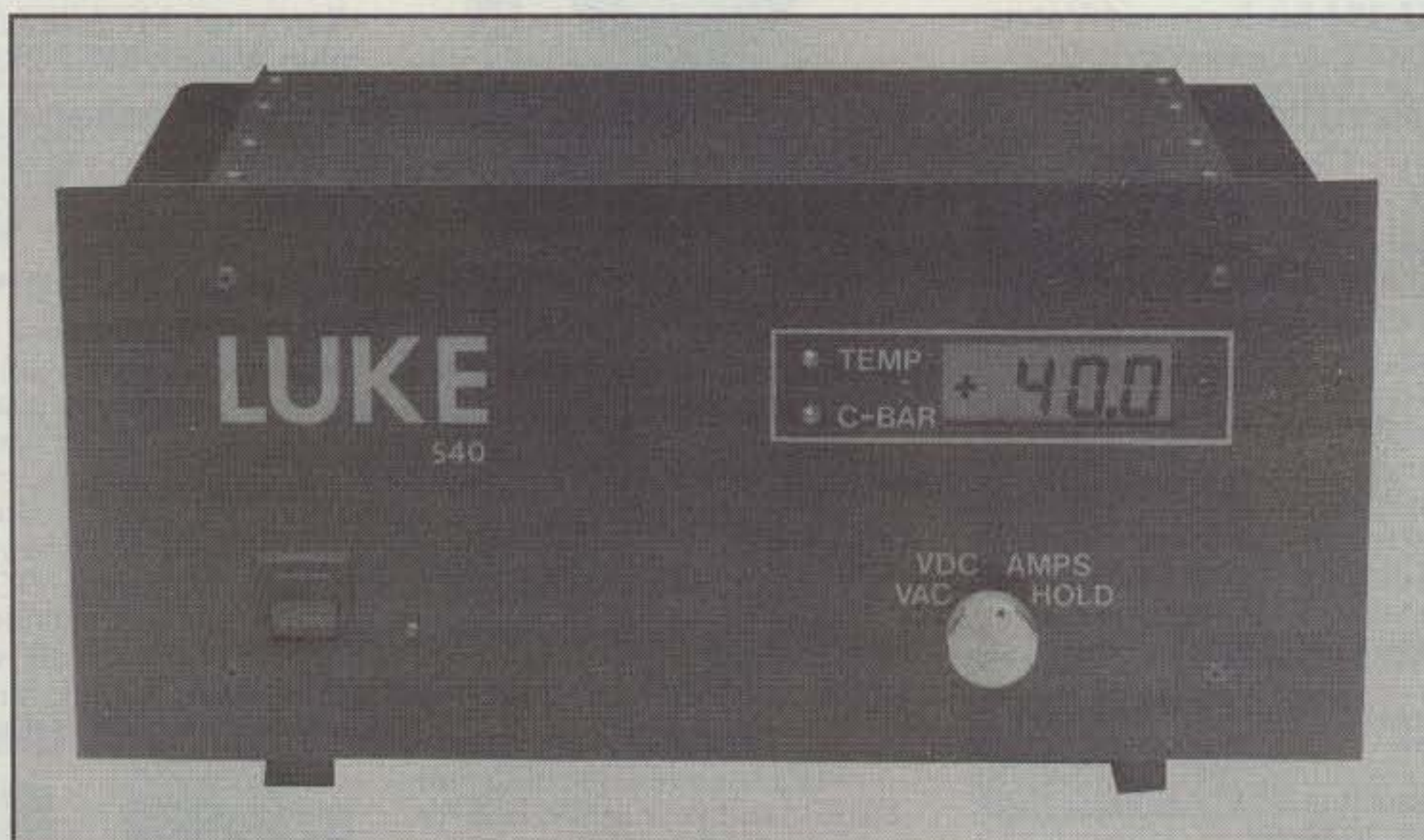
BY DOUG DEMAW*, W1FB

Perhaps nothing appears more mundane than a power supply in these days of high-tech amateur gear. But without well-engineered and reliable power supplies, our high-tech equipment will not operate. Worse still, it might be destroyed in a wink if the regulator circuit fails and allows excessive voltage to reach the equipment. Many kilobuck rigs have gone back to the dealer for repairs after a catastrophe of this type. It is because of the foregoing consideration that I am so impressed with the Luke line of regulated, high-current power supplies. They are designed to avoid destructive events of this kind.

I was pleasantly surprised to learn that a manufacturer of high-quality power supplies for the commercial and amateur markets is a mere 40 miles from my home. Both the Luke owner and engineering supervisor are radio amateurs. The owner is Jim Benedict, N8FVZ. I was greatly impressed with his knowledge of circuit design and application when I first met him. Gordon Baldwin, N8GFL, whom I have known for several years, is a top-notch, hands-on engineer who supervises the production of the Luke power supplies.

The Product Line

At this time the Luke Company manufactures power supplies for the military and commercial markets. It was just recently that Luke entered the amateur market with display ads in *CQ*. Equipment models are available for 13.8, 28, and 50 volts at continuous current ratings from 40 to 100 amps. I have the smallest of their power supplies, which is the S40 model. It delivers 13.8 volts at up to 40 amps. It supplies power to my Kenwood TS450S and TS140S and Yaesu 2 meter transceivers. Other 12 volt station equipment also is powered by the S40. It is convenient to have a single power supply handling all of the 12 volt equipment in my shack, as opposed to the old system, which required three low-current regulat-



The Luke Company S40 13.8 volt power supply.

ed power supplies. This feature should appeal to you as well.

Technical Data

I have designed and built numerous low-voltage, high-current DC power supplies during my professional career, and I have used many manufactured power supplies. However, I have never seen one as conservatively engineered as the Luke S40. It is probably the best unit I have owned in terms of quality design, safety features, and under-rated components.

The S40 has a very low noise output during a 40 amp load condition. I examined the output with my Tektronix 453 scope and measured less than 3 millivolts of noise. This was when I had a quality earth ground attached to the negative output terminal. The noise increased to 4 millivolts when I removed the earth ground—still a remarkably low level of noise at 40 amps.

I also performed a "brick-down" test by terminating the power supply with a 40 amp resistive load for 30 minutes. At the end of the period the pass transistors and heat sinks were only warm to the touch. From no load to full load the output volt-

age varied only 0.02 volt. The input voltage was then reduced from 120 to 105 volts AC, and still the DC output voltage remained at 13.8 volts, thus indicating good overall voltage regulation.

It seemed appropriate to go full measure during my tests by placing a short circuit across the power supply output terminals. For this critical test I used a heavy-duty screwdriver. After repeating this part of the test several times there were some weld marks on the shaft of the screwdriver from the momentary arcs, but the supply still operated flawlessly.

Luke's crowbar circuit uses an SCR triggered by an IC which provides a 0.75 millisecond delay. This delay helps to prevent false tripping in environments where transients occur. The large internal capacitor absorbs over-voltage events, should they occur during the delay period.

With respect to the overcurrent fold-back tripping point, Luke has set this at 1.3 times the rated output current in amperes. Also, an over-temperature sensor protects the power supply if the continuous-current rating is exceeded over an extended period. This ensures high dynamic range and peak performance for RF power amplifiers. The cooler opera-

*P.O.Box 250, Luther, MI 49656

MFJ TNCs for VHF/HF Packet

MFJ-1270B super TAPR TNC clone has a world wide reputation as *the most reliable packet TNC in the world!* Thousands used as digipeaters, nodes, BBS and in all kinds of commercial applications working 24 hours a day — many work for years without a single failure . . .

NEW ENHANCED MAILBOX

- Expandable 32K, 128K or 512K
- Separate callsign for mailbox
- Mailbox stays on during packet connects
- Auto forwarding and reverse mail forwarding
- Remote Sysop access, Sysop paging
- Chat mode, mailbox C-text
- "Has mail" LED indicator



NEW LOWER PRICES!

MFJ-1270B
\$119⁹⁵

MFJ-1274, with HF tuning indicator
\$139⁹⁵

The MFJ-1270B super TAPR TNC clone has a world wide reputation as *the most reliable TNC in the world!*

Thousands are dedicated as digipeaters, nodes, BBS and used in all kinds of commercial applications working 24 hours a day — many work for years without a single failure.

The Most for Your Money

The widely acclaimed MFJ-1270B may not be the cheapest TNC, but it gives you the most for your money. You get features that others just don't have. See for yourself . . .

Fully TAPR TNC-2 Compatible

You get full TAPR TNC-2 compatibility — all software and hardware designed for the TAPR TNC-2 standard works without modification.

You get Net Rom compatibility that turns your MFJ-1270B into a Layer Three and Four networking node and Rose Switch compatibility that gives you another networking option.

VHF and HF operation

You get high performance VHF and HF modems as standard equipment — lets you double your fun on packet.

You get a true DCD circuit that dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

FREE AC Power Supply

You get a free 110 VAC power supply at no extra cost. With other brands, the AC power supply could cost you an extra \$20.95.

New enhanced Personal Mailbox

The enhanced Easy Mail™ personal mailbox lets you use a dedicated call-sign for your mailbox. Now your mailbox can stay on while you operate packet. This new mailbox will also auto forward or reverse forward mail to and from other BBS. Plus, the "has mail" LED blinks when you have

mail. More features: remote Sysop access, sysop paging, mailbox C-text, chat mode and many other features not available in other TNCs or multimodes. The MFJ TNC mailbox memory is expandable to 32K, 128K, 512K.

WeFAX gives you Weather Maps

You get a WeFAX mode that lets you print full fledged weather maps from your HF radio to screen or printer or save to disk using an MFJ Starter Pack.

2400 or 9600 Baud Modem simply plugs in

You can add MFJ's optional internal 2400 baud or 9600 baud modem just by plugging it in and making a few simple connections.

KISS interface and MFJ Host Mode

You get a KISS interface that lets you run TCP/IP and MYSYS and MFJ's Host Mode that makes it easy to write efficient application programs.

MFJ Anti-Collision™ Technology

You get MFJ's Anti-Collision™ technology (Prioritized Acknowledgement) that prevents packet collisions to improve performance on busy channels.

Plus more . . .

You also get 32K RAM, IC sockets for easy service, true DCD for HF, 256K ROM, speaker jack, lithium battery backup, RS-232 and TTL serial ports, radio cable (you have to add a connector for your particular radio), Fast-Start™ Manual plus much more. Use 12 VDC or 110 VAC. 9½x1½x7½ inches.

One Year Unconditional Guarantee

You get MFJ's famous *No Matter What™* one year unconditional guarantee.

Enjoy Packet for a long, long time

If you want a packet TNC that'll work 24 hours a day without failure — one that has more features than any other — get the ultra reliable MFJ-1270B today and enjoy packet for a long, long time.

TNC with built-in HF Tuning Indicator
MFJ-1274, \$139.95. Same TNC as MFJ-1270B but has precision tuning indicator for HF packet — makes operating HF a pleasure. Just tune your radio to center single LED and you're precisely tuned in to within 10 Hz — and it shows you which way to tune!

New 2400 baud Turbo TNCs
MFJ-1270BT, \$209.95 and MFJ-1274T, \$229.95 have built-in fast 2400 baud modem. Lets you operate 300, 1200 and 2400 baud packet.

ACCESSORIES for TNCs

MFJ Starter Packs

An MFJ Starter Pack, \$24.95, gets you on the air instantly. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order MFJ-1284 for IBM or compatibles, MFJ-1282 for Commodore 64/128 or MFJ-1287 for Macintosh. For VIC-20 or C64/128 with tape drive use MFJ-1283, \$24.95.

Mailbox Memory Expansion Board

For all MFJ TNCs. MFJ-47A, \$49.95, 32K RAM; MFJ-47B, \$69.95, 128K RAM; MFJ-47C, \$239.95, 512K RAM. Complete with Firmware.

MFJ TNC Real Time Clock

MFJ-43, \$29.95. Ends frustration of setting TNC clock everytime you turn it on. Maintains correct time even when TNC is turned off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

MFJ TNC Firmware Upgrade Release 1.2.9

New firmware features enhanced mailbox and supports expandable mailbox up to 512K. MFJ-40C, \$24.95.

MFJ 2400 and 9600 Baud Modems

MFJ-2400, \$89.95. Operates 300, 1200 and 2400 baud packet. Works with any radio. MFJ-9600, \$109.95. G3RUH compatible 9600 baud modem. Not all radios compatible with 9600 baud. Both plug in MFJ TNCs and MFJ-1278 for easy installation.

MFJ's new TNC/Mic Switch . . . lets you switch between your TNC or microphone by pushing a button!

The MFJ-1272B **\$34⁹⁵**

is the most popular TNC/multimode accessory in ham radio! Why? Because you can switch between your microphone and packet TNC or multimode by pushing a button.

You won't have to unplug your microphone and plug in your TNC everytime you want to work packet or other digital modes.



Just plug the pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hunting for hard-to-find connectors and wiring up complicated cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors — including Kenwood, ICOM, Yaesu, Alinco and others.

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy to follow instructions. Has audio-in and speaker jacks. 3-¼ x 1-¼ x 4 inches.

MFJ-1272B, \$34.95, for MFJ TNC/multimodes and TAPR TNC-2 clones.

MFJ-1272BX, \$39.95, wired with connector for PK-232.

MFJ-1272BYV, \$39.95, wired with connector for KAM, VHF Port.

MFJ-1272BYH, \$39.95, wired with connector for KAM, HF Port.

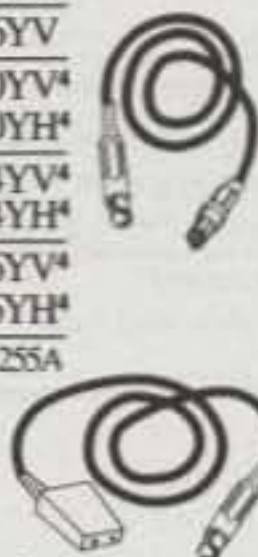
MFJ-1272BZ, \$39.95, wired with connector for PK-88.

Pre-wired Radio-to-TNC cables . . . \$14⁹⁵

	All MFJ	PK-232™	PK-88™	KAM™
Icom/Yaesu HTs	MFJ-5024	MFJ-5024X	MFJ-5024Z	MFJ-5024YV
Kenwood HTs	MFJ-5026	MFJ-5026X	MFJ-5026Z	MFJ-5026YV
Yaesu 8 pin radios	MFJ-5080	MFJ-5080X	MFJ-5080Z	MFJ-5080YV ⁴ MFJ-5080YH ⁴
Icom 8 pin radios	MFJ-5084	MFJ-5084X	MFJ-5084Z	MFJ-5084YV ⁴ MFJ-5084YH ⁴
Kenwood/Alinco 8 pin radios	MFJ-5086	MFJ-5086X	MFJ-5086Z	MFJ-5086YV ⁴ MFJ-5086YH ⁴

1 does not include IC-W2A 2 does not include 2500 3 does not include 25A & 255A
4 YV models connect VHF port of KAM. YH models connect HF port of KAM

- MFJ-5082, \$9.95, open end cable with 8-pin microphone connector
- MFJ-5224, \$9.95, open end cable for Icom/Yaesu handhells
- MFJ-5226, \$9.95, open end cable for Kenwood handhells
- MFJ-5268, \$7.95, open end cable with 8-pin modular telephone plug for Yaesu FT-2400H, Kenwood TM641A, TM714A, TM732A



MFJ-1271 turns your Commodore 64/128 into full featured packet TNC!

Just plug in this MFJ-1271 modem and boot up the public domain Digicom/64 software (not included) to enjoy VHF or HF packet at 1200 and 300 bauds.

You get a high performance modem featuring true DCD circuit with adjustable threshold. DCD detect LED tells you when you're receiving a good signal. Plugs into cassette port and uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

MFJ-1271
\$49⁹⁵



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Technical Help: 800-647-TECH(8324)

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tion, due to the conservative design, provides reliable performance and longevity for the components.

I mentioned earlier that the heat sinks were only warm to the touch after a 30 minute full-load test. This feature is vital in the interest of minimizing stress to the pass transistors. According to the manufacturer's data, for every 10°C reduction in transistor junction temperature the life of the device is doubled. The large external heat sinks keep the pass-transistor junction temperature well below the maximum safe ratings specified by the transistor manufacturer.

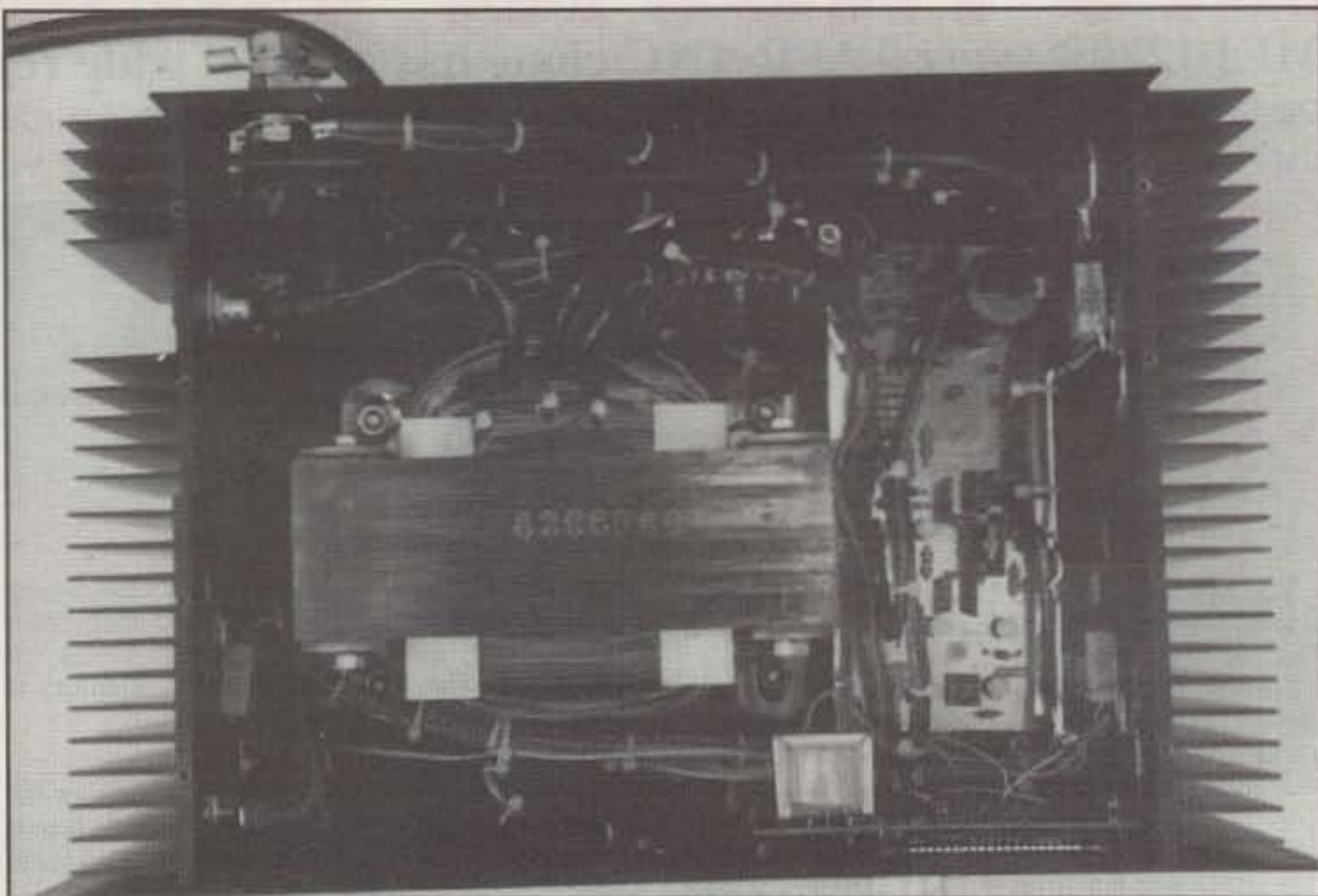
Other Features

The Luke power supplies include input surge protection. As an option they can be equipped with a large (0.7 inch) LCD display that indicates input voltage, output voltage, output current, and peak output current. A front-panel switch is used to select the desired metering function. I have the metering feature on my S40 unit.

You may order your power supply for 120 or 240 volt operation. The positive and negative output terminals are floated so that the power supply may be used as a positive or negative power source.

Luke's supplies contain power transformers that have 200°C insulation, even though its transformers operate at roughly 55°C rise. The transformer cores are large, and heavy-gauge copper wire is used in the windings. These features minimize the operating temperature and extend transformer life. The transformers are made in the USA and conform to the UL 109449 standard.

I did not observe RFI to the power supply circuitry from 1.8 to 29 MHz while using maximum legal amateur power. In a like manner, no RFI was noted while using 50 watts at 144 MHz. Luke has included RFI suppression components that prevent stray RF energy from entering the



Interior view of the Luke S40 regulated power supply. The massive power transformer is at the lower left. Nestled at the right of the transformer is the sensing, protection PC board. Note the huge pass transistor heat sinks outside the case, left and right. Voltage does not appear on the heat sinks.

power supply and disrupting circuit performance. Unlike some power supplies used by amateurs, it is not normally necessary to install ferrite chokes in the power leads external to the power-supply enclosure.

A comprehensive seven-page manual was included with the S40 unit. It contains details for proper installation with regard to electrical distribution, grounding, and other important operating considerations.

Physical Traits

The S40 weighs 38 pounds. Dimensions are 7"H x 14 1/2"W x 9"D. The cabinet is painted matte black and the labeling is light gray. The painting process results in

the application of a thick, scratch-resistant coating.

Large screw terminals are used for the DC output port of the supply. They are equipped with heavy-duty solder lugs and nuts. These terminals are located on the rear panel of the power supply.

The front panel contains three LEDs. One is an over-temperature indicator. Another LED serves as a crowbar indicator. The third LED is a power-on indicator. The over-temperature and crowbar status LEDs glow green during normal operation, but change to orange when a fault occurs.

Closing Comments

I have no reservations about recommending the Luke product line to amateur and commercial users. Although the unit price may be a tad higher than for competitive products, I believe that the excellent design, conservative ratings, and safety features merit the market price. Certainly, maintenance expense should be substantially lower than for similar power supplies that cost less and are not designed for maximum performance.

In a recent conversation with the manufacturer I learned that Luke is planning to offer high-voltage power transformers to amateurs for use in high-power linear amplifiers. Luke intends to market these at very competitive prices. Standby!

You may purchase a Luke power supply from the Luke Company, 7113 N. 9 Mile Rd., Lake City, MI 49651 (616-229-4593) for further information. The S40 power supply sells for \$275.

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With the "PC Packet Station"

By PKT Electronics, Inc.

More than just a TNC, the "PC Packet Station" is a complete packet radio station for the IBM PC including:

-> **VHF Radio Transceiver** by Motorola <-

-> **1200 baud modem** <- -> **TNC Software** <-

You just plug the PC Packet Station into a half slot in your PC, plug in your VHF antenna into the card, load the software and you're on packet, it's just that easy! PC Packet Stations are \$419 and up.

Tired of your low speed 1200 & 2400 baud telecom modem and want a new high speed modem? But, do you buy a 14,400 now, or wait for 19,200 to stabilize? We have a better solution, a Digicom Software upgradable internal modem. It is based on Digicom's Softmodem™ Technology, which allows the modem to be upgraded just by downloading new software. Suggested list \$258 our Price **\$189**.

VISA, Mastercard and Personal Checks gladly accepted. Dealer inquiries welcome.
PKT Electronics, Inc. 2668 Haverstraw Ave. Dayton, OH 45414. (513) 454-0242 Voice and Fax

MFJ's world famous 3 KW Antenna Tuner

If you won't settle for less . . . here is the finest 3 KW tuner money can buy!

The MFJ-989C is not for everyone. However, if you make the investment, you'll get the finest 3 KW antenna tuner money can buy.

Here's why . . .

Massive Transmitting Capacitors
You get two massive 250 pf transmitting variable capacitors with detailed logging scales. They can handle amps of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

Precision Roller Inductor
A precision roller inductor lets you tune your SWR down to the absolute minimum. A 3-digit turns counter plus a spinner knob gives you exact inductance control.

Ball bearings on front and back shafts give you a velvet smooth vernier feel. Steel end plates and shafts give you lifetime durability.

You won't have arcing problems with this roller inductor. That's



MFJ-989C **\$349⁹⁵**

because firm springs put considerable pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high current connections and a new core gives you excellent RF properties for minimum loss.

Cross-Needle Meter

You get a lighted peak and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate SWR and power readings over the entire 1.8 to 30 MHz range.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It's made with two giant 2 1/2 inch powder iron toroid cores and wound with Teflon® wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation or voltage breakdown.

Ceramic Antenna Switch

You get a two wafer 6 position ceramic antenna switch with extra large contacts for trouble free switching.

Plus much, much more

You also get a built-in 300 watt dummy load, full one year unconditional guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. Meter lamp needs 12 volts. Compact 10 3/4 x 4 1/2 x 1 1/2 in. Made in the USA. Add \$13 s/h. **Don't settle for less--get yours today!**

MFJ's deluxe 300 Watt Tuner



MFJ-949E More hams use the MFJ-949E than \$149⁹⁵ any other antenna tuner in the world! Why? Because you get proven reliability, the ability to match just about anything and a one year unconditional guarantee.

You get a lighted peak and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a full size dummy load that easily handles 300 watts of abusive tune-up power.

New 8 position antenna switch lets you pre-tune into dummy load to minimize QRM.

The inductor switch is designed to withstand extreme voltages and currents--it's not an underrated off-the-shelf switch that can put you off-the-air.

Each MFJ-949E aluminum cabinet is chemically etched to strongly bond MFJ's tough baked-on paint. You won't find a tougher, longer lasting finish anywhere.

MFJ's new 300 Watt Tuner



MFJ-948 If you don't need a dummy load but \$129⁹⁵ want all the other features of the MFJ-949E, choose the MFJ-948 for \$129.95. The MFJ-948 features a peak reading lighted Cross-Needle meter with a built-in lamp switch, one year unconditional guarantee and is made here in the USA.

MFJ's smallest Versa Tuner

The MFJ-901B is our smallest --5x2x6 inches --(and most affordable) 200 watt PEP tuner -- when both your space and your budget is limited. Great for matching solid state rigs to linear amps.

MFJ's artificial RF Ground

Creates artificial RF ground. Eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.



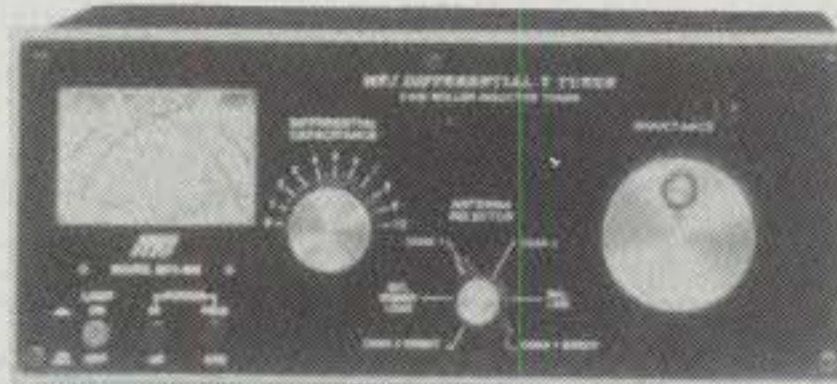
MFJ's super value Tuner



MFJ-941E The new MFJ-941E gives you a \$109⁹⁵ 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a lighted cross-needle meter, antenna switch and balun . . . for an incredible \$109.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10 5/8 x 2 7/8 x 7 inches.

2 Knob Differential-T™ Tuner



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THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

A Lightweight 2-Element Yagi For 18 MHz

In my last column I discussed the virtues and deficiencies of the 2-element Yagi beam. The virtues are that it is small, lightweight, and exhibits very high gain for the boom length. The deficiencies are that the front-to-back ratio is mediocre and the feedpoint impedance can be quite low. Moreover, the operational bandwidth defined by the allowable SWR and minimum front-to-back ratio is small compared to that of an optimized 3-element Yagi.

Having said that, I believe the virtues greatly outweigh the deficiencies of this little array. Take an 18 MHz design, for example. It can be built light enough to be mounted easily above an existing tri-band array and is (relatively) unobtrusive to the cold eye of a neighbor who equates beam size directly with TVI or telephone interference!

The 18 MHz band is narrow (18.068 to 18.168 MHz), only 100 kHz, so operational bandwidth is not a problem, and even though the feedpoint impedance is low (of the order of 12 ohms), the 2-element Yagi can be matched properly with either a Gamma match or a Hairpin match. I think a 2-element Yagi is an ideal antenna for this band!

Average front-to-back (F/B) ratio of the little beam is about 10 dB. This is nothing to get excited about, but the relatively long skip on 18 MHz usually means that when the antenna is aimed in the direction of propagation, relatively little is coming in off the back of the beam. At least that's the way it has worked for me on the west coast!

During my morning hours, when the band is open to Europe and Africa, the Pacific area (off the back of the beam) is closed. And during the afternoon when the band is open to the Pacific, most of the signals to the east of me have faded out. In my case, therefore, F/B ratio is no big deal. If you have a similar propagation situation, the 2-element Yagi may be the right beam for you.

The Design

The Yagi lends itself to accurate computer-aided design. The beam described in this section was taken from a set of generic, untapered dimensions and placed in the Yagi Optimizer (YO) pro-

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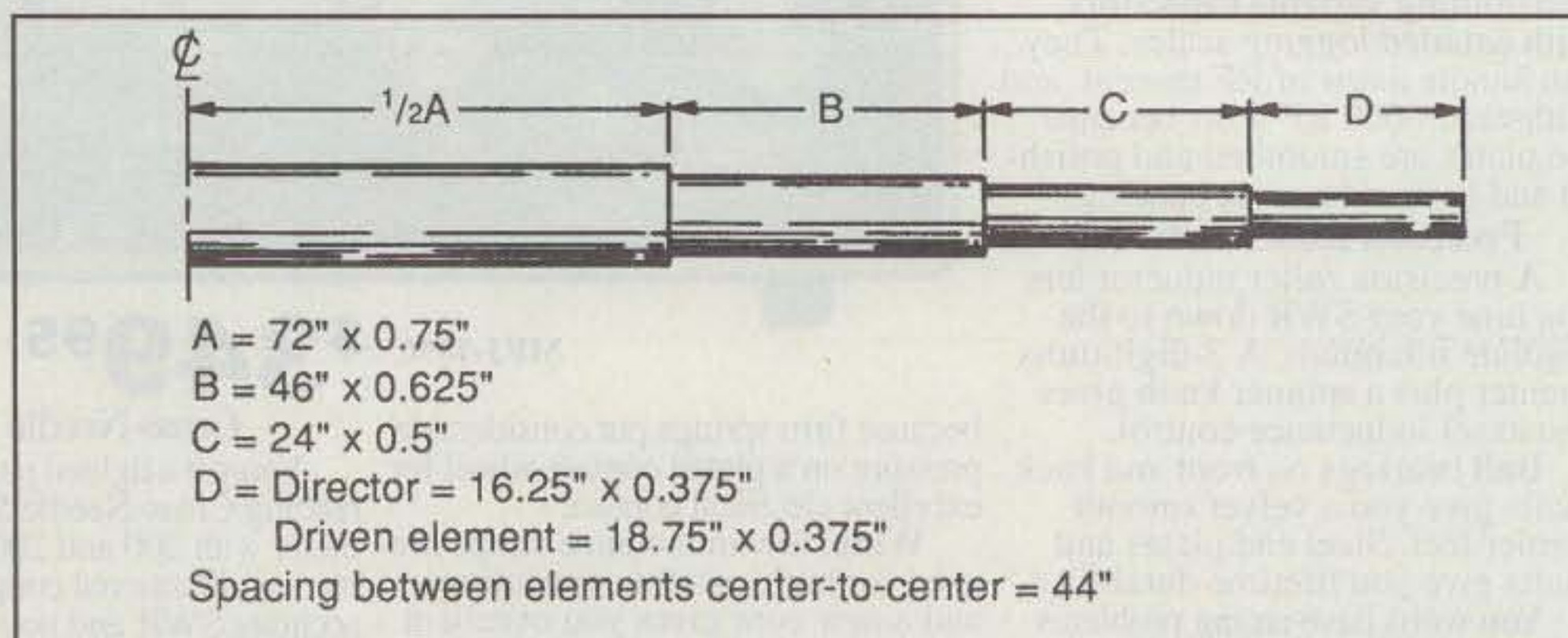


Fig. 1—Dimensions for half-elements of driven element and director.

gram of K6STI (Brian Beezley, 507 1/2 Taylor St., Vista, CA 92084). This program analyzes and optimizes a Yagi array using performance criteria that the user specifies.

In this case my specifications called for a short boom (not over 4 feet long), elements tapered from 0.75 inch down to 0.375 inch, and the choice of either Gamma or Hairpin match. Elements are to be mounted directly by U-bolts to small plates attached to a 2 inch diameter boom. Feed-point impedance is to be 50 ohms, unbalanced.

Optimization frequencies are 18.068, 18.115, and 18.168 MHz. The antenna is designed in a "free space" environment.

The YO program permits tradeoffs in the areas of forward gain, F/B, and input impedance. The tradeoffs are expressed in percent, and in this case to keep input impedance and F/B values reasonable, forward gain percentage of trade-off was set at 60%. Input impedance and F/B ratio were set at 20% each. These choices were intuitive. If the gain trade-off was too high, both SWR bandwidth and input impedance would suffer. A nice point about the YO program is that if the results are not to your liking, the trade-offs can be modified quickly.

The YO program iterates the generic design 482 times during the optimization process in this manner: Each element length and position is changed individually by a small amount to calculate the sensitivity of the **objective** to each variable. The objective is the combination of gain, F/B, and impedance defined with the trade-offs. The set of sensitivities is called the **gradient**. The gradient points in the direction that maximizes the objective.

Once the gradient is calculated, element lengths and position are upgraded, each in proportion to its sensitivity. The upgrade yields a new design with incrementally higher performance. The optimizer program runs until further improvement is not possible when additional small changes are made.

If the user decides that additional investigation is worthwhile, he can modify antenna dimensions manually and continue automatic optimization.

In the case of the 2-element Yagi there aren't many variables to play with. As far as gain and F/B ratio go, driven-element length is relatively unimportant. It is important, however, in determining impedance matching to the feedline.

This leaves director length and element spacing as variables to investigate. By experience, intuition, or data gleaned from handbooks and magazine articles, the approximate spacing and director length can be determined to a rough degree. Director spacing falls in the 0.07 to 0.12 wavelength range. The forward gain target is 5 dBd. The F/B target is about 10 dB. The feedpoint impedance (before matching) should be 10 ohms or more.

As optimization progresses these criteria, and others, are continually upgraded on the computer screen. With a keen eye and experience the optimizer can be guided in the correct direction to produce the desired results.

Once the program has produced the design, tapering information is available for the tubing diameters specified by the programmer. This information is important, as overall element length is a function of the taper. For a given element, the greater the taper, the greater the element

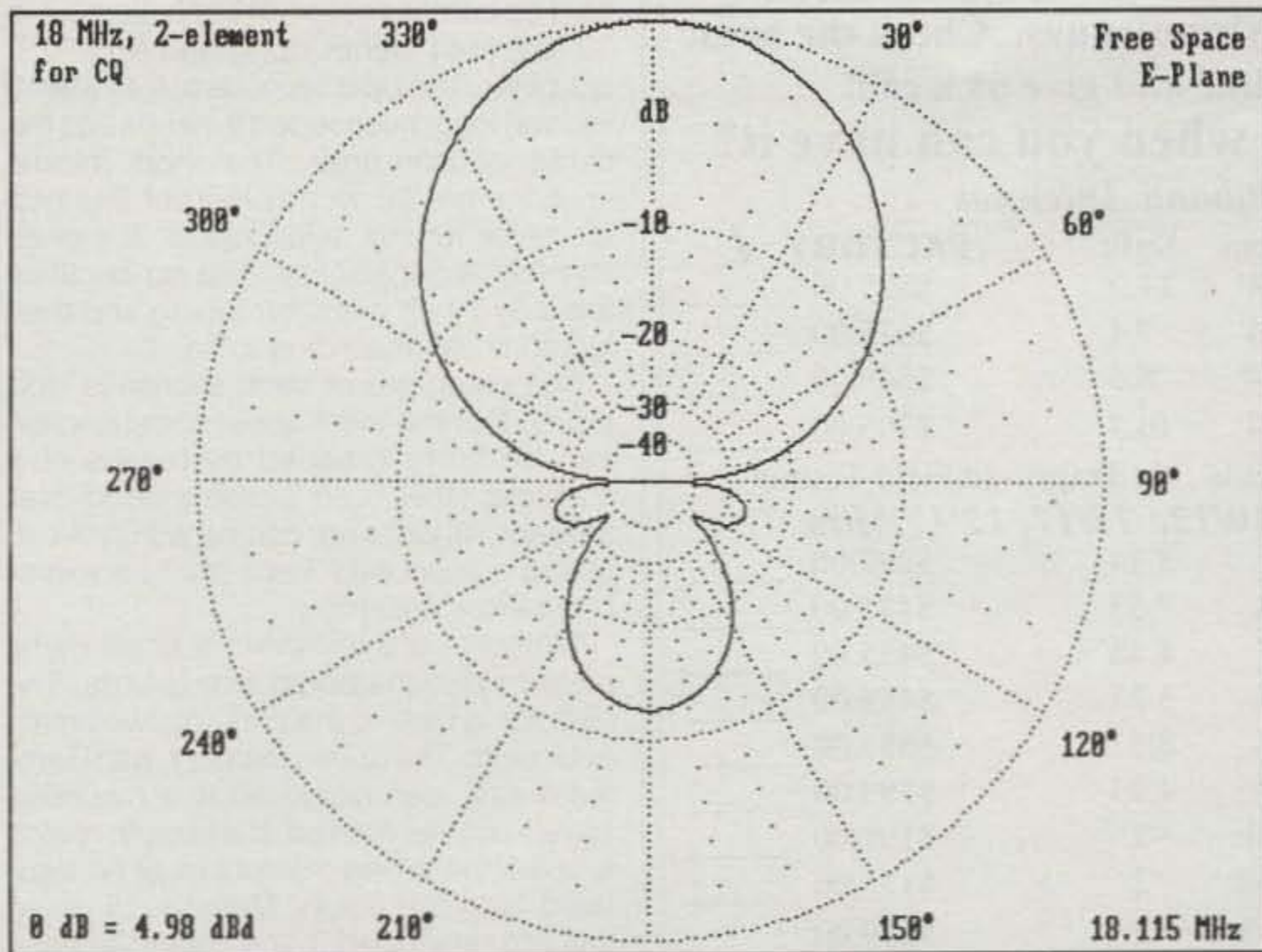


Fig. 2—Polar plot of two-element beam.

length. The final computerized dimensions for this Yagi antenna are given in fig. 1.

Note that in the case of the driven element, if a Gamma match is used, the half-length dimension is from the center of the element to the tip. If a Hairpin match is used, the half-length dimension is from the attachment of the feedpoint of the element to the tip. Because a gap exists

at the element center when the Hairpin match is used, the overall physical length of the driven element is slightly longer than in the case of the Gamma match.

Antenna Construction

A 4 foot length of 2 inch diameter aluminum tubing serves as the boom. Element spacing, center to center, is 44 inch-

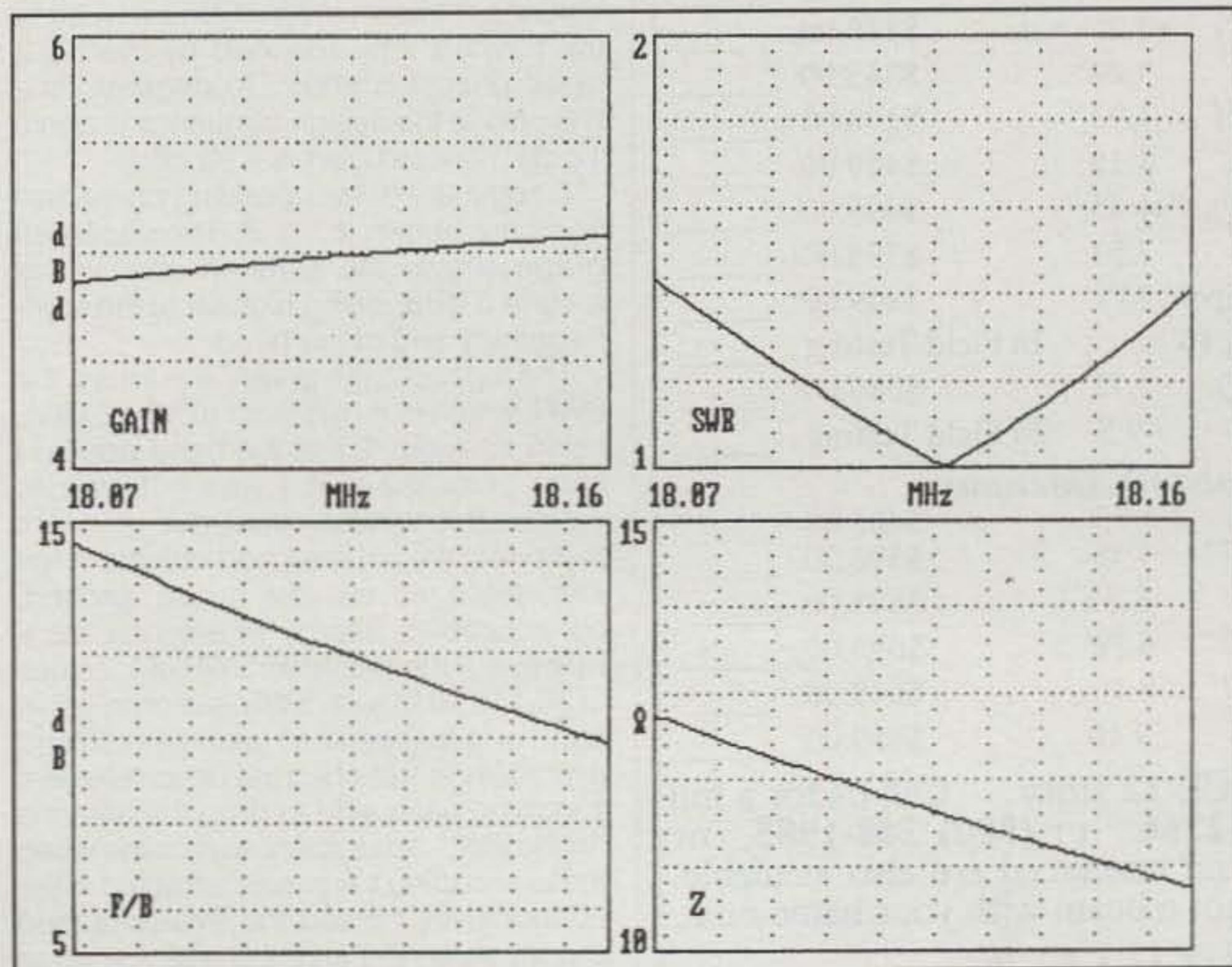


Fig. 3—Parameters of two-element beam. (See text for details.)

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es. The center section of each element is 12 feet (144 inches) long and 0.75 inch diameter. The next sections are 4 feet (48 inches) long, telescoped 2 inches into the center section ends. The short, middle sections are 26 inches long of 0.5 inch diameter tubing, telescoped 2 inches into the larger section. The tip sections are 0.375 inch diameter tubing and their length is set according to fig. 1.

The outer end of each section is slotted so that the inner telescoping section can be firmly grasped by means of a stainless-steel hose clamp placed over the joint. All joints are coated with anti-oxidizing compound ("Penetrox," for example) before assembly.

Elements are affixed to a small metal plate held to the boom with U-bolts. The director is held to the plate by two smaller U-bolts. The driven element, with Gamma match, can be bolted to a mounting plate in similar fashion. If a Hairpin match is used, the driven element must be insulated from the boom. Methods of doing this are described in the *Beam Antenna Handbook* (available from Radio Bookstore, Box 209, Rindge, NH 03461; 603-899-6957).

The usual anti-rust precautions should be observed. All hardware should be stainless steel, or in the case of nuts, bolts, and U-bolts, plated. After assembly it is a good idea to give each joint and connection a shot of rust-preventive paint from a spray can.

Operating Characteristics Of The Antenna

The azimuth, free-space field plot of the antenna is shown in fig. 2. Beam width of the forward lobe (defined by the 3 dB down points) is about 70 degrees. The F/B ratio at the design frequency is about 12 dB. Forward gain is 4.98 dBd.

A summary of the operating characteristics are shown in fig. 3. The upper-left graph shows the antenna gain varies around 5 dBd, being highest at the high-frequency end of the band.

The upper-right graph illustrates the SWR, which is a minimum at 18.12 MHz, rising to about 1.4 at the band edges. I must point out that I was not able to achieve this pristine curve, due no doubt to the fact the antenna had objects in the immediate vicinity (the house, ground, control cables, nearby TV antenna, etc.). However, I measured an SWR of 1.2 close to 18.115 MHz, with SWR less than 1.6 at band edges. I used a Hairpin match and eventually lengthened the driven element 1 inch on each side to drop the antenna "in the slot." Adjustment was made when the telescoping tower was retracted to the 20 foot level. I noted the SWR changed slightly when the antenna was run up to its normal 45 foot elevation.

The lower-left graph illustrates the F/B ratio of the antenna. Note that F/B decreases rapidly, while power gain increases very slowly as the operating frequency is raised. That is characteristic of this type of simple Yagi. At the low end of the band the F/B ratio is quite good, approaching 15 dB.

The lower-right graph shows the feed-point impedance of the antenna. It runs from about 12.5 ohms to 10.5 ohms, which is within the limits of both the Gamma and Hairpin match systems.

Antenna Matching

So there you are. The antenna is ideal for stacking above a 20 meter beam, for example. I did not derive any stacking information, but I would suggest a stacking distance of at least 6 feet for minimum interaction with a bigger array.

While the builder can hit the design frequency and minimum SWR values quite well, a purist may wish to adjust the match to provide unity SWR at the design frequency. To do this, it is necessary to be able to reach the matching system from a safe perch atop the tower. The short boom makes this job easy. As with any antenna work, a safety belt is mandatory!

With regard to the Hairpin match, the length of the driven element is more critical than is Hairpin length. Enough overlap should be left at the first antenna joints so that the driven element can be lengthened or shortened 3 or 4 inches.

My preliminary Hairpin match was made from two lengths of #10 copper wire, plus a jumper made of back-to-back alligator clips. The length of the Hairpin and that of the driven element can be varied by the experimenter, noting the SWR on the coax line for each adjustment. A notebook to log the dimensions and an assistant to turn on and off the transmitter are most helpful.

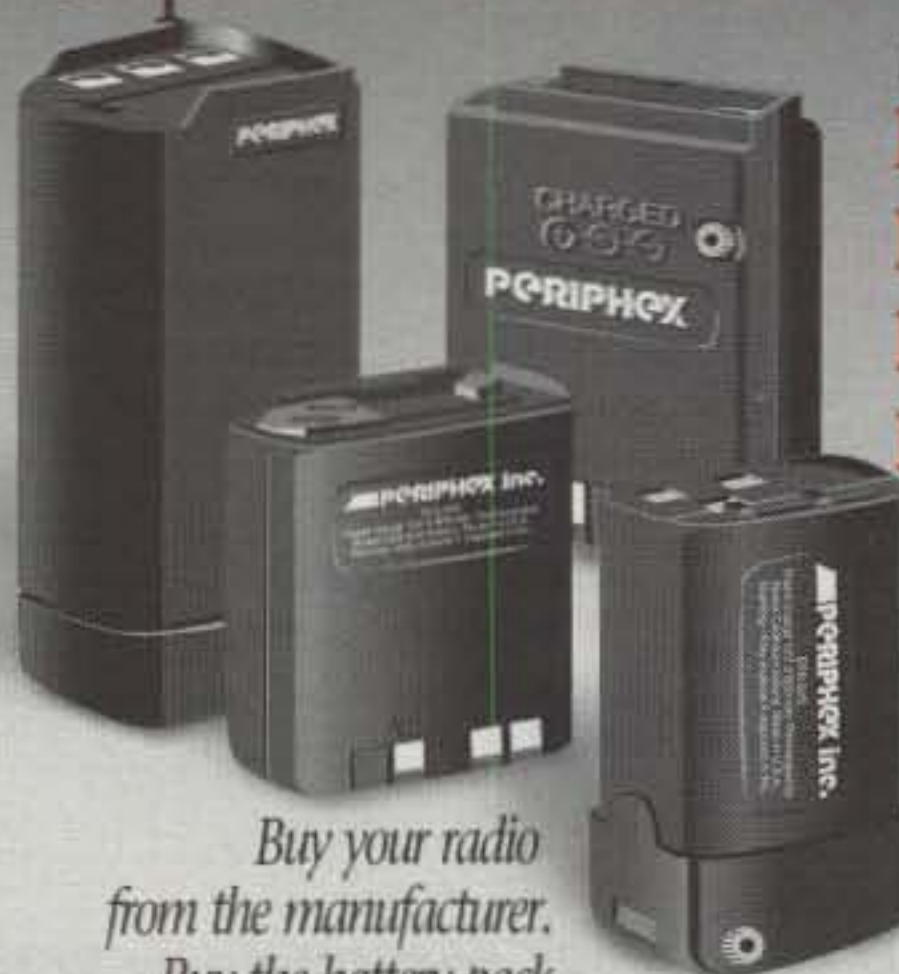
The length of the matching rod and the value of the Gamma capacitor are the variables in the Gamma match. Information on building and adjusting both matching systems are given in the *Beam Antenna Handbook*.

Bigger and Better Yagi Antennas

It is interesting to plot antenna gain versus the number of Yagi elements, as I have done in fig. 4. I've taken these points from various antenna designs whose gain measurements have been verified on computer programs or in the field. The graph shows two different antenna types. The higher curve shows power gain for various numbers of elements, where boom length is adjusted for maximum gain. Element spacing is one variable in the search for antenna gain, and the ele-

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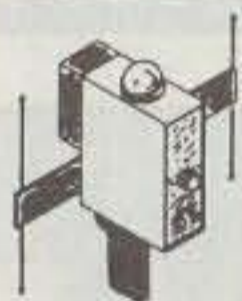


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I Get Letters . . .

I really appreciate hearing from readers of this column. I'm only sorry that I can't reply individually to each letter. I've gotten communications from the following, for which I thank each and every one: KH6GI, KD3OR, W8YFB, WA3EOQ, WU2J, PA0SE, NA2M, VE4AE, WO5H, and KG7BK.

With regard to the Z-match tuner, WA3EOQ, VE7BS, and W0EDS point out that the old Harvey-Wells "Bandmaster" tuner operated on the same general principle. KC1DI and W0EDS both report good results using the little tuner.

Dave, WO5H, alerts me to his monthly newsletter "Packet Power" written for packet buffs. He sent me a sample copy and it really looks first-class. Sample issues usually go for a buck, but Dave says he'll send a free sample to readers of this column who send him an SASE and mention this offer. Write to Dave Wolf, Box 189, Burleson, TX 76097-0189 (FAX 817-295-6232).

And I have two more interesting letters from experimenters who have built the Z-match tuner described in past columns. Dale, W4DM, reports his model tunes down to 3.322 for MARS operation. He has used the tuner on all bands (80-10 meters) with a 170 foot horizontal loop with 65 feet of balanced line, a 4BTV trap vertical with radials, an 80 meter dipole,



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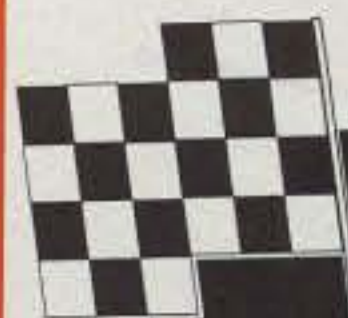
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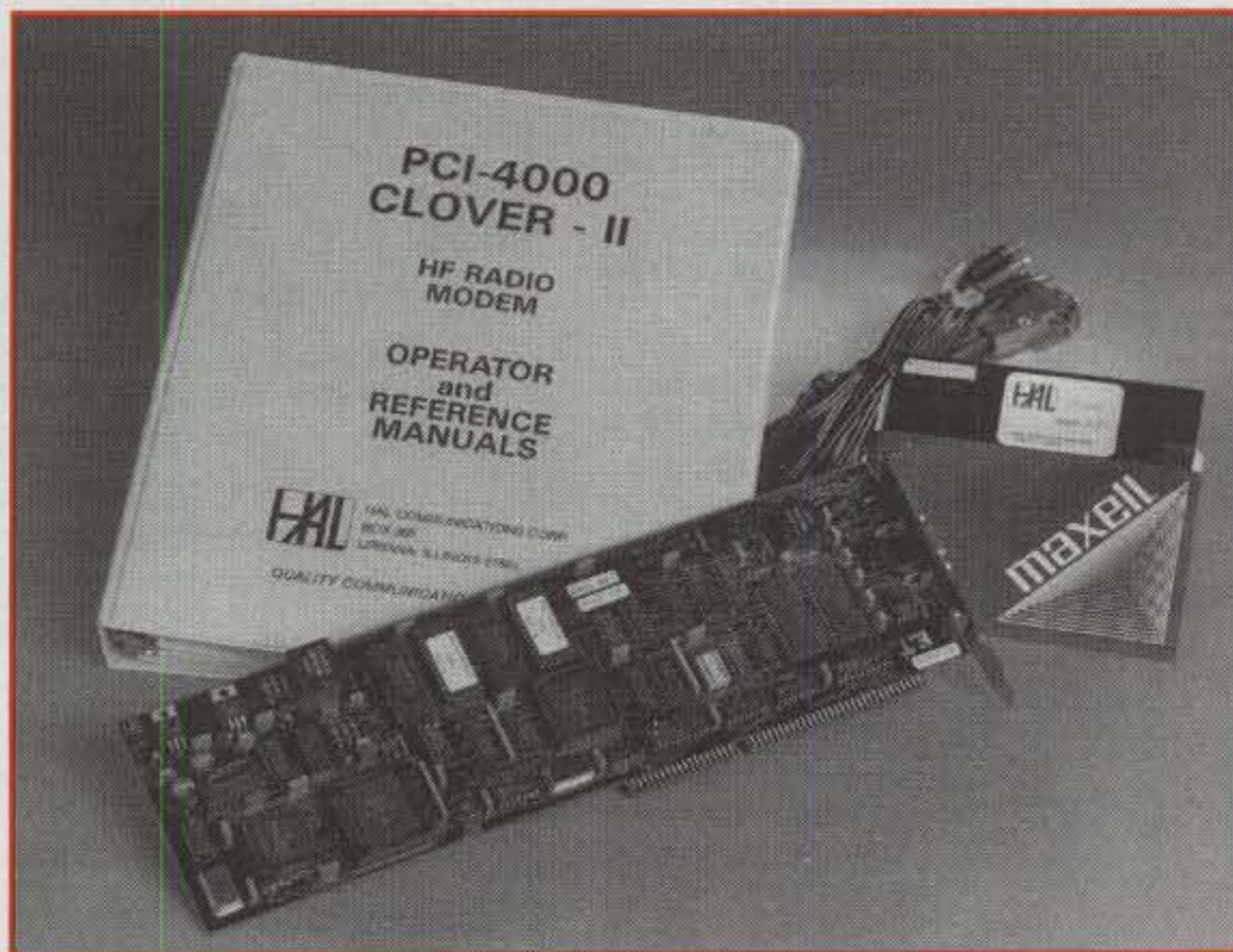
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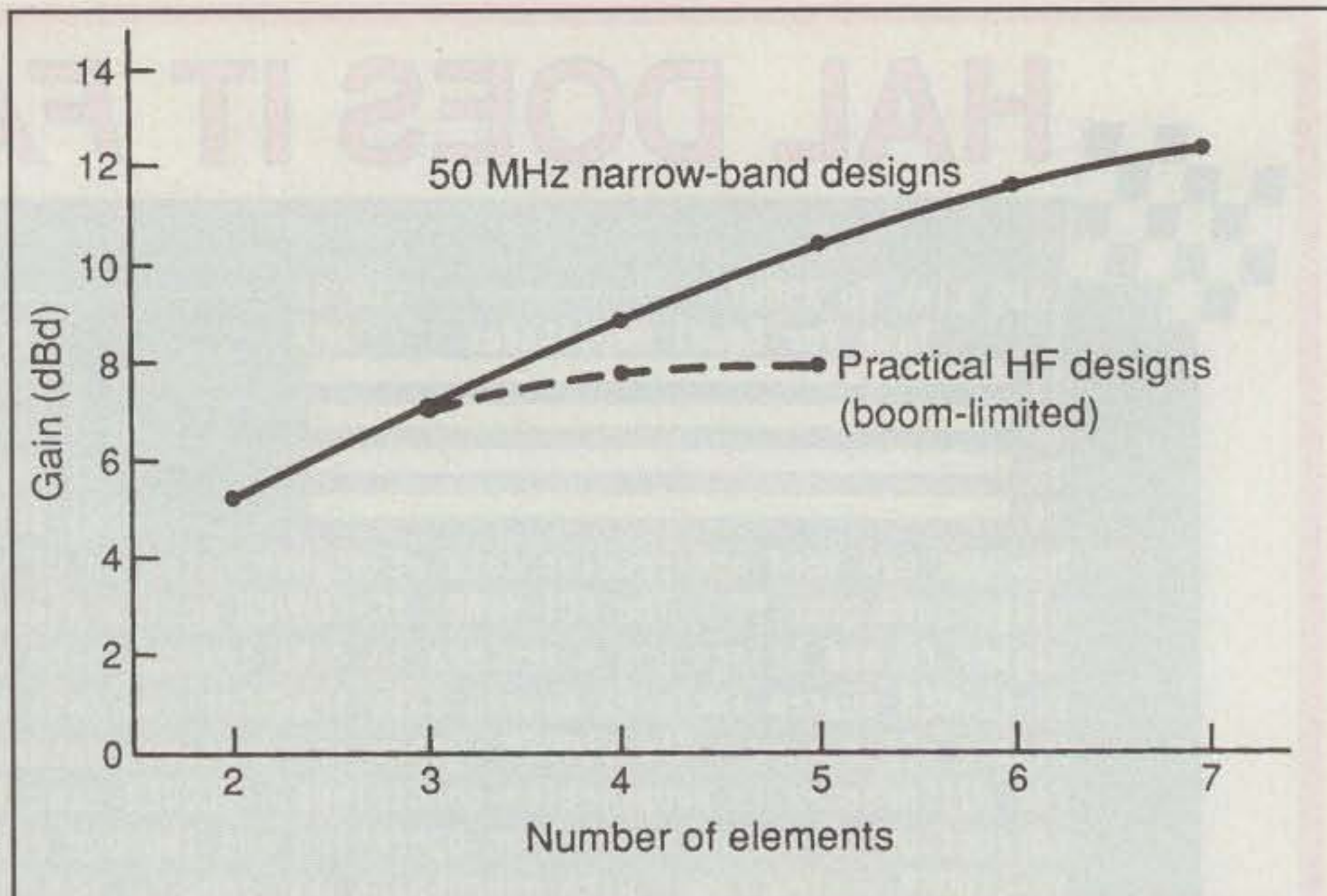


Fig. 4— My best estimate of Yagi gain for a given number of elements.

and a 120 foot long wire. He says it works just great! And he also mentions he's seen a commercial version of the tuner made by the Wanzer Co. in Seattle, Washington (address unknown).

Bryan, G3MND, made a version of the Z-match and found it worked on all bands on a double extended 40 meter Zepp (a 190 foot center-fed affair) and an 80 meter loop of 280 feet circumference. Good reports keep coming in on this little matching device. Try it yourself!

A New SWL/Amateur Listening Guidebook

Harry Helms, AA6FW, has brought out his second edition of the *Shortwave Listening Guidebook*. This 321-page book has been updated to cover the revolutionary changes in international broadcasting since the break up of the Soviet Union. Gone is the monolithic Radio Moscow which collapsed after the failed 1991 coup. To raise money Radio Moscow began renting out its transmitting facilities. Adventist World Radio, the BBC, and even the Voice of America (!) are being relayed over the same transmitters that only a few years before had been used by Radio Moscow to denounce the "lies" of such broadcasters!

Other splinter groups of the old Radio Moscow are on the air: Radio Ukraine International, Radio Estonia, Radio Yerevan, and others have taken over the facilities in their areas.

Harry also notes the break up in Yugoslavia and Czechoslovakia and how these changes have altered shortwave

broadcasts from these countries. And Roumania's Radio Bucharest has apologized to listeners for giving misleading news and information in the past!

The political changes have made great changes in the airwaves, and a good way of bringing yourself up to date is to read this book.

In addition to the world update, the book also covers other types of shortwave broadcasts including clandestine and pirate stations. And there's plenty of information on receiving antennas, shortwave receivers, and receiving accessories. Shortwave propagation is also covered in detail.

This is a great book for a friend of yours wanting to break into shortwave listening. And many amateurs are also SWLs and enjoy tuning outside the amateur bands. Either way, I recommend this book highly. I really enjoyed reading it! The *Shortwave Listening Guidebook* is available from book stores and dealers specializing in shortwave radio equipment. It is also available from HighText Publications, Box 1489, Solana Beach, CA 92075 for \$19.95 plus \$3 shipping, or by calling 1-800-888-4741.

The Dead Band Quiz

I'm still getting answers to the little problem of the three light bulbs. Readers who have solved this quiz include: NØXFK, KB7SFA, W3ZNB/DA1QO, SV1CDN (congratulations Dionisis on your new amateur ticket!), and Scott Muma (call unknown).

73, Bill, W6SAI



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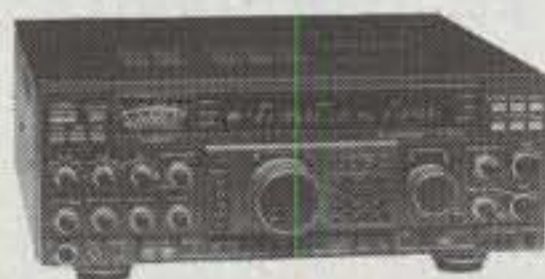
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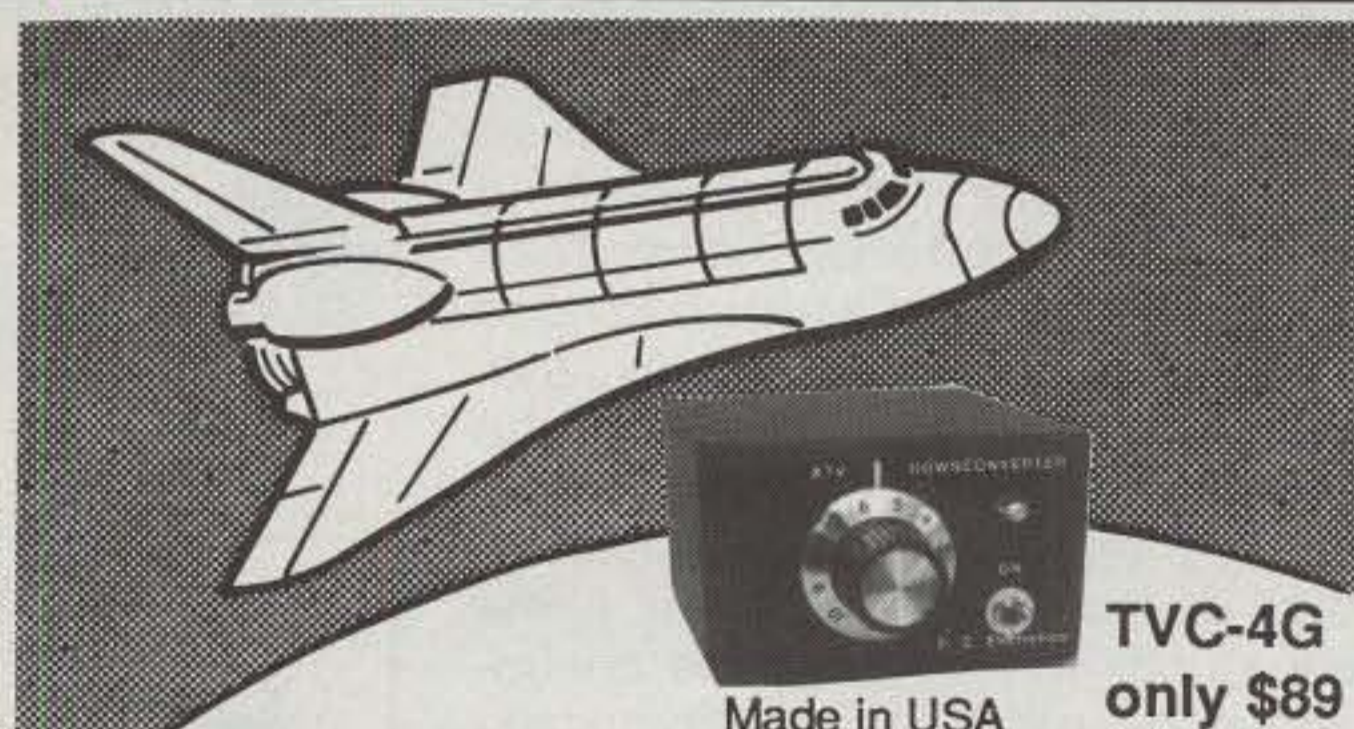
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Working With Balanced Line

BY FRED BONAVIDA*, W5QJM

At a recent Saturday morning swapfest in South Texas a prospective buyer spotted an antenna coupler for sale, picked it up, turned it over several times, and looked at the owner inquiringly.

"That's for balanced lines," volunteered the owner in anticipation of the question.

"Oh, you mean it'll tune a balun?" asked the man.

"No, it's to tune balanced feeders. You know, open-wire line," the owner patiently replied.

"Oh, I hate that stuff! You can't work with it," snorted the first man, abandoning his role as a prospective buyer as he put the coupler down and turned away.

Not to be put off, the owner countered, "Oh, but you can, and it's very easy. And you don't waste a lot of power heating up a chunk of coax. Your signal is all going into the air where it belongs."

Unpersuaded, the man walked away, but I caught up with him (let's call him Jim) a few minutes later at the coffee and doughnuts counter. We began talking about balanced feed line. Over coffee I told him the ease with which balanced feeders—known variously as twinlead, ladder line, or open-wire line—can be managed.

Jim countered that while balanced feeders do indeed get the signal to the antenna, coax is easier to handle, cheaper, and more versatile. It took some talking, but I showed him that for the most part he was wrong.

When the coffee break ended, Jim went back to the table, and after a little face-saving haggling over the price, he bought the coupler. He also found a 100 foot roll of 450 ohm twinlead. When last heard from, Jim was happy as a pig in mud. For some reason, he said, he was getting and giving better signal reports.

There are instances when use of coax is inescapable. I use it in my antenna system, but at last count I have fewer than 10 feet of it, mostly linking my rigs to my antenna coupler. An additional 15 feet connect my 2 meter rig and antenna in my car. But that's it. I am an unrecon-

structed QRPer, and I want my power in the antenna, not absorbed by the feed-line.

Rather than reopen the balanced-versus-unbalanced feeder battle here, this article is to help dispel the notion that twinlead or open-wire line is difficult to manage. The second part of this series will show how easy, inexpensive, and satisfying it is to roll your own open-wire line for great performance.

Numerous articles on how easy it is to work with balanced feeders have appeared in the literature¹ over the years, and I will not rerun them here. The footnotes list some of these articles and sources of commercially available feed-line.²

Lew McCoy, W1ICP, set the tone for a resurgence of interest in and use of balanced line in these pages in an August 1982 article that asked, "A time for revival?" Lew once again proved himself a prophet. One major dealer later reported that over five years "the volume of the stuff through our doors has risen about 2000 percent." Balanced feeders were back.

Before dealing with ways of working with twin feeders, it is necessary to list



Electric fence insulators are an inexpensive and easy tool for managing balanced feeders. Runs of 450 ohm "windowed" ladder line fit over the top. Three-hundred ohm "windowed" line can be held by the hooks on the side, and a pair of these at the required spacing will keep open-wire line in place. (Photos in this article by Don Randall, WB5ROU)

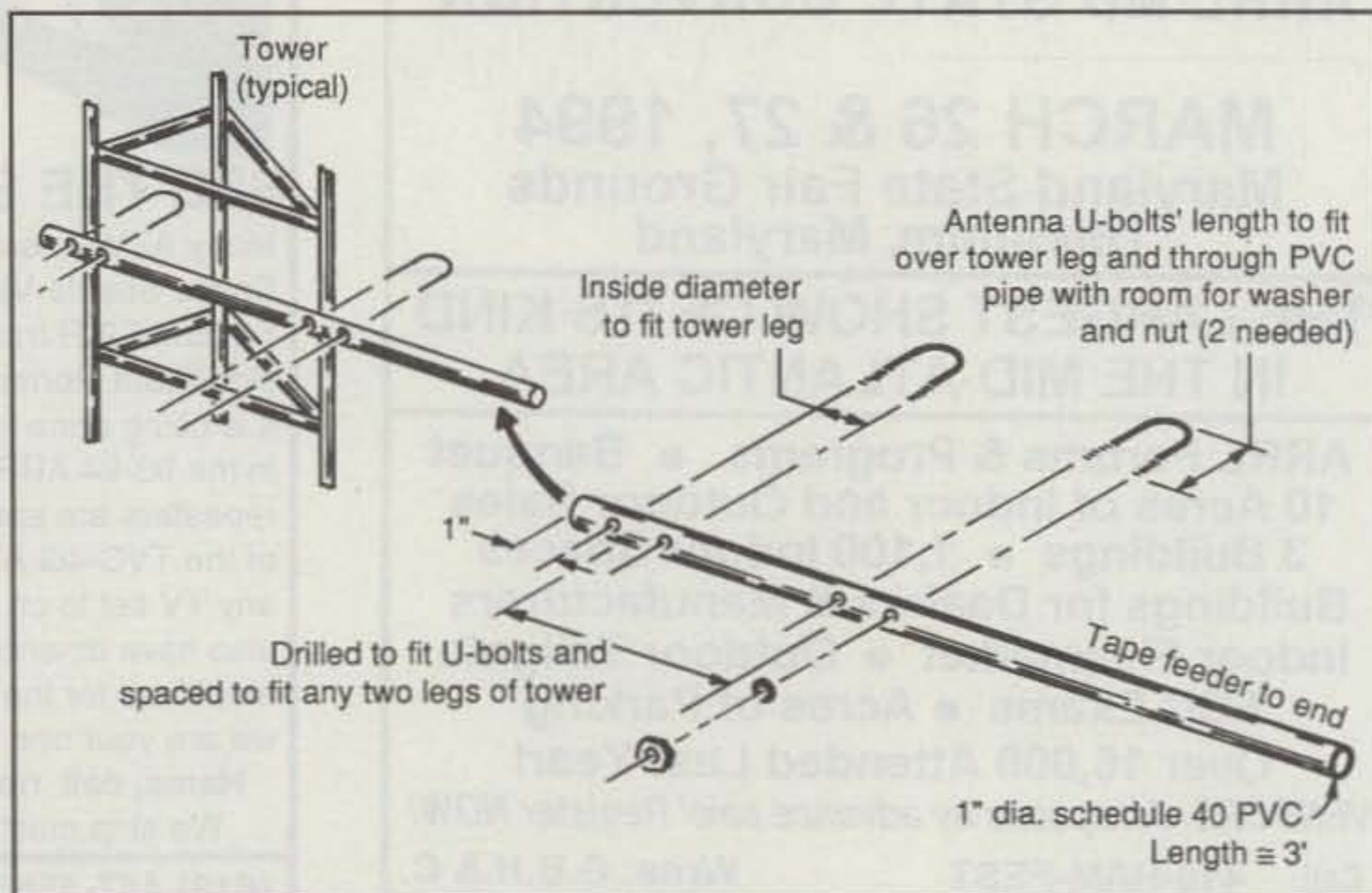


Fig. 1— A simple tower stand-off for balanced-line feeders.

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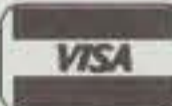
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CIRCLE 53 ON READER SERVICE CARD

58 • CQ • January 1994



Electric fence stand-off insulators hold these two runs of 450 ohm ladder line in place under the eaves of the house. Note one at right is twisted about twice each 3 feet. The run at left has been replaced with homemade open-wire line.

some important don'ts (which thereby recite some problems with ladder line) when handling them so mistakes won't be made.

- Keep them clear of metal. The rule-of-thumb holds that balanced line should be kept away from metal a distance equal at least to twice the width of the line. For 300 ohm TV-type ribbon, for instance, that would be about an inch. For 600 ohm line with a spacing between conductors of as much as 6 inches, the separation from metal should be at least a foot. Standing off from a metal tower will be discussed in a moment.

- Don't bury the line.
- Changes in direction of ladder line should be gradual, not abrupt. An arc is preferred to a sharp angle.
- Avoid long, unsupported runs of twin-lead, especially in areas of high winds or where icing could occur. This applies to coax, too.

Okay, with those no-no's out of the way, let's get to handling balanced feeders: routing them from the output of the coupler to the feedpoint of the antenna overhead.

Lew McCoy revisited the problem in the January and February 1993 issues of CQ, and those pieces are recommended for some methods of getting the line out of the shack.

I have successfully used another approach for years: I had built an insert for the horizontally sliding window next to the operating position. It is a variation of the wood insert long used for windows that raise or lower vertically.

My insert is made of a piece of Plexiglas® framed with metal and drilled for feed-through connectors. On the inside are the leads from the antenna tuner, and the outside connects to the line to the feedpoint of my antenna.

The inside connectors are quick-dis-

connect types so the antenna can be unplugged easily and promptly in case of a lightning-packing storm. But they also make a solid electrical connection to transfer the energy.

The Plexiglas originally was a carpet protector for a desk chair in an office building, but it cracked and was tossed in the trash, where I found and salvaged it. Not only did I get the main ingredient of my insert, but I cut up other pieces for antenna end insulators. Over the years I have harvested large pieces of Plexiglas from office trash.

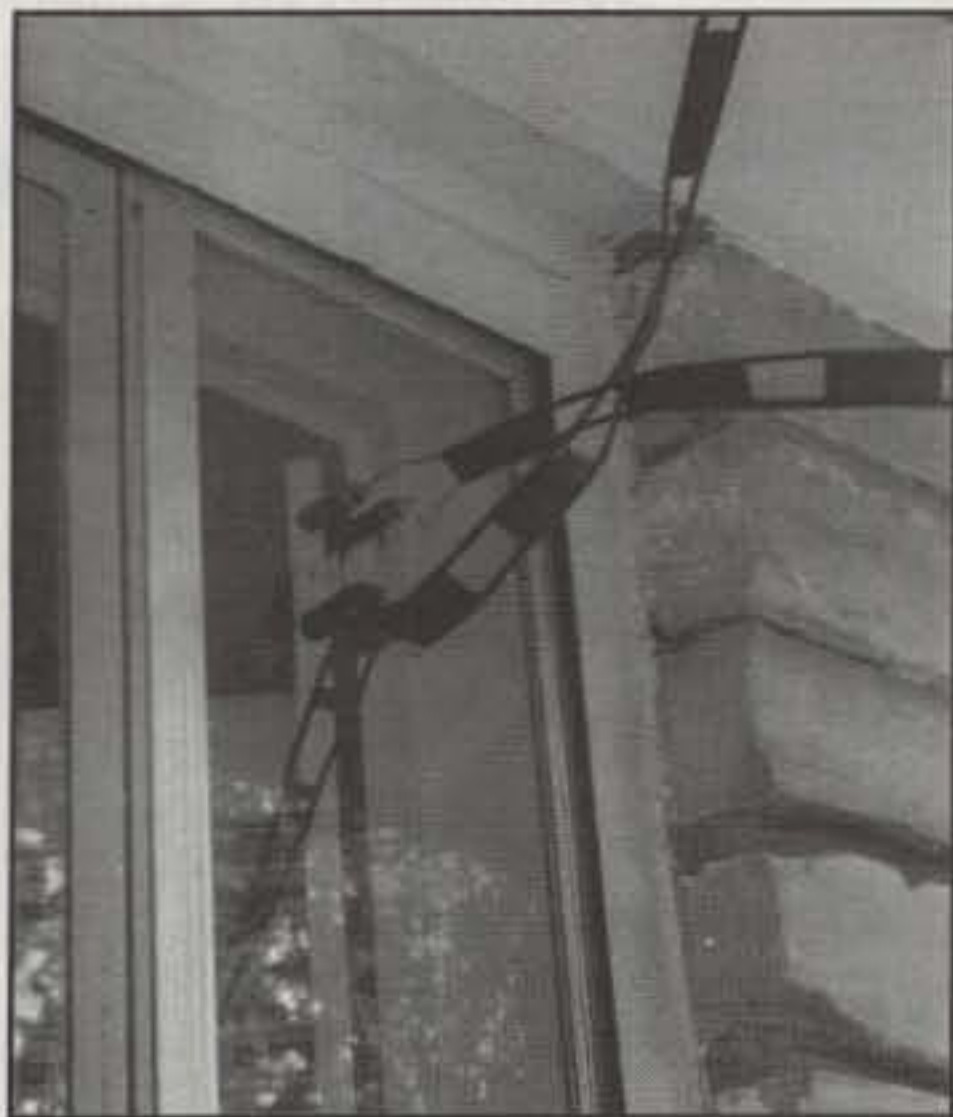
Cutting Plexiglas is tricky, however, and it will fracture at the slightest wrong pressure from a saw. I took mine to a friend who owns an advertising sign shop, and he cut it to order in a matter of minutes on a saw equipped with a special and expensive blade.

My next trip was to the shop of a man who specializes in replacement window screens. He caught on immediately as to what I wanted, and since he knew the measurements of the standard-size windows in my house, he was able to frame my insert in a matter of hours. The cost was \$10, but that was in the mid-1980s. The insert went with me when I moved and fit exactly in the window of my new house.

The outside edges of the insert were lined with adhesive-backed weather stripping, and the whole thing fits snugly into the window frame. For security, the sliding portion of the window is kept from being opened farther. Could a burglar pry it loose and gain entry? Only by pulling the window out too, and that would be a noisy job.

Having found a way to get my leads outside without having to drill any holes in the house, I began tackling the job of running the ladder line into position to approach the antenna feedpoint from a right

Say You Saw It In CQ



A close-up shot of the insert in the window shows the snug fit and the 450 ohm "windowed" ladder line leading off to various antennas.

angle. That meant snaking the feeders a short distance along the roof overhang.

Several options were available. The easiest and least expensive were plastic stand-off insulators for electric fences, and I found a package of them for a few dollars at a farm-supply store. They are sold by Radioware and other sources of wire, spreaders, insulators, and the like.

These insulators are ideal for 300 or 450 ohm ladder line—the kind with the "windows" cut in it to reduce weight and pressure on the line in strong winds. These insulators also work with roll-your-own open-wire line. An insulator every few feet not only keeps the ladderline in place, it also lets you tuck the line out of sight. Two are needed to handle open-wire line with, say, more than 2 inches between feeders—one for each side.

My shopping also turned up insulated staples from All Electronics and a simple standoff made from PVC pipe from the Wireman. The staples work well with 300 or 450 ohm twinlead with windows, while the PVC unit handles anything from 72 or 300 ohm ribbon twinlead (with or without windows) to 600 ohm open-wire line.

Despite the fact ladderline and open-wire line cannot be taped to the leg of a metal tower, balanced feeders still can be used easily for antennas hung from a tower. Just stand them off.

Faced with this problem several years ago, I came up with some 3 foot sections of 1 inch diameter, schedule 40 PVC pipe. I drilled the pipe to accept surplus antenna U-bolts, spaced so they would hold the pipe to any two legs on the triangular tower. I then routed the open-wire line to the outside ends of the pipe and taped it in place for ease of removal later. The result was a line that was not affected by the presence of all that metal.

One other hint: When running balanced feed line, whether under the eaves of the house, up the side of a tower, or to the feedpoint, twist the line at least twice in every 3 feet of length. An old hand told me that further reduces unwanted reaction and coupling with nearby objects.

In any event, working with balanced feeders is not the chore some folks would have you believe.

(To Be Continued)

Footnotes

1. L.A. Moxon, "HF Antennas for All Locations," Radio Society of Great Britain publication, 1988, pp. 47-51.

J.D. Heys, "Practical Wire Antennas," RSGB publication, 1991, pp. 34-35.

D. DeMaw, "Feeding Your Station," QST, December 1983, pp. 20-23.

2. Among suppliers of commercially-made balanced feedline, stand-off insulators, and wire staples are: Radioware Corp., P.O. Box 1478, Westford, MA 01886 (1-800-950-9273). Free catalog.

All Electronics, P.O. Box 567, Van Nuys, CA 91408 (1-800-826-5432). Free catalog.

The Wireman Inc., 261 Pittman Road, Landrum, SC 29356 (1-800-727-9473). Catalog \$2.

The Radio Works, P.O. Box 6159, Portsmouth, VA 23703 (1-804-483-1873). General reference catalog \$4.

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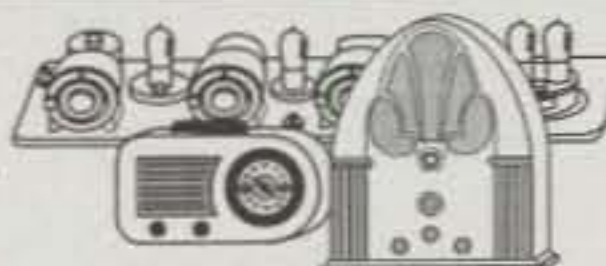
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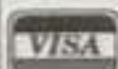
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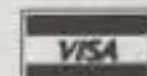
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CIRCLE 21 ON READER SERVICE CARD

WHAT'S NEW AND HOW TO USE IT

Single Power Supply RS-232 Interface Chips

First of all let me wish all of my loyal readers a very happy and healthy New Year. I hope that 1994 is the year that all of your wishes come true. This begins my 24th year with Dick Ross, K2MGA, Alan Dorhoffer, K2EEK, and the CQ staff, and I would like to state that it has been a real pleasure knowing and dealing with all of you for these many years. I sincerely wish the best for you, your families, and of course the magazine. And now down to business!

As experimenters are well aware, the electrical signal levels required by the popular RS-232 protocol require that both positive as well as negative voltages be produced to represent the logic 0 and logic 1 conditions. This usually results in the use of a negative power supply along with the positive one. Often, especially with battery-operated equipment, this requirement overly complicates the design and results in DC/DC converters or dual batteries. This is most frustrating where only the negative voltage is needed for the actual RS-232 connection.

Fortunately, we are not alone. The electronics industry also has the same problem and several chips have been developed to solve it rather neatly. Typical of these is the MAX220 through MAX249 series of chips manufactured by Maxim Integrated Products (120 San Gabriel Dr., Sunnyvale, CA 94086-9892). These chips accept TTL inputs and convert them to RS-232 outputs (with the negative level) while also accepting RS-232 levels and converting them to TTL. And best of all, all operation is from a single +5 volt power supply.

Fig. 1 is a block diagram of the basic chip in the series, the MAX220. As you can see, the chip contains a +5 volt to +10 volt voltage doubler and a +10 volt to -10 volt voltage inverter. These two sub-circuits produce the output levels while the rest of the chip performs the TTL processing. The chip contains two independent TTL to RS-232 interfaces and two independent RS-232 TTL interfaces.

Pins 10 and 11 are the TTL inputs. These are pulled high with internal 400K resistors, making the inputs compatible with both standard TTL and CMOS TTL. Unused inputs may be left unconnected due to these internal resistors. Signals are converted to RS-232 levels and outputted on pins 8 and 15. The output levels make use of the internal voltage converters and produce a typical output swing of ± 8 volts into a normal RS-232 load.

c/o CQ magazine

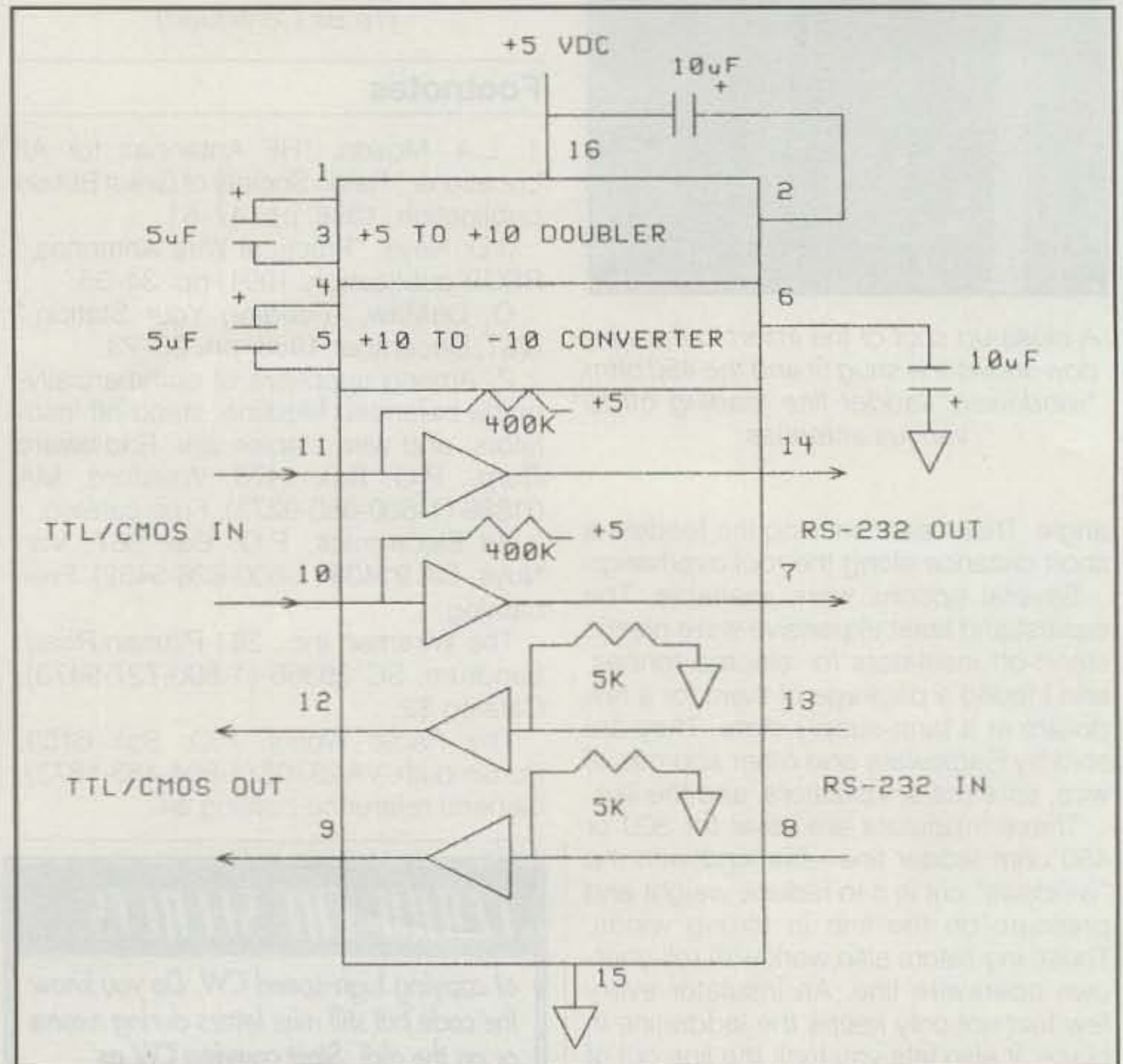


Fig. 1- Internal block diagram of MAX220.

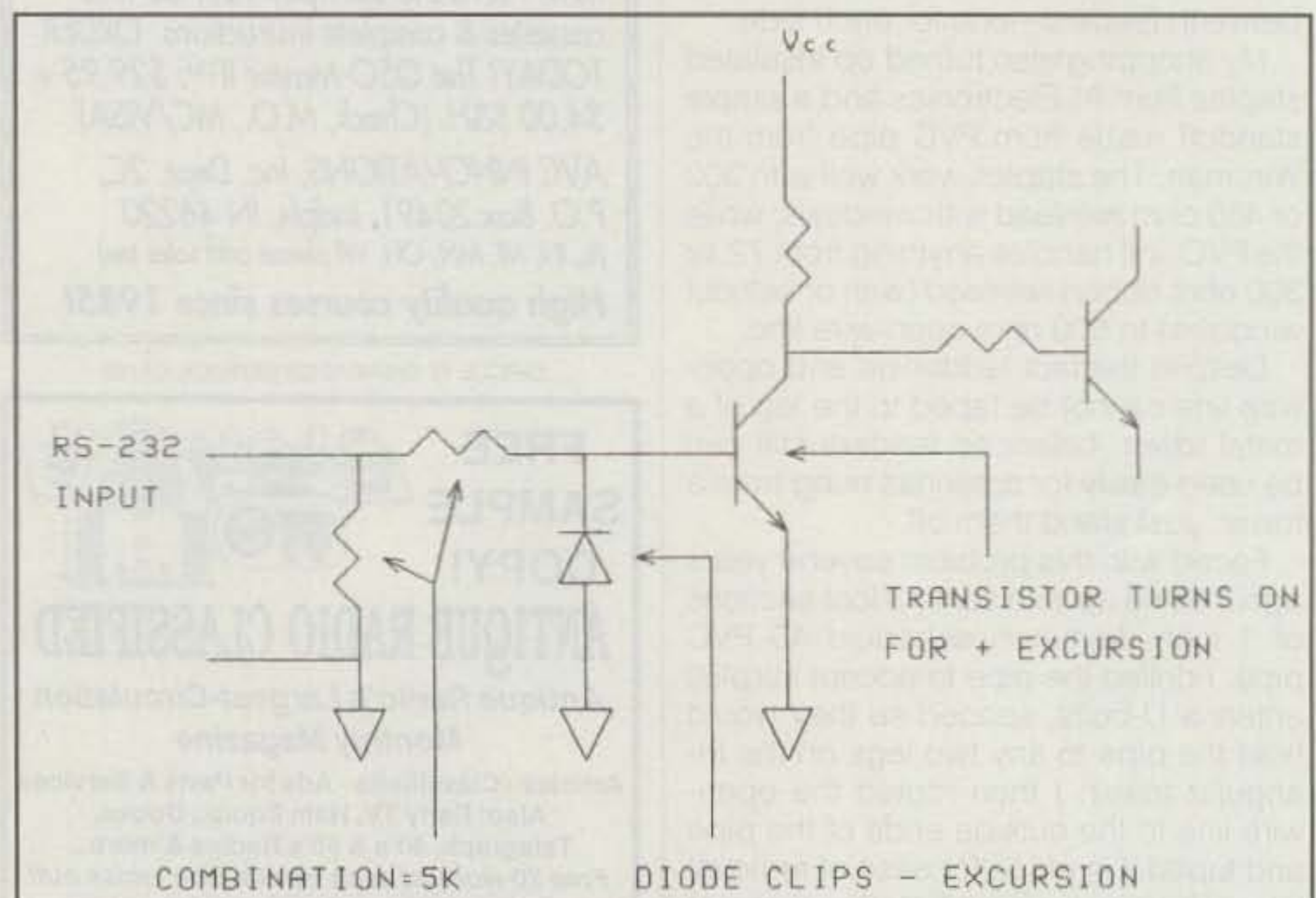


Fig. 2- Details of RS-232 input circuitry.

Pins 8 and 13 are the RS-232 inputs. Incoming RS-232 signals are applied to a 5K load (the RS-232 specs allows this load to go as low as 3K), and only the positive data levels are actually detected. The negative levels are clamped in a manner similar to the one shown in fig. 2. This detection scheme was first used in early RS-232 line receivers such as the popular MC-1489 and works well in all cases. After conversion to TTL levels, the signals are present on pins 9 and 12.

As you can see from fig. 1, use of the MAX220 is quite simple. Just connect the various inputs and outputs and you are in business. Since the chip only draws 15 ma from the 5 volt supply, battery operation is feasible and the need for the negative supply is gone.

Maxim offers other chips in the same series with slightly different pin connections and functions. The features of some of these are as follows:

MAX232: Same as MAX220 but 10x the data rate (200 Kb/s).

MAX242: Same as MAX220 but with low-power shut-down mode.

MAX230: Five TTL to RS-232 drivers.

MAX235: Five TTL to RS-232 and five RS-232 to TTL.

MAX236: Five TTL to RS-232, three RS-232 to TTL.

MAX244: Eight TTL to RS-232, ten RS-232 to TTL.

As you can see, there are enough combinations to satisfy all needs. If this is your "thing," be sure to contact MAXIM for more specific details. 73, Irwin, WA2NDM

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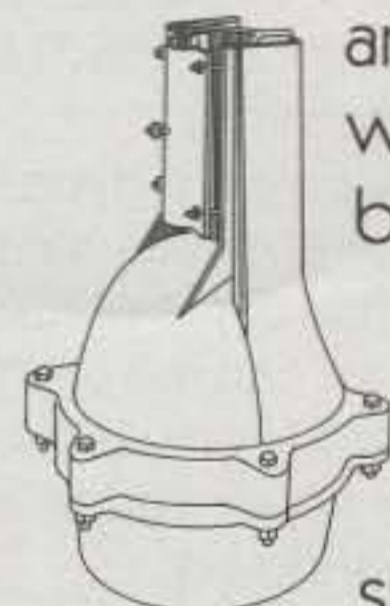
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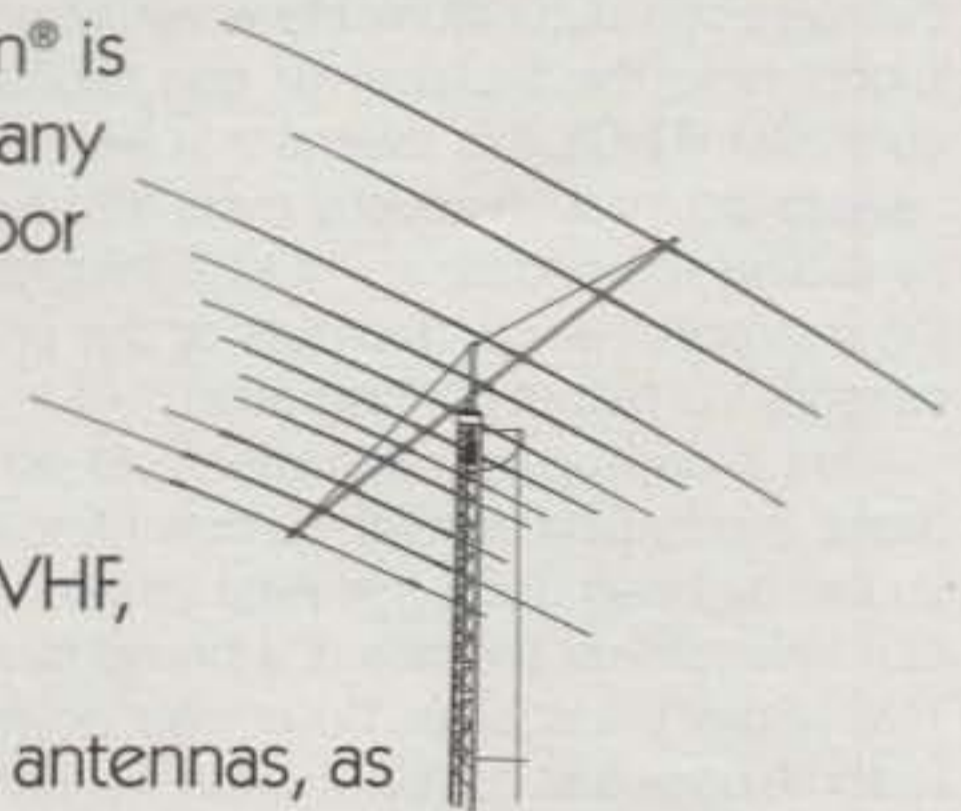
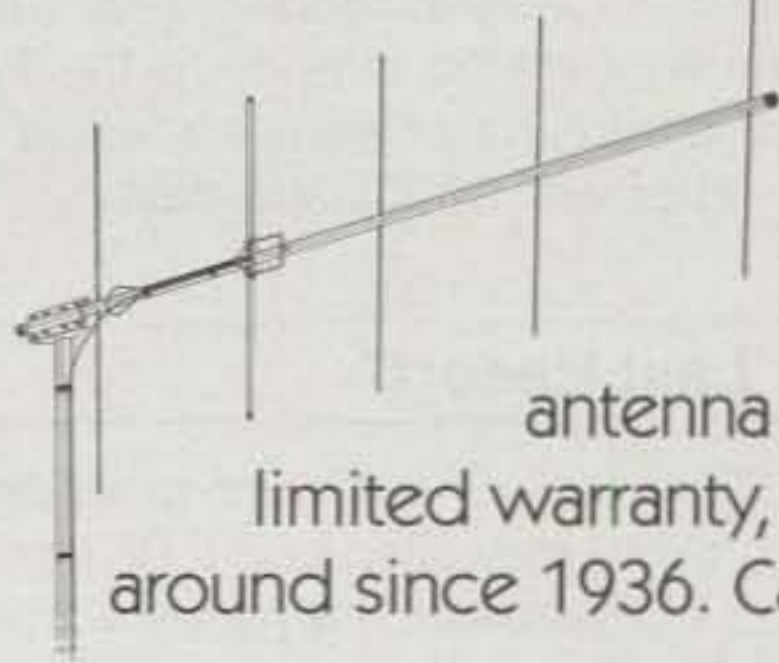
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PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

Interfacing—The Basics

Each year after the holidays many of us face the happy if not enviable problem of hooking up a new piece of equipment. For the digital operator, this may mean interfacing a new TNC, multimode, or all-mode controller and a new transceiver.

Interfacing a computer to a new TNC is relatively easy these days, as we can find RS-232 cables at almost any department store, and sometimes we actually can find them at a computer store. However, when it comes to the transceiver and digital controller (TNC), this means that we first have to dig through several manuals and try to find the necessary illustrations for the microphone input/outputs or the accessory I/O pinout configuration.

I felt it appropriate this month to address this happy problem, since I know you've all been good this past year and that lurking near the tree is a brand new TNC and/or transceiver. So let's get down to some basics to consider when we start to interface these goodies.

Lessons Learned (The Hard Way)

Long ago—(thirty plus years ago)—in the beginning, while employed as the chief engineer for a group of broadcast stations, I found how important it is to avoid "ground-loops." Ground loops are the most fierce dragons to appear in the life of a young engineer, or even worse, the environment of the new digital amateur.

I try to make it a practice *never* to ground both ends of the "shield" of the TNC-to-radio interconnect cable. Yes, I do use a "signal ground," but a ground that is separate from the shield. At first glance it will appear that the shield is grounded at both ends. However, in fact the shield is grounded only at the transceiver or radio end (see fig. 1). Most TNC manufacturers supply TNC-to-radio interface cables with a shield and a separate ground. If the shield is grounded at the TNC end, I go into the cable and disconnects the shield. I leave the (usually brown) single-wire ground attached.

I hear the sound of distant drums as

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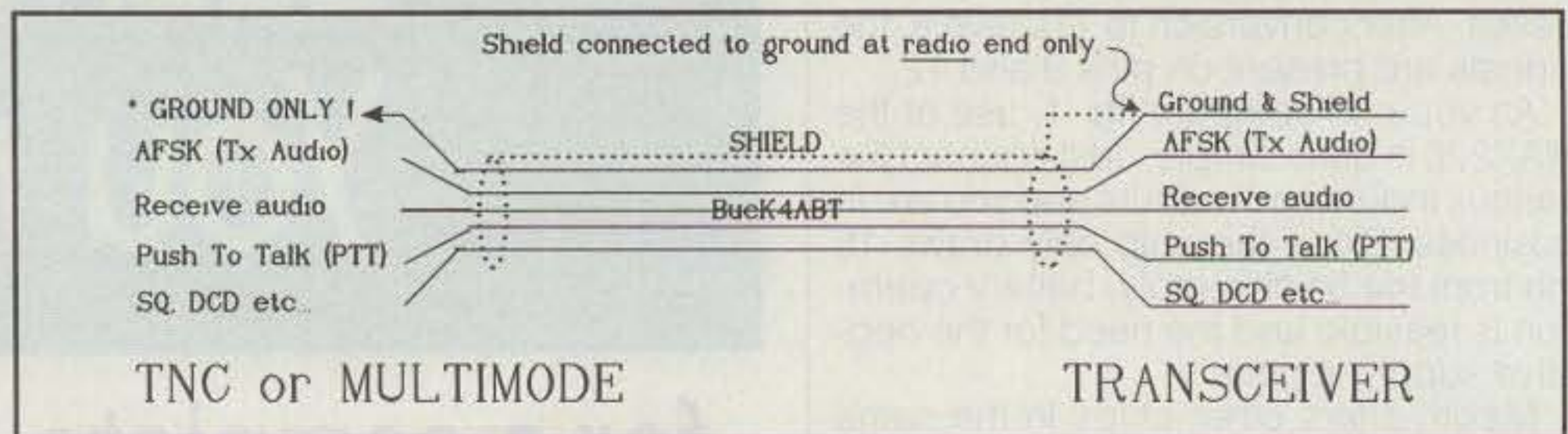


Fig. 1— TNC to radio interconnect cable.

some of the more seasoned amateurs among my readers begin to chant "bypass . . . bypass . . . bypass." Of course, we can use bypass capacitors to get rid of RF, and in some cases "hum" that may have ingressed into the cable via a ground loop, but let's reserve the use of bypass capacitors for the last resort. I feel that I'll be forgiven after I explain why I don't use bypass capacitors in the TNC audio path to the transceiver(s).

Here's the reason: Because a bypass capacitor can destroy or eliminate some of the frequency response of the (AFSK) audio path. The capacitor can roll off the higher frequencies, especially those near 2200 Hertz, or near the upper end of an FM transceiver audio bandpass.

Remember, as these audio frequencies go through the microphone amplifier, they are already beginning to roll off at the high (3000 Hz) end. Evidence of this can be seen when we try to push a 9600 baud signal through the microphone input of many of today's VHF or UHF FM transceivers. This is one of many reasons why we go directly to the frequency modulator or varactor stage of these radios with 9600 baud data.

The "Last Resort"

Stray RF or lack of sufficient grounding (earth ground) may often cause RF rectification or RF feedback. This happens when the interface cable between the TNC and the transceiver is exposed to strong RF fields, and RF invades the AFSK line and reaches the microphone input. When the RF enters the first microphone amplifier stage, a form of "base rectification" takes place. The result is a squeal, or whistle, that

appears on the carrier along with the data. This is where we begin to consider the "last resort."

If it becomes necessary to use bypass capacitors, I found that in about 85% of the cases, it will only be at HF frequencies. Even as I commit these words to print, I can hear screams coming from Florida, Mississippi, Kansas, and Washington states. Gentlemen, I said, "if."

Okay, I gave you the easy way out first. Now we'll look at "the good, the bad, and the ugly" ways.

The "Good" Way

Before going to extremes, let's try some tried and proven methods to control RF feedback. The first method is an easy one. Find a supplier of the MFJ-701 ferrite RF chokes. They usually come in a package of four for \$14.95. These chokes are two halves fitted together in such a manner that it takes less than a minute to install one, and they are reusable. The best place to start is on the cable end nearest the radio microphone (AFSK) input.

The "Bad" Way

Another and more complicated means of defeating RF feedback is by installing a small ferrite bead on the audio input line *inside* the microphone of the accessory I/O connector.

The "Ugly," (Get Out The Soldering Iron) Way

A more complex method is to add a series

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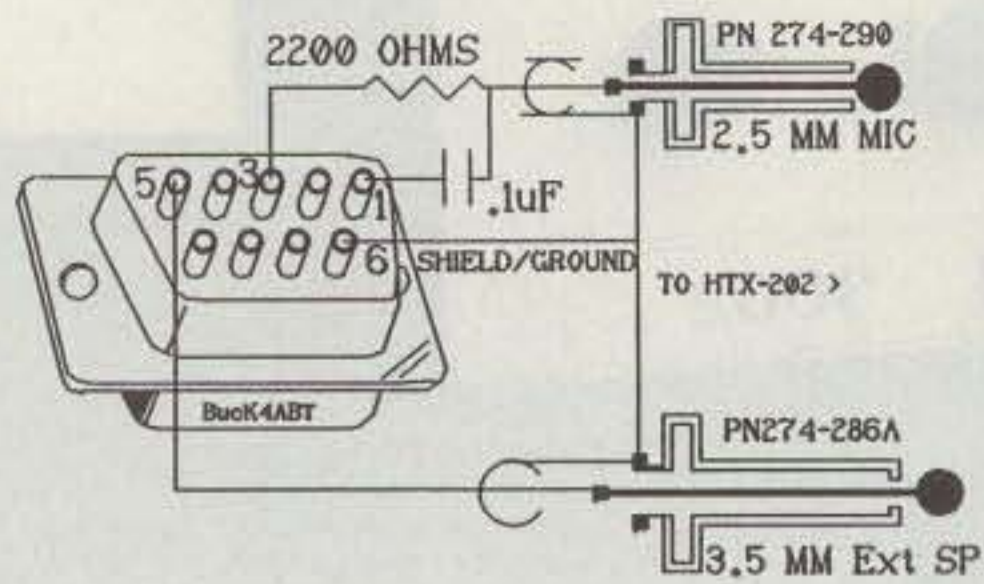
2KD Classic Desk model	3.5-30 MHz	2006-A Desk model	50-54 MHz
2K Classic Console	3.5-30 MHz	2002-A Desk model	144-148 MHz
2K Classic X Heavy duty console	3.5-30 MHz	2002-A Desk model	220 MHz
3K Classic Mk II	3.5-30 MHz	2004-A Desk model	430-450 MHz
3KD Premier Desk model	1.8-30 MHz	3004-A Console	430-450 MHz
3K Premier Console	1.8-30 MHz	3006-A Console	50-54 MHz
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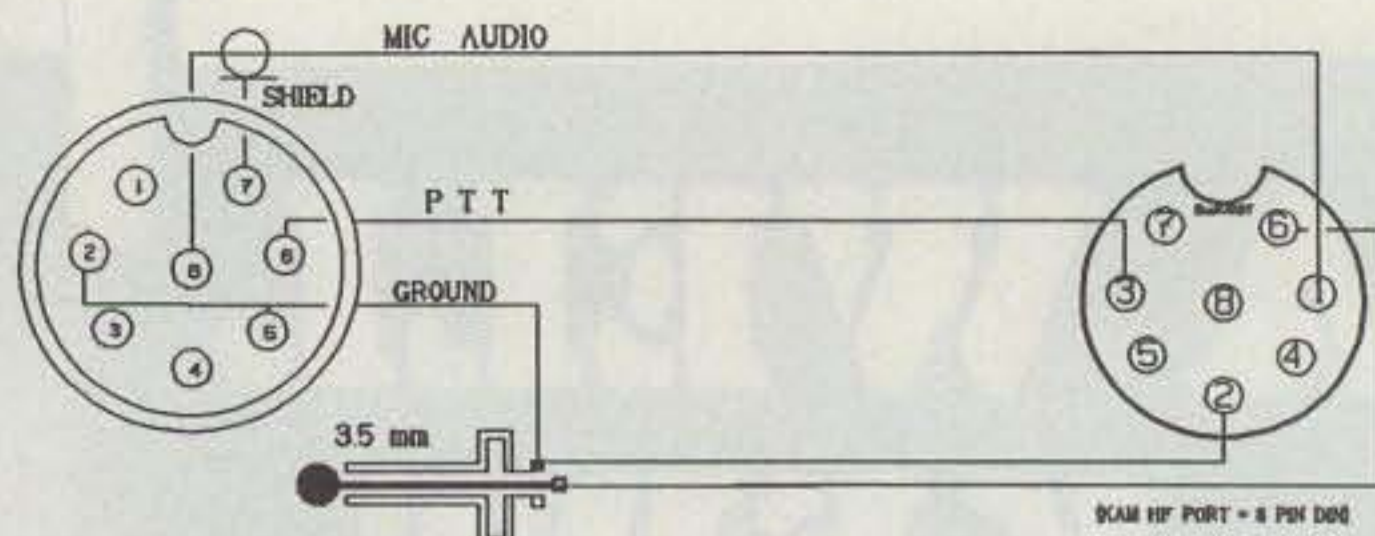
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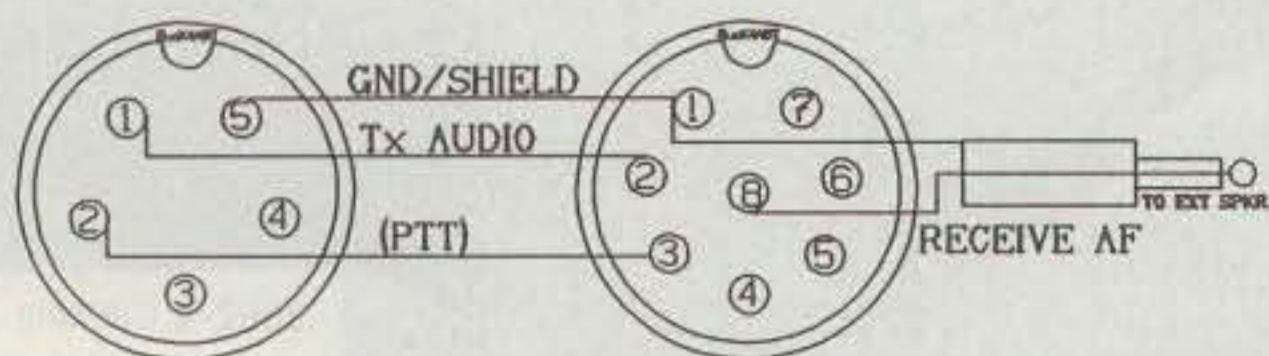
PACKET INTERCONNECTIONS



KPC-3 connected to RADIO SHACK HTX-202 HT.



YAESU FT-757 GTX-II TO KANTRONICS KAM HF PORT



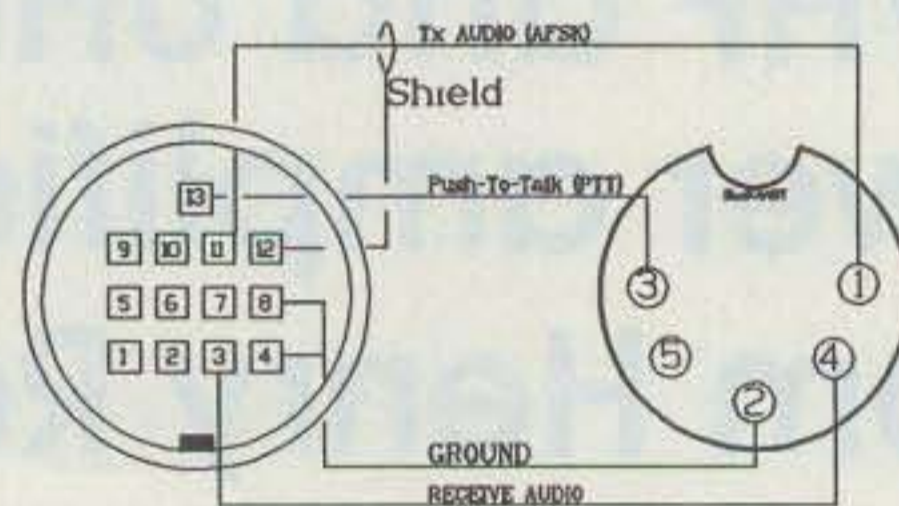
KENWOOD TR-7600 TO AEA PK-88



KPC-3 to ALINCO DR-1200 VHF Transceiver.

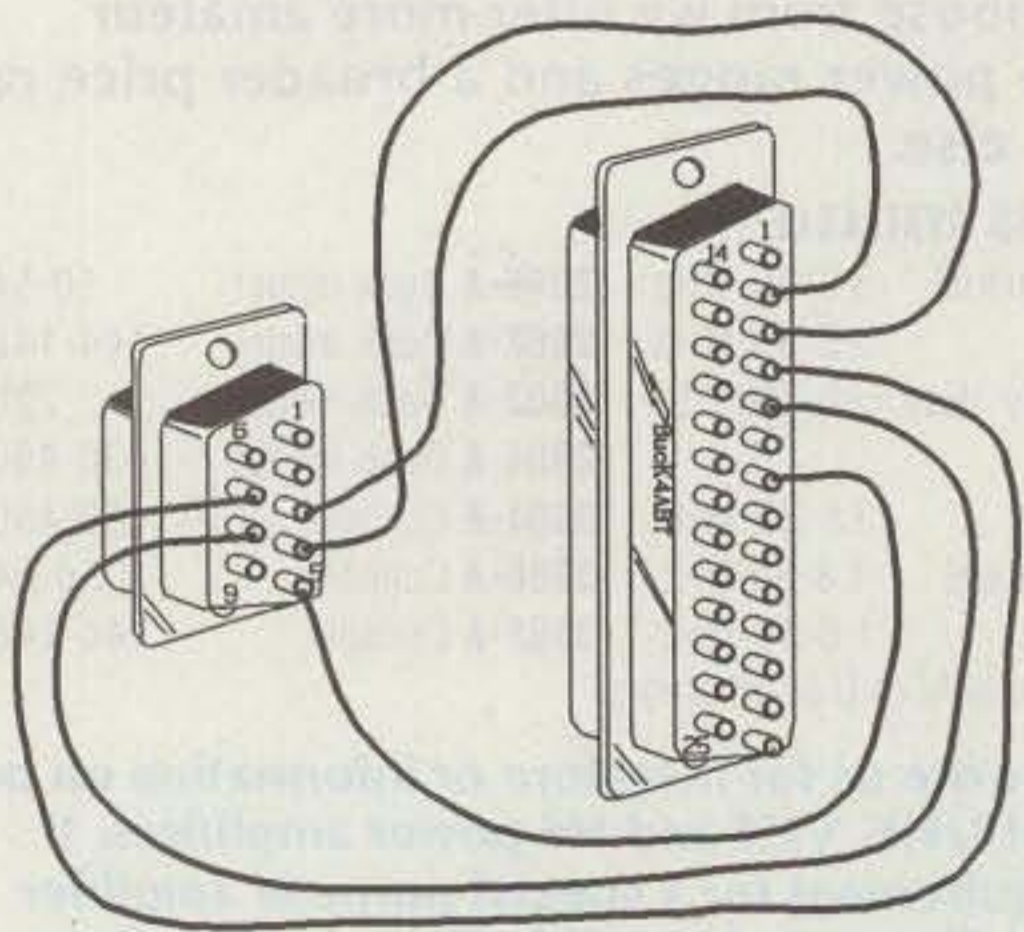


ICOM IC-27A, 28A, & 38A TO PK-88

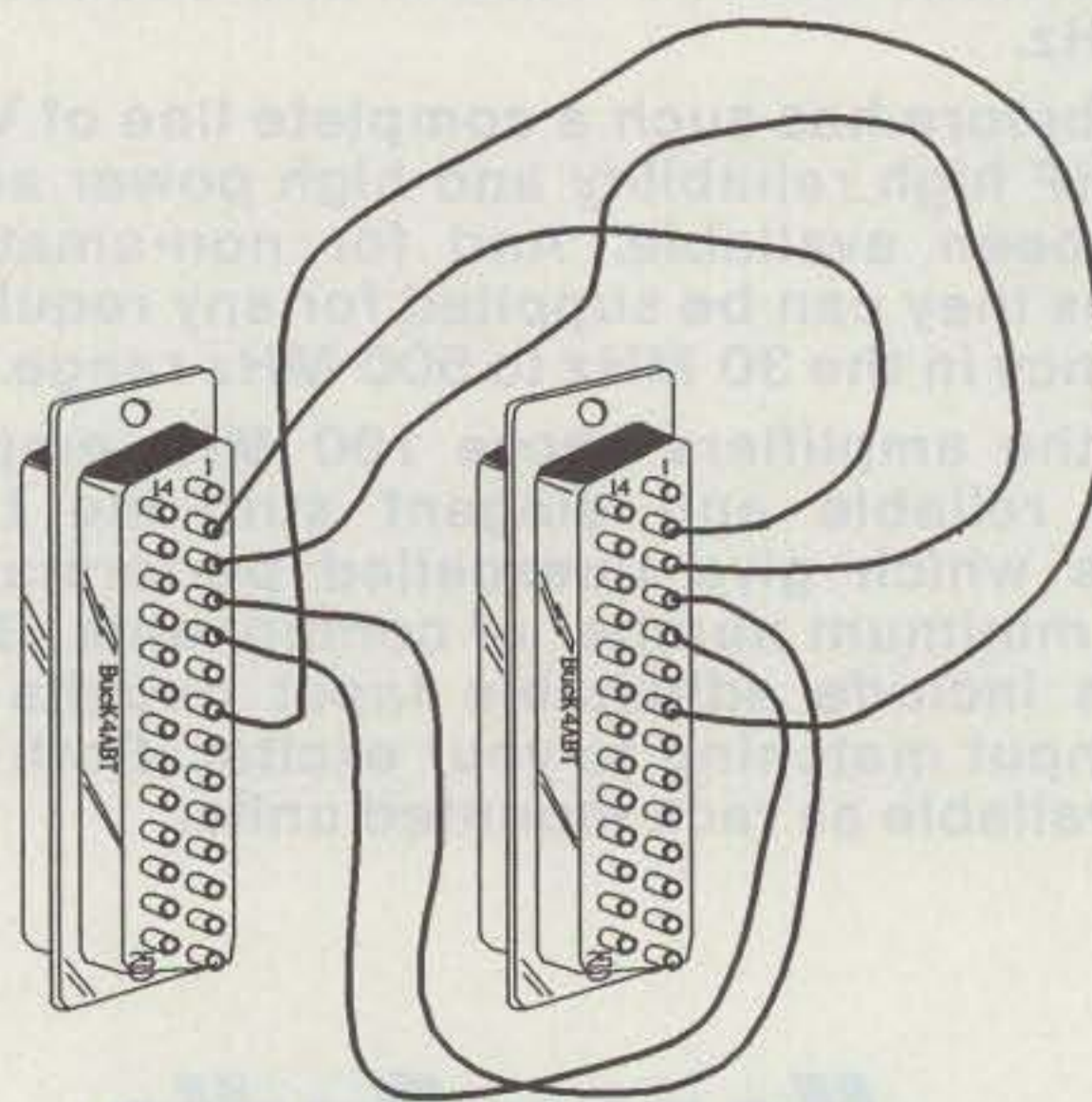


KENWOOD TS-440/940/450/95 ACCY-2 = 13 PIN DIN
AEA PK-900 & 1232 (5 PIN DIN RADIO PORT)

ACC-2 PORT OF TS-450 & TS-950 are similar.

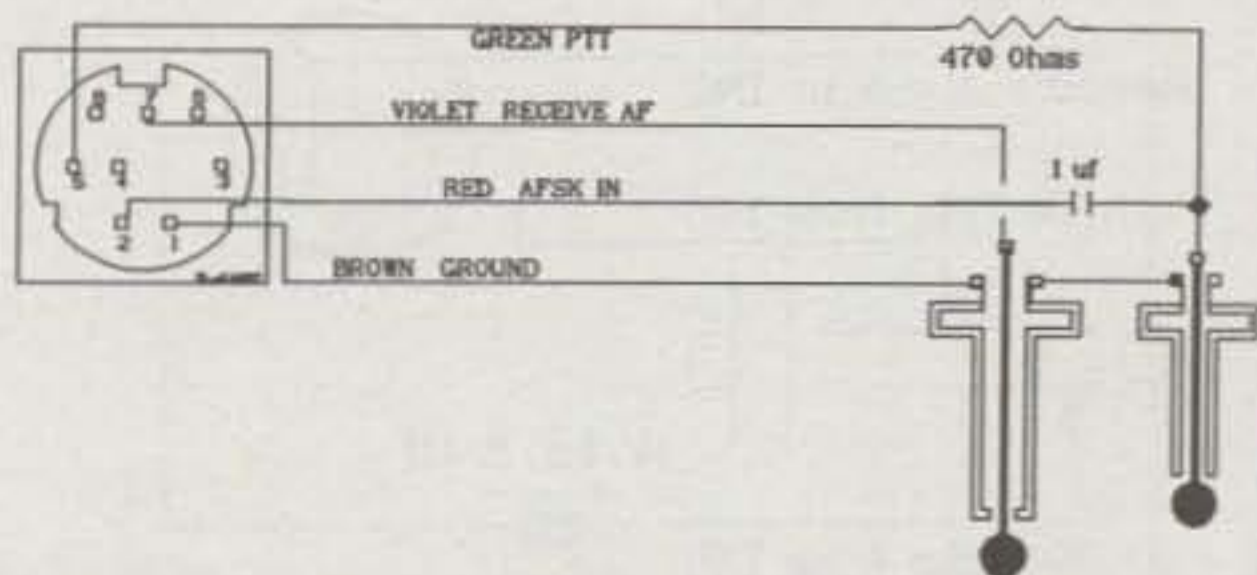
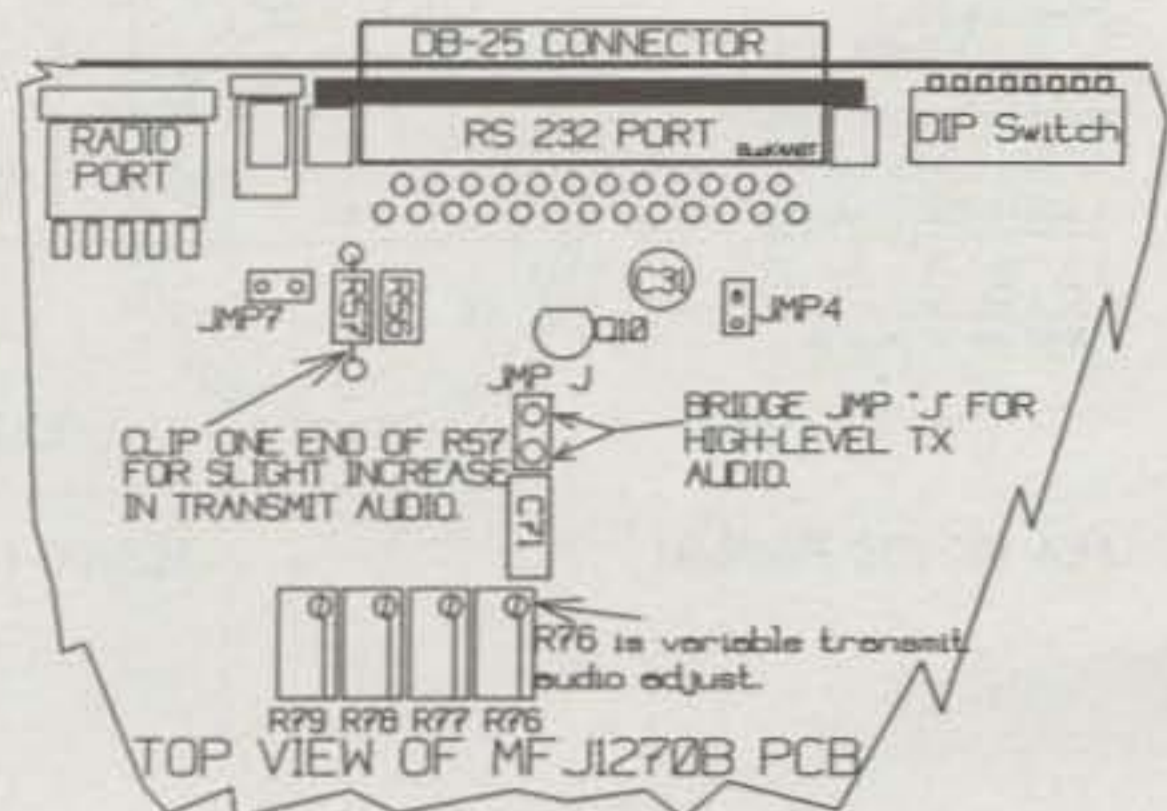


PC or compatible 9 pin comport to KPC-3



PC or compatible 25 pin comport to KPC-3

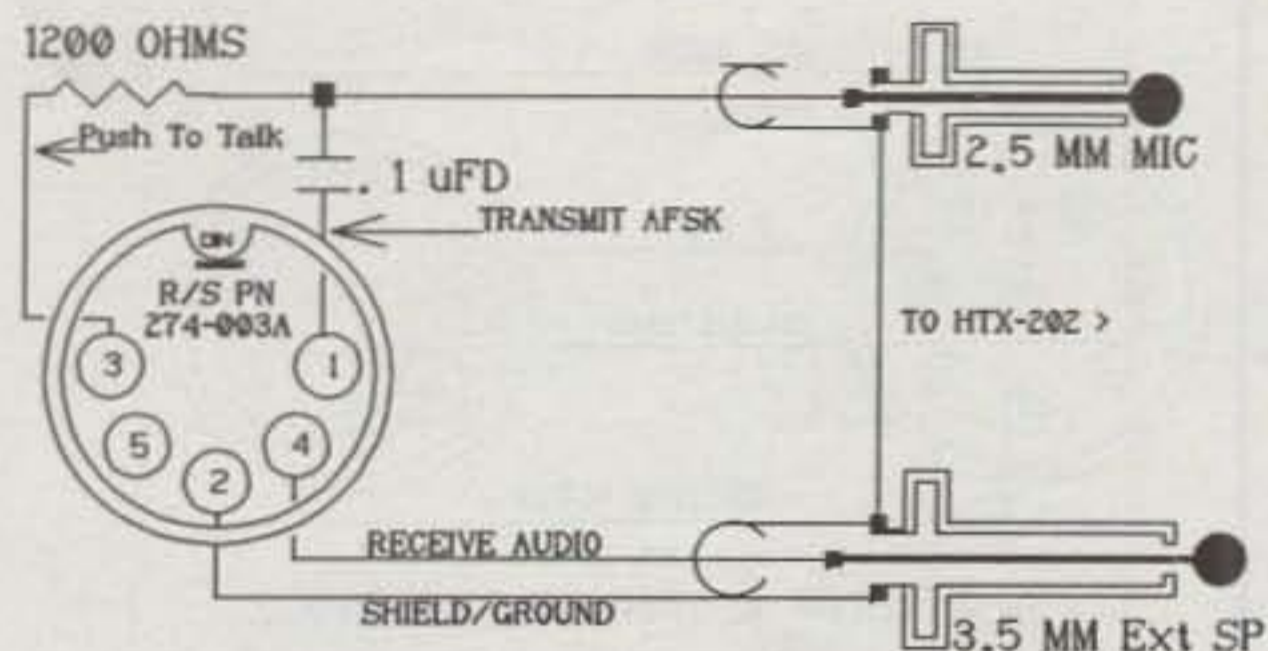
PACKET INTERCONNECTIONS



PacComm HandiPacket

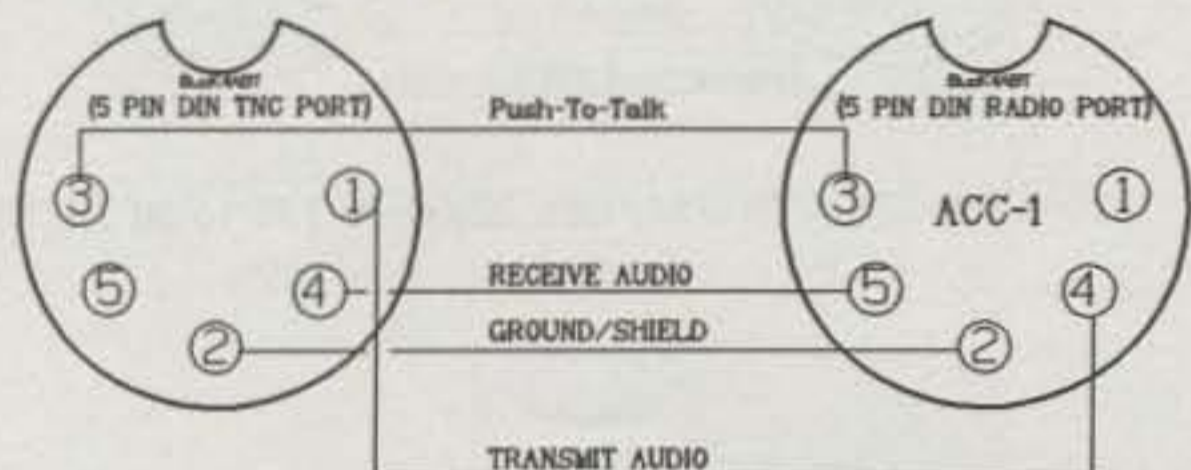
ALINCO DJ-F1

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PacComm Tiny 2

ALINCO DJF1 or DJ 580

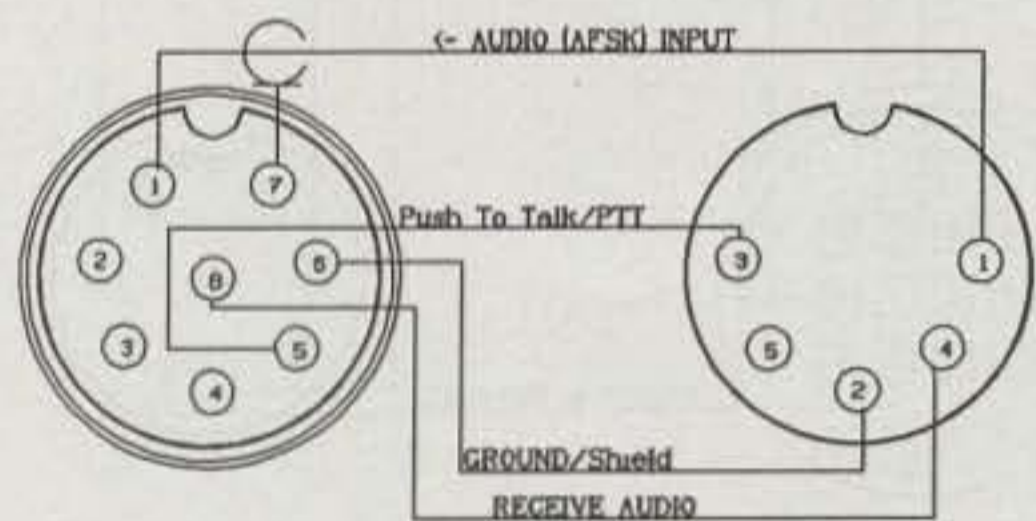


MFJ-1278 WITH PARAMETERS SET FOR HF. TO ICOM IC-735.



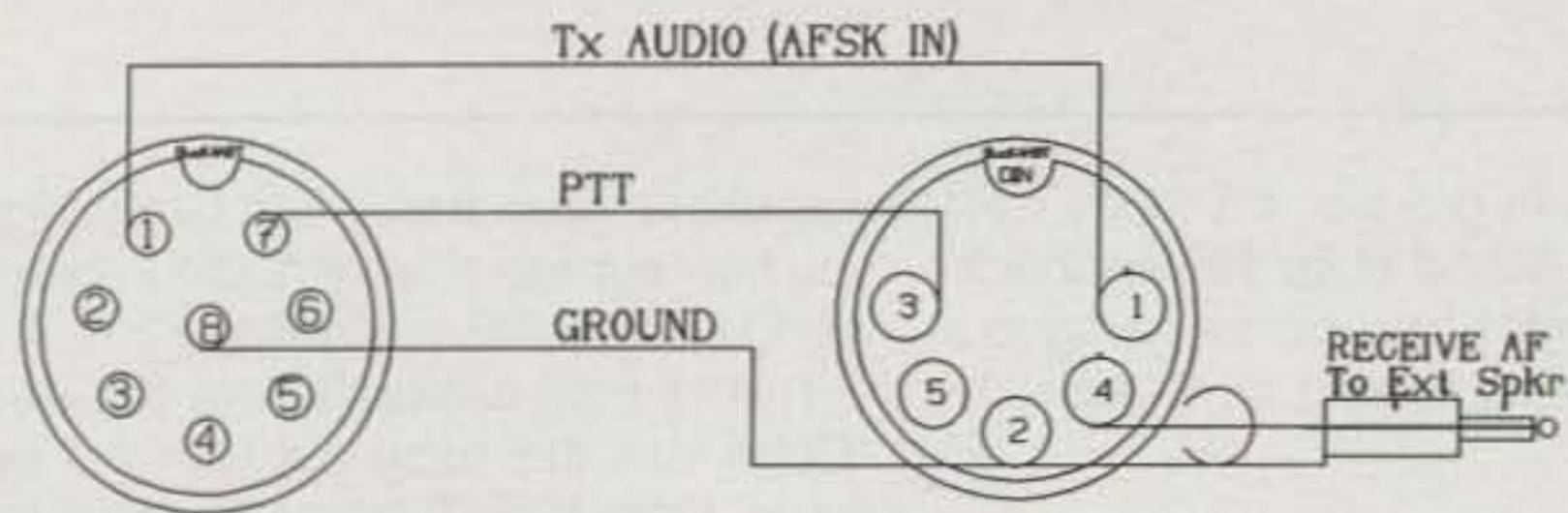
ALINCO DR-1200 DRSI PC Packet Adapter

(NOTE: Receive AF may be taken from the External Speaker or from pin 6 of the transceiver MIC connector)

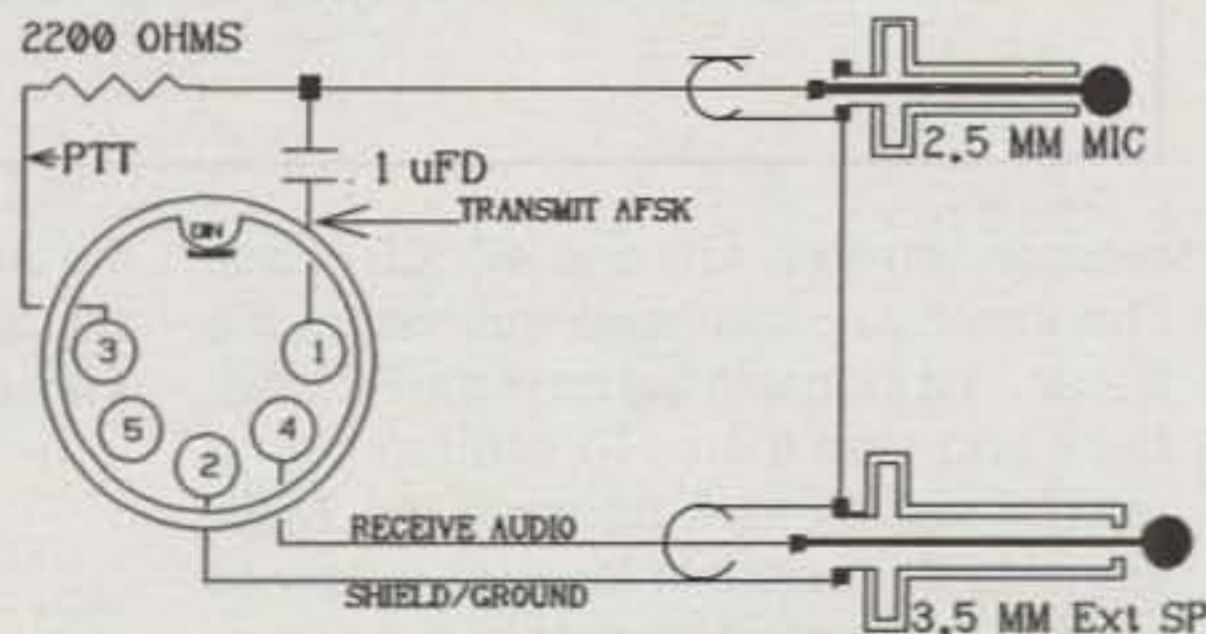


ICOM
27A/H 28A/H 228A/H

MFJ-1278/MFJ-1274
& MFJ-1270B



AZDEN PCS-5000 TO DRSI DPK-2

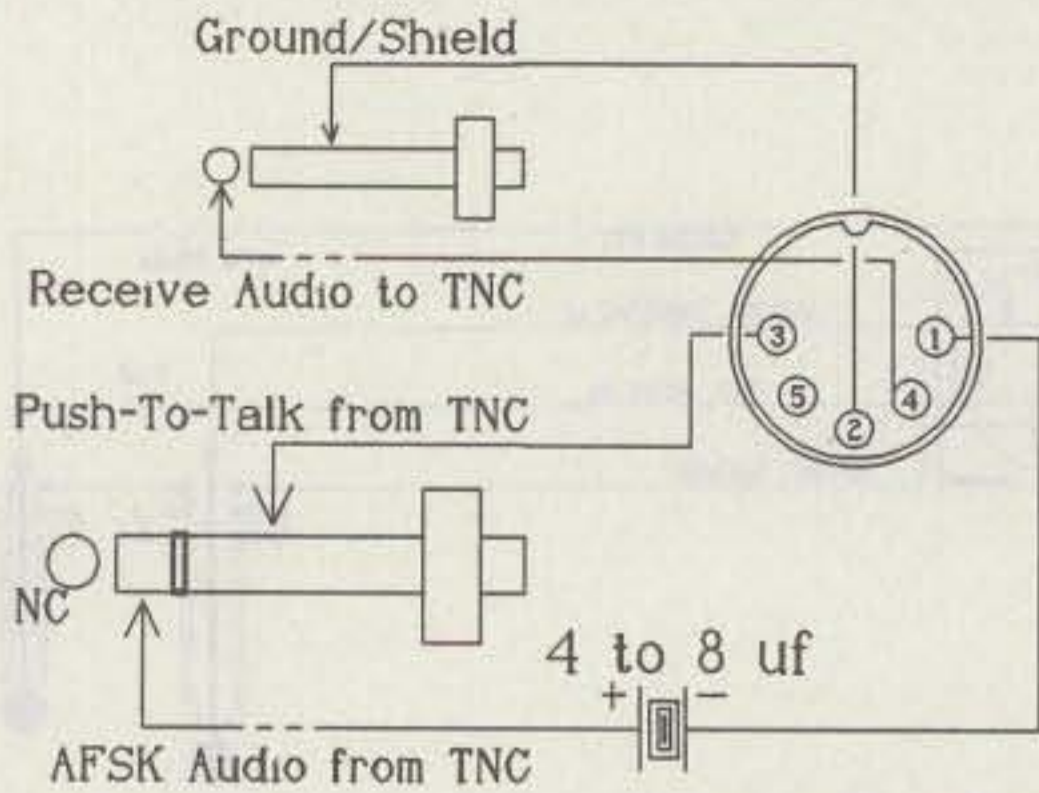


DRSI DPK-2

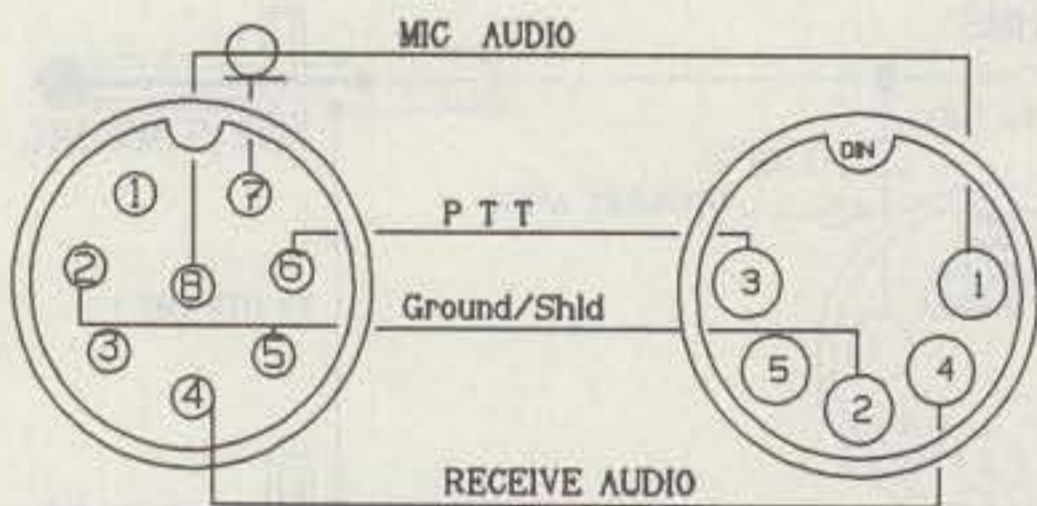
ALINCO DJ-580 (TwinBand HT)

PACKET INTERCONNECTIONS

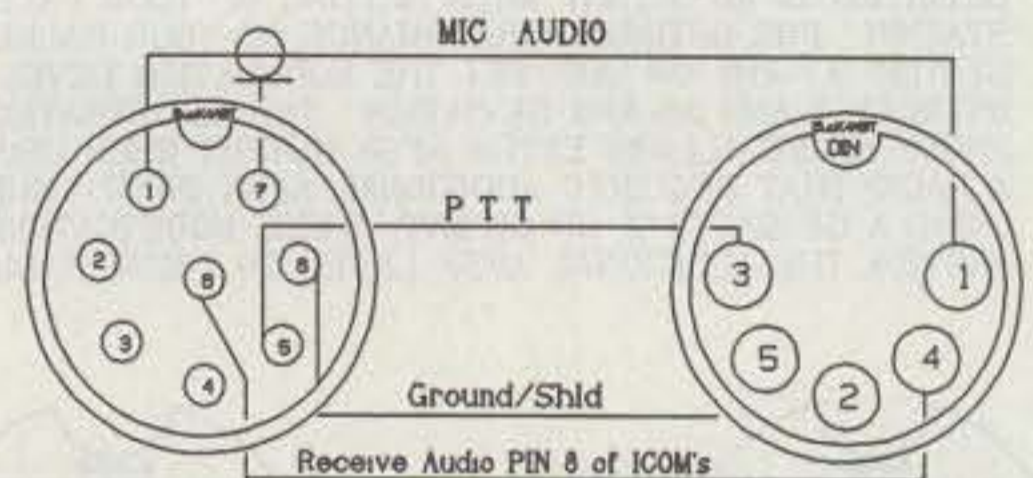
KENWOOD TH-25/26/27/45/55/75/205/215/225/315/415



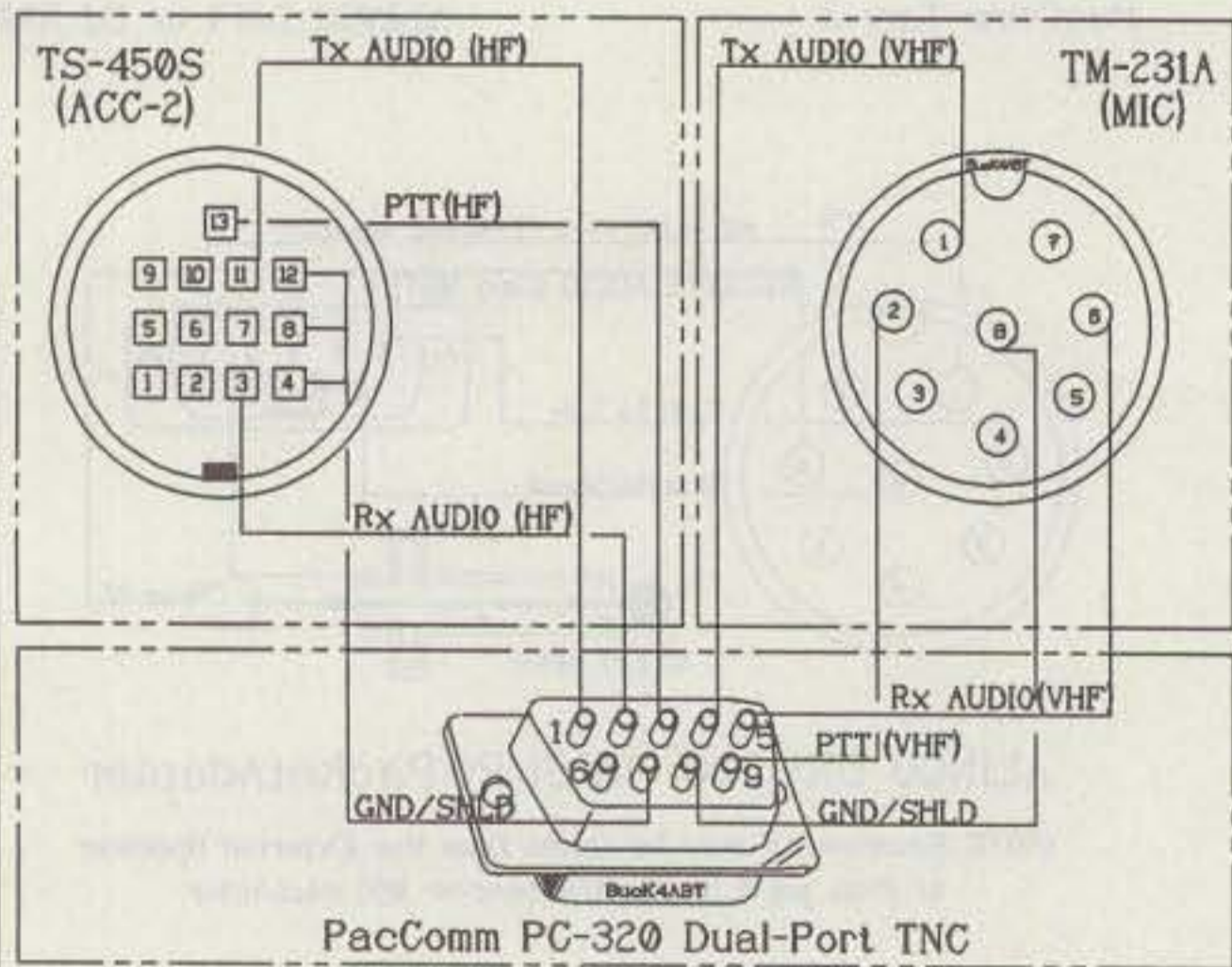
KENWOOD HT's MFJ-1270B



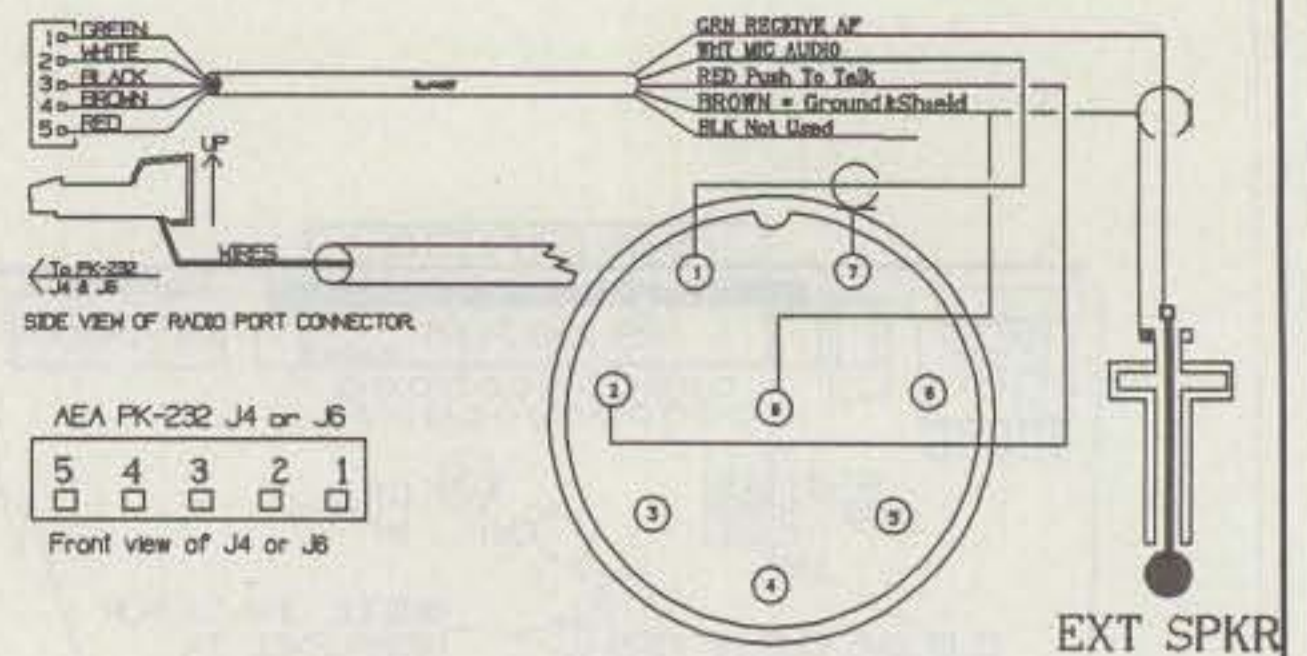
YAESU FT-2700 & 4700 TO DRSI DPK-2



IC-3200, 27A/27H, 28A/28H, 228/H & 735 to MFJ-1278

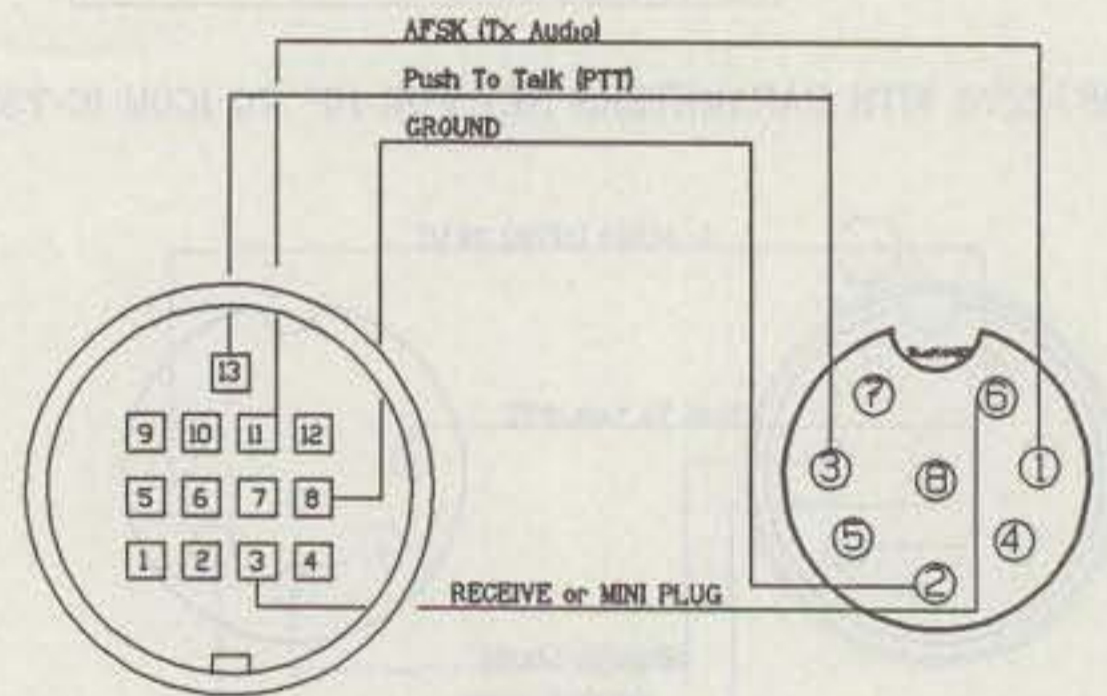


KENWOOD TS-450S (HF) & TM-231A (VHF) TO PacComm PC-320



AEA PK-232 PacRatt

ALINCO DR-600



KENWOOD TS-450 & 950 ACC-2

KAM Plus "HF" PORT

resistor between 470 and 47,000 ohms. The lower you can keep this value, the better. The idea is to get rid of the RF feedback and stop there. To use too high a resistor value might degrade the AFSK signal to an unusable level, or suppress the AFSK signal altogether.

A similar rule applies when using a capacitor to eliminate RF feedback, except that in this case, the capacitor is installed in a parallel configuration or from

the AFSK line to ground. If a .0001 mFd capacitor will get rid of the RF feedback, then by all means try it before going to a larger value such as .001 or .01 mFd.

AC Hurts and RF Hertz, Too

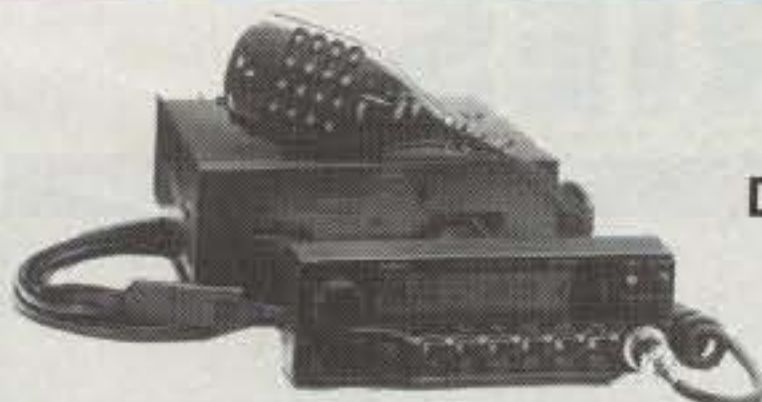
Remember, RF is an alternating current, and so is audio. The other rule to remember: A capacitor passes AC, not DC. If

you use a value that is too large (high), you may bypass all your audio to ground along with the RF component.

This is truly a case where the axiom "Don't toss the baby out with the bath water" holds true. The end result will be a cleaner signal on the air, and above all, you will have faster connects and fewer tries (retries).

Happy Packeting!

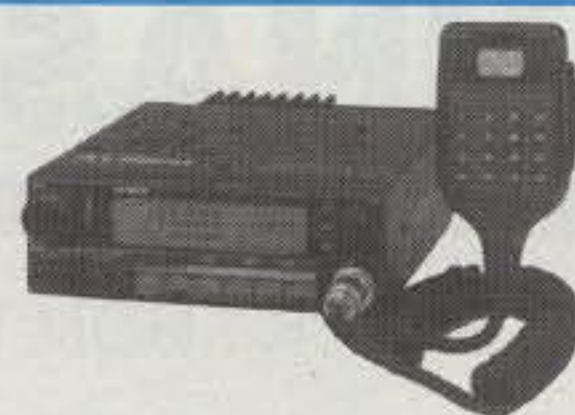
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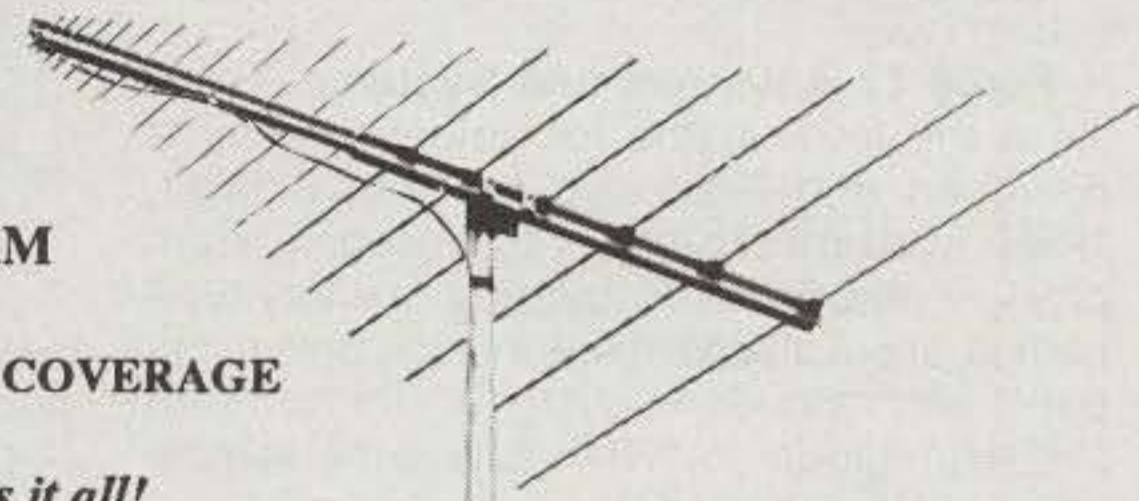
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ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Happy New Year '94!

As we soon enter our fourteenth year of doing the "Antennas and Accessories" column in *CQ* we extend to all our readers the very best of wishes for a happy and prosperous 1994. That said, let's dig right into the "meat" of this month's column.

Antenna Topix

Larsen Mobile Antenna Tip. A tech tip found in Larsen Antennas' *Antenna News* is worth passing on. When installing mobile antennas, there's the understandable tendency to do minimum damage to the vehicle's paint job and overall appearance, often at the expense of antenna efficiency. But don't overlook the importance of obtaining a good ground to bare metal.

There's more to preparing the ground than first appears, and a bad ground often results in poor antenna performance. When installing a permanent rooftop mount, for example, you may have to "work blind" beneath the vehicle's roof to scrape away the undercoat. Before permanently putting a mount in place, use an angle screwdriver or other scraping device to clean away any paint that remains beneath the hole. Finally, always take an SWR reading before completing and buttoning up the installation.

Force 12 Antennas and Systems. Force 12 is the trade name for antenna systems designed and produced by Tom Schiller, N6BT. At least three major HF directional beam product lines, each bearing military-type names, are available; these include both multi-band and monoband systems. Tom's vision sets high standards: "Why imagine the ultimate when you can have it?"

Force 12's general goals are to produce systems for the amateur who would like to have a good, competitive signal even while living in an urban setting. More to the point, specific design goals for the antennas include keeping parts and assembly simple; having good appearance and a "low profile"; possessing high strength with minimal weight; offering minimal wind load; and delivering high performance in gain, pattern, and SWR.

A key feature of the Force 12 line is wind survival. The name itself is based on the "force 12" of the Beaufort wind scale that defines wind force 12 as 73-136 MPH, or hurricane force, the point at which devastation occurs. Force 12 minimum survival is computed at 75 MPH or more; even higher reliability models are available. Each element and the boom are modeled for maximum strength with minimum profile and weight. Element-to-beam attachment is made by a hot-dip galvanized steel clamp around the boom. The beams are wind



The Electron Processing SCANR SAVR addresses the problem of RF-overload induced mobile scanner failure. The unit installs in the scanner's antenna line; when it senses radio signals strong enough to cause damage, it disconnects the scanner from the antenna, preventing damage to the radio. In addition, the \$65 device also can be used to protect base station scanners. (Photo courtesy Electron Processing, Inc.)

balanced using proprietary wind-balancing and compensation software.

One of the most interesting Force 12 products is the NOMAD (NO loss Multiband ADaptable Yagi) series antenna. It's a dual-band Yagi with a single feedline, with no matching system and no traps. An adaptation of a sleeve antenna is used for the driver section, which is composed of three elements. These are the center (feed point), tuned for the lower band, and two adjacent, parasitically excited elements for the higher band. The three elements are claimed to excite the array "with no loss" and also perform an impedance transformation for 50 ohm feed. A separate reflector is included for the lower band; the parasitic directors for the higher band also act as directors on the lower frequency (although they aren't optimally tuned). NOMADs range from \$297 to \$685, depending on band combinations and number of elements.

For a brochure, contact Force 12 Antennas and Systems, 3350 Scott Blvd., Bldg. 6102, Santa Clara, CA 95054 (1-800-248-1985).

EP SCANR SAVR. Electron Processing has introduced what it considers to be an answer to the problem of RF-overload induced mobile scanner failure, a possibility in installations that contain both a mobile scanner and mobile

transceiver. With a limited amount of spacing between the scanner and transceiver antennas, the scanner is at risk of having its receiving "front end" circuitry damaged by the strong transmitter, especially when high power or closely mounted antennas are used.

The SCANR SAVR installs in the antenna line of the scanner. When it senses radio signals strong enough to cause damage, it disconnects the scanner from the antenna, preventing damage. Housed in a 2 inch square box, the unit mounts near your scanner and connects using BNC connectors.

Signals within the range 15-2000 MHz are detected by the sensing circuit, which has an adjustable trip point that allows the unit to be adjusted to correspond with the overload characteristics of the scanner. The device also can be used to protect base station scanners. It is priced at \$65.

For a free 14-page accessories catalog contact Electron Processing, Inc., P.O. Box 68, Cedar, MI 49621 (616-228-7020).

SGC Followup. We have mentioned SGC in several columns, providing thumbnail profiles of several of their antenna systems and accessories. SGC has expanded its product line considerably to become a leading supplier of "ruggedized" communications products, including commercial/military quality SSB mobile and base station transceivers and RF-related accessories.

Recently SGC has made efforts to increase sales in the amateur market. SGC's George A. Ure, AC7X, notes that the company tries to produce American-made equipment that is truly different, both in the transceiver and in the RF accessory product lines. It's the accessories that especially interest us.

Probably best known among them is SGC's microprocessor-controlled "intelligent" (frequency memorizing) automatic HF antenna coupler for marine, aviation, paramilitary, and amateur operation. The SGC-230 Smartuner handles any antenna length from 8 to 80 feet in any HF band from 1.8 to 30 MHz, and using up to 150 watts PEP. No preliminary tuning or adjustment is required, and the unit operates with most HF transceivers; 12 VDC is required. The input impedance (from the transceiver) ranges from 45-55 ohms, and a typical SWR of 2:1 results. It's \$595.

SGC also offers the SG-303, a rugged 9 foot HF antenna for marine and mobile use. For the range 2-30 MHz the antenna is intended for use with the SC-230 Smartuner or other automatic coupler. Included is a stainless-steel ratchet mount, a heavy-duty base spring, and other installation accessories that facilitate use with the SG-230 coupler. The ratchet mount allows the antenna to be folded down when the vehicle is in operation. The antenna handles 150 watts and weighs 6 pounds. It's \$495.

One of SGC's newest products is the Quick

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IC-4KL 1 kW Amp	7865.00	Call \$
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IC-R71A 100 kHz - 30 MHz Rcvr	1279.00	Call \$
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IC-R72 30 kHz - 30 MHz Rcvr	1145.00	Call \$
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IC-2SAT Micro Sized HT	372.00	Call \$
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IC-901 New Remote Mount Mobile	1119.00	Call \$
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IC-W21AT Dual Band HT	625.00	Call \$
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IC-Δ1A, 2M, 440, 1.2 GHz, HT	TBA	Call \$
IC-2330, 2M/220 Mobile	865.00	Call \$
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220 MHz		
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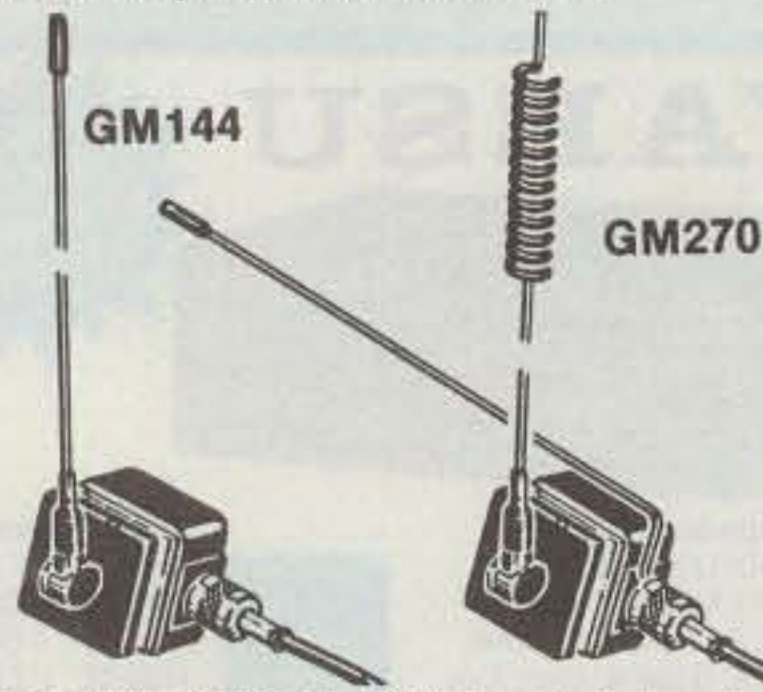
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PRO•AM's GM270 is 26 inches tall, handles 50 watts, and covers 144-148 plus 440-450 MHz with SWR less than < 2:1 at band edges (tunable via interior coupling unit). Gain is 2.6 dB 2m and 6.3 dB 70cm. A real tiger!

"Stylish, trim, and petite" only begin to describe PRO•AM's exciting new 2 meter, 70 cm, and dualband mobile antennas. They feature a slender black chrome whip and small candy kiss-size base that looks terrific on any auto. Inside the little 1 1/4 inch diameter base is a newly-developed and ultra-strong titanium magnet that holds in place like a bulldog, even at high speeds. These new micro magnet antennas are supplied fully assembled and ready to use, with 9 feet of RG-174 mini coax and BNC connector.

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Technical Data

- MM144B 2m: 19" tall
1/4 wave whip
- MM450B 70cm: 6.5" tall
1/4 wave whip
- MM270B 2m/70cm: 19" tall
1/4 wave 2m,
5/8 wave 70 cm



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Rabun Labs offers ILD/P equipment protection models for amateur radio and two-way communications gear, satellite receiving systems, PCs, well pump motors, air-conditioning compressors, and other electrical devices. The systems effectively unplug (disconnect) your equipment before the electrical storm gets close enough to get into your equipment and do damage. (Photo courtesy Rabun Labs, Inc.)

Mount System (QMS), which enables quick mounting of the SG-230 antenna coupler and SGC-303 antenna. QMS is universally adaptable to any size vehicle or vessel, without drilling holes. The system originally was custom-designed for overseas military use to provide rapid HF communications system installation on field vehicles. QMS, which can be installed in about 15 minutes, is supplied with straps, buckles, and a case for the SG-230 coupler. The case has four suction-cup feet so vehicle surfaces will not be damaged. The system, priced at \$490 (less tuner and antenna), can withstand high speeds without performance limitation.

For more information contact SGC, Inc., 13737 S.E. 26th St., Box 3526, Bellevue, WA 98009 (206-746-6310).

Rutland Arrays Update. We have highlighted Rutland Arrays previously; they're well-known for their VHF and UHF Yagis for 50 to 450 MHz. The K1FO and K3IPW-based designs feature high gain, wide gain bandwidth, clean patterns, a good impedance match, and a high F/B (front-to-back) ratio. Specialized interests served include tropo, meteor scatter, EME, ATV, and weak-signal DXing.

The current Rutland antenna lineup features 13 single band Yagis ranging from 144 to 440 MHz, using from 4 to 33 elements. Prices are somewhat upscale, from \$91.75 to \$279.95, depending on type, band, and number of elements; power dividers and stacking frames also are available. Rutland's prices seem reasonable in view of their strong commitment to high-quality materials and workmanship, embodied in the plain-talk motto: "We design and build our antennas for performance not price."

For detailed specs and pricing, contact Rutland Arrays, 1703 Warren Street, New Cumberland, PA 17070 (1-800-536-3268).

Rabun Labs ILD/P System Update. Last June we profiled the Rabun Labs ILD/P system (the acronym refers to the "Incipient Lightning Detection and Device Protection System," patent pending). You're all well aware of the possibility of lightning-related damage to your radio gear and other electronic equipment, computers, telephones, FAX machines, modems, and antennas. Often, when a storm threatens, you disconnect and ground high-value equipment as a safety precaution—if you're home or remember to do so before leaving home. ILD/P can provide an automatic solution to the problem of equipment protec-

tion that goes far beyond the protection offered by ordinary surge protectors.

ILD/P effectively unplugs (disconnects) and grounds your equipment before a storm gets close enough to get into your equipment and do damage. A responsive electronic detector constantly monitors the atmosphere for an approaching storm. When the storm becomes a threat (typically 2 to 5 miles distant), the ILD/P system automatically disconnects AC power, telephone line, and coaxial cable connections. When the storm has passed, the system restores all connections to your gear.

In expanding their product line considerably, Dan Young, Rabun Labs president, explains that the firm now offers about a dozen ILD/P models for amateur radio and other two-way communications gear, satellite receiving systems, PCs, well pump motors, air-conditioning compressors, and other electrical devices. Models also are available that can automatically power standby AC power generators and provide emergency notifications and alarms, detect power surges, or just provide warning only (with output for an alarm or siren). Prices range from about \$200 to \$1000, depending on the application and unit's features.

Dan also told us that his company relocated from the Peach State to sunny Orlando, Florida. Contact Rabun Labs, Inc., at their new address; 4407 Vineland Rd., Suite D-18, Orlando, FL 32811 (1-800-788-1824).

Software Topics

FlexPac. Over the course of about five years Bob Seidel, ND2O, developed what became known as FlexPac for the IBM PC. Originally it was for use on the K5NA PacketCluster® in New York. There was no intent to distribute the program, but many users praised the program as one of the most advanced packet terminals available, so Bob began distribution with the help of Rich Thorne, WB5M, initially as shareware. Bob continues to provide technical support for FlexPac.

FlexPac boasts that it's a "real" packet/TNC program, not just a glorified terminal. Some of its features include ease of use; enhancement for PacketCluster users; multiple windows and sessions; separate DX and stream windows; ability to send "DX spots" to a printer; pull-down menus; automatic log-ons; a full script language; a connect alarm; simultaneous input and output; and full documentation.

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YAESU FT-1000 • 200W - 9-band, all-mode HF transceiver with 100kHz-30MHz receive, 99 memories, built-in antenna tuner with memories. Built-in AC ps. 6"h x 16"w x 15"d, 58 lbs... **SPECIAL** ☎

YAESU FT-1000D • Deluxe version with dual band-pass filter for crossband receive, temperature compensated crystal oscillator, 2.4kHz/2KHz SSB filters and 500Hz CW xtal filter **SPECIAL** ☎



YAESU FT-990 • 100W - all mode 160-10M HF transceiver with 100kHz-30MHz receiver, 99 memories. Built-in antenna tuner and AC power supply. 12¾" w x 4½" h x 11½" d, 30 lbs **SPECIAL** ☎

FT-990DC • No AC ps or CW filter **SPECIAL** ☎



YAESU FT-767GX • All-mode, 160-10M xcvr with 100kHz-30MHz receiver. Options for 6M, 2M & 70cm 100W out to 30MHz, 10W above. Built-in AC ps. 5¾" h x 14½" w x 11½" d, 30 lbs. **CLOSEOUT** \$1699



YAESU FT-890 • 100W 160-10m all mode transceiver with 100kHz-30MHz receiver. Optional internal automatic antenna tuner. 13.5VDC @ 20A. 9½" w x 3¾" x 9½" d, 12.3 lbs..... ☎

YAESU FT-890/AT • w/ant tuner ☎

NEW! YAESU FT-840 • HF transceiver..... ☎



YAESU FT-747GX (left) • 100W, 160-10M SSB/CW base or mobile transceiver with 100kHz-30MHz receiver, and optional FM transmit/receive. 12V DC @ 20A. 3¾" h x 9½" w x 9½" d, 7 lbs..... ☎

YAESU FT-650 (right) • 100W, 6, 10 & 12M all mode with 24.5-56.0 MHz receive. 105 memories: 99 for channels, 4 programmable scan memories and 2 priority channels. Built-in AC supply or 12V DC. @ 18A. 5¼" h x 11½" w x 11½" d, 18 lbs..... ☎



YAESU FL-7000 • Solid-state, 160-12M. linear with built-in automatic antenna tuner and power supply. 70W drive for 600W output. Full break-in for CW, HF Packet and AMTOR. Auto. selection of 4 antennas with opt. unit. 5" h x 15" w x 15" d, 66 lbs..... ☎



YAESU FT-736R • All-mode, 2M/430 multi-band VHF/UHF. Optional. modules for 50MHz, 220MHz, and 1.2GHz. 10W on 50MHz and 1.2GHz, 25W. on 2m and 440 MHz. Built-in AC ps, or 12V DC w/optional power cord. 5½" h x 14½" w x 11½" d, 19.8 lbs ☎



MK II's 2½W, FM, SSB/CW portable. Requires 12V DC @ 1.1A, or opt. battery case with 9 (C) cells or nicads. DTMF mic with up-down control, dual VFOs, 10 memories with scan. Offset tuning, LCD display. 2¾" h 6¼" w x 7½" d, 2.6 lbs.

- FT-290R MK II** • 2 meters, 25W..... ☎
- FT-690R MK II** • 6m, 50-54MHz, 10W..... ☎
- FT-790R MK II** • 430-450MHz, 25W ☎



YAESU FT-5200 • 2m/440MHz FM Mobile. Covers 140-150 (tx), 140-174 (rx) & 430-450MHz. 32 memories, CTCSS encoder. (2m) 50/5W, (70cm) 35/5W. Cross band full duplex. DTMF mic., detachable front panel for remote. 5½" w x 1¾" h x 6" d, 2 lbs.. **SPECIAL** ☎

FT-5100 • Like 5200 w/o remote cap. **SPECIAL** ☎

FT-6200 • 35/10w, 440MHz/1.2GHz ☎

FT-2200 • 50w 2m FM xcvr w/TTP mic ☎

FT-7200 • 35W 440MHz FM/TTP..... ☎

FT-912RH • 1.2GHz, 10W, 12VDC @ 4A..... ☎

YAESU FT-2400H • Rugged 2m FM mobile. 50W/25W/5W. Receives 140-174MHz (140-150MHz tx). 31 memories, CTCSS encoder, 5 scan functions. Programmable call channel, auto. offset. Backlit DTMF mic. 6" w x 1¾" h x 7" d, 1½ lbs.. **SPECIAL** ☎

YAESU FT-7400H • 35W 440MHz FM..... ☎

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Due to foreign currency fluctuations, please ☎ Call Toll Free for Prices.



YAESU FT-411E (C) • 2m, 140-150MHz (tx), 140-174MHz (rx). 2½w FM HT. LCD, keypad and rotary-dial frequency entry. 5½" h 2¼" w x 1½" d, .85 lb..... ☎

YAESU FT-811 (A) • 2w, 430-450..... **CLOSEOUT** \$259.95

YAESU FT-911 (A) • 1w, 1.2GHz..... ☎

YAESU FT-416 Black 2m FM HT/batt/chgr..... **SPECIAL** ☎

YAESU FT-816 Black 440 FM HT/batt/chgr..... ☎

YAESU FT-470 (B) • 2m/440MHz, 2.3w, FM HT. Similar to FT-411/811. Simult. receive, both bands, 21 memories/band. 6½" h x 2¼" w x 1½" d, .88 lbs **SPECIAL** ☎

YAESU FT-815 (D) • 70cm, 2W, 430-450MHz receive and transmit. Dual VFOs, 41 tunable memories. 2½" w x 5¾" h x 1¾" d, 12½ oz..... **CLOSEOUT** \$329.95

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FT-26/27 • 2-meters, 5W, 130-174MHz receive and 140-150MHz transmit..... ☎

FT-76/25 • 70cm, 2W, 430/450 MHz..... ☎

YAESU FT-23R-17 (E) • 2m FM HT 2.5w output, rotary dial frequency entry, LCD display, 10 memories, scanning, priority. Rugged and weatherproofed. 4¾" h x 2¼" x 1¾" d, 1 lb ☎

FT-23R-12 • as above but 2m, 5w..... ☎

FT-33R • 220 MHz FM, 5w ☎

FT-530 • 2m/440 FM HT w/TTP **SPECIAL** ☎

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G-800SDX • Med/hvy duty, 21 sq. ft, presets..... ☎

G-1000SDX • HD, 21 sq. ft, 450° rot/presets ☎

G-2700SDX • HD, 34 sq. ft, 450° rot/presets ☎

G-5400B • Light/med, 11 sq. ft. az/el combo ☎

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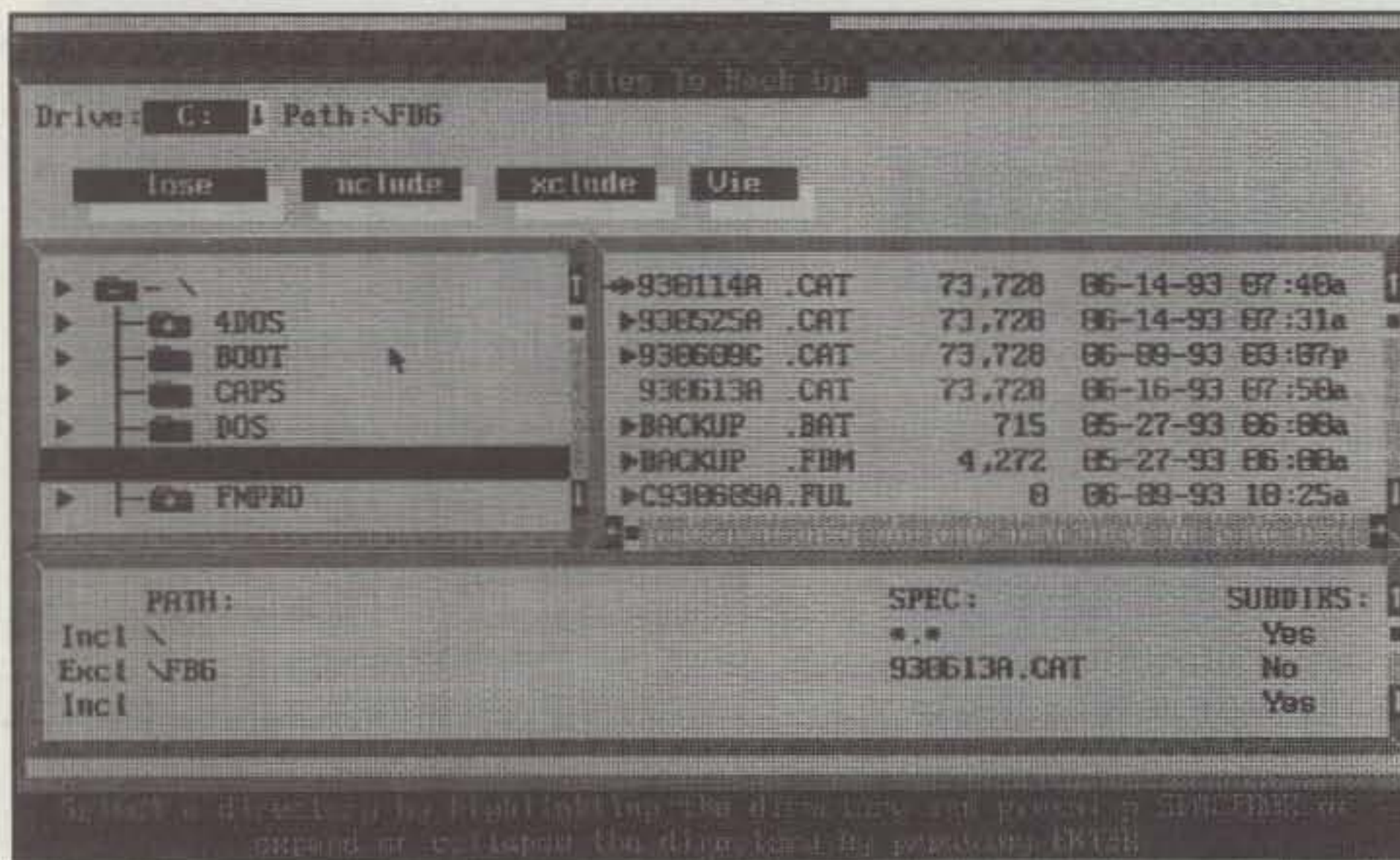


Fig. 1—Fastback Plus 6.0 is the latest in the long line of Fastback Plus backup programs for the IBM PC. Featuring a much-simplified interface, the new version is fully compatible with MS-DOS 6.0. (Photo courtesy Fifth Generation Systems, Inc.)

FlexPac is \$40 on 3.5 or 5.25 inch diskettes. Contact Rich Thorne, WB5M, 133 Light Falls Drive, Wake Forest, NC 27587. Be sure to include your callsign when ordering.

QRZ! Ham Radio CD-ROM. There's yet another CD-ROM amateur radio callsign database on the market. This one is called QRZ! and is offered by Walnut Creek CD-ROM.

The \$24.95 disc contains the entire FCC callbook, along with Canadian callsign listings, bundled with easy-to-use search software. There also are thousands of programs relating

to amateur radio and related fields in two major archives, as well as lists of amateur radio clubs and organizations, FCC Part 97 rules and regulations, DX/DXCC information, bulletin board system (BBS) lists, and a great deal of other information.

With the included CD-ROM search and retrieval program you can locate and display any US callsign in under 2 seconds directly from the CD drive. No hard-disk space is required, as the search software is preinstalled on the CD-ROM. Search results can be sent to the

screen, to mailing labels, or to datafiles you specify (for use with other programs). You can search the QRZ! database by callsign, name, address, and/or ZIPcode, which makes custom mailing list generation easy.

For more details and an interesting CD-ROM catalog, contact Walnut Creek CD-ROM, 1547 Palos Verdes Mall #260, Walnut Creek, CA 94596 (1-800-786-9907). Incidentally, the firm also sells CD-ROM "jewel boxes" at 10 for \$5, and high-quality CD-ROM "caddies" for \$4.95 each. Both are hard-to-beat prices.

CQ Five Year Index. From reading this column you're probably aware of the comprehensive magazine and journal article indexing undertaken by Rich Rosen, K2RR. Rich initially developed a massive listing on microfiche of most of the articles that have appeared in the amateur radio and communications-electronics press this century. Entitled *From Beverages Through OSCAR—A Bibliography 1909-1990*, the index contains about 53,000 single-line abstracts in 92 communications subject areas.

As we have noted, Rich offers the bibliography on diskette. The computerized bibliography and several subsidiary disk-based magazine databases for individual publications cover *QST* (1945-1990), *CQ* (1945-1990), *73* (1960-1990), *Ham Radio* (1968-1990), and the British journal *Radio Communication* (1979-1990). Dozens of inexpensive, specialized, functional category computer databases are available too, as are hardcopy indexes equivalent to the computer-based products.

Recently Rich came up with a product I've been waiting to see for a long time: a low-cost software version of the *CQ* index (*CQ* used to be indexed and printed in the magazine, but



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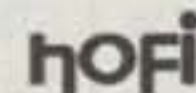
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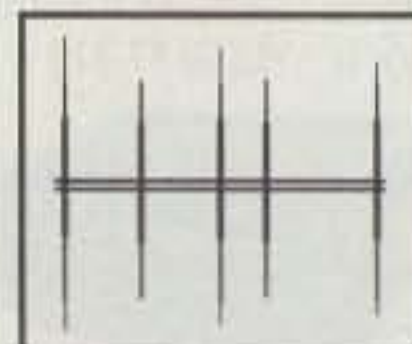
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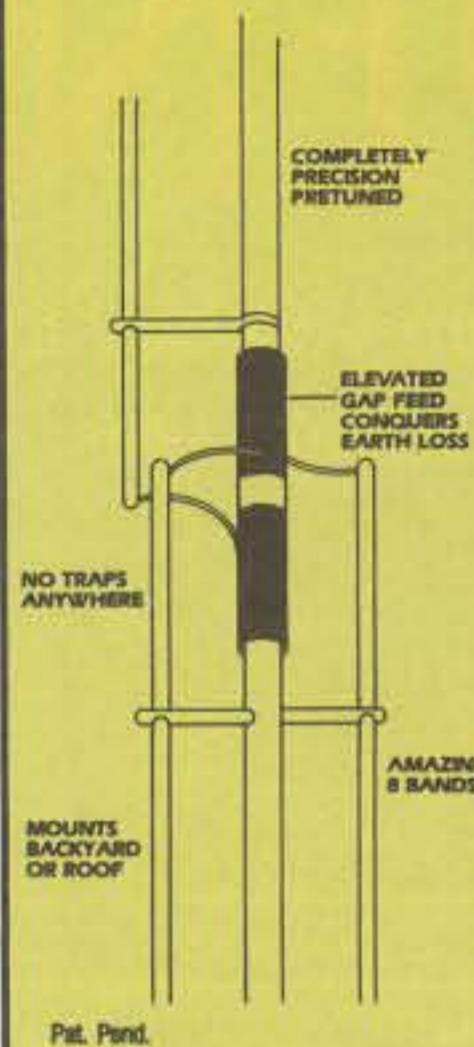
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manpower and cost considerations put an end to that years ago). Rich's CQ index works similarly to the other specialized magazine indexes he issues, although it covers only the past 5 years. Presently updated through December 1992, it fulfills a real need to find out which issue or issues contain the information you need.

I did notice one quirk in browsing through my own CQ writings over the past 5 years, one that illustrates the difficulties involved in professional indexing. I couldn't search by my callsign ("W8FX" wasn't in the database), but I *could* search by other criteria, including my last name (Thurber). Searching by name found an amazing 658 "mentions" or "hits" over the past 5 years; the number was large because each column covers so many separately indexed topics, as though they were separate articles.

According to Rich, years ago he decided to *either* list the article or review author by name or callsign: the sixth field of each record in the original paper version of the bibliography had room for one or the other, but not both. Since most articles included the name of the author but not always the callsign, he chose to go with the name. But, says he, had he known what he knows now he would have included many more fields for each record. (Sounds like DOS, gang. In the early 1980s who would have thought that anyone could *possibly* need more than 640 KB of computer memory or file names any longer than eight characters?)

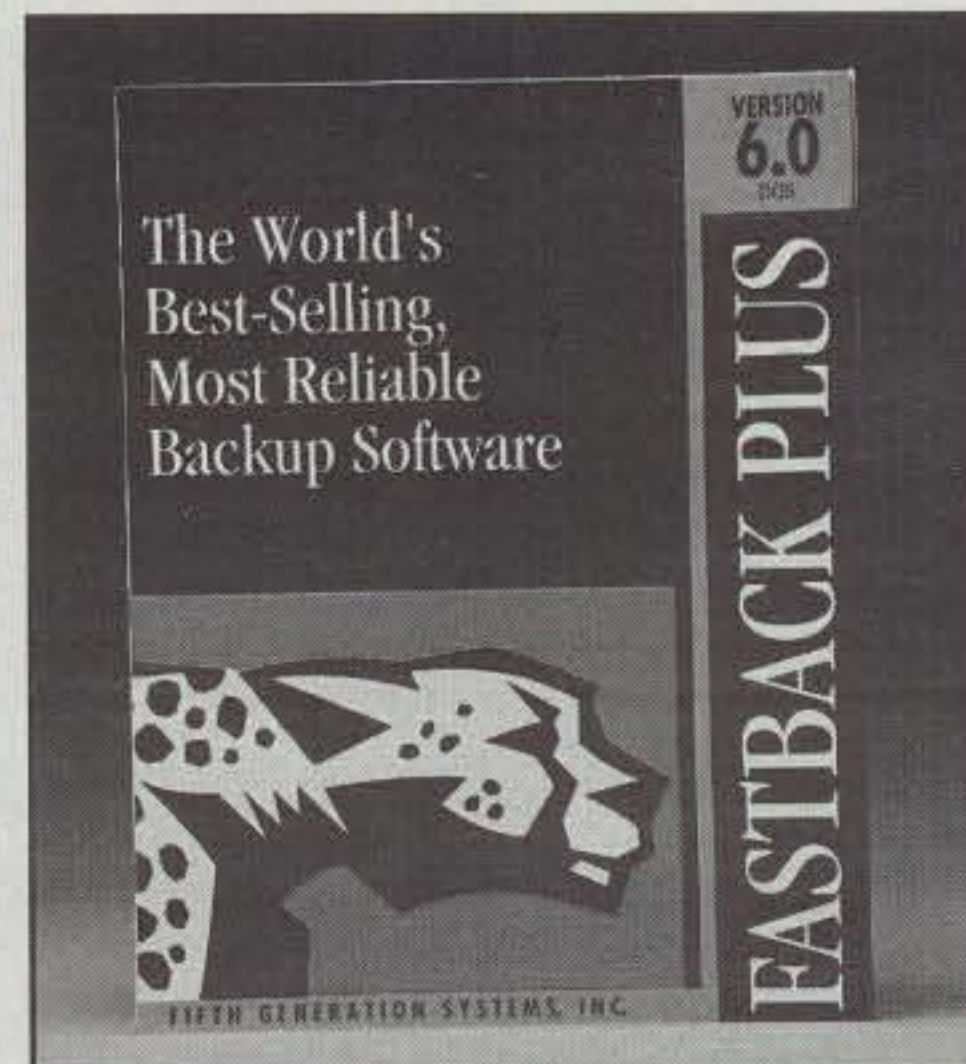
Rich has a deal going. The 1988-1992 CQ index sells for \$5 postpaid until 1,000 are sold; then the price goes to \$10. Specify 3.5 or 5.25 inch diskettes and add \$2 outside the USA. Order from Rich Rosen, K2RR, Didah Publishing, P.O. Box 7368, Nashua, NH 03060-7368 (603-878-3628).

1010: Wired for Sound! We have covered several specialized recordkeeping programs for 10 meter contesting offered by Jim Hardy, K4HAV, most recently in last February's column. Jim's programs are for those who chase "10X" certificates and awards sponsored by the 10-10 International organization and others that focus exclusively on 10 meters.

Presently Jim offers the 1010 Contest Program (\$35), the 1010CH County Hunter Program (\$25), the ZipCode/County Add-On Package (\$25), and various program updates, upgrades, and combination deals. But that's not all Jim's been up to these days. He has released a new, high-tech program, 1010SB, for 1010 users who have a SoundBlaster or compatible PC sound board. This is the basic 1010 Contest Program modified to work with a sound board to provide eight prerecorded contest messages you can send by depressing one of eight keys. The messages can be recorded from within 1010SB or at the DOS prompt. Two of the messages have an optional delayed repeat feature that allows for continuous CQs during poor band conditions or on a worked-out band.

With 1010SB you can make nine off-the-air recordings. Also, a continuous loop recording (of a length you specify) can be made consisting of two recorded files that alternate. At any time you can stop the recording and play back one or both files to hear the last 30 to 120 seconds of whatever was on your receiver. Transmitter push-to-talk (PTT) output keying is available from the PC's communications ports. The 1010SB program is \$50.

For more information, contact Hardy Data



Fastback Plus 6.0's streamlined user interface offers high-performance backups while keeping things simple. The menuing system is straightforward and lets you immediately back up and restore files without wading through a confusing hierarchy of menus and commands. New software version is \$149. (Photo courtesy Fifth Generation Systems)

Systems, P.O. Box 7304, Tifton, GA 31793 (912-387-7373).

The SemWare Editor. In the May 1991 column we discussed two excellent DOS-based text editors from SemWare, QEdit Advanced and QEdit TSR, based on the popular shareware editor, QEdit. As we noted, QEdit Advanced, at \$54.95, was (and still is) one of the most promising, full-featured text editors for entering simple documents, letters, and program code. I also found QEdit TSR to be handy: it's a separate memory resident version of QEdit Advanced that contains all of its features. QEdit TSR resides in the background until you call it up with a single keystroke, without having to exit the application you're working in—an extremely useful feature, to say the least. As we noted then, QEdit TSR was \$99 and included a copy of QEdit Advanced.

Recently we had the opportunity to try out an even more advanced product, The SemWare Editor, or TSE, in its prerelease V1.0 form, and have found it to be a most useful DOS-based PC tool. According to SemWare's president, Sammy Mitchell, initially TSE was simply going to be the next major release of QEdit. But as development progressed he decided to develop TSE separately. Adding a number of "elegant and powerful" features meant that the program just couldn't be as small and simple as QEdit.

SE lets you to edit very large files (up to 32 MB), and it has a powerful macro programming language to make the editor flexible and extendible. Features include very fast operation; mouse support; enhanced printing options; advanced search and replace; vertical and horizontal windows to view and edit files; 26 bookmarks, to return to selected positions; and support for fixed, variable, and hard tabs. Other features include easy and complete reconfigurability; powerful block operations; convenient file-handling features; new editing and formatting options; and more. Another plus: in these days of monster computer pro-

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grams, and even with all this power, a minimum installation requires only one executable program that's under 100 KB in size. TSE runs in as little as 140 KB of memory.

By the time this appears in print the final version of TSE should be available at \$79. For more details contact SemWare Corporation, 4343 Shallowford Rd., Suite C3A, Marietta, GA 30062-5022 (404-641-9002).

Postscript: As this issue went to press, SemWare announced the release of version 3.0 of its popular QEdit® line of editing software, which we have reviewed in previous columns. New versions of Qedit Advanced, QEdit TSR, and QEdit for OS/2 began shipping about two months ago. We'll keep you posted.

Fastback Plus 6.0. We're a longtime Fastback Plus user and have reviewed several versions over the years. Fifth Generation Software has continued to upgrade their flagship hard disk backup program, tossing in many bells and whistles. The strengthening of the product over the years has, to many, made it the most complete backup program you can buy. On the other hand, other users complained that it had become too complicated and difficult to use, suffering especially from a too-complex interface.

Fastback Plus 6.0 (see fig. 1) offers a simplified interface reminiscent of previous versions, while offering more functionality. It provides fast virus detection (over 200 MB/minute scanning), enhanced tape drive support, backup of a notebook computer using a desktop PC, an ASCII file viewer, and backup to tape drives connected to other PCs across networks.

There's also enhanced user assistance in the form of an "information line" at the bottom of each screen which provides a description of whatever option or operation you currently have highlighted as well as backup and restore tutorials to walk you through the procedures. It's fully compatible with MS-DOS 6.0.

What didn't I like about Fastback Plus 6.0? To be honest, very little, although I wondered what happened to versions 4 and 5; they apparently went from V3 to V6 in one giant step. More significantly, in their quest to produce a simpler product, the macro command language, which you could use to customize and automate backups, is no longer documented in the user's manual. The macro language is still a part of Fastback Plus, but to figure out how to use it you need to buy a separate \$10 "Guide to Macro Commands." In fairness, probably only users of previous versions would notice the omission. Other than that, the Fastback changes are positive ones, and the product is very easy to use.

The new version is list priced at \$149, less than previous versions, and is available discounted from mail-order firms. For more information, contact Fifth Generation Systems, 10049 North Reiger Road, Baton Rouge, LA 70809-4562 (1-800-873-4384).

From the Bookshelf

Some Publication Notes from AA6FW. Harry Helms, AA6FW, of HighText Publications, let us know that some of the firm's books will get wider distribution to the public. This is as the result of a change in the way the publications are distributed, which is now through a consortium of independent publishers. In particular, Harry advises that his excellent *All About*

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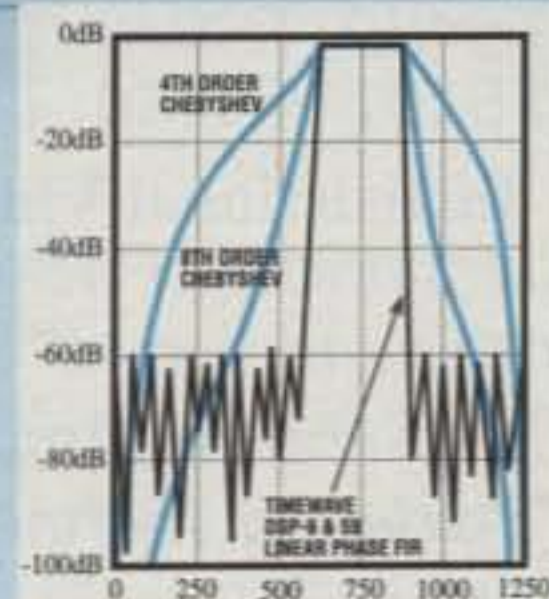
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Ham Radio beginner's book, which we highlighted in the February 1993 column, is now available through major bookseller chains such as B. Dalton, Waldenbooks, Barnes & Noble, and others.

Harry also sent along one of HighText's newest books carrying the DX/SWL Press imprint. It's Larry M. Barker's *Scanner Radio Guide*, a beginner-oriented but fairly thorough introduction to scanning. There are eight chapters and three appendixes. The chapters include good discussions on choosing a scanner and on radio propagation, and one of the indexes includes a handy listing of scanner frequencies in use nationwide. The 148-page *Guide* is \$14.95 plus \$3 shipping from High-Text Publications, Inc., P.O. Box 1489, Solana Beach, CA 92075 (1-800-888-4741).

Prentice Hall Computer Books. The computer books offered by Prentice Hall Computer Publishing have grown considerably in number and quality as PHCP has absorbed several technical publishers such as Que, Sams Publishing, New Riders Publishing, Brady, Hayden, and Alpha Books. Some time ago I received a big box of their latest titles, and without exception I find them quite interesting. There are too many "goodies" to properly

review here, but a few definitely should be highlighted.

As a new Windows™ user who already wants to optimize the way it performs and customize its interface (I finally took the plunge and found it's not half-bad), I was impressed with the Que title *Killer Windows Utilities*, which, incidentally, was edited by a 14-person team. It contains at least 20 topnotch Windows utilities in a three-disk, 7+ MB book/disk package. The massive 1340-page book is both a tutorial on maximizing Windows performance and a guide to the software, most of which is shareware. A real bargain at \$39.95, the book helps you make a good start at enhancing your Windows environment.

If you're so new to Windows that you're not yet ready to tune it up, consider *Windows 3.1 SureSteps* by Sue Plumley. The 300-page, \$24.95 Que book/disk package helps you get comfortable working in the Windows environment by offering an accelerated approach to self-teaching. Topics include starting and navigating Windows, using Desktop Accessories, mastering Windows Paint and Write, using Windows applications, and customizing and optimizing Windows. (Similar SureSteps book and disk tutorial packages are available or are

planned for several Windows applications.)

At the same time you're tuning up Windows, you might take a look at DOS itself. Check out David L. Busch's *How to Get the Most Out of DOS 6 Utilities*; the 475-page, \$24.95 Brady book also helps you go beyond Microsoft's DOS 6 utilities to suggest several third-party utilities. And if you're still sticking with good ol' DOS, and have obtained the latest version of the popular Norton Utilities, consider Rob Krumm's task-oriented, hands-on *Inside the Norton Utilities 7.0*. The fact that it's the fourth edition with over 225,000 copies in print tells you that the book's a real survivor. The 711-page Brady title is \$26.95.

For a catalog, contact Prentice Hall Computer Publishing, Simon & Schuster Business and Professional Group, 11711 North College Ave., Carmel, IN 46032 (1-800-858-7674).

Short Bursts

All We Can Do is Try. Occasionally we receive a letter from a disgruntled reader who contacts an individual or company we mention in the column but receives no response, even when enclosing a SASE. Most frequently this happens with software, where a program author sends us a sample of his or her program and we review or mention it in the column. Sometimes the "vaporware" is hardware, but in most cases it's software that presents the problem; you don't need a real factory to crank out software disks and program documentation.

Because of the possibility that we will inadvertently end up promoting vaporware, we usually don't review or even mention software in the column unless we have seen (and often tried) a copy ourselves, or at least have correspondence from the author or other evidence that the product is really available. A problem sometime arises when a software author we mention asks for a formatted disk, an SASE, and a buck or two; sometimes the guy on the other end gets overwhelmed with requests and just gives up, or he has since moved, causing you to lose your SASE, disk, and buck. Such things happen and are the risks of the game.

Exercise common sense. A good rule to follow is to never send any significant payment for something you read about in a magazine column, article, or ad unless you personally touch base with the offeror, obtain product literature, confirm current pricing and availability, get any questions you might have answered, and otherwise satisfy yourself that the "deal" is a good one for you. Personally, I like to see an amateur callsign, name, street address (not just a post office box), and phone number listed.

Bottom line: We try to filter out what we report, but occasionally problems do surface. Bear with us, and let us know when things don't work out when you respond to an individual or company we mention in the column.

Wrap-Up

That's all for this time. Next month more Antennas and Accessories subjects of current topical interest. See you then.

Overheard: You can overcome just about any technical problem if you're given enough time and money. Problem is, you're never given enough time or money.

73, Karl, W8FX

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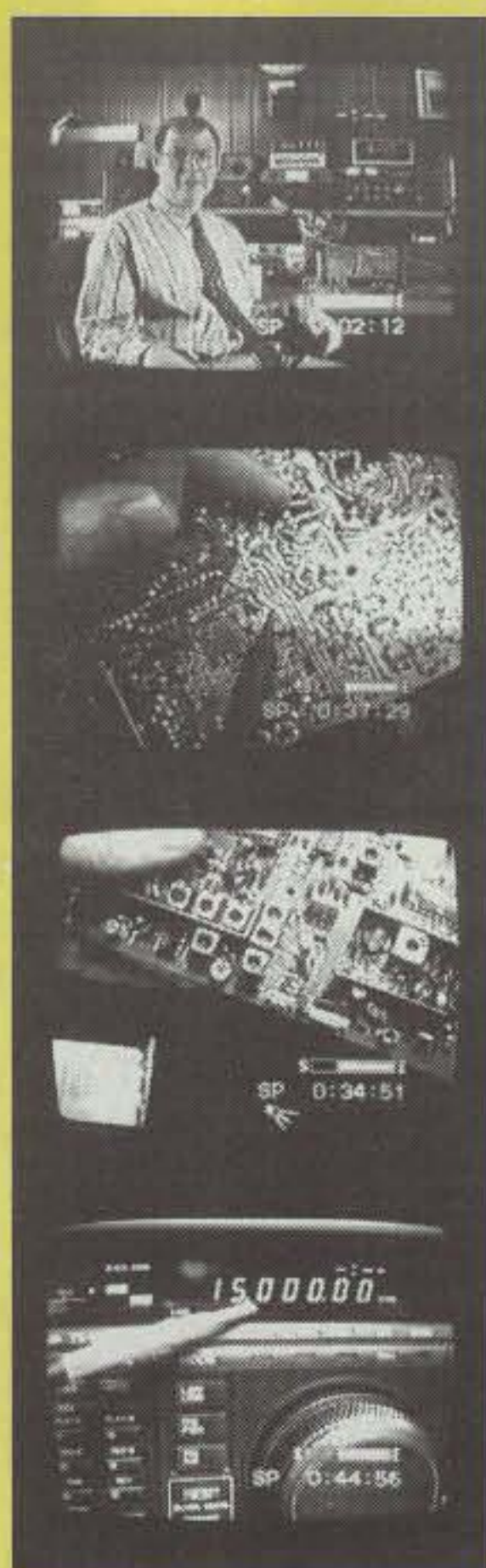
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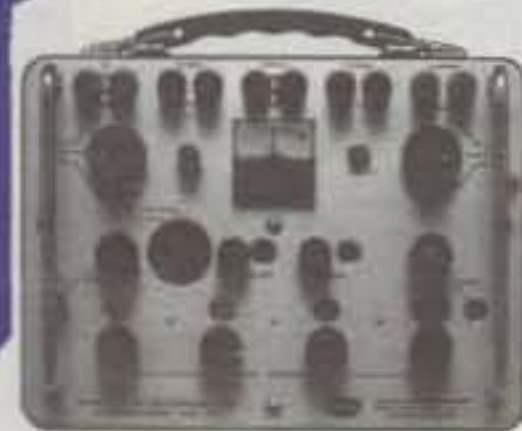
covers the frequency range of DC to 500 MHz with an input voltage range of 50 mV to 1 VRMS. This versatile, easy to operate system measures period, multiple period, average, ratio and multiple ratio with measurements read directly from an 8-digit display. The timebase has a short-term accuracy of 2 parts in 10⁶. The mainframe will accept a wide variety of other plug-ins.



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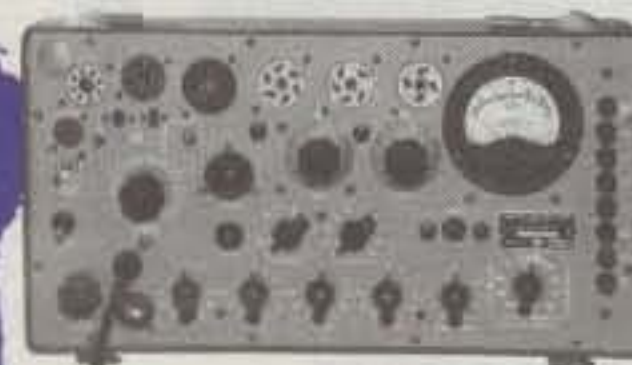
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Wavetek DMI5XL \$59

Digital Multimeter

This versatile hand-held Digital Multimeter provides all basic measurements of DC and AC Volts, DC & AC Current to 10 Amps, and Resistance. Readout is provided by a 3 1/2 digit LCD display. Other features include Auto Polarity, Over-Range indicators, Auto Zero, Diode Tester, and an Audible Continuity Tester. Plus the ability to make Logic measurements of high and low TTL logic pulses. A great safety feature is also built into the DMI5XL which warns the operator if the test leads are plugged-in incorrectly for making current measurements. Comes complete with one pair of test leads, one spare fuse, battery, and operator's manual. 6.1" x 2.8" x 1.3".



HP 5254B \$125

Plug-In

- Designed to increase frequency range of HP 5240-Series of counters

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- Input Voltage Range: 50 mV to 1 V
- 50 Ω Input Impedance, AC Coupling



HP 5255A \$300

Plug-In

The HP 5255A Frequency Converter extends the range of the 5245L and 5246L

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HP 608E \$350

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- 0 to 95% AM MOD; + CW or PULSE
- ±0.5% frequency accuracy



HP 606A \$250

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HP 410C \$299

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Electro Impulse DPM-3 \$169

RF Power Meter

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Military 50 MHz Solid-State Oscilloscope (USM 281E, Manufactured by Dumont) Oscilloscope \$299

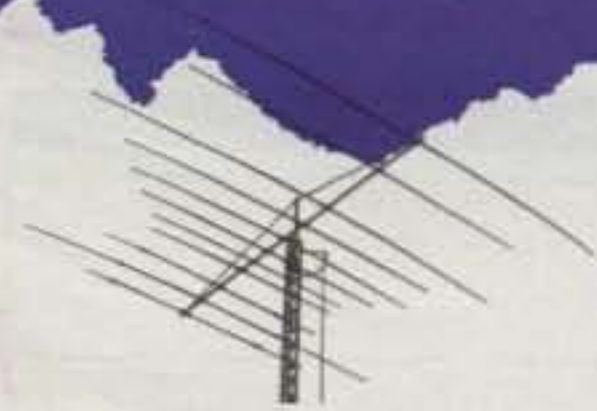
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TH11DX**

11-Element Broadband 5 Band Super Thunderbird Beam - 10, 12, 15, 17, 20 Meters \$859
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CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORYs

Power FETs vs Bipolars at RF

Those who new to the technical side of amateur radio are often perplexed about the difference between power FETs and bipolar transistors with respect to design procedures, general performance, and the peculiarities of each. This article is aimed at the beginner to the art and is presented in a purely practical manner. I'll leave the page-wide equations to the IEEE *Transactions* and manufacturers' application note writers in an effort to present guidelines you can grasp easily.

What Is A Power FET?

Power field-effect transistors are similar to high- μ triode vacuum tubes in many ways. Specifically, the input impedance to the gate (equivalent to a tube grid) is inherently high—on the order of a megohm or greater. The output impedance (the drain, which is similar to a vacuum-tube anode or plate) is substantially lower than for a triode tube. In fact, it compares with the output impedance of a bipolar transistor. Fig. 1 shows the symbols for the two types of power transistor.

The operating voltage (referred to as V_{DD}) is higher for power FETs than for bipolars. Most power FETs require 24 volts or greater, whereas bipolars can easily produce full-rated output power at 12 volts. The only complication we encounter with the specified power FET drain voltage is when we want to use those devices for mobile operation. On the other hand, it's easy to buy or build a 24 VDC power supply for fixed-station use. It is important to acknowledge that power FETs can be used at reduced efficiency when using a 12 volt supply. They can be forward biased (a positive gate voltage) sufficiently to make them draw the desired drain current. This places them in the Class A or Class AB mode and the efficiency declines. I prefer to avoid this procedure.

Electrical Comparison

The input impedance of a typical power bipolar transistor is very low and is therefore rather difficult to match to the preceding stage of a transmitter. It is not uncommon to encounter impedances on the order of 3 to 10 ohms. Matching net-

works that use coils and capacitors are generally used to provide an impedance match at the transistor input port. Power FETs, on the other hand, seldom require a matching network. Most designers use a resistor from gate to ground for the purpose of establishing a fixed input resistance. For example, a 50 ohm gate resistor provides a match for a 50 ohm driver stage. I have used resistor values up to 1K in the gate return of the stage, depending upon the nature of the stage that provided the driving signal. Fig. 2 shows an example of a power FET RF amplifier with a gate resistor instead of an LC matching network. A word of caution is in order here: The higher the value of the gate resistor the greater the chance for self-oscillation at the operating frequency. In other words, if you try to use, say, a 15K ohm resistor it is quite likely that the stage will break into oscillation when power is applied. I try to keep the resistor value below 560 ohms in my circuits, and even then it is possible to experience self-oscillation if the circuit is not built with short leads.

Another difference between the two types of transistor is the device input and

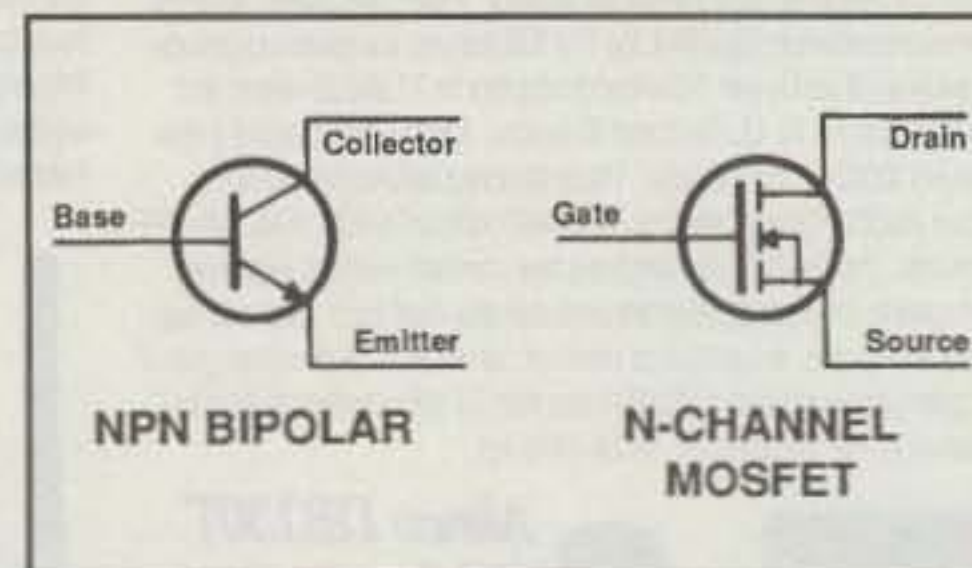


Fig. 1—Electrical symbols for bipolar and MOSFET power transistors.

output capacitances. Power FETs have specific input and output capacitance values (as stated on their data sheets), and those values remain the same regardless of the operating frequency. This makes it much easier to design feedback networks and matching networks for wideband operation because bipolar transistor input and output capacitances change markedly with frequency. For example, moving the operating frequency from 1.8 to 7 MHz may cause an increase in the effective transistor input capacitance of as much as 1500 pF, depending

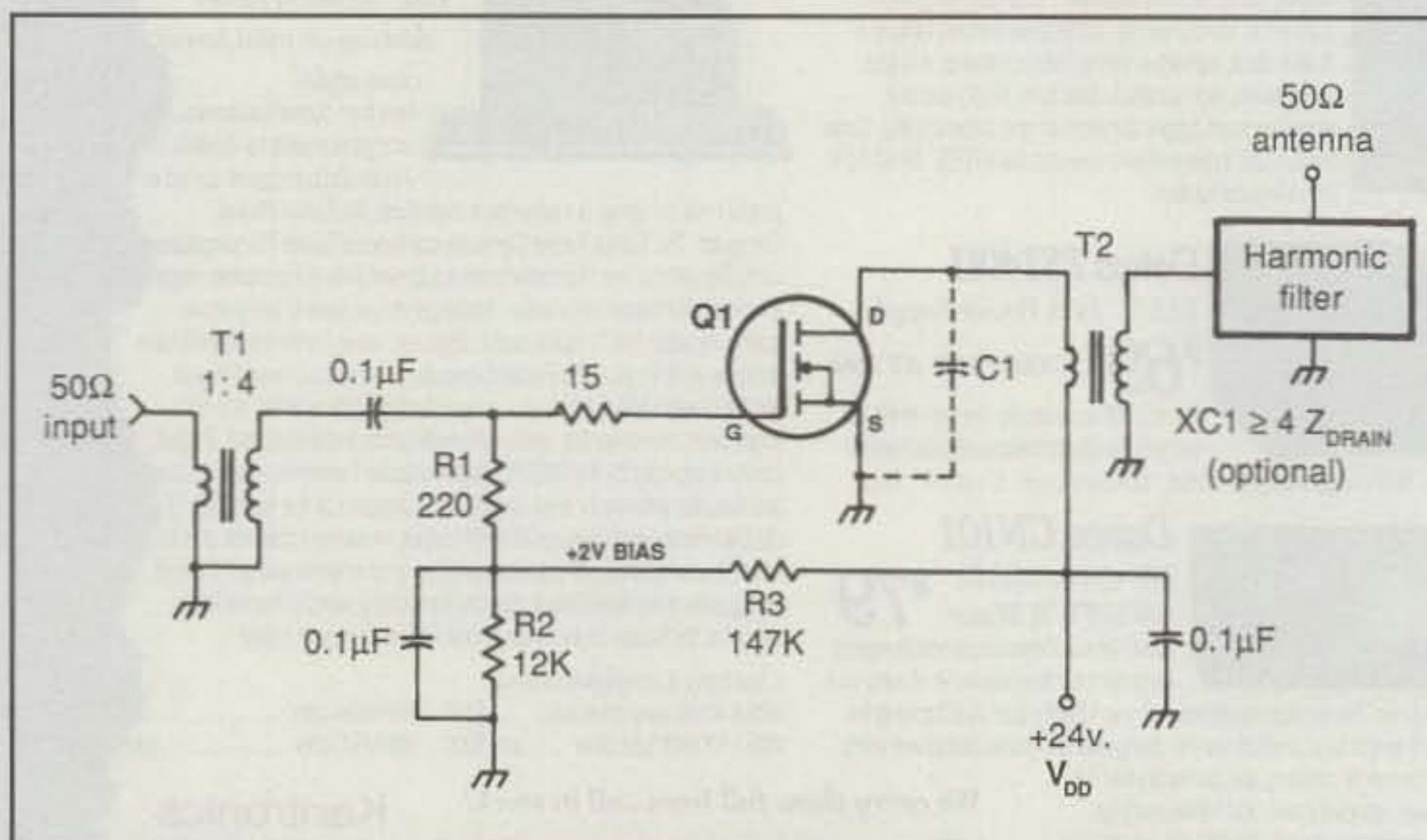


Fig. 2— Example of a power FET RF amplifier that is biased for Class AB operation with a simple resistive divider. R1 establishes the input impedance of the circuit by terminating a broadband 4:1 transformer (T1) with a 220 ohm resistor. The 15 ohm gate resistor serves as a VHF parasitic suppressor. C1 may be added for additional VHF parasitic suppression. C1 also reduces harmonic currents at the amplifier output port. The X_C of C1 must be at least four times the calculated drain impedance (see text) in order to prevent attenuation at the operating frequency. T2 is a broadband transformer for matching the drain to a 50 ohm harmonic filter.

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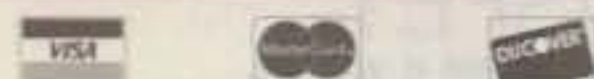
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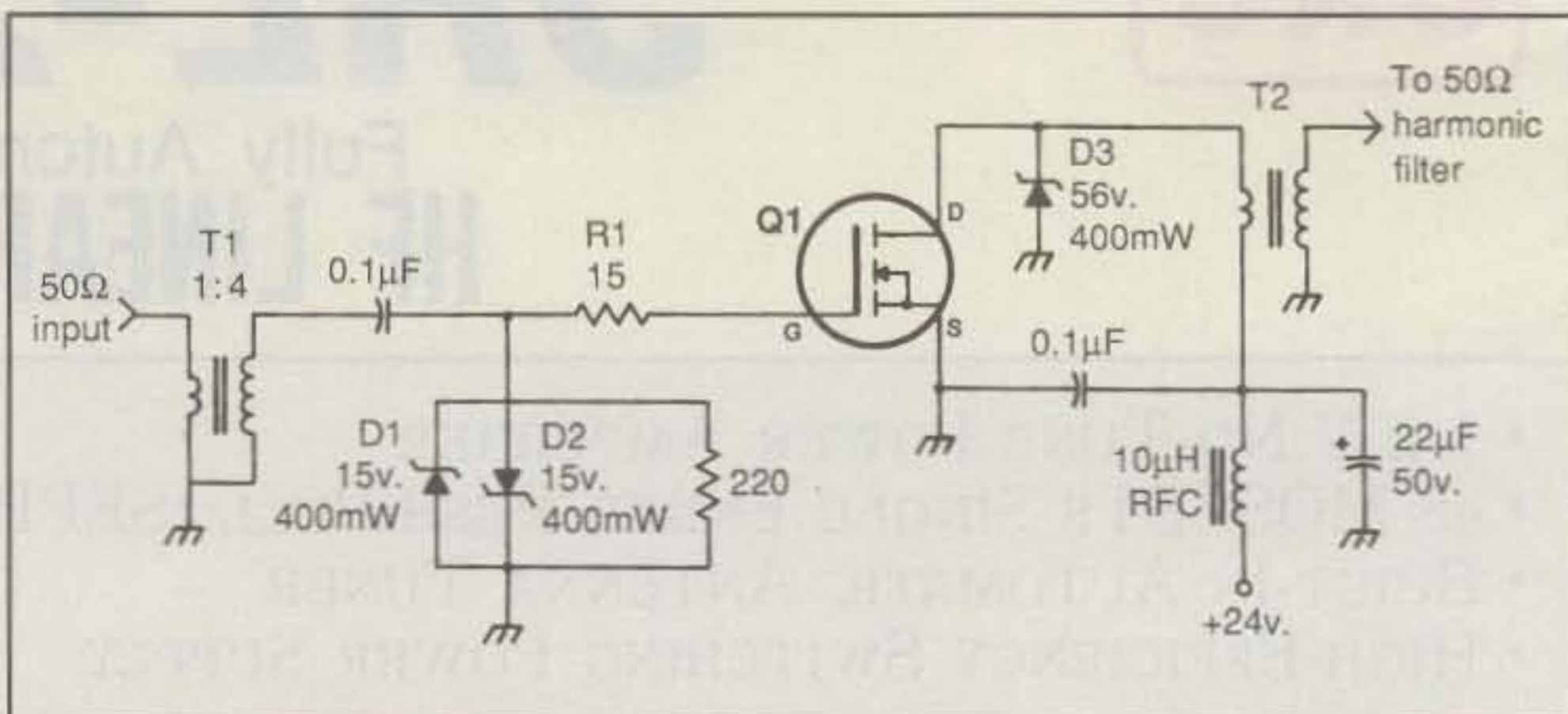


Fig. 3— Zener diodes may be added to protect the power FET gate from excessive P-P voltage. D1 and D2 are used back to back to provide clamping at 30 volts P-P or greater. D3 can be included to provide clamping at 56 volts or greater, but does not conduct when the drain voltage rises to its normal 48 volts peak swing. D3 also protects the drain-source junction from spikes that may occur on the V_{DD} supply line. R1 is a VHF parasitic suppressor. T1 and T2 are broadband transformers. D1, D2, and D3 add some shunt capacitance at the gate and drain, even when they are not in conduction.

upon the particular transistor used. It is not unusual to contend with input capacitances as great as 3000 pF. A Motorola MRF171 RF power FET has an input capacitance of 55 pF and an output capacitance of 70 pF. It can produce a power output of 45 watts from 1.8 to 200 MHz with a 24 V_{DD} and 2 watts of driving power. By general comparison, the popular Motorola bipolar transistor favored by QRPers, which is an MRF475, has an output capacitance that varies from 500 pF at 30 MHz to 3500 pF at 2 MHz. This is called the "equivalent parallel output capacitance." No mention is made in the data sheet about the input capacitance, which changes significantly also.

The efficiency of power FETs is substantially greater than for bipolars. A typical linear amplifier that uses bipolars can reach an efficiency of 60%. A similar power-FET amplifier may reach as high as 80% with careful tweaking and biasing. Class C efficiencies as great as 90% were reported to me some years ago by an engineer colleague at Siliconix, Inc. The best I have done was 82%, and even that amazed me. At first I thought my calculations were grossly in error!

Harmonic output is lower with power FETs than with bipolars, especially if the devices are operated Class A, AB, or B. In a like manner, the high-order IMD (intermodulation distortion) products are much lower in amplitude for a FET linear amplifier. This produces a cleaner SSB signal.

In a broad sense you will not need as much drive for a given output power when using power FETs. I built an 80 watt push-pull power-FET amplifier that delivered full output with less than $\frac{3}{4}$ watt of drive at 7 MHz. A bipolar amplifier of the same

power output would need approximately 5 watts of drive to obtain those 80 watts.

FETs Are Frail

All is not milk and honey when designing with power FETs. They are fragile with respect to excessive gate voltage and current. Self-oscillation can destroy a FET almost instantly because very high peak RF voltages can occur under that condition. Exceeding the gate-source, drain-gate or drain-source maximum ratings will make the device self-destruct faster than you can say Lew McCoy.

Owing to the foregoing weakness of FETs it is important that we take precautions against voltage spikes, excessive drive, and self-oscillations. It is common practice to bridge 15 volt Zener diodes from gate to ground so that excessive positive and negative RF voltage peaks will clamp and not exceed the gate-voltage rating. A 56 volt, 1 watt diode can be added from drain to ground for protecting the drain-source junction from excessive voltage peaks (especially during self-oscillation or severe load mismatch). It should be noted that the addition of Zener diodes adds to the input and output capacitance of the power FET. This has not caused a problem in my designs, although a purist might object to the use of these diodes.

Self-oscillation at VHF can be prevented easily by adding a 15 ohm, $\frac{1}{4}$ watt carbon or carbon-film resistor in the signal path at the gate terminal of the FET. I have achieved the same damping effect by using a 125 mu ferrite bead at the FET gate. The use of parasitic suppression and Zener diodes, as discussed here, is shown in fig. 3. Short, low-inductance cir-

cuit leads are mandatory for ensuring that self-oscillation does not occur. Reasonable care must be exercised during layout to minimize stray coupling between the FET input and output circuits.

The output impedance of FETs may be calculated in the same manner as for bipolar RF power amplifiers:

$$Z_D = V_{DD}^2/2PO$$

where PO is the power output in watts. It can be seen therefore that the output impedance of the amplifier is generally the same for bipolars and FETs, with the FET impedance being somewhat higher because of the higher DC drain voltage. A 25 watt bipolar amplifier would have a Z of 2.88 ohms at 12 V_{CC}, whereas a 25 watt FET amplifier with a 24 volt V_{DD} would have a Z of 11.52 ohms. This establishes an advantage when it comes to designing output networks because of the higher Z of the FET.

Choosing A Power FET For RF

Fortunately, the internal geometry of most power FETs enables them to work well into the VHF region. The limitation is seen in large FETs in TO-3 cases and those which contain gate and/or drain Zener diodes. The former usually have too much internal lead inductance and too much capacitance for frequencies much above 7 MHz. Internal Zener diodes present a similar problem because they shunt the RF energy to ground at the higher frequencies and greatly disturb the input and output impedances of the device.

The popular, low-cost IRF511 power FET is used by a number of amateurs when building 25 watt RF amplifiers. However, its output power declines exponentially above 7 MHz because of the internal Zener diode. It can still be driven to full drain current, but the output power is nil at 10 MHz and higher.

Power FETs that are designed for RF service, such as the MRF171, work extremely well through 2 meters, but the price tag may cause you to gasp for breath. The IRF511, on the other hand, has been available for \$1.00 per unit.

It is worth experimenting with various power FETs that are designed for audio and switching applications. Some of them work nicely through 30 MHz, while others won't. Try to select devices that are packaged in TO-220 cases. Any FET in a strip-line case should be okay for RF service.

Summary

I have tried to lay down the basic ground rules for designing amateur gear around power FETs. Certainly, commercial engineers approach this task in a far more sophisticated way. Computer-aided design has become a way of life in the indus-

try, but it is by no means mandatory if you recognize the pitfalls associated with FETs. I maintain that "learning by doing" is an important freedom we have as amateurs. At least the project manager won't fire one of us if we blow a couple of devices during our lab tests!

I failed earlier to mention still another advantage common to power FETs: The bias supply need not be regulated, because the gate draws only microamperes of current. Therefore, a simple resistive divider may be used to obtain gate bias from the V_{DD} line. Conversely, some very elaborate regulated bias supplies are used in bipolar power amplifiers. This is because the base current varies and is in the milliampere region, which rules out the use of resistive dividers.

73, Doug, W1FB

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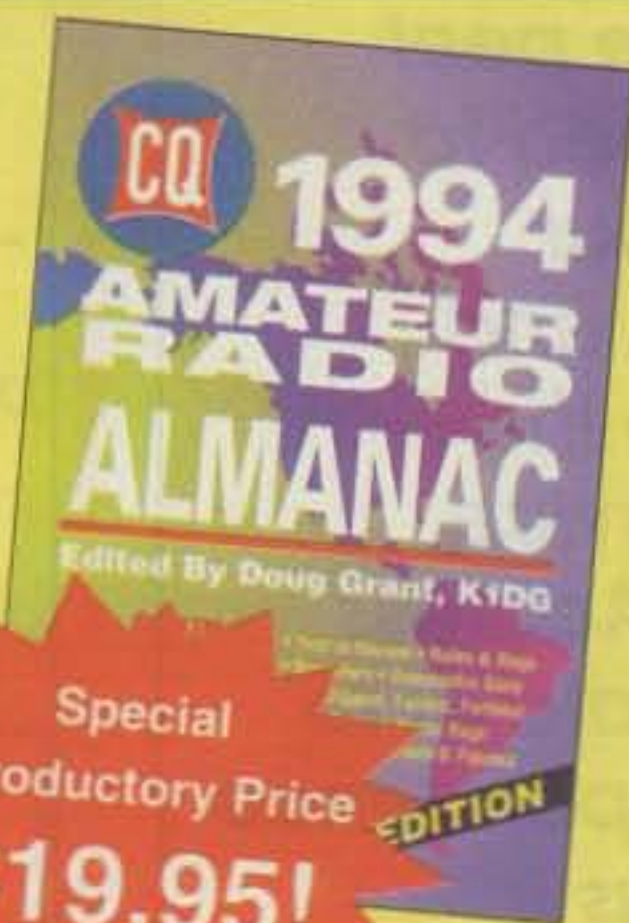
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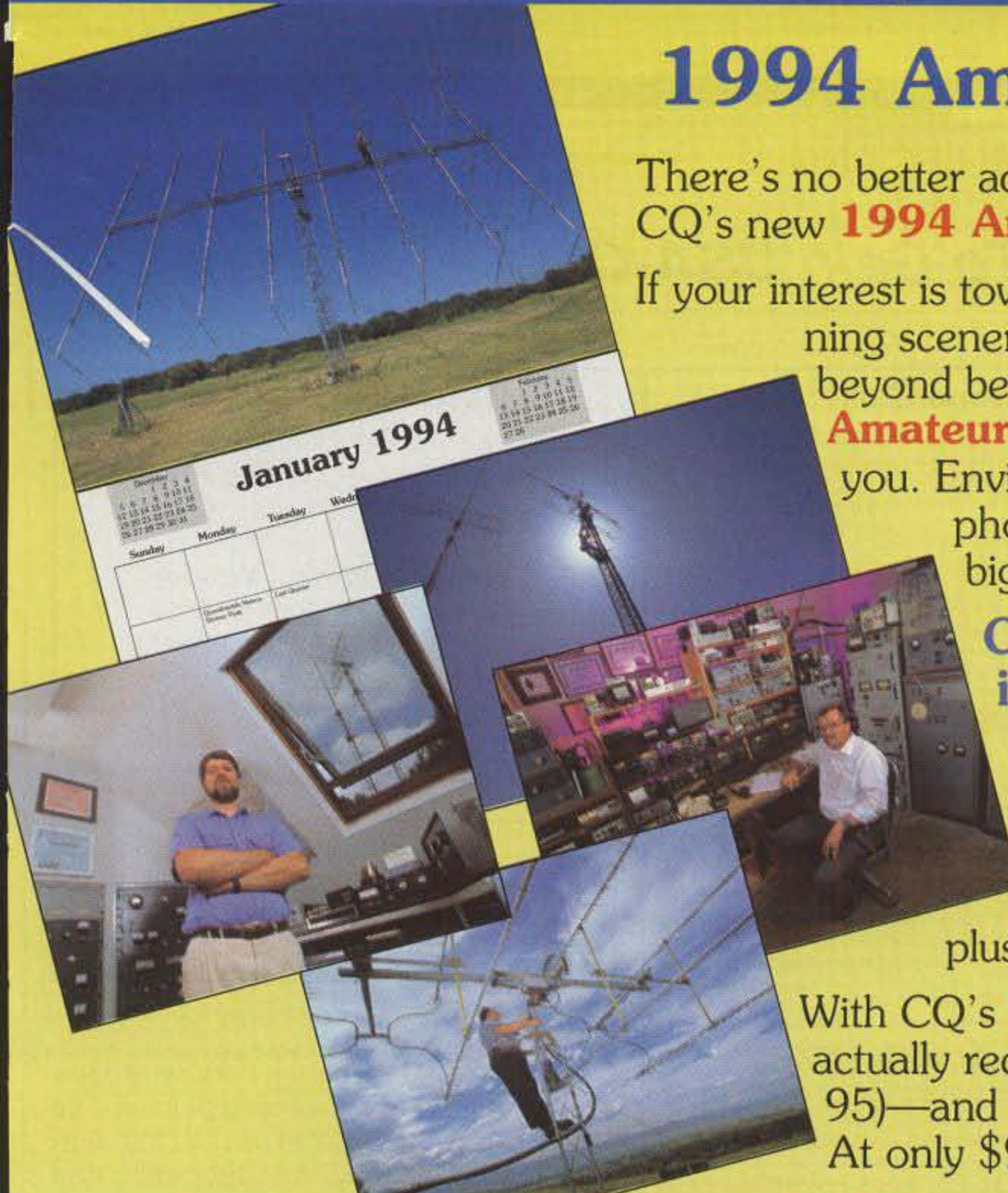
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NEWS OF CERTIFICATE AND AWARD COLLECTING

PT2TF First Brazilian To Gain USA-CA All Counties

To start off the New Year we turn to a DX station in South America:

Therezinha Cardoso, PT2TF USA-CA All Counties #816, 11-1-93

"Teresa," PT2TF, Brasilia, Brasil, has the distinction of being the first station in Brazil to accomplish one of the most difficult challenges in amateur radio, receiving USA-CA All Counties #816 on November 1, 1993.

Regular listeners to the net on 14.336 will remember her voice cutting through the QRM evening after evening. Her persistence is as remarkable as her achievement. Following is her story.

"Finally the day has come and here I am working my two 'last counties' for the whole ball of wax to become the first USA-CA in Brasil.

"It all started back in February 1986 when by pure chance I bumped into 14.336 and was invited by the net control (Ed Daigre, W5ILR) to join and become a County Hunter. I had spent many spare hours on nets running phone patches between USA and South American stations. I was always QRV for any traffic to Brasilia. I also had been a DXer since the early days in 1972 and became a member of 10 X, ISSB, DIG, and CHC. I collected QSL cards from around the world and was eager to make new friends on the air.

"I had heard of the CQ USA-CA Award while working other awards, but was also aware of how difficult it would be from South America due to propagation and all that it involves in working and confirming 1076 different counties, many times depending on mobiles. It was a challenge, so while waiting for new countries to add to my DXCC list I turned my whole attention to County Hunting.

"I wrote to Dorothy Johnson, WB9RCY, the USA-CA Custodian at that time, and asked for the Record Book. Meanwhile, I went through the QSL cards I had collected all those years and began listening on the bands for USA stations. Fortunately I had a postal directory; it cleared up some cards that did not have the county listed.

"W5ILR then sent me the information on the Mobile Amateur Radio Awards Club (MARAC) and sponsored me. He offered

Box 76, Pleasant Mount, PA 18453-0076

Honor Roll

3000		OH3JF	1083
PT2TF	838	AJ3X	1084
W5VRA	839	WD6CKT	1085
AJ3X	840		
WD6CKT	841		
2500		1000	
PT2TF	916	W5VRA	1295
W5VRA	917	AJ3X	1296
AJ3X	918	WD6CKT	1297
WD6CKT	919		
2000		500	
W5VRA	992	W5VRA	2716
OH3JF	993	9A3IJ	2717
AJ3X	994	DL4MCF	2718
WD6CKT	995	DK0EE	2719
		JA7JI	2720
		BV2TA	2721
		DJ4GJ	2722
		AJ3X	2723
		WD6CKT	2724
1500			
W5VRA	1082		

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is \$4.00. For nonsubscribers it is \$10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA for \$2.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Award Manager, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

to be my QSL manager for County Hunting and has carried this job efficiently and in the most dedicated way, right up to the end. Frequently he was net control, and along with other net controllers such as Paul, WA3TUC; Scotty, AA4LY; Joe, W1WLW; Alma, WA5INV; Margaret, W0GOQ; Joyce, WB9NUL; Keith, W7KEU; and Pauline, N9CLZ, he kept encouraging my interest in County Hunting. The pleasure of completing, one by one, the pages of my coloring book also helped keep my interest alive. Net controllers are the heart of that net and are special for DX stations. I pay tribute to them, for with their cooperation I was able to raise signals from N9CHU, WB9TKR, AK8A, N0GYN, and so many others listed in my logs.

"Propagation was the great villain. It was only after 2300 UTC (8 PM in Brasilia) that we begin to hear the mobiles, and a couple of hours later they were all 'going into the barn' for some needed and deserved rest.

"In the pursuit of new counties I worked many MARAC contests and am proud to

Special Honor Roll

Therezinha Felix Cardoso, PT2TF
USA-CA All Counties #816
All SSB, Mixed Bands, 10-22-93

Robert L. Willsey, W5VRA
USA-CA All Counties #817
SSB Mixed Bands, 10-23-93

George E. Baker, AJ3X
USA-CA All Counties #818
Mixed Band/Modes, 10-25-93

Gary Prader, WD6CKT
USA-CA All Counties #819
Mixed Band/Modes, 10-29-93

have won three 'wooden cars' which are on my wall along with other diplomas. The USA-CA Award, however, is the outstanding star on my certificate wall. I can imagine how nice it will look with all the seals and ribbons attached.

"Through the years I learned to recognize voices and became friendly with many of the regular mobile stations. I will never forget Grady, W5QLD, now a Silent Key, one of the very first stations I worked; and the trip all around the U.S. that KB7QO made giving out counties during the early days of my county hunting.

"I think highly of G4KHG, HB9RG, and HR1KAS, who many times called me off frequency to correct calls/counties I misunderstood or to give me hints to help my



Therezinha Cardoso, PT2TF, the first Brazilian ham to gain USA-CA All Counties.

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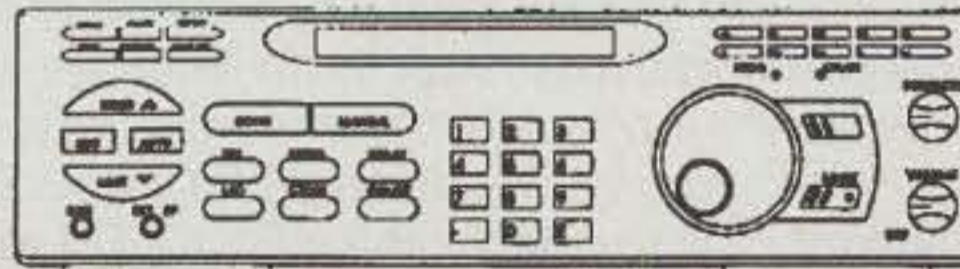
On April 19, 1993, the FCC amended Parts 2 and 15 of its rules to prohibit the manufacture and importation of scanning radios capable of intercepting the 800 MHz. cellular telephone service. Supplies of full coverage 800 MHz. scanners are in *very* short supply. If you need technical assistance or recommendations to locate a special scanner or solve a communications problem, call the Communications Electronics Inc. technical support hotline for \$2.00 per minute at 1-900-555-SCAN.

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Tony H.C. Kuo, BV2TA, sent a picture of the newly organized CTARL North of Taiwan Branch members, as well as an announcement of his election as a leader. Tony is in the center of the second row.

quest . . . while we all rode along with the mobiles, north-south, east-west along the roads of the USA.

"I love to hear Father Terry, who gave me the last in CA years ago and who has recently given me my last in NE. And I love to contact Ralph, WB4FFV, who always has a good report for me. He even went far out of his way just to give me the county line of Saline/Jefferson NE. I have to thank W5VRA for a special trip to the county line of Woods OK and Comanche KS; W0DFK for driving to Randolph/Perry, my last in IL; WS3F, who waited for hours at Clayton IA until propagation permitted a good contact; WB9OOG, who changed his route just to give me my last in VA; KG5UZ whom I worked in Garrett MD—my last one there.

"And then there was KA9FUG, who was responsible for tough Nance NE and so many others in different states; and the trips of WA4NBC, who helped with so many; as well as W5TQE, who added Cherokee OK; KA9PZS, who drove all the way to Big Stone MN at my request; and N4WAO, who in answer to my letter gave me Northampton VA. Other voices never to be forgotten include N7OTR; Bill, N6OKN; Dick, K7IOO; Bill, KC7JC; Doug, N7BKW; Dave, VE2MS; Bernard, W0AYL; Ms. Ella, NV4Z; and Mary. All these folks were always there to help relay light signals as well as give contacts from counties as they traveled the length and breath of the United States. Thanks to W5ILR, who sent me photos some of these voices, I have faces to go with the calls. Ed knew of my interest in all the mobiles I worked kept me up to date.

"To attend a MARAC Convention is one of our hopes. Family has kept us from traveling the past five years, but in the future who knows? We may finally have some eyeball QSOs.

"My OM has been an amateur longer than I have and is the one who keeps up my antennas and equipment. His interest in our hobby is ia much more technical. Our three sons also hold licenses but are too involved with raising their families and making a good living for them to be too active on the air. I trust that one day at least one of our twelve grandchildren will follow in our shoes and enjoy the pleasures of making friends all around the world.

"From now on I will be chasing Islands On The Air. I will continue to work mobiles for the pleasure of hearing them on 14.336 and collect reports for a second time around with no time limit—Hi Hi!

"I take this opportunity to thank all, and especially my good friend W5ILR, who drove all the way to MS for the last two for all the counties. He made it possible for me to become the first Brazilian to be a part of the select group of USA-CA holders. Thank you all so very much."

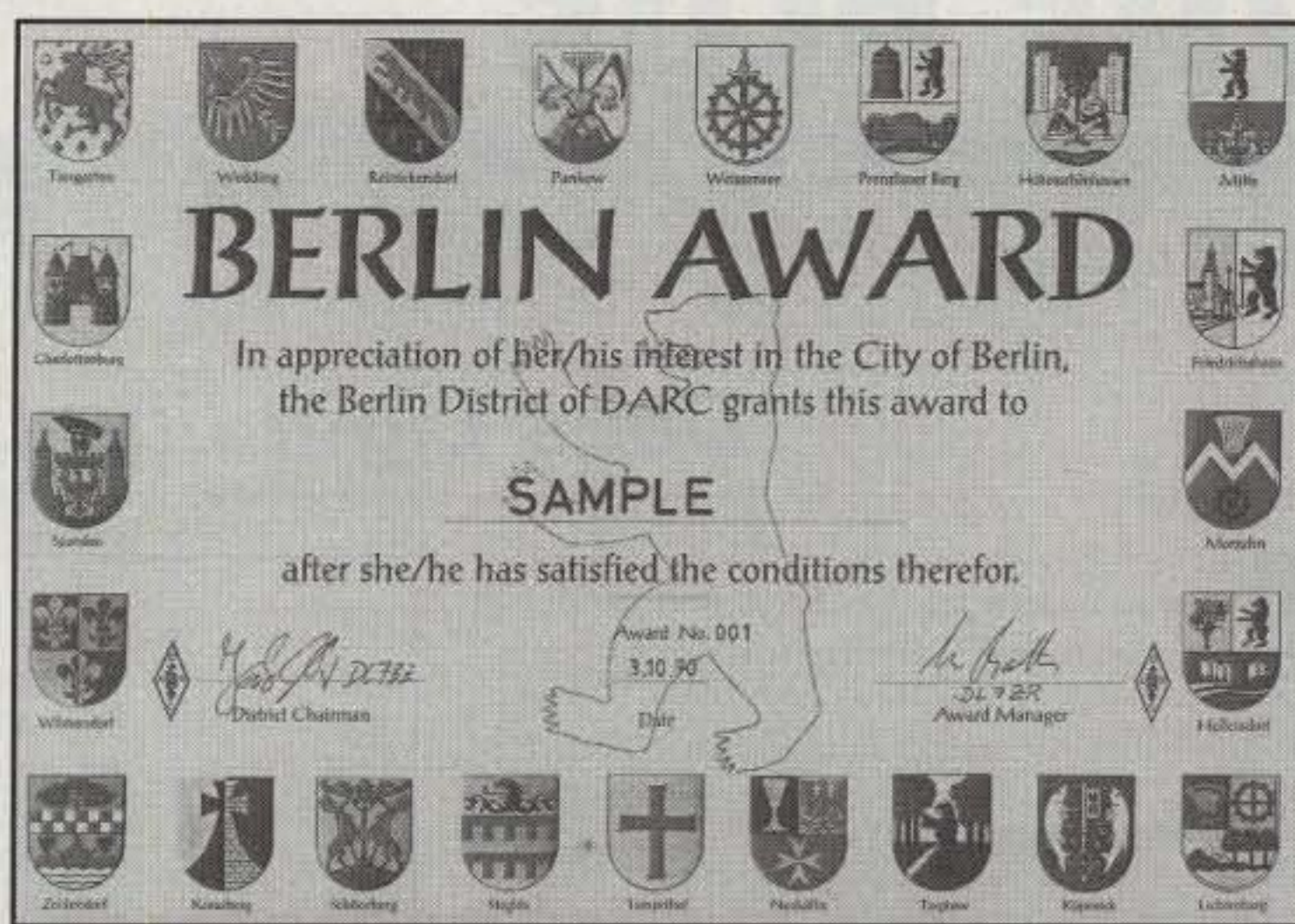
CQ and the County Hunting community join in congratulating Teresa on her accomplishment. And PT2TF's comments demonstrate how important and valuable net control stations are for DX stations. Good going, folks.

Awards Issued

Therezinha Felix Cardoso, PT2TF, completed her book and received USA-CA 2500 #916, USA-CA 3000 #838, and USA-CA All Counties #816. Teresa is our featured award winner this month.

Robert L. Willsey, W5VRA, USA-CA #2716, USA-CA 1000 #1295, USA-CA 1500 #1082, USA-CA 2000 #992, USA-CA 2500 #917, USA-CA 3000 839, USA-CA All Counties #817.

George E. Baker, AJ3X, USA-CA 500 #2723, USA-CA 1000 #1296, USA-CA



Both sides of the Berlin award issued by the Berlin District of the DARC.

1500 #1084, USA-CA 2000 #994, USA-CA 2500 #917, USA-CA 3000 #840, USA-CA All Counties #818.

Gary Prader, WD6CKT, USA-CA 500 2724, USA-CA 1000 #1297, USA-CA 1500 #1085, USA-CA 2000 #995, USA-CA 2500 #919, USA-CA 3000 #841, USA-CA All Counties #819.

Keikki Tamminen, OH3JF, boosted his collection to USA-CA 1500 #1083 and USA-CA 2000 #993.

The following received their basic award USA-CA 500: Spaic Kruno, 9A3IJ, #2717; Thomas Platz, DL4MCF, #2718; Darc OV Eching, DK0EE, #2719; Hiroshi Ohara, JA7JI, #2720; Tony H.C. Kuo, BV2TA, #2721; and Bernd Keitemeier, DJ4GJ, #2722.

Congratulations to the January 1994 class of USA-CA Award holders.

Awards

Berlin Award. This attractive award is issued by the Berlin District of Deutscher Amateur Radio Club (DARC). Contacts with Berlin amateur radio operators on or after 3 October 1990 count toward this award. Applications may be submitted by licensed amateur radio operators and shortwave listeners.

European stations require 100 points and DX stations outside Europe require 50 points. Points are obtained by contacting stations in at least 20 DARC and VFDB locals in Berlin. Each QSO counts one point; club stations count two points. Each Berlin station may only be counted once. There are no limitations as to band or operating mode. QSOs with stations in cities also named Berlin will be accepted as jokers and count three points each.

The award designed by DL7BE and DL7ZR is printed on both sides. One side shows the Brandenburg Gate at night with the text of the award in German, and the coat of arms of all Berlin districts with the text in English is on the other side. The

award is recognized by the DARC general assembly.

Application accompanied by a GCR list and a fee of DM 10 (8 IRCs or US\$ 6) should be sent to: Michael Barth, DL7ZR, An Den Achterhofen 19, W-1000 Berlin 47, 12349 Germany. (Information supplied by Dwaine Modock, WA8MEM.)

The WSPHCM Award. This award is available to licensed radio amateurs and SWLs for contacting members of the SPHC after 1 October 1959. There are no band or mode limitations. Requirements follow:

DX Stations

- 3rd class—5 QSOs
- 2nd class—10 QSOs
- 1st class—20 QSOs

EU Stations

- 3rd class—10 QSOs
- 2nd class—20 QSOs
- 1st class—40 QSOs

SPHC members are as follows: SP1—ADM, DPA, IXG, LOP, NQT; SP2—BKF, FAP, IW, MDK, OFK, ZFJ, ZT, SP2-7354; SP3—AKA, BGD, BYZ, CMX, KB, SUN, ZAH, SP-0047-GO, SP0402-KL, SP-0059-KN, SP-0005-KL, SP-1151-PO; SP4—CUF, GFG, SP-0100-OL, SP4-208; SP5—CJQ, FLA, GTC, JXK, KVW, LKL, MBA, NE, XD, SP-0094-WA, SP-010305-OS; SP6—AGD, BFK, BSB, CJZ, CXH, DVP, EGC, FER, FXX, PAZ, PWT, SP-0060-JG, SP-0160-JG, SP-0048-JG, SP-3003-LG; SP7—AW, AWA, CKF, ENU, GV, IVW, IXT, JWR, KTE, LZD, MJL, PAD, PBC, XK, XX, SP7-1230/P-LD; SP8—DYY, HR, KEA, PFI, SR, SP-0062-ZA; SP9—ADU, AQY, DH, EEE, HTD, HWN, KOU, PRO, SP9-1573-KA, SP9-3010-KA, SP9-3110-KA, SP9-3354-KA. Silent Keys: SP3AUZ, SP5AWV, SP8EV.

Send applications with GRC and 10 IRCs (US\$5), endorsement 2 IRCs, to Cierieszko Mikokaj, SP5CJQ, P.O. Box 13, 05-100 NOWY DWOR MAZ, Poland.

Notes

On a personal note, my antenna is back up and on the air again. And I promised my wife, Carol, that I would let everyone know that I hit a deer this time and did twice as much damage to the other car.

Thanks to K9DCJ and W4RKV for announcing new recipients on the net.

I hope everyone had a meaningful holiday season. Happy New Year!

73, Norm, WA3RTY

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ALL ABOUT THE WORLD ABOVE HF

Does Lightning Cause Sporadic-E?

This is a debate that has raged on almost as long as sporadic-E has been known to exist. For the most part, the relationship has been so-called "guilt by association," because most sporadic-E events occur in the summer, and thunderstorms seem to be most active across the U.S. continent also in the summer.

Now comes word that there might be some credibility to this theory. A report entitled "NASA Confirms Odd Atmospheric Flashes" appeared in the October 18, 1993 issue of *Aviation Week and Space Technology*. It discussed the experiments of University of Alaska physicists Dr. Davis Sentman (who is a former ham) and Dr. Eugene Wescott, both of whom studied and photographed high-altitude lightning flashes this past summer.

On 8 July, while working from a NASA/Ames Research Center DC-8 flying at 40,000 feet next to a line of severe thunderstorms over the Kansas-Nebraska border, they were able to photograph flashes of lightning with a low-light, all-sky camera. They observed that these flashes of light were different from bolts of lightning in that they were diffused and extended very high into the atmosphere.

In an interview with your editor, Sentman said that they were able to observe as many as 19 such flashes during a 15 minute period. He related that there was around one upward flash for every 300 lightning strokes.

Sentman stated that because of limitations on exploring the troposphere, the section of the atmosphere just below the E-layer, little is known about it. He also said that because aircraft and balloon flights generally cannot go above 60,000 feet, and satellite observations are well above the troposphere, little has been done in exploring this region and most that is known about it is speculation.

Nevertheless, Sentman speculated that these flashes extended as high as 100 km, which is through the troposphere and into the lower limit of the E-layer of the atmosphere. He also put forth another interesting theory (not his) that when these flashes of lightning hit the E-layer, they could cause meteors that were traversing the E-layer and burning up to explode, thereby causing their heat-induced ionization of the E-layer to be scattered, rather than being held within the tube-like propagation normally exhibited by meteors.

As if to add more evidence to the theory, Sentman also disclosed contemporary work being performed by Professor Umran Inan of Stanford University on the study of the relationship between effects on the D- and E-layers and lightning flashes. Sentman stated that because of a sophisticated low-frequency monitoring system that is in place throughout most of the U.S., most lightning flashes can be observed in real time.

P.O. Box 73, Oklahoma City, OK 73101

VHF PLUS CALENDAR

Jan. 2	Very good EME conditions.
Jan. 3	Quadrantids meteor shower predicted peak, 1843 UTC.
Jan. 4	Last quarter moon.
Jan. 5	Perigee.
Jan. 9	Very poor EME conditions.
Jan. 11	New moon.
Jan. 16	Moderate EME conditions.
Jan. 18	Apogee and first quarter moon.
Jan. 22-24	ARRL VHF Sweepstakes, 1800 UTC 22 Jan. to 0300 UTC 24 Jan. (See column for details.)
Jan. 23	Poor EME conditions.
Jan. 27	Full moon.
Jan. 30	Very good EME conditions.
Jan. 31	Perigee.

(Have you ever noticed during a severe weather report on the television that the weather reporter is displaying a map of your state and gleefully pointing to all the strikes as they appear on the map, saying, "There's one now . . . and another . . . and another?" Have you ever wondered how he or she did it? Well, now you know. You too can subscribe to this service, for not a cheap price.)

When there is an ionization event on the E-layer, there is also a corresponding event on the D-layer. You may recall that in the August 1992 column in my discussion of the June 1975 invisible meteor shower, I mentioned that the D-layer forms a waveguide effect on signals within the VLF frequency range, transporting them for long distances across the earth's surface. Meteoroid vaporization would cause phase shifts in the D- and E-layers of the atmosphere and thus phase shifts in the reception of the VLF signals. Well, Sentman reported that Inan has been able to detect similar phase shifts, and with a high degree of certainty has also been able to tie these shifts to specific lightning flashes.

While much of this work being done by these gentlemen is very preliminary, there does seem to be a door opening toward proving what so many have believed because of their observations. However, their work is far from conclusive. While on a trip to South America, Sentman had an opportunity to observe thunderstorms over Uruguay and Colombia. In neither case did he observe the upward flashes. Nevertheless, Sentman hopes to take another trip over the central part of the U.S. this summer.

It is important to note that a major precaution should be taken into consideration before examining these theories and implementing them into your own amateur radio practices. The precaution: If there is a lightning storm in your area, you should stay off the air. The lightning that is occurring nearby is not going to create the propagation that will benefit you, at least not on 6 meters. Lightning scatter prop-

agation on the microwave bands is another subject, and not what is under consideration here.

If you want to check out these theories, then look at a weather map for a severe storm that is between 300 and 500 miles from you. If there is ionization being caused by that storm, then it will be taking place directly overhead of it. This is the distance that would be far enough from you for your signal to be reflected off the E-layer and back to earth at a distant location.

Above all, be safe in your hobby. Don't let amateur radio be the death of you.

Romancing The Moon

When I was a teenager, my mentor, Bert Adams, K6BTO, told me about the first amateur radio VHF contacts being made by bouncing signals off the moon. After hearing those stories, I would go outside and look at the moon and wonder how it was possible to send a signal that far into space and one which would be strong enough to be reflected back to earth. I also wondered if I would ever have the equipment to also bounce a signal off the moon.

This "romancing the moon" also was in the hearts of many other VHF+ operators during that time in their youth. Among them was a group of Canadians. One of their members, Peter Shilton, VE3VD, would also look at the giant Algonquin Radio Telescope and in his mind's eye wonder about the possibilities of using it to bounce signals off the moon.

Also sharing his dream was another member of the group, Dennis Mungham, VE3ASO. Dennis also wondered, but he put his thoughts into action. Several years ago Dennis contacted the National Research Council, the previous managers of the telescope, about the possibility of operating an amateur radio station from it. They were not interested.

In 1991, however, the Institute for Space and Terrestrial Science became the new trustee for the site. Upon hearing that the Institute had as its mission exposure of space communications

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to Canada's youth, Dennis saw an opportunity to expose amateur radio to the Institute and to show its leaders the potential of blending its goals with that of the hobby of amateur radio.

Normally, the Institute would charge a client \$1000 per hour for the use of the dish. However, knowing that the amateur operators had knowledge and skills, particularly in development of very low-noise-figure preamps that would perform satisfactorily in the GHz range, Dennis pitched this trade-off to the Institute. It was interested in possibly waiving the fees in exchange for services rendered by the amateurs. With these possibilities in mind, Dennis was asked to make a presentation to the Institute's leadership.

Dennis got Peter, and together they made their pitch, which also included suggestions on how the amateurs could be of assistance in the Institute's Space Seminars that are held on the Algonquin Park campus.

The Institute's director, Dr. Wayne Cannon, was keenly interested in what the amateurs were proposing. He asked that the team—which now included Hans Peters, VE3CRU, and Mike Owen, W9IP—develop a proposal in writing.

The team prepared a 40-page paper outlining all aspects of the operation, such as equipment type, location, and safety considerations. After only a couple of weeks following submission of the paper, the team received the go-ahead to operate radio telescope the second weekend of the 1992 EME contest.

Unfortunately, Mother Nature (who is the mother of Mr. Murphy) had other plans. Winds in excess of 60 mph toppled trees everywhere the day before the contest. Some of these trees fell into the power lines headed to the Algonquin site. However, undaunted by the initial reports, the team proceeded to the site anyway.

Upon arrival they were informed that the only power was a large diesel generator. They were also advised by the site manager that he would not give them permission to move the dish for fear of the potential of back EMF from the motors affecting the generator.

Nevertheless they charged ahead, mounting equipment and generally getting organized for the possibility of operating the dish that weekend should the commercial power return.

As Murphy would have it, they were not able to operate during the contest. Nevertheless, this "dry run" helped them get past the learning curve and gave them ideas on how to improve the assembly and installation operation for the next opportunity.

Because of an accident with the cherry picker, a proposed trip in the spring was cancelled. Because the guys like to get together at their regular site for the summer contests, no effort was made to go to the dish over the summer.

So it turns out that the next opportunity was the next EME contest. Dennis was able to secure permission from the Institute to operate both weekends of the contest. Plans were made and the list of team members grew to include VE2DFO, VE3ASO, VE3BFM, VE3CRU, VE3DSS, VE3EMS, VE3KDH, VE3VD, and W9IP.

Equipment was assembled in garages. Bob Morton, VE3BFM, and Dana Shtun, VE3DSS, both at Sinclabs Amateur Radio Products, worked on the antennas. Tommy Henderson, WD5AGO, built and tested the preamps for 432 and 1296 MHz.

The second weekend in October was the

Canadian Thanksgiving weekend, and the nine guys and one gal (Heather, VE3EMS, wife of Peter, VE3VD) left families behind to make the trip.

The departure day finally arrived. They all made the trip to the park (including the 75 miles into the wilderness) without incident. Owing to their planning from the previous year, assembly and setup went much more smoothly. All they had to do was wait for moonrise plus 9° (because the dish cannot be lowered to anything less than 9° above the horizon). Thanks to Michael Owen, W9IP's Realtrack software, they knew precisely when this was to occur. Nevertheless, they tested the equipment before the moon came in full view of the dish and were sweetly surprised as to how loud their echoes sounded.

Once underway they found the pile-up as awesome as anything they had ever heard on HF. In fact, it was so big that the decision made in the planning stages to work "HF contest style" proved to be the right one because of the improved efficiency of working each station (over that of the conventional sequencing method). In fact, their QSO rate approached that of an HF contest station.

Still Murphy would not quite leave them alone. A nasty hum on 432 MHz kept them from hearing the really weak stations (unfortunately, the ones they really wanted to work). Nevertheless, they pressed on through their lunar window, finishing the first day with 246 QSOs and 41 multipliers.

The next day, as planned, they switch to 144 MHz. Again Murphy stepped in and made problems. The first problem was a tripped circuit breaker in the feed cabin that forced them to awaken Kevin (the only one at that time who knew how to work the cherry picker) out of a sound sleep to ride it up the 90 feet in order to enter the feed cabin and reset the errant circuit breaker. Quickly after that Kevin taught the others how to use the cherry picker.

The next problem came via a solar event that produced an aurora which degraded conditions for EME work on 144 MHz. In spite of the diminished conditions they were able to make 235 QSOs with 46 multipliers during this 24 hour period.

The second weekend of the contest saw far fewer of the team members present. Included on this trip were VE3s ASO, CRU, VD, and W9IP. Again 432 MHz was operated on the first day. And again Mr. Murphy showed up. During the night the temperature dropped from 6°C to -10°C in just a few hours. Because of this drop the 432 MHz amplifier became untuned, causing the signal to be extremely chirpy.

This time it was Michael Owen, W9IP's turn to be roused out of bed. He made one trip up the cherry picker and into the feed cabin and retuned the amplifier. Upon returning to the control room they discovered that they now had no power out. Michael went up once again to the feed cabin, this time to replace a bad section of coax connected to the wattmeter.

During this run on 432 MHz they made an additional 79 contacts in 4 more multipliers (including your editor).

The next day they switched to 1296 MHz, where they literally "worked the band dry." For the most part Murphy left them alone on this band. Their total was 79 QSOs and 29 multipliers.

Overall, after subtracting the duplicate contacts, their score was 560 QSOs in 116 multi-

pliers for a total of 6.496 million points, obviously the highest total for any station in any previous EME contest.

Speaking of "high," the guys and gal were high for several days following the contest. Peter remarked that the trip was doubly special. His dream of "romancing the moon" that he had as a teenager was fulfilled way beyond his expectations. Additionally, having Heather, his wife, along for the first weekend and their nearly complete contact during the second weekend meant something very special to him.

Peter told your editor that Heather came to a new understanding of just how important his hobby is to him and conveyed to him how she also has grown to appreciate the importance of the hobby. For them, it was one of those unique events that only "in love" couples can experience, especially when "romancing the moon."

What about the future? The team is confident that because the experience was positive for both the Institute and them, they will be able to gain permission to operate once again.

However, success breeds its own set of problems. Questions are being asked about what other bands should they operate. Six meters and 3 cm are being suggested. Obviously, because of the few number of EME operators on these bands, the group could work all of these stations in a very short time. This would leave time left over to once again work bands previously worked.

However, this presents yet another problem. One of their prime objectives was to work as many as the lesser equipped stations as possible. Should they go back up during another contest weekend, they would be obliged to work the big guns all over again.

Frankly, some of the big guns—those who made two and three duplicate contacts, thereby depriving some of the weak stations of the opportunity—really should ashamedly abstain from making any contacts, no matter when the dish is back on the air again. I was truly disappointed to hear about these big guns who insisted on SSB contacts and additional CW contacts on the same band after knowing that they were in the log for their first contact. This kind of behavior is usually HF DXer's poor operating practice. It doesn't even belong there and it certainly doesn't belong on VHF! Enough of the sermon.

Because of the problem of the necessity of working the big guns during a contest, one idea is to operate during a non-contest weekend and insist that only contacts with stations previously unworked be made.

What are your suggestions? Send them to Dennis with your QSL card or SWL report (yes, they want to hear from people who only heard them, as well). When you write to Dennis, tell him "thank you." If it was not for him, this operation would never have gotten off the ground. It was his vision and persistent contacting of the managers of the dish that opened the door.

The team received excellent media coverage. Members were interviewed on Toronto television, and Shelley Page, the science writer for the Ottawa *Citizen* newspaper, wrote a very complimentary article about their operations. It is especially well written because it shows that in spite of her not being a ham, she has a remarkable grasp of the subject.

Yes, it was a team effort, a Canadian team (with one token U.S. citizen). Among the great things our Canadian friends have accom-

plished over the years, this ranks way up there. There was a great deal of selflessness involved in the operation. In fact, in thinking of their selflessness, I was reminded of how another group of Canadians performed another collection of selfless acts during the Iranian hostage crisis, when they hid several U.S. citizens who were caught outside the embassy but inside the country with no easy way out. It was our Canadian friends who paved the way home for the U.S. citizens then, and it was our Canadian friends who created the opportunity to make the biggest ever effort on EME during the contest weekends. Thanks much, great friends!

Current Grid Expeditions

Bill Wiseman, KM1E/C6AGN, continues to be

active on 6 meters from Green Turtle Cay through 23 February. QSLs go via KA1DIG.

Raphael Ortiz, XE2LQB, is planning a trip to DL85 during the Christmas holidays. QSLs go to: Raphael Ortiz, Zaragoza 385 Sur, Nava, Coahuila, Mexico 26170.

Your editor is also planning a return trip to Ojinaga and possibly some other Mexican grid squares during the Christmas-New Year holidays. Listen for my beacon. I will be running 100 watts into a 5 element beam, pointed state-side when I am set up.

Current Contests

ARRL VHF Sweepstakes: This annual winter classic takes place 22-24 January, beginning 1800Z 22 January and ending 0300Z 24

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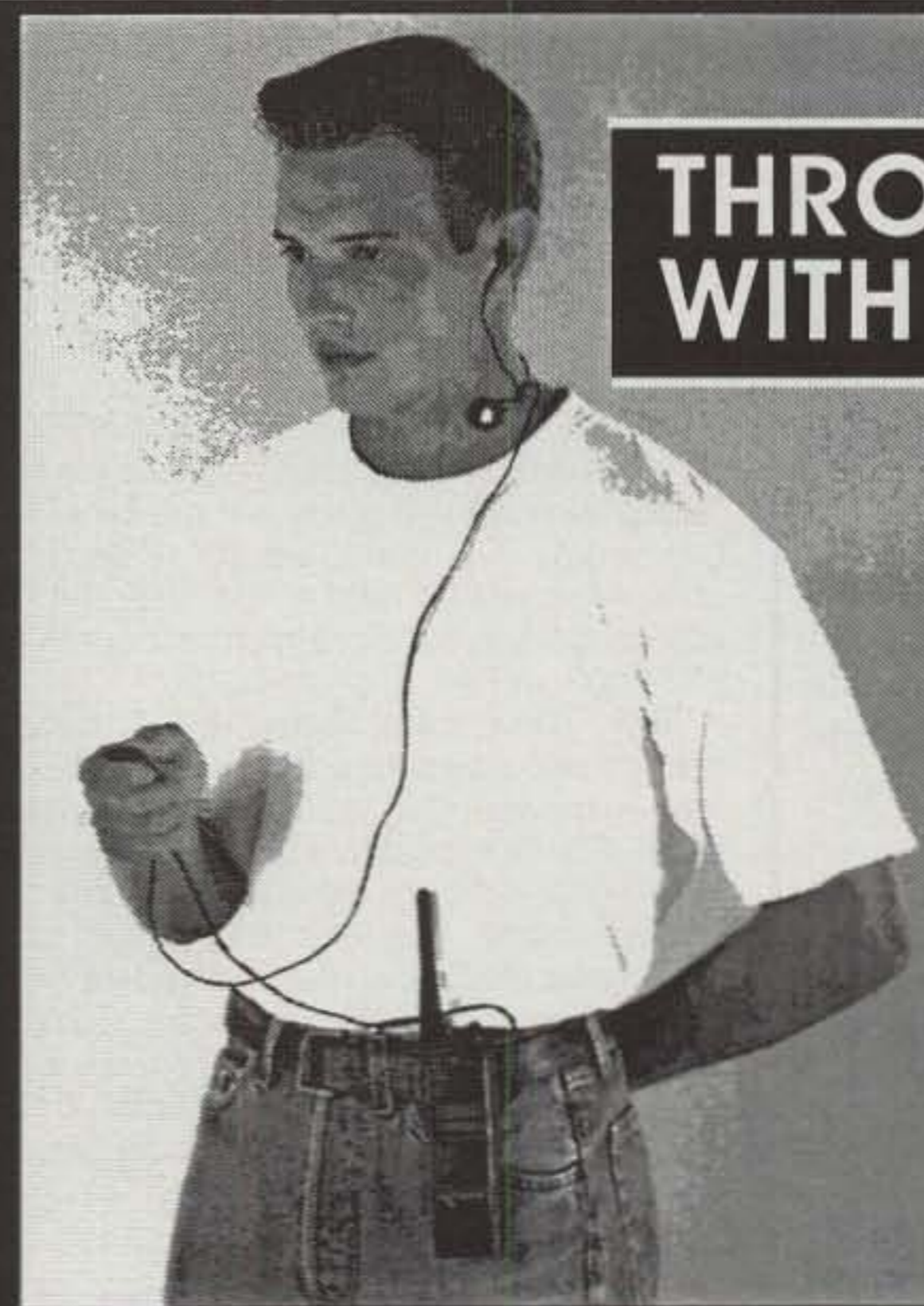
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January. This is the only VHF contest that features club competition. Warren Stankiewicz, NF1J, ARRL assistant contest manager, reported at the Packrat conference that the League was considering a change to the rover rule and that it may be implemented as early as this contest. It is very important therefore to check the complete rules as they appear in December QST. Exchange is your grid square. As always, send your log and summary sheets to the League.

Current Meteor Showers

The Quads: The *Quadrantids*, or *Quads*, is a brief but very active meteor shower. Expected peak is around 1843Z on 3 January. The best paths are north-south. Long-duration meteors can be expected about 1 1/2 hours after the predicted peak. As always, look to 3818 or 3843 kHz in the evening hours for opportunities for schedules.

Coming Conferences

The following information on conferences that I know about is presented with this disclaimer: The dates are tentative and not guaranteed. Contact the organizer for more up-to-date information if you are interested in attending.

March: The 1994 Charlotte Hamfest and ComputeFair promises to have its usual broad-base appeal to the amateur radio operator. It is scheduled for 12-13 March. Your editor was there last year and was quite impressed with the hamfest. For more information, contact Ted Goldthorpe, WA4VCC, at 803-547-6980.

April: Dayton, the biggest event of the year, will also feature the VHF forum. While the program for the forum is not set at this time, it is always worthwhile to attend. Dates for Dayton are 29-30 April, and May 1.

This year the West Coast VHF Conference is being sponsored by the Southern California Six Meter Club. The tentative dates for this year's conference are 29-30 April and 1 May. The location is to be in Cerritos. For more information, contact Gracie Hastings, KK6CG, at 714-990-9203.

June: Ham-Com will sponsor the ARRL National Convention this year. As usual the North Texas Microwave Society will put on at least two forums. The dates are 10-12 June. The convention will be held at the Arlington Convention Center. For more information, call 214-522-5003, or FAX 214-521-0016.

July: The Central States VHF Society will hold its annual conference in Memphis, Tennessee between 29-30 July at the Wilson World Hotel. Contact President Dave Meier, N4MW, at 901-382-4919, for more information.

September: The tenth anniversary of the Microwave Update conference will be held at the location of its roots, Estes Park, Colorado, 22-25 September. Contact Bill McCaa, KØRZ, at 303-499-1936 for more information.

Perseids Observations From SM2CEW

The following is quite a different perspective on this year's *Perseids* meteor shower. It is from Peter, SM2CEW, Lulea, Sweden, grid square KP15cr. As there were great expectations over this year's shower, he made it a point to be ready for the action. Peter states that on the

evening of the 11th the activity was picking up all the time. He says that he could observe this because he was monitoring the TV-carriers on 49.750 MHz.

He reports that throughout the shower there was a constant rate of bursts, some very long. At 1930 UTC he ran a sked on 432 MHz with DF8LC and heard some bursts, but they were short. However, Peter observed that some of the bursts were quite impressive, reaching over S9! Nevertheless, he did not complete the QSO.

Later, at 2200 UTC, Peter ran a CW sked with UA4AQL at a distance of about 2200 KM. Peter states that the UA4 is running 100 watts and a single Yagi. He states that he heard some really good bursts early in the sked, indicating good potential, but this was before he sent any report to him. Unfortunately, the propagation failed to be sustained and they did not complete.

Following this attempt Peter turned to SSB for random contacts. He observed that around 2300 UTC propagation was very good, but short. He noted that the best signals came from the eastern direction. At the same time he observed that 49.750 MHz was more or less filled with carriers, with constant bursts all the time. Peter noted that monitoring 49 MHz was interesting for him, as he could follow the meteor activity's peaks and valleys very clearly. There was no difficulty in distinguishing the peaks time for him.

On the 12th at 0030 UTC he noted that things were really getting good on SSB. Burns were getting longer, and it was easy to complete a contact in one burst. However, he noted, most of the signals were coming in while beaming somewhere between 135-215° azimuth. He also noticed that practically no signals were coming in from the UK, with the exception of GM4YXI, whom he heard constantly, just as if it was sporadic-E.

During the following 2 hours the band was extremely good. Peter worked about 50 stations on SSB, completing up to 5 QSOs in one burst. Distances were all out between 1500-2200 KM. Peter stated that he completed many 2000 KM QSOs with the antenna about 25-35° off in azimuth.

Peter observed that QRM was a tremendous problem, as there were many stations on the same frequency whenever there was a burst (sound familiar?). He noted that many more QSOs could have been completed in the absence of so many signals.

Peter noticed that at this time 49.750 MHz contained only carriers, just as if there was sporadic-E. He tried many times to turn the beam to the UK, but hardly any signals heard when beaming to the UK. It seemed to him that the radiant really favored QSOs in the E-SE-S-SSW direction. It is very apparent that between 0045-0130 there was a very intense peak. Almost all long-distance QSOs were taking place at this time, distances of 1800-2200 KM.

Peter noted that during this peak signal levels were incredible, some pinning the S-meter! Between 0130-0200 UTC there was a noticeable decrease in meteor activity, and then at 0200 UTC it all picked up again and activity was again very high, with long distances easily covered, and signal strengths in excess of S9+ were heard!

Around 0300 UTC the long-distance stations were no longer being heard, but instead were being replaced with very short-distance

stations. Peter noticed that they were now very strong. However, he did observe that bursts were still long and steady, and that more than one minute bursts were very frequent.

Peter went QRT for the night at about 0400 UTC, with conditions still the same.

At 1100 UTC Peter tried a CW-ms sked with F1HRY, again about 2200 KM, and heard good signals. However, they were not able to complete. Peter states that he was not sure about his report. He noted that a one hour sked was just a little too short. Longest burst was 15 seconds, and that was in the first period.

Peter also tried a sked on 432 with GD4IOM, and signals heard both ways, but the bursts were too short to complete. He noted that at that time there was strong sporadic-E on 49.750 MHz to the east. Later in the afternoon he completed an SSB random QSO with OZ1IPU. His log showed that there was still quite good meteor activity, but bursts now were getting quite short. This sked was his last activity in the shower, as he had other obligations during the following days.

Peter states that it is always difficult to compare different years, but he can honestly say that he has never seen anything like this year's peak. There were good peaks before in different showers, but nothing as good as this one. There was an apparent favored direction of communication from his QTH, but the antenna direction did not play an important role. Peter seems to have had a very enjoyable time during the shower. His radio observations parallel the visual observations that also reported more activity in the higher latitudes. Thanks to Shelby Ennis, W8WN, and the VHF/UHF BBS for this report.

Rover Controversy One More Look

Fred Gore, KA1TBS, and Bob Gutowski, KA1QFE, a Rover team that operated with the Hampden County (Massachusetts) Radio Association, reported to me that they strongly disagree with Stan Hilinski, KA1ZE's position regarding the rover controversy. They stated that Stan, while keeping the letter of the rule, did not keep the spirit of the rule, which states in part, "... All rovers are encouraged to adopt operating practices that allow as many stations as possible to contact them." It is interesting to note, however, that at the Central States VHF Conference Stan defended his position by saying that he purposely exploited the rule to demonstrate the absurdity of it.

Indeed, for years contest groups have used so called "captive" rovers to make additional contacts in grid squares not normally accessible to anyone, let alone the big-gun contest stations. However, as Doug Sharp, WB2KMY, reported in his session at the CSVHF conference, the W2SZ Contest group by necessity is getting away from using captive rovers. It seems that more and more people are becoming attracted to being rovers and want to work the big guns, such as W2SZ, but do not want to be tied to them. It may not be too long before the practice of big-gun stations maintaining weird split frequencies for captive rovers will be a thing of the past.

While both Fred and Bob are campaigning for no changes in the rover rules (Fred FAXed me a copy of a letter that Bob had sent to the League opposing changes), some still wonder

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CIRCLE 18 ON READER SERVICE CARD

if changes aren't warranted. It is interesting to note, however, that preliminary results of the June contest indicate that no one decided to operate so called "Rover Squared" stations. Perhaps the issue, although not really dead, has quietly receded to the back stage in our wonderful world of VHF+ activities.

East Coast 70 CM Net

The East Coast 70 CM Net meets each Wednesday night at 9 PM Eastern time on 432.090 MHz SSB. The net control is Charles Osborne, WD4MBK, located in EM73vx (Atlanta, GA). The NET is used largely to coordinate schedules on higher bands and to perpetuate activity on 432 MHz. Charles states that with a limited number of people spread thinly across the southeast, narrow beam widths, frequency accuracy subject to a couple kHz typical un-

certainty rig to rig, and hit or miss timing, it's a wonder any of the net participants ever cross paths. The net helps by giving a weekly frequency calibration and a little activity that can be depended on. Otherwise, he states, "... we might be listening night after night to a feed line full of water and not know it."

The net was started in 1979. In the following 14 years over 500 different stations in 27 states have checked into it. Charles urges those of you who live on the east coast to please join them in order to keep activity strong on 70 CM.

Charles says that they begin the net with calls to the northeast. By 9:30 they try to be on Charleston, SC. This is often delayed due to heavy call-ins from the northeast. By 9:45 he is looking toward the Niceville, Florida/Panama City area. By 10:00 he is looking west and working northwest. A typical net runs till about 10:20 EST/EDT. Coverage area is about 400 miles

under average conditions, 600 miles with a little enhancement, centered on Atlanta. Don't think your station has no chance of reaching Charles. Even a satellite station with the antenna at rooftop level and 10 watts can often check in out to Knoxville TN, Statesville NC, Jacksonville FL, Savannah GA, etc. A typical station with 100 watts to a single Yagi at 60 feet can be heard about a hundred miles farther than the above example.

Charles's station is a TS-940-SAT with Microwave Modules Transverter. Preamp is located at the top of the tower. Antennas are four 22-element K1FO Yagis at 105 feet (1180 feet ASL) in a 1 wide x 4 high array. This arrangement allows him to have the gain of a four Yagi array, but a wide pattern like a single antenna. This is very useful for calling the net and hearing stations off to the side of the main beam. The array can also be elevated for satellite use, EME, or just to optimize the signal arrival angle. He is also using an NIR-10 Digital Signal Processor to pull in weak signals that might otherwise be missed. On transmit he currently runs a pair of 8930 tubes in a K2RIW amp, producing 850 watts output. Charles urges you to give him a call.

For more information, write to Charles Osborne, WD4MBK, 881 Lakeshore Drive, Berkeley Lake, GA 30136-3041 (phone 404-242-7070 or 242-7864 at home, or 404-903-6229 work, or FAX to 404-903-6245).

VE1MQ Beacon Has New Keyer

Mike Smith, VE1MQ, reports that his 6 meter beacon, VE1MQ/B, located on 50.073, is now signing "DE VE1MQ/B FN65 5W ES STACKED LOOPS (DIT, DIT, DIT [SPACE] DIT, DIT [SPACE] DIT, DIT)." Mike's neighbor has recently signed up for cable TV and is now receiving Mike! He wonders if anyone has any suggestions for curing the problem. You can contact him with your SWL reports of his beacon at Michael Smith, VE1MQ, 131 Smith Rd., Geary, NB Canada E2V 2G3.

And Finally

Thanks to all of you who sent and FAXed reports. My apologies to Rob Gerardi, N9LAG, whom I manage to misidentify in both the November and December columns. Now that's gratitude. Rob sends me a copy of Harry School, KA3B's report and I can never get his name straight. I will have a report on his part in the "Bald Knob DX Hogs" contest team in a future column.

My thanks also goes to Bill LeBaron, W0MTK, for FAXing a report on his trip to the midwest. I will highlight it in a future column.

Additionally, I want to thank all the newsletter editors who send me their issues. I really appreciate your hard work in furnishing the news to your community and sharing it with me so that I can pass it on to the rest of the VHF+ family.

Remember, you can FAX your reports to 405-528-0746, can call me at 405-528-6625, or can leave a message on CompuServe (my number there is 72124,2734).

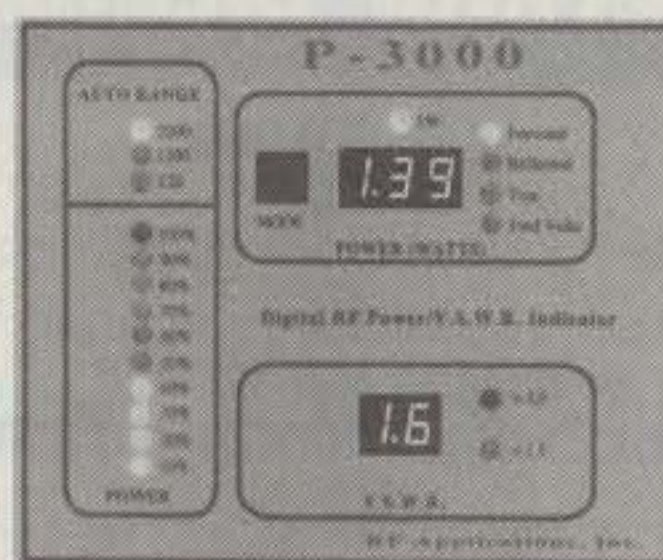
My best wishes to you and yours in the new year!

73, Joe, N6CL

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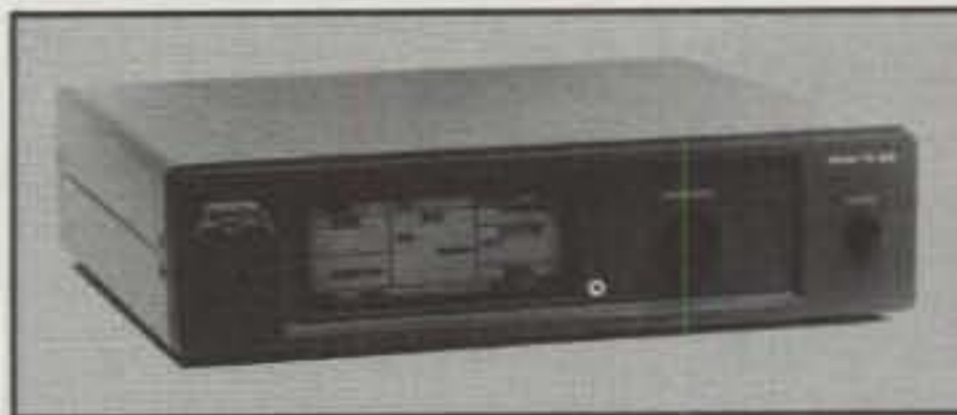


an EEPROM memory bank which does not require any backup battery; and a 6 volt battery pack that produces 5 watts of power. The wide-band receiver covers 136 to 173.99 MHz.

For more information, contact Kenwood Communications Corp., P.O. Box 22745, Long Beach, CA 90801-5745, or circle number 102 on the reader service card.

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pairs from 170 Hz to 1000 Hz; packet and AMTOR Maildrop; 16 gray shade WEFAX (with optional software); and more. Suggested list price is \$549.

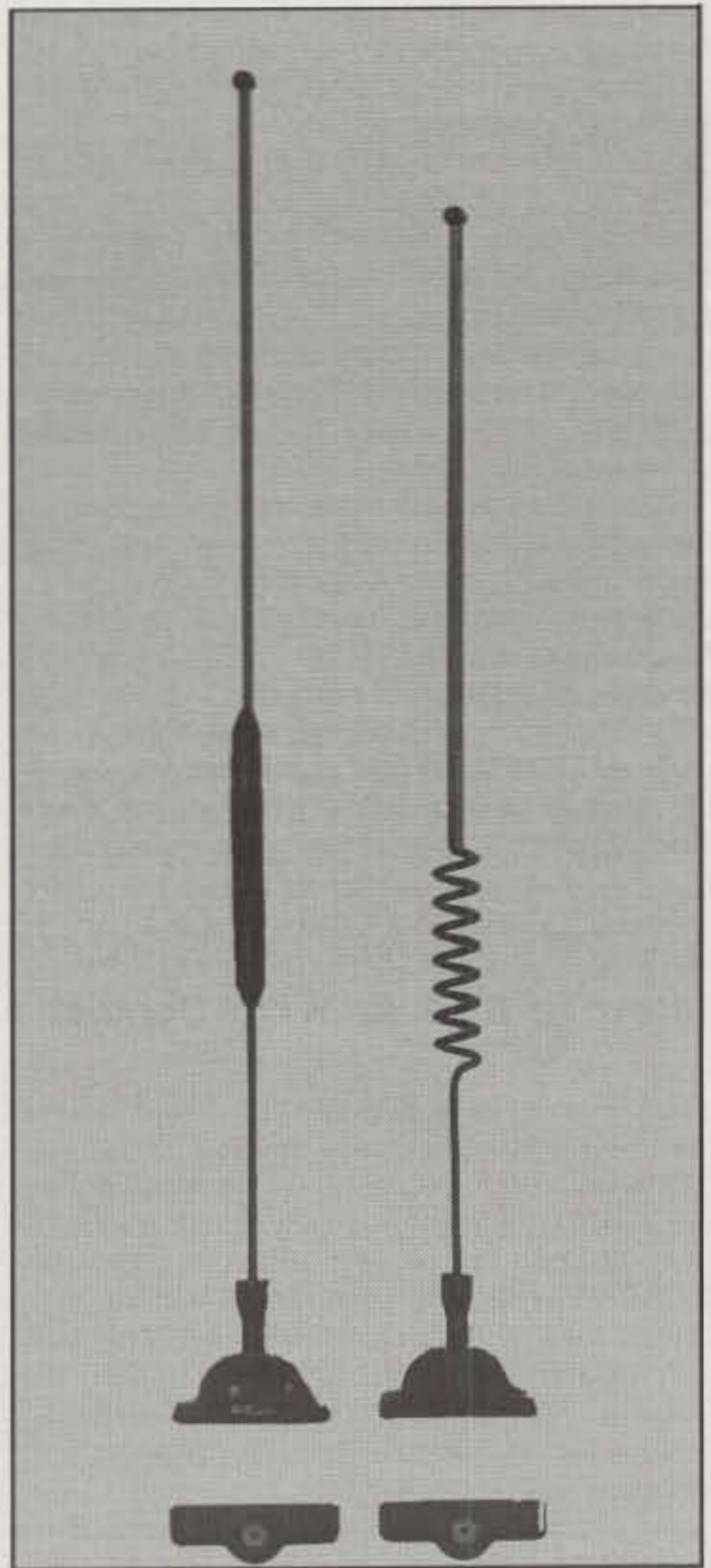
For a product data sheet and a list of authorized dealers, call AEA's Literature Request Line at 800-432-8873. Advanced Electronic Applications, Inc., 2006 196th St. SW, Lynnwood, WA 98036, or circle number 106 on the reader service card.

SLOW SCAN II From Harlan Technologies

Harlan Technologies has introduced SLOW SCAN II, a new method of copying slow scan TV that uses software and a Sound Blaster compatible sound card with a PC. Slow Scan II works with the Sound Blaster, Sound Blaster Pro, SB16, Pro Audio Spectrum 16, Fusion 16, and other Sound Blaster compatible sound cards. The program will copy Robot 8, 12, 24, and 36 second black and white, Robot 36 and 72 second color, Scotty 1 and Scotty 2. All color modes display in black and white in this version. Slow Scan II will also retransmit pictures that were received and save them as .VOC files. Pictures can also be saved in .PCX format for using in paintbrush programs, etc. Requirements include a PC with hard drive,



VGA monitor capable of 640 x 480, 256 colors, and a Sound Blaster compatible card. The Slow Scan II software can be purchased for \$40.00 plus \$5.00 s/h (Illinois residents add \$2.50 tax). For more information contact Harlan Technologies, 5931 Alma Drive, Rockford, IL 61108 (815-398-2683), or circle number 102 on the reader service card.



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NEWS/VIEWS OF ON-THE-AIR COMPETITION

RTTY Contesting—A Tutorial

Amateurs operate on RTTY (and other digital modes) for a number of reasons. Their desire to use these modes is driven by anything from the urge to experiment with new modes of operation to simply keeping up with a fellow amateur across town.

In my case, the ease with which one can enter into this fascinating world pushed me over the edge. I remember the first time I hooked up my new "hi-tech" TNC and began decoding a RTTY signal. It was so easy! Some of my friends were so shocked to see me (as opposed to hearing me?) that I even received a phone call from Carl, N4AA, asking, "Is that really you, John?"

Naturally, it was not long before I discovered the connection between RTTY and contesting. For a diehard rate guy such as myself, RTTY contesting was like operating in a Novice Roundup at first—slow but steady. It wasn't long before the bug bit hard and I was addicted to another part of our fabulous hobby!

When it comes to RTTY operating, however, I'm really just a beginner. For that reason, Chris Burger, ZS6EZ, has written a wonderful summary of RTTY contesting that I want to share with you. Now without further delay . . .

How To Work An RTTY Contest

By Chris R. Burger, ZS6EZ

RTTY used to be a very specialized activity until about a decade ago. Most RTTY operators were imagined as hams wearing leather aprons and protective glasses, with the smell of oil on their hands. Most stations used surplus military or other electromechanical teleprinter machines, and virtually all activity was confined to 45.45 Bd Baudot. Ticker-tape punches were used to store messages, and an entire pine tree had to be felled to make enough paper for a day's operating.

All this started changing with the availability of affordable home computers. The first generation consisted of the Apple II, the Radio Shack TRS80, and the Commodore PET. The latter was mainly a business machine, and to my knowledge relatively few PETs ever ended up serving RTTY duty. However, using an Apple or TRS80 machine, scores of amateurs became active on RTTY at modest cost and, more important, without consuming most of their shack's available space.

At about the same time, several manufacturers introduced microprocessor-based dedicated terminals. Possibly the most popular were Tono, Telereader, and Robot.

With the advent of the IBM PC and its horde of clones, both hardware and software became more readily available at a very reasonable cost. Virtually anyone wanting RTTY capability could now add it to an existing station without a lot of effort or expense.

c/o CQ magazine

Calendar of Events

Dec.	31	ARRL Straight Key Night
Jan.	1-2	ARRL RTTY Roundup
Jan.	1-2	Michigan QRP CW Contest
Jan.	8-9	North American CW QSO Party
Jan.	15	Winter NWQRP Sprint
Jan.	15	Ukrainian Teenage Int'l Contest
Jan.	15-16	North Amer. SSB QSO Party
Jan.	15-16	HA DX Contest
Jan.	22-24	ARRL VHF Sweepstakes
Jan.	28-30	CQ WW 160M CW Contest
Jan.	29-30	U.B.A. Belgian SSB Contest
Jan.	29-Feb. 6	ARRL Novice Roundup
Feb.	6-7	1994 Classic Radio Exchange
Feb.	12	QCWA CW QSO Party
Feb.	12-13	EA RTTY Contest
Feb.	12-14	New Hampshire QSO Party
Feb.	19-20	ARRL CW DX Contest
Feb.	25-27	CQ WW 160M SSB Contest
Feb.	26-27	U.B.A. Belgian CW Contest
Mar.	5-6	ARRL SSB DX Contest
Mar.	12	QCWA SSB QSO Party
Mar.	26-27	CQ WW WPX SSB Contest

RTTY activity has grown accordingly. Split-frequency pile-ups and contests with wall-to-wall activity are both a relatively new phenomena in the RTTY sub-bands. During the CQ WW RTTY Contest the sub-bands are filled to capacity, and very often the activity spills over into adjacent CW or phone territory.

My perception is that RTTY contest operators mainly come from two distinct backgrounds. First, there's the long-time RTTY operator who is looking for a few new countries and sees the contest as a vehicle for finding them. Second, there's the dyed-in-the-wool contest operator who can't resist the temptation of trying a new mode in his favorite pastime.

Contesting For The RTTY Buff. The discussion that follows in this segment is geared to allow you to work participants rather than to win. However, to understand how to work the participants most efficiently, you must understand what they are trying to achieve.

Contests are, by their nature, an exercise in achieving the greatest possible operating efficiency. Winners will go all out to work every station on the band. In their quest to do so, a few tactics are employed.

•*Find that ideal QTH.* It should be so desirable that it becomes nearly impossible for anyone on the band to resist calling you. To achieve this goal, the country must be rare. It is also necessary to be in a continent where little activity exists, because one normally gets additional points for contacts in a different continent. Being in Europe when working Europeans is not a winning formula, but it is necessary to be close enough to be loud!

•*Be loud.* Not only must the winner run the maximum power possible under legal and financial constraints, but there must be anten-

January's Contest Tip

Do you recall the painful experience of having a beautiful QSO run disappear almost instantly? Many times it's nothing more than the band changing. However, it often can be the result of QRM caused by a station you can't hear. An open frequency does not always mean it is QRM-free on the other end. Try asking the question "How clear is my frequency on your side?"

nas to match. It's no good to be able to raise lots of callers if you can't hear the guy with the peanut whistle and the basement dipole. The location plays a major part in determining how loud you can be into major population centers on a specific band.

•*Work hard.* This involves choosing the right times to operate if a rule or personal stamina restricts operating times. Anyone who intends to win must not only work the JTs and other exotic DX, but also every ham in the Ukraine, Japan, and California, even if it gets dead boring at times.

This situation is very advantageous for the RTTY DXer. It's almost like a dream come true. Someone activates a country that's normally very difficult to work, puts up giant antennas to make sure he can hear you well, and then turns out to be just as keen to work you as you are to work him!

If you want to spend your operating time productively, there are some tricks to learn, though.

The guy at the other end is interested in working everyone on the band. He doesn't want to know your name, your QTH, your rig, your antenna, the weather, or your shoe size. He just wants your callsign and your exchange. The exchange for a specific contest may include his RST, your state, a serial number, your CQ zone (e.g., 3, 4, or 5 for US stations). Some contests even require the time as part of the exchange! In the CQ WW RTTY Contest you should send an RST, your zone number and your US state or Canadian province. Most serious participants know the two-letter abbrevia-

Contest	Month of Activity
ARRL RTTY (US)	Jan.
EA RTTY contest (Spanish)	Feb.
BARTG RTTY contest (British)	Mar.
SARTG AMTOR contest (Scandinavian)	Apr.
Volta RTTY contest (Italian)	May
ANARTS RTTY contest	June
SARTG RTTY contest (Scandinavian)	Aug.
CQ World Wide DX RTTY Contest	Sep.
WAE DX RTTY Contest (European)	Nov.

Table 1—Major RTTY contests and scheduled month of activity.

Check QSOs	%	Check QSOs	%		
1921	2	0.2%	1962	42	3.4%
1923	1	0.1%	1963	43	3.5%
1927	1	0.1%	1964	29	2.4%
1930	5	0.4%	1965	22	1.8%
1931	3	0.2%	1966	33	2.7%
1932	6	0.5%	1967	33	2.7%
1933	2	0.2%	1968	27	2.2%
1934	5	0.4%	1969	30	2.4%
1935	10	0.8%	1970	25	2.0%
1936	9	0.7%	1971	23	1.9%
1937	4	0.3%	1972	30	2.4%
1938	10	0.8%	1973	24	2.0%
1939	8	0.7%	1974	16	1.3%
1940	3	0.2%	1975	14	1.1%
1941	6	0.5%	1976	32	2.6%
1942	3	0.2%	1977	49	4.0%
1946	4	0.3%	1978	21	1.7%
1947	14	1.1%	1979	22	1.8%
1948	12	1.0%	1980	9	0.7%
1949	8	0.7%	1981	11	0.9%
1950	6	0.5%	1982	10	0.8%
1951	14	1.1%	1983	6	0.5%
1952	28	2.3%	1984	5	0.4%
1953	20	1.6%	1985	14	1.1%
1954	29	2.4%	1986	9	0.7%
1955	38	3.1%	1987	8	0.7%
1956	39	3.2%	1988	20	1.6%
1957	59	4.8%	1989	21	1.7%
1958	46	3.7%	1990	31	2.5%
1959	46	3.7%	1991	32	2.6%
1960	24	2.0%	1992	23	1.9%
1961	41	3.3%	1993	8	0.7%

Table II—WB5VZL 1993 ARRL SS CW log. Total contacts = 1228.

tions for all 50 states and the Canadian provinces, so you can use those with confidence. DX stations only send the report and zone number.

Above all, the guy at the other end is proficient at working RTTY, has a good receiver, and is listening on his own frequency. **Do not** send any tuning signals. Most operators I know will studiously ignore anyone who starts his transmission with typical RTTY start-up sequences such as RYRYRYRYRYRY or a "Quick Brown Fox" message. Also, it makes no sense to sign off with strings of 73s, your name, the date, the time, or any other "cute" endings. In fact, no ending signals at all are necessary. Anyone can hear when your carrier disappears, and it's obvious that you are listening.

When a DX station calls "CQ" or "QRZ?" send your callsign between one and three times. No more. If everyone keeps calling, he won't be able to copy anything. If the DX station doesn't answer anyone, you can drop in your call again. Doing this several times is a far more successful strategy than irritating the DX station by sending long transmissions. In severe cases you may even end up in his "black book" and never get a QSL card.

Here's an example. The DX station's transmissions are in italics.

CQ DE ZS6EZ ZS6EZ TEST
 DE WD9ZZZ WD9ZZZ
 WD9ZZZ 59938
 TU 599W104 DE WD9ZZZ
 TU DE ZS6EZ ZS6EZ TEST

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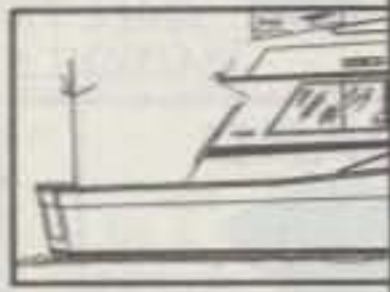
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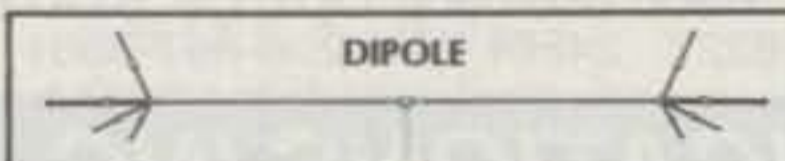
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Unfortunately, in these days of microcomputers, some operators insist on using long strings of RYs before sending their callsigns.

You need to develop a strategy to deal with these people, just like you have to deal with phone operators yelling only the last two letters of their callsigns. One possibility is to ignore them, but do this at your peril, as a few more strings of RYRY are likely to precede the next call, obliterating enough signals to fill a callbook.

You also may find that your station hardware might need some attention. If you're using a logging program already, you'll know that hash on any band can ruin your whole day. You'll also know that transmitting can hang the computer if you're not careful. Make sure you are using 170 Hz shift, and that your transmitter and receiver are on the same frequency. Some radios have built-in RTTY modulators, but your terminal unit's decoder may require different tones, and you'll find yourself being always off frequency and never in the log. In that case, you may want to use AFSK—get the terminal unit to generate the tones and feed them directly into the radio's microphone input. Ask a friend to listen to your signal to ensure that no hum or buzz is present on your signal. The name of the game is, like any other contest, to check out things ahead of time!

Receiver filters also require some thought. The Carson bandwidth of a standard RTTY signal is just over 400 Hz, so a standard 500 Hz filter works extremely well for crowded conditions. Just ensure that the 500 Hz filter's center frequency coincides with the pitch of the incoming signals. Most CW filters are set up for around 800 Hz, while most RTTY signals appear in the 2300 Hz region.

You also may require some spotting assistance. Some radios have a monitor capability, which enables you to hear your own signal. Your own signal is an excellent spotting aid, but if you don't have monitor capability, you may need some additional help. Most terminal units have a built-in tuning indicator, but they are generally ineffective devices with very low resolution. A better idea is to add a tuning scope to the terminal unit. Outputs for this purpose are provided on most units. A standard oscilloscope with X-Y inputs is used on those outputs.

Then there's the matter of finals. If you have the latest top-of-the-line radio, don't worry. It's supposed to be able to cope with continuous carrier. However, ten-year-old radios and even some of the latest \$2000 radios will blow up when submitted to full-carrier transmissions for extended periods. The biggest problem is with amplifiers and antennas. Most amplifiers have limits on their output. If you're in a hot climate or high above sea level, you may find that continuous carrier is a problem even for "brick-on-the-key" amplifiers. Amplifiers built for the old 1 kW input limit will generally handle about 500 W output nicely. Some of the new generation amplifiers can cope with 1.5 kW output, but there are not many! The best idea is to drive your amplifier to its rated continuous power by reducing power on the driver. This will allow both the driver and the amplifier to survive the ordeal.

Apart from the duty cycle, there's another reason your finals will get hotter than usual. You'll find that you'll spend a lot more time than usual calling CQ without responses in an RTTY contest. I find that I call CQ an average of two

to four times for a single response. Good rates are between 60 and 100 per hour. A winning single-band effort needs about 800 contacts, while a winning single operator needs about 1200—certainly not earth-shattering scores by CW or phone standards.

Conclusion. If you've read this far, at least you're entertaining the idea of RTTY operation. Give it a try. It's relatively easy to make a start, and it adds a new challenge to the operator who's worked them all and finds himself scraping the bottom of the barrel. If you've compulsively started collecting prefixes, ITU zones, or even 10-X numbers, it's time to try RTTY. See you in the next one! . . . ZS6EZ

For Contest Statisticians

With special thanks to N5HD for writing the software and George, WB5VZL, for reporting the data, I thought it would be interesting to share a typical example of license aging for operators in the 1992/93 SS contest based on their reported check. For your information, the "check" is part of the exchange in the SS. It is the year you received your first license as a new amateur.

Of course, the check only tells you how long these folks have been hams. For example, I have a SS check of 69 and am at the ripe old age of 38. In any event, it's fair to conclude that SSB draws newer operators. This is notable in this data presentation due to the higher use of 10 meters on SSB. For the record, the WB5VZL phone log had less than 600 QSOs on 10 meters and about 1100 contacts on 20.

Study the tables—I'm sure you'll find them as fascinating as I did.

Final Comments

Next month I will reveal the results of the CQ 1993 Contest Survey. I am overwhelmed by the number of responses, as this is the best year ever. Stay tuned for some fascinating results.

As always, submissions for the May Contest Calendar are due no later than March 1st. Remember that rules submitted on disk (in virtually any format) are preferable to hard copy.

For now I want to wish all of you the best in the upcoming year. May 1994 be a fantastic year for everyone!

73, John, K1AR

Michigan QRP CW Contest

1200Z Sat. to 2359Z Sun., Jan. 1-2

This is the 14th annual CW contest sponsored by the Michigan QRP Club. The contest is open to all amateurs and all are eligible for awards.

Classes: (A) Less than 250 milliwatts. (B) 250 milliwatts to 1 watt. (C) 1 watt to 5 watts. (D) Over 5 watts.

The same station can be worked on each band for QSO and multiplier credit.

Exchange: RST; state, province, or country; and club membership number. Non-members send power output.

Scoring: Contacts with members 5 points. Non-members 1 point. Bonus of 1.25 if power used is either receiver or transmitter homebrew and 1.5 for a totally homebrewed station.

Final Score: Total QSO points × states, provinces, and countries worked per band × power bonus if applicable.

Frequencies: 1810, 3560, 7040, 14060,

21060, 28060, 50060. Novice—3710, 7110, 21110, 28110 kHz.

Awards: Certificates to top scorers in each state, province, and country.

Use a separate log for each band and include a summary sheet showing the scoring, operating class, and equipment used, plus the usual signed declaration.

Logs must be received no later than Feb. 5th by L.T. Switzer, N8CQA, 654 Georgia, Marysville, MI 48040. Include a large SASE for a copy of the results or for sample forms.

ARRL RTTY Roundup

1800Z Sat. to 2400Z Sun., Jan. 1-2

This is the 6th annual all-digital contest sponsored by the ARRL. Any station may work any other station worldwide. You may operate more than one digital mode, but QSOs and multipliers are counted once only regardless of modes used.

Operation is limited to 24 hours out of the 30-hour contest period. Two rest periods must be taken in two separate blocks of time and clearly marked in the log.

Modes: Baudot, RTTY, ASCII, AMTOR, and packet.

Bands: 3.5-30 MHz on those frequencies recommended for digital operation (no 10, 18, or 24 MHz).

Categories: Single operator, multi-band, (1) less than 150 watts output, (2) 150 watts or more. And multi-operator, single transmitter, all band.

Exchange: Signal report and QTH. State for the U.S., province for Canada. DX will send a serial QSO number.

Scoring: One point per QSO. A station may be worked once per band for QSO credit.

Multiplier: Each US state (48), each VE province (12), and each DXCC country, counted only once, not once per band (KH6 and KL7 are countries; VO1/VO2 counts as one VE province).

Entries with 200 or more contacts must submit a duplicate QSO check sheet.

Awards: Certificates to the top-single operator, both low and high power, and multi-operator scorers in each ARRL/CRRL section, and each DXCC country. Novice/Tech entrant with at least 50 QSOs will also receive a certificate.

Detailed information appeared in the November issue of QST. Contest forms are available from the ARRL for an SASE and two units of first-class postage.

Postmark your entry by February 2nd and send it to: ARRL RTTY Contest, 225 Main St., Newington, CT 06111.

1994 North American QSO Party

CW: 1800Z Sat. to 0600Z Sun., Jan. 8-9
SSB: 1800Z Sat. To 0600Z Sun., Jan: 15-16

The object of this one is to work as many North American stations (and/or other stations if you are in North America) as possible during the contest period. North American stations are defined by the rules of the CQ WW DX Contests with the addition of KH6.

Classes: Single operator and multi-operator, two transmitters. Multi-operator stations shall keep a separate log for each transmitter and must have at least 10 minutes between band changes. Use of helpers or spotting nets by single operator entries is not permitted. Single operator entrants may only have one

transmitted signal at a time. Output power must be limited to 100 watts for eligible entries. Multi-operator stations may operate for the entire 12 hour period. Single operator stations may operate 10 out of 12 hours. Off times must be at least 30 minutes in length and must be clearly marked in the log.

Mode: CW only in CW parties. Phone only in phone parties.

Bands: 160-10 meters only (no WARC bands). You may work a station once per band. Suggested frequencies are 1815, 3535, 7035, 14035, 21035, and 28035 (20 kHz up from band edge for Novice) on CW; and 1865, 3850, 7225, 14250, 21300, and 28450 on phone. Try 10 meters at 1900Z and 2000Z, 15 meters at 1930Z and 2030Z, and 160 meters at 0430Z and 0530Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian call areas (VE1-VE8, VO1, VO2, VY1, and VY2) and other North American coun-

tries. Do not count USA, Canada, KH6, or KL7 as countries. Non-North American countries do not count as multipliers, but may be worked for QSO credit.

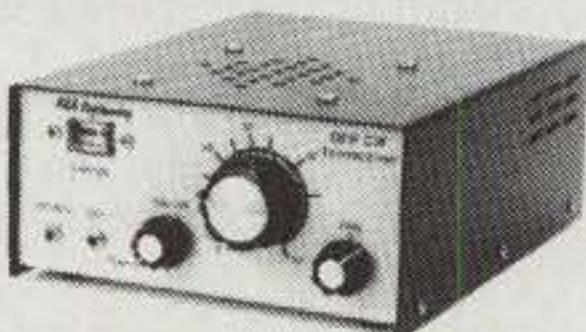
Team Competition: Team competition is limited to a maximum of five single operator stations as a single entry unit. *Pre-contest Requirement:* To qualify as a team entry, you must register the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his own (e.g., N4RJ op. by KM9P). Teams must be registered with KZ2S.

Penalties: For each unmarked duplicate QSO, you lose that contact plus an additional three contacts; for each QSO for which you are not in the other station's log, you lose that QSO plus an additional one contact; and for each QSO for which the log data is incorrectly copied in any respect, you lose that contact. Entries with score reductions greater than 5% will be disqualified.

Awards: A total of five trophies will be awarded for the high score in each of the following categories: Single Operator CW and

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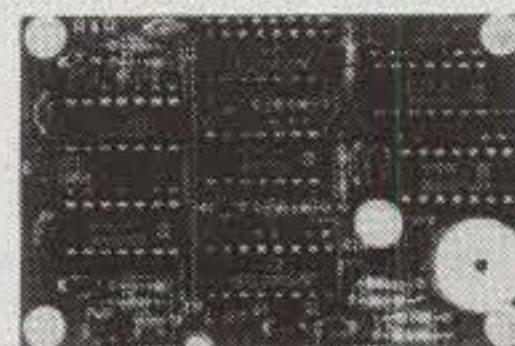
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Phone, Multi-Operator CW and Phone, and Single Operator Combined score. Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each state, province, and North American country.

Send all North American QSO Party entries to John Golomb, KZ2S, 107 Bailey Corner Road, Wall, NJ 07719. Entries must be post-marked no later than 30 days after the party to be eligible for trophies and awards. Logs may be submitted on disk in the form of files generated by K8CC's NA program or MS-DOS ASCII files.

HA DX Contest

2200Z Sat. to 2200Z Sun., Jan. 15-16

Sponsored by the Hungarian Radioamateur Society, this is one of several very popular Eastern European contests. The contest is CW only and stations may be only worked once per band.

Exchange: RST plus serial number (599001). HA stations will also send a two-letter code corresponding to their county. The possible codes are: BA, BE, BP, BN, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA.

Scoring: Count 6 points per HA QSO and 3 points for non-HA QSOs on other continents. Final score is total QSO points times sum of HA counties worked per band.

Entries are due 6 weeks after the contest and should be sent to: Hungarian Radioamateur Society, Box 86, Budapest H-1581, Hungary.

ARRL VHF Sweepstakes

1900Z Sat. to 0400Z Mon., Jan 22-24

This is the 47th ARRL January VHF Sweepstakes. ARRL Headquarters recommends that you use the official log forms. It will make your log keeping and the scoring much easier. A large SASE to Newington will get you the necessary forms.

Complete rules will be found in the December issue of *QST*. They are a bit complicated, so look them over carefully.

CQ WW DX 160 Meter Contest

CW: Jan. 28-30 SSB: Feb. 25-27
2200Z Friday to 1600Z Sunday

Complete rules were published in the November issue. The following is a brief rundown.

Exchange: RS(T) and QTH. State for the U.S., areas for Canada, country abbreviation for DX.

Scoring: Contacts with stations in own country 2 points, other countries in same continent 5 points, and with other continents 10 points.

Multiplier: Each U.S. state (48), Canadian area (13), and DX country. (ARRL and WAE country lists and WAC boundaries are the standards.)

Awards: Certificates to the top-scoring stations in each U.S. state, Canadian area, and DX country. And an assortment of 14 plaques for U.S. and world winners.

Penalties: Three contacts will be deleted for each duplicate that has not been removed.

Disqualification: Taking credit for excessive duplicate contacts, and the usual assortment of rules violations and unsportsmanlike conduct.

Mailing deadline for logs is March 1st for CW entries and March 27th for the SSB section.

Logs should be sent directly to: CQ 160 Meter Contest, 76 North Broadway, Hicksville, NY 11801. **Be sure to indicate CW or SSB on the envelope.**

ARRL Novice Roundup

0001Z Sat. Jan. 29 to 2359Z Sun. Feb. 6

This is a nine-day long contest, but only 30 hours of actual operating time is permitted for scoring.

Novice/Tech will work each other and higher class licensees who, of course, are limited to contacting Novice/Tech only. All bands and modes open to Novice/Tech can be used.

Exchange: Signal report and ARRL section (country for DX stations).

Scoring: One point for phone QSOs, two points for CW, including RTTY and packet.

Multiplier: Each ARRL section plus each DXCC country. There is also a bonus for stations holding a code proficiency certificate.

Final Score: Add your code bonus to your QSO points total and multiply that total by your multiplier.

Awards: Certificates to every Novice/Tech who submits a valid entry. Higher class licensees are not eligible for awards.

The use of official forms is not only highly recommended, but is a must. A large SASE to ARRL Novice Roundup will get you a contest package with all the necessary forms. The January issue of *QST* had a detailed announcement with suggestions and operating details not covered here.

Postmark your entry no later than March 6th to: ARRL Novice Roundup, 225 Main Street, Newington, CT 06111.

U.B.A. CW/SSB Contest

Phone: 1300Z Sat. to 1300Z Sun. Jan. 29-30
CW: 1300Z Sat. To 1300Z Sun. Feb. 26-27

This one is sponsored by the Belgium Amateur Radio Union (U.B.A.) and is any station working any other worldwide. Numerous operating awards are available and contest QSOs may be credited towards these awards.

Classes: 5 categories exist—Single Operator, All Band/Single Band, Multi-Operator/Single Transmitter, QRP 5 watts, and SWL.

Frequencies: CW 3500-3560, 7000-7035, 1400-14060, 21000-21060, 28000-28060 kHz. SSB 3600-3650, 3700-3800, 7040-7100, 14125-14300, 21175-21350, 28400-28700 kHz.

Exchange: RS(T) and consecutive serial number. Belgian stations also give their province abbreviation.

Multipliers: All Belgian Provinces, prefixes: ON4-9, DA1-2, and European Community countries.

Scoring: QSOs with ON count 10 points. European QSOs count 3 points. All others are 1 point. Final score is total QSO points times total multipliers.

Awards: There are several awards available, including trophies and certificates to the high scorers in each operating class.

Send your final results no later than 30 days after each contest mode to: UBAHF Contest Committee, Galicia Jan, ON6JG, Oude Gendarmeriestraat 62, B-2220 Heist Op Den Berg, Belgium. Note that logs may also be submitted on disk in K1EA's CT or ASCII format.

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January 1994 • CQ • 105

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

The 1994 Novice Roundup

The American Radio Relay League (ARRL) sponsors the annual Novice Roundup (NR) Contest, a must event for Novices and Tech-Plus operators. This is a nine-day contest which sandwiches a full week in between two weekends. It is a pleasant low-pressure contest for Novices and Technicians who may otherwise have little (or no) interest in contesting. You can participate for just a few minutes, or for as long as 30 hours (maximum) in the NR.

With 10 meter band operating conditions greatly degraded since last year's NR, it is extremely important for Novice and Technician-Plus operators to use the 1994 NR as a code training exercise. The NR provides an excellent opportunity to increase code proficiency. No one has a code speed that is too low for NR activity. Mistakes are not just tolerated in the NR; they are expected.

You must acquire reasonable code proficiency to upgrade to higher class licenses. The NR gives operators a great boost toward increasing code proficiency. If you don't want to just wait for the 10 meter band to open again (it will be a long wait), participate in the NR to get a good start on upgrading to increased operating privileges.

I look forward to contacting many of you during the Novice Roundup, and I am good for a QSL. If you are listed correctly in the current *Callbook*, you will receive my card if we have a contact. If you are not listed there correctly, just send QSO (contact) information to me, and you will receive my QSL. On the 10, 15, and 40 meter Novice bands I can usually be found on 123 or 144 (7123 or 7144 kHz, for example). I operate close to 3700 kHz in the 80 meter Novice band. I always respond to the weakest signal I hear.

Name. The name "Novice Roundup" was established many years before Technician licensees were granted code operating privileges in the so-called Novice bands. The name remains appropriate because operation remains confined to the frequency segments (sub-bands) available to Novice class licensees, on a shared basis with all classes of American amateur radio licensees other than codeless Technicians. Technician-Plus licens-



Eleven-year-old Sohrab (Rob) Esfandiari, KD6EWT/AG, of Chatsworth, California shares a station with his uncle. The station includes a Drake TR-7 transceiver, Kenwood TS-850S/AT transceiver, Yaesu FT-736R VHF/UHF transceiver, Henry 3K amplifier, Gap Challenger DX-VI antenna, and more. I recently had the pleasure of working Rob on the air. Rob is of Iranian descent, and he hopes to contact a few EP amateurs. Now that he has upgraded to a General ticket, he is making good use of the 20 meter code segment working a lot of foreign (DX) stations.

ees have full operating privileges above 50 MHz, but their NR activities are limited to frequencies shared with Novices.

Objective. The objective is for Novice and Technician-Plus operators to contact as many amateurs as possible. The contest score is multiplied by the total number of ARRL/CRRL sections and foreign (DX) countries contacted.

Participants. This contest is primarily for American Novice and Technician-Plus licensees, but General, Advanced, Extra, and foreign (DX) operators are also invited to operate in it. Novice and Technician-Plus amateurs can work all amateurs (Novice, Technician-Plus, General, Advanced, Extra, and DX), but General, Advanced, Extra, and DX amateurs are only allowed to work Novice and Technician-Plus amateurs in the contest. This is a good rule, because it guarantees that at least one Novice or Technician-Plus is involved in each NR contact. This contest is open to all Novice and Technician-Plus operators in the 50 states, plus those who are in U.S. possessions and territories.

Rules. A basic condition of entry for NR contest participants is that they abide by the ARRL NR rules, decisions of the ARRL awards committee, and the regulations of the FCC. Failure to abide by these requirements is reason for disqualification. It is common to have other amateurs ask you what "NR" is, or what the NR rules are, during the first few days of this contest. It is unreasonable for them to expect you to lose operating time providing such information; it is suitable to simply direct these operators to the January issues of *CQ* or *QST* for NR details. Know the NR contest rules and abide by them. Read this article carefully a couple of times before getting on the air in the contest.

Benefits. I advise you to operate in the NR even if you have a poor station and/or low code proficiency. It will be nice if you get a certificate for working at least 200 NR contacts, and you will have just cause to be extremely proud if you are the top scorer in your ARRL section or division, or one of the top ten scorers in the country. However, you do not need to achieve

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6	EB/E BAY LAX/LA ORG PAC	East Bay Los Angeles Orange Pacific (KC6, KH6, etc.)		VE1 VE2 VE3 VE4 VE5 VE6 VE7 VE8/NY1	MAR/NFLD Quebec Ontario Manitoba Saskatchewan Alberta British Columbia Northwest Territory/Yukon	

Table 1- ARRL sections are needed as part of the NR contest exchange.

these lofty accomplishments to benefit from NR activity. This contest provides a great opportunity to contact amateurs in many counties, states, and countries. You can probably work more contacts during one day of the NR contest than you normally work in a month. These contacts can help you qualify for hundreds of operating awards. Novice contacts remain valid after one upgrades, even if the call sign is changed.

NR operation will let you judge your operating skills and station performance against those of other operators. NR participation can also help you increase code receiving and sending proficiencies to help you prepare to pass license upgrade tests. You can benefit in many ways by operating in contests.

Competition and Awards. This contest provides a unique opportunity for Novice and Technician-Plus amateurs to compete on the air against other Novice and Technician-Plus operators in their own ARRL sections, plus against those

who operate from other ARRL sections. Novices just compete against Novices, and Technician-Plus amateurs only compete against Technician-Plus operators; Novice and Technician-Plus amateurs do not compete against each other in this contest.

The ARRL issues a certificate to each Novice and Technician-Plus amateur who participates in the contest. These certificates are endorsed appropriately for the top-scoring Novice and Technician-Plus amateurs in each ARRL section and division.

General, Advanced, Extra, and foreign (DX) amateurs are invited to take part in the NR contest, but they are not eligible for NR certificates. These operators provide contacts, cards, and code practice for Novice and Technician-Plus amateurs.

No certificates are awarded to DX Novices who operate in the NR. However, American Novices greatly appreciate opportunities to contact DX amateurs, and I hope many DX amateurs will be on the

Novice bands during this contest. Novice and Technician-Plus amateurs are likely to be happy with a few DX contacts.

Dates and Times. The NR contest starts at 0001 UTC on the 30th of January, and it ends at 2359 UTC on the 7th of February. Simply stated, it starts Friday evening (January 29th) local time, and it ends early Sunday evening (February 7th). If you are not familiar with Coordinated Universal Time (UTC), you can listen to WWV (Fort Collins, Colorado) on 5 or 10 megaHertz to hear the plain-language statement of time (UTC) every 5 minutes. Simply note the time difference (in hours) between UTC and your local time. The NR starts 1 minute past 4, 5, 6, and 7 PM PST, MST, CST, and EST, respectively. Similarly, the NR ends 1 minute before 4, 5, 6, and 7 Pacific, Mountain, Central, and Eastern Standard Times, respectively.

The NR contest length is 215 hours and 58 minutes. Novice and Technician-Plus are allowed to work a maximum of 30



Twenty-three month old Rachel Britton of Durant, Oklahoma enjoys CQ almost as much as her dad, Dr. James Britton, N5KFS. This photo was used as the family's Christmas card this past holiday. (Photo by Dr. Jim Harmon, K5BNK)

hours in the NR. The NR log must show each time you go on and off the air during the contest, and the minimum allowable time off the air is 15 minutes. Listening time on the air counts as contest operating time, and it must be shown as time on the air. I advise you to be completely honest in all contest matters; it helps you to accurately gauge your improvement in subsequent contests.

Frequencies, Modes, and Output Powers. The 80 meter Novice subband is 3675-3725 kHz. Only code (A1A) may be used. All classes of USA amateurs are limited to 200 watts maximum output power in this subband.

The 40 meter Novice subband is 7100-7150 kHz. Only code (A1A) may be used. All classes of USA amateurs are limited to 200 watts maximum output power in this subband.

The 15 meter Novice subband is 21.1-21.2 MHz. Only code (A1A) may be used. All classes of USA amateurs are limited to 200 watts maximum output power in this subband.

The 10 meter Novice subband is 28.1-28.5 MHz. Throughout this subband code (A1A) is allowed, but it is commonly used just in the 28.1-28.3 MHz segment, where RTTY (radioteletype) and packet radio are also allowed. The suggested simplex packet radio frequencies on this subband are 28102.3 and 28104.3 kHz. Voice con-

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tacts are restricted to the 28.3–28.5 MHz segment of this subband. Only Novice and Technician-Plus amateurs are limited to 200 watts maximum output power in the 28.1–28.5 MHz Novice subband; all other classes of U.S.A. amateurs may operate at up to 1500 watts PEP (peak envelope power) maximum output power on this Novice subband.

The 1.25 meter Novice subband is 222.10–223.91 MHz. Novices and Technicians may operate all modes available to all other classes of USA amateurs on this band. However, Novices (only) are limited to 25 watts maximum output power on this subband. The national simplex packet radio frequency is 223.40 MHz, and the national simplex voice calling frequency is 223.50 MHz. It is standard practice to make the initial contact on a calling frequency and to shift up or down one channel to complete the contact. However, if the calling frequency is not busy, it is okay to complete the contact on the calling frequency.

The 23 centimeter Novice subband is 1270–1295 MHz. Novices and Technicians may use all modes that are authorized for use by all other classes of USA amateurs on this subband. However, Novices (only) are limited to 5 watts maximum output power on this subband. The national simplex calling frequency is 1294.5 MHz.

Categories. Most entries are by single operator stations wherein the individual Novice or Tech-Plus operator transmits, receives, and logs all contacts without assistance. Multi-operator entries will be accepted. The assistance may be operating and/or logging help during the NR.

Operating. All NR contacts must be made in the Novice subbands. A Novice or Technician-Plus operator must be involved in each NR QSO (contact). General, Advanced, Extra Class, and DX amateurs should not contact each other while they are participating in the NR contest.

Crossband contacts are not allowed, such as receiving on 10 meters and transmitting on 15 meters. Crossmode contacts are no longer allowed, such as listening to a DX voice station on 15 meters and transmitting to her/him using code (A1A). NR contacts are not allowed on any repeater frequency. Packet radio digipeater contacts do not count in the NR.

The same station may be contacted two times during the NR. One contact must be digital (A1A code, radioteletype, or packet radio), and the other contact with the same station must be voice (SSB or FM). Any subsequent digital or voice contact with the same station is invalid, regardless of the subband that is used.

It is beneficial to use at least two bands so you will have a reasonable chance of contacting amateurs in many countries

and ARRL/CRRL sections. The 15 and 10 meter bands provide the best opportunities to contact amateurs in other countries (DX), plus amateurs in the Canadian (CRRL) provinces and distant parts of our own country. Use 10 and 15 during the daylight hours. Switch to 40 and 80 at night when 10 and 15 close down. This type of operation provides the best possibilities of working desired states, provinces, and countries. When operating on the high-frequency (3–30 MHz) Novice subbands, it is advisable to start at the low end and to shift up through the band as contacts are made. Most NR contest activity will be evenings of weekdays, plus night and day of weekends. If you can do so, schedule your operating time to be on the air during periods of maximum activity.

Identification. Novice add /N and Technician-Plus amateurs add /T to their callsigns during this contest to indicate their eligibility to all amateurs participating in the NR. Examples: A Novice with a callsign such as KB6RXU uses KB6RXU/N, and a Technician-Plus with a callsign such as WA6FNM uses WA6FNM/T during the contest. Out-of-area operation is also indicated in callsigns to minimize confusion. As an example, if a Technician-Plus operator with an apparent California callsign, such as WA6FNM, is operating in the NR from Louisiana, he would identify as WA6FNM/5T to indicate that he is operating from ARRL Louisiana (LA) section instead of the Los Angeles (LAX) section.

General, Advanced, and Extra Class licensees are not required to indicate class of license as part of the callsign used in the NR. However, many of us use IG, /A, or /E to make it very clear to other General, Advanced, Extra, and DX amateurs that we are not valid NR contacts for them; we are only valid NR contacts for Novice and Technician-Plus operators. This additional identification is particularly useful in cases in which General, Advanced, and Extra Class amateurs have retained callsigns that could indicate they are Novice or Technician-Plus licensees.

Exchange. The on-the-air NR contest exchange is limited to a signal report (RST for code, or RS for voice) and one's ARRL section. The ARRL sections are listed in Table I for your information. This information must be exchanged both ways for the contact to count.

Where more than one identifier is shown, the preferred (shorter) identifier is listed first. You must know your ARRL section to participate in the NR. Fortunately, most ARRL sections are entire states or provinces.

Since the objective is to work as many amateurs as possible, in as many countries and ARRL/CRRL sections as you can contact in the NR contest, it is helpful to



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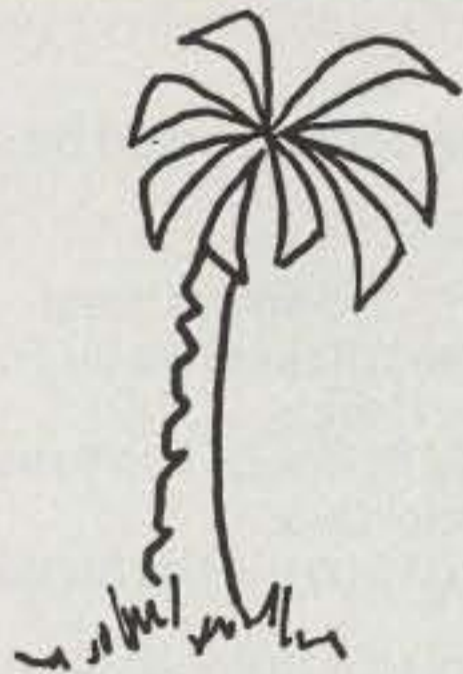
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maintain a check sheet that shows at a glance which countries and sections you have already worked during the contest. It is simple to start with a list showing all the ARRL/CRRL sections grouped by callsign areas and just cross out each section as you work it. Maintain a second list showing the callsign of the first amateur contacted in each country worked during the NR.

Each time a new section or country is worked it must be indicated (in sequence) in the NR log. Simply start with number one and continue up as you earn multipliers, including countries other than Canada and the United States.

Typical Contacts. As is true in all contests, NR contacts should be as brief as possible. A typical good NR code contact between KB6RXU and W6JEP in the first few days of this contest could be as follows:

CQ NR CQ NR CQ NR CQ NR
 CQ NR DE KB6RXU/N
 CQ NR CQ NR CQ NR CQ NR
 DE KB6RXU/N KB6RXU/N
 CQ NR CQ NR CQ NR DE
 KB6RXU/N KB6RXU/N KB6RXU/N K
 KB6RXU KB6RXU DE W6JEP
 W6JEP NR K
 W6JEP DE KB6RXU BT 579
 LAX 579 LAX BK
 BK R 589 LAX 589 LAX DE
 W6JEP BK
 BK R 73 CQ NR CQ NR CQ NR
 DE KB6RXU/N KB6RXU/N NR K

Look at the preceding typical exchange and evaluate it very carefully with regard to the comments in the rest of this paragraph. In the initial call, KB6RXU included the /N each time with his callsign to indicate contest eligibility to all other amateurs. Notice also that the number of CQ NR transmissions decreased from five to three, and station identification increased from one to three during the calling sequence, and the NR contest activity was again indicated prior to the invitation to transmit (K) at the end of the third CQ NR sequence. When W6JEP answered the call, she just identified both stations twice, left off the /N, and indicated contest participation by sending NR before the invitation to transmit. Once the two-way contact has been established, there is no need to continue using /N or /T.

The KB6RXU reply to W6JEP is very brief; the callsigns are just sent one time each, and only at the beginning of the reply. The RST report and ARRL section are sent twice to minimize possible requests for repeats. Neither the term *RST* nor the word *section* precedes the report and League section, since it is obvious what both are, and the break sign (BK) is used to eliminate unnecessary identifications. During contest activity a series of short transmissions is not likely to extend past 10 minutes, and the

identification shown in the sample exchange suffices. Note that the W6JEP response is short; the *R* advises that the KB6RXU contest data has been received. W6JEP then sends the report (RST) and her section twice, identifies with just her callsign to give KB6RXU assurance that he is copying the correct signal, and sends the break sign to invite KB6RXU to respond.

When KB6RXU answers, he sends *R* to indicate the contest data has been received. He may send best regards (73), and he then sends a short contest call in case another station is waiting for a contest contact. When the short call is sent, the /N is again added to indicate contest eligibility to all amateurs. This indicated brief exchange is further abbreviated after the first few days the contest has been in progress, but the sample exchange is suitable at the start of each year's NR. Remember to zero your RIT control, or to turn off receiver incremental tuning, prior to tuning in a station you intend to answer. This will put you on the same frequency as the other station, improving your chances of being heard.

After the first few days of NR activity, shorten the call to a single 3 by 3 or 2 by 2 (CQ NR CQ NR DE KB6RXU/N KB6RXU/N NR K, as an example) and listen carefully (above and below your transmitting frequency) for answers before repeating this call. The rest of the previous explanation holds true when using this preferred shorter calling procedure.

A typical NR voice contact could be as follows:

CQ Novice Roundup (2 or 3 times) this is
 WA6FNM Technician Whiskey Alfa Six Foxtrot November Mike Over
 WA6FNM this is KB6SOH Novice Kilo Baker
 Six Sierra Oscar Hotel Over
 KB6SOH from WA6FNM 5 by 9 in Los Angeles
 Section Over
 WA6FNM from KB6SOH 5 by 9 in Los Angeles
 Section Over
 Thank you KB6SOH This is WA6FNM Technician Whiskey Alfa Six Foxtrot November Mike calling CQ November Roundup Over

The voice procedure is basically the same as for a code contact. Again, the calling sequence is abbreviated after the contest has been running a few days.

Brevity. Do not routinely exchange normal contact information during contest contacts. In other words, do not send your name, location (QTH), rig, antenna, weather (WX), or mailing address information as part of contest contacts. Keep each contact brief. Do not send faster than you can receive accurately; let the other fellow slow down to a speed you can copy. If the other operator sends too fast, tell her/him to send more slowly (QRS).

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try you need to have confirmed, simply request a QSL when you send your card. I send a card to each amateur contacted for the first time, which is not a common practice among most amateurs. However, most amateurs send a QSL in response to each card received. If all amateurs just responded to cards received, none would be exchanged. Nevertheless, if received cards initiate completion of the QSL exchange, that is okay; the person who wants the other amateur's card is simply the one who begins the exchange.

Required Log Entries. Your NR log must show the time each contest contact started. It is preferable to use Universal Time Coordinated (UTC) when logging radio contacts, since it eliminates possible time zone confusion. Most experienced amateurs only use UTC. UTC is still called Greenwich Mean Time (GMT), Greenwich Civil Time (GCT), Zebra time, or Zulu (Z) time by many amateurs, and they are all meant to indicate the same time. However, UTC has been the correct term since 1 January 1974 and it should be used. The other amateur's callsign (/N and /T indicators not required) and ARRL/CRRL section (or country) must be logged for each contact. Received and sent signal (RST/RS) reports must both appear in the NR log. Your station callsign, frequency, and dates of contest operation are also required.

It is best to maintain separate logs and check sheets for voice and digital contacts.

Scoring. The following scoring information applies to the NR.

Contact Points. One point is earned for each station contacted by voice while on the air in the NR, whether or not contacted amateurs are participating in the contest, as long as the report and ARRL/

CRRL section (or country) are obtained. Each digital (A1A code, RTTY, or packet radio) contact counts for two points.

Code Proficiency Points. If you have an ARRL code proficiency certificate, your stated receiving speed (words per minute) is added to the point total for the stations you contacted. If you do not hold an ARRL code proficiency certificate, or if you want to increase the rate shown on your certificate, you can submit your January or February W1AW or W6OWP qualifying copy with your NR material to claim these extra points.

Multipliers. The total number of points derived from your contest contacts and your ARRL (not FCC) certified code proficiency rate are multiplied by the number of foreign countries and ARRL/CRRL sections you contacted during your NR contest operation. Remember that Alaska, Canadian Provinces, Hawaii, and the West Indies (Guantanamo Bay, Puerto Rico, and Virgin Islands) are ARRL sections, and they do not count as countries in this contest.

Forms. It is advisable to request one set of NR contest forms from the ARRL, preferably before the contest starts. If you send a self-addressed and stamped business (#10) envelope to the ARRL with your request for a set of NR material, they will send two log sheets, two dupe (duplication avoidance) sheets, and one NR contest summary sheet. You are welcome to duplicate League material to meet your needs. The ARRL mailing address is 225 Main St., Newington, CT 06111.

NR logs do not have to be mailed to the ARRL until 30 days after the contest ends, so you have time to request logs from the ARRL, fill them in, and mail them. If you transcribe NR contest entries from your original log, be sure to repeat all contact information on the forms to be turned in.

If you make more than 200 contacts, you must include a sequential listing of callsigns worked, using the *Callbook* sequence system. Callsigns are arranged by number (one through zero/ten), then by suffix, and last by prefix.

Submitted Material. The contest material submitted to the ARRL is not returned, so do not send your only (original) log sheets. It is a simple matter for most of us to duplicate material before mailing it to the ARRL. Take your time and try to submit correct material that is easy to read. Checking contest entries is a tough job, but you can make it easier for League checkers by turning in good material. The League appreciates receiving check logs from General, Advanced, Extra, and DX operators who take part in the NR.

Incomplete and/or late logs are just used as check logs. They are not eligible towards NR awards or QST listing.

Closing Comments

NR contest activity has always been slow at the start, and it is common to have other operators request an explanation of contest rules. As previously stated, I advise you to direct them to the NR coverage in this column or in other magazines, which is simpler and better than trying to give all this information to each amateur who requests it. NR activity continues to build as the days pass and more amateurs become aware of it. By the last few days of the contest activity is excellent. If you get this issue before the contest starts, please mention the Novice Roundup to every amateur you contact to let them prepare for this excellent contest.

I hope to contact you on one of the Novice bands. I work about 1000 Novice band contacts every year, and I have participated in each Novice Roundup. When the NR contests were held in the 1952 through mid-1970 era, the Novice license was just valid one year; it could not be renewed, and it was not available to anyone who had previously held any class of amateur radio operator license. In that time frame no Novice could compete in more than one NR as a Novice, and newer Novices seldom participated at all. Novice licenses are now valid a maximum of ten years and they can be renewed, which means that many Novices have acquired experience in previous NR contests, and improved scores should result. Similarly, a change allows Technician-Plus amateurs to use the Novice code bands. Enjoy this contest by putting your station in top condition and reserving adequate good operating time during the NR.

We appreciate the cooperation of the NR Contest Manager, Billy Lunt, KR1R, who informed us of no changes in this year's NR contest.

73, Bill, W6DDB

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WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

The 1993 Amateur Radio Year in Review!

About this time every year we reflect on what has happened during the prior year and look ahead to what may be coming. The past year started off with:

Excellent Continuing Amateur Radio Growth!

A year ago the amateur radio operator census in the United States stood at 587,657 individual operators. It is now up around 638,000—a gain of nearly 9%. Before the arrival of the No-Code Technician Class ticket, amateur radio was growing at a much slower rate. And during the mid-1980s it was not growing at all! See Table I for the year-ending census comparisons by license class. All figures are from the FCC's licensing division in Gettysburg, Pennsylvania. Of particular interest is that the number of Technician Class amateurs has tripled during the past ten years. This single license class accounts for most of the amateur radio growth over the past decade.

Up until three years ago every amateur entering amateur radio had to know Morse code. You simply couldn't become an amateur radio operator without it. Now there are two entry paths into the amateur radio hobby. You can begin the traditional way as a Novice, which requires passing a 30-question multiple-choice written examination and a 5 wpm code test. Or you can pass an additional (25 question) exam which emphasizes VHF operation instead of learning the code. By far, today most newcomers are choosing the Technician path into amateur radio.

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For the last three years the Technician Class has been growing at an annual rate of nearly 25%. Ten years ago one amateur in five held a Technician ticket, and there were more Novice operators than Technicians. Today one-third of all amateur radio operators hold a Technician Class license. There are now more than twice as many Technicians as Novices. The amateur ranks have swelled by more than 100,000 new Techs since January 1991. If the present rate of growth continues, the Amateur Service could grow to more than one million licensees within the next five years. And 60 percent will hold the Technician Class! This assumes, of course, that every eligible amateur will renew their license when eligible. And history has shown that they don't.

This is not to say that the other classes are not growing, too. They are, but at a much slower rate. And contrary to popular opinion, more licensees are upgrading their licenses than ever before. FCC statistics show that an average of 1100 Tech and higher class amateurs upgraded their license monthly during the three-year period prior to "No-Code." It jumped to more than 1300 a month after the code-free ticket began in early 1991.

A Dark Cloud On The Horizon

Here is something that not many of us have thought about! The FCC began mailing ten-year term licenses in early 1984. They also dropped the grace period from five to two years at the same time. All licenses issued or renewed during the period of January 1984 to December 1989 were ten-year term tickets. Thus, there were no renewals between January 1989 and December 1993. Renewals of the

five-year license simply stopped in 1989. The reason for no renewals during this period was that the ten-year term licenses issued between 1984 and 1989 still had another five years to run before they had to be renewed (or be dropped to inactive status by the FCC). Amateurs who might have dropped out of amateur radio by not renewing their five-year license got an "automatic extension" for another five years.

A review of the FCC licensing records between 1984 and 1989 shows that on average 1150 amateurs dropped out of amateur radio monthly and were purged from the active database. Does this mean that the amateur census could drop by far more beginning in January 1994, since have been no records have been purged for five years? It probably does.

Thus, the big question for 1994 is what effect will the ten-year term license have on renewals which will be starting up in January 1994. About 4600 amateurs should be renewing their licenses every month during 1994. Will they? And how many have dropped out of amateur radio during the past ten years? The FCC had planned to issue a new "mail back" renewal card beginning in January when a new computer was due to come on-line at Gettysburg. It now looks as if this new procedure will not begin until later on during the year, since the new computer project is behind schedule.

In any event, it appears that we easily could have a period of far less growth. Table II indicates the number of new and renewed licenses during the five-year period from 1984 to 1989 which should be renewed from 1994 to 1999. We also show the number of licensees who have dropped out of amateur radio during this five-year period. Would this same number of amateurs have dropped amateur radio during the period from 1989 to 1993 if they had been issued a five-year ticket between 1984

Year	Extra	Advanced	General	Technician	Novice	Total	Increase
1982	31,530	94,588	119,684	75,703	88,799	410,304	.8%
1983	34,511	95,771	118,223	77,298	85,823	411,626	.3%
1984	36,149	97,765	116,963	80,680	80,599	412,156	.1%
1985	38,495	97,959	117,107	83,679	78,616	415,856	.9%
1986	41,082	97,771	115,715	85,312	79,882	419,762	.9%
1987	43,902	98,610	114,398	93,466	83,013	433,389	3.2%
1988	46,885	98,681	113,082	101,495	80,168	440,031	1.5%
1989	50,324	102,141	117,153	115,427	84,747	470,792	7.0%
1990	53,836	105,309	119,796	127,427	93,875	500,243	6.2%
1991	57,488	107,642	122,592	158,041	97,354	543,117	8.6%
1992	61,319	109,882	125,207	192,184	99,065	587,657	8.2%
1993*	65,500*	112,800*	129,000*	227,700*	103,000*	638,000*	8.6%

(* Full year 1993 figures are estimated based on actual figures through the third quarter of 1993.)

Table I—U.S. amateur radio operators by license class. Note the consistent growth rate after the advent of the no-code license in 1991. The first Codeless Technician license was issued on March 12, 1991.

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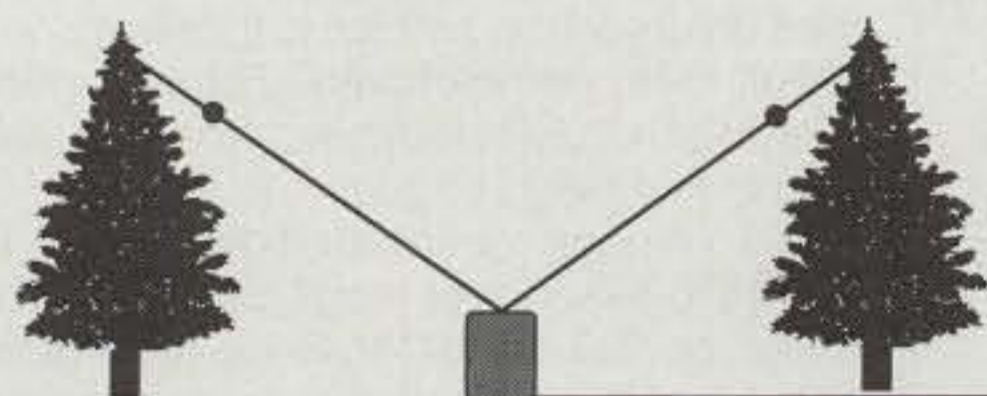
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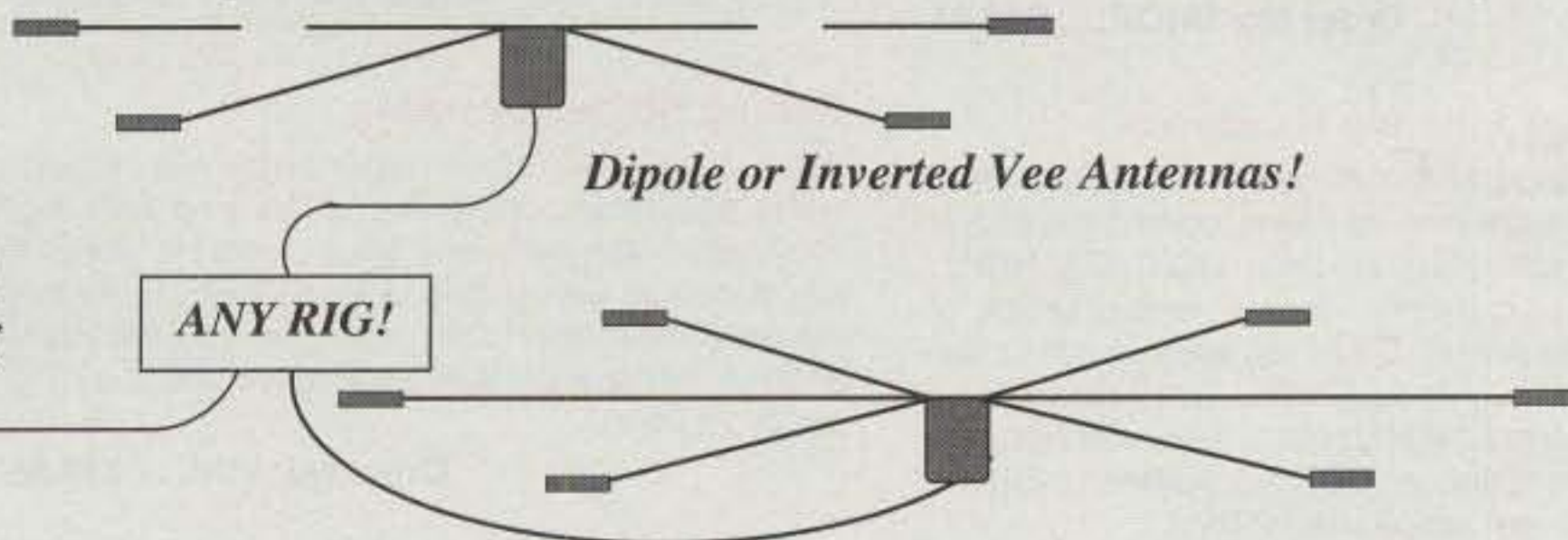
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The Quad Antenna

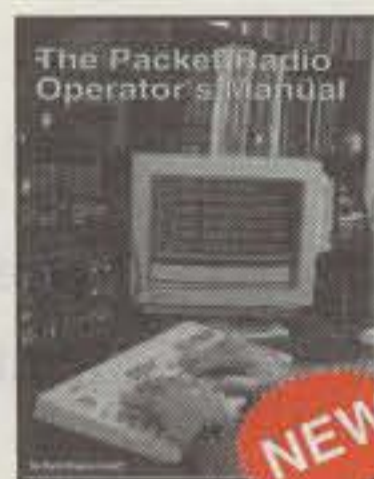
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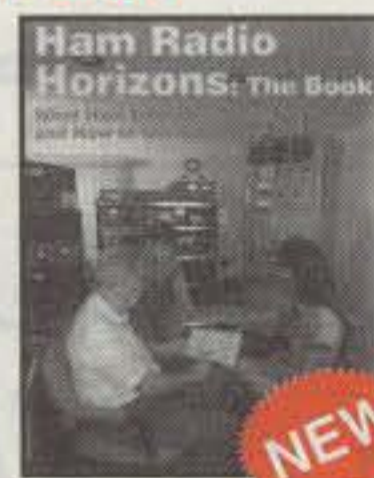
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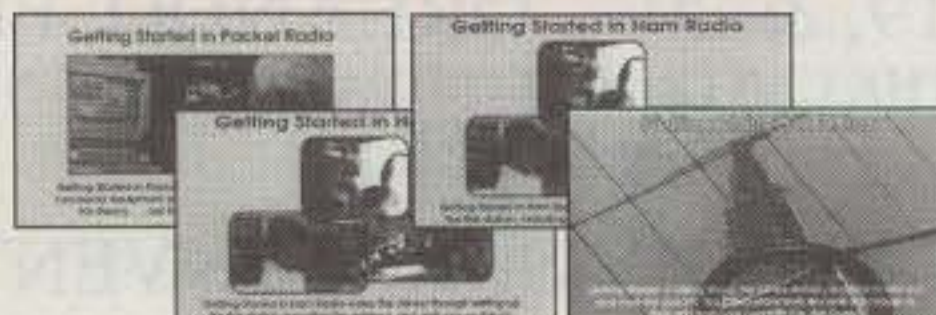
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and 1989 instead of a ten-year term? We will know shortly!

"No Business" Rule Changed!

For years amateurs have wanted to be able to use their amateur radio communications capability for more activities than the FCC Rules allowed. They got their wish effective September 12th. Acting at the request of the amateur community, the Commission agreed to relax the permissible communications content rule listed in Section 97.113. Basically, that rule bans all commercial radio transmissions of any type. Amateurs may even use amateur radio to facilitate their own personal communications needs.

This proceeding got its start more than two years ago when the FCC suggested permitting "other than regular" amateur communications on the amateur bands to "provide greater flexibility to transmit communications for public service projects and personal matters." Historically, amateurs have been restricted to emergency, technical, and non-business communications.

The restrictions were designed to protect the non-commercial character of the Amateur Service and ensure its basis and purpose—that is, as a reservoir of volunteer communicators, technicians, and electronics experts dedicated to advancing the radio art, to provide public service communications particularly in times of emergencies, and to enhance international goodwill.

Amateur radio was never intended to be a communications service to assist public safety and other government agencies, or for such things as logistical support for parades and other events, classroom instruction, ordering supplies for remotely located organizations, supplying news to the media, selling amateur gear, rebroadcasting non-amateur communications, or for expediting the personal and club business of amateur radio operators. In fact, these communications are specifically outlawed from the amateur bands. Still, the FCC gets dozens of requests to permit this type of information to be handled on the amateur frequencies.

The challenge was how to write a simple, easy-to-understand rule that allows expansion of amateur communications without throwing open amateur frequencies to those who would exploit them commercially. The Commission asked for recommendations from the American Radio Relay League.

In a 14-page letter dated January 6, 1992 the ARRL asked that modifications be made to Section §97.113 of the Rules to allow amateurs to more fully participate in public service activities. The League suggested expanding some business-related amateur radio operations and permitting communications which might be provided through other radio services as long as it was not conducted on a regular basis. The Commission treated the letter as a petition for rule making.

The League also felt that all "... communications for hire or for material compensation direct or indirect, paid or promised" except classroom instruction, telegraphy practice, and information bulletins should be outlawed. Surprisingly, the League's proposal did not address the use of amateur radio spectrum for personal business use, a key component of what was to become the FCC's proposal for

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Month	3,030	2,875	3,057	3,280	3,284	1,644*
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Year	7,086	12,047	20,316	15,231	12,865	3,796
Month	591	1,004	1,693	1,269	1,072	1,265

Table II—Number of new and renewal licenses issued and licenses purged by FCC between 1984 and 1989. What will be the effect of the ten-year term license (versus the previous five-year license) on amateur radio growth? When the FCC doubled the term of an amateur license in 1984, it meant there would be no renewals (or licensees dropped) between 1989 and 1993.

new permissible communications on the amateur bands. The Commission repeatedly mentioned the possibility of using amateur radio to conduct personal business, such as for ordering a pizza or making a hotel reservation, on the amateur air waves!

The ARRL did not define what "on a regular basis meant" except to say that a "... degree of rigidity ... does not properly belong in the content rules for the Amateur Radio Service." In August 1993 the Federal Communications Commission basically adopted the ARRL proposal. Any amateur-to-amateur and personal business communications are now permitted unless:

(a) Specifically prohibited. These include:

1. Music (except incidental space shuttle music);
2. Communications facilitating a criminal act;
3. Messages obscured by codes or ciphers;
4. Obscene or indecent words or language;
5. False or deceptive messages, signals, or identification.

(b) Transmissions for compensation. The following exceptions apply:

1. Morse code practice and information bulletins (special criteria);
2. Classroom teachers using amateur radio in the classroom.

(c) Transmissions for the pecuniary benefit of the station control operator or his or her employer.

The following communications are permitted, but not "... on a regular basis" which was not further defined by the FCC:

1. Communications which could reasonably be furnished through other radio services;
2. Notices concerning sale or trade of amateur station apparatus; and
3. Retransmissions of Government provided space shuttle, propagation, and weather forecast broadcasts.
4. News information dissemination to the public, news gathering, and program production for broadcast purposes are still prohibited unless related to the immediate safety of human life or the protection of property and no other means of communication is reasonably available.

The Commission established a four-part test that amateurs will have to use in deciding whether or not they should transmit a particu-

lar communication. That test is:

1. Whether the communications are for hire or material compensation;
2. does the control operator or
3. his employer have a pecuniary interest in the communication, and
4. is it specifically prohibited.

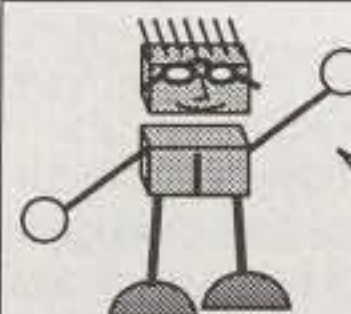
If the control operator determines that he is not on the wrong side of one of those standards, then it is up to the operator to decide whether or not to transmit that message.

Special Personal And Club Station Callsigns

Obtaining a special callsign has always been a key wish of every amateur and amateur radio club. As it is now, you can change your own callsign, but you cannot get a specific combination. According to law, amateur station callsigns must be issued in strict sequential law. It now appears that this all is about to change! The FCC has not issued club and military recreation amateur station callsigns since 1978. And special station callsigns have not been available since the mid-1970s, when Extra Class amateurs were permitted to select any available station call.

In the Telecommunications Act of 1992 Congress authorized the FCC to use the uncompensated and unreimbursed services of amateur radio organizations who have tax exempt status under Sec. 501(c)3 of the Internal Revenue Service code to provide club and military recreation callsigns. Several amateur organizations applied to become club callsign administrators. And the ARRL asked that they be designated the exclusive club and military recreational station callsign administrator.

This past summer Congress surprised the amateur community by including a provision for "vanity" amateur station callsigns in President Clinton's much publicized Deficit Reduction Plan. The legislation authorizes the Federal Communications Commission to issue unique amateur station callsigns at a cost of \$7.00 per year to the general amateur radio population. Believe it or not, this action was largely the result of a single amateur who told his congressman that amateurs were indeed willing to pay for a special callsign. It came at an opportune time when the Clinton administration was looking for ways to generate revenue. Clinton signed the legislation into law on



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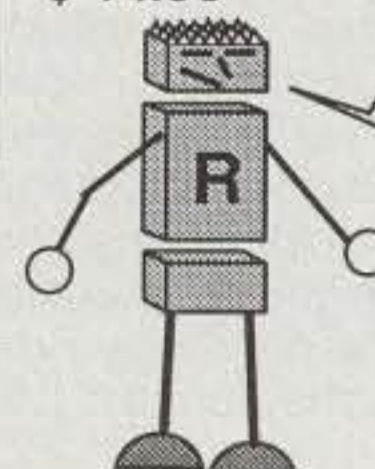
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August 10. The Commission now has the authority to charge for special amateur callsigns.

The FCC is in the process of bringing a new computer system on-line at their Gettysburg, Pennsylvania licensing facility. And it is being programmed to issue distinctive "vanity" callsigns. These special callsigns will probably be in addition to the current Group A, B, C, and D callsign system adopted in 1978.

The FCC has said that it could be possible in the future—maybe as early as 1994—to obtain any unassigned callsign, "will" callsigns to heirs or friends, or retire a callsign permanently. An applicant would list up to five callsigns and the first available call would be assigned. And there could be two types of "reserved" calls. First, upon notification, a current holder of a callsign could reserve his/her call for assignment only to a designated club station or to a designated person upon that person becoming eligible for a callsign in that group. Second, anyone—amateur or non-amateur—could reserve any available callsign. This reserved callsign would be available for assignment only to a designated club station or to a designated person, including the person making the reservation, upon that person becoming eligible for a callsign in that group.

Since the FCC now has authority to issue "vanity" station callsigns, the earlier authorized special club and military callsign program has been put on "hold." It is anticipated that the FCC will now handle all assigning of special callsigns rather than use the previously proposed Call Sign Administrators from the private sector.

The FCC has also proposed a system that

would allow new amateurs to become control operators immediately after passing the required examinations. The current system requires a wait of two or three months for the first callsign to arrive! The "instant authorization" would utilize a temporary callsign from the WZ-by-3 letter callsign block. A new amateur would simply use his or her initials and the appropriate license class identifier indicating that he/she has qualified for a specific amateur license class. This temporary self-assigned callsign could be used for a period not to exceed six months, by which time the examinee's permanent callsign will have arrived.

A "redeveloped amateur licensing system" scheduled for implementation in the first quarter of 1994 will accommodate both paper and electronic filings from the Volunteer Examiner Coordinators. Using a PC, VECs will be able to file Form 610 applications over the phone lines direct to the FCC. After reviewing the submission from the VEC, the FCC will then dump the data into their computer database system, which will also issue the license. It is anticipated that with electronic filing, amateur licenses could be issued in as little as a week or less. The goal is paperless communications with the FCC's licensing facility in Gettysburg.

And be on the lookout for a newly designed FCC Form 610 which has been developed to facilitate electronic filing. The new streamlined Form 610 will be easier to fill out and will not ask some of the information currently on the present version. For example, you no longer have to indicate a station location, and the Administering VE's Report has been greatly reduced. One part that has not been cut down

is the Physician's Certification of Disability. This section has been expanded to clearly tell the doctor exactly what he is certifying.

Novice Class Folded Into The VEC System

As expected, the FCC has added Novice testing to the Volunteer-Examiner Coordinator (VEC) System. It is the VEC System that provides the amateur radio operator license testing and develops all exam question pools. Up until 1984 the FCC spent hundreds of thousands of dollars maintaining and conducting the Amateur Service's license examination program. The government said at the time that it was costing them \$7.26 to administer an amateur radio exam to a person. Using that figure, it would have cost the Government nearly a million dollars to examine applicants for amateur radio tickets last year. Under the VEC System this cost is shifted away from the taxpayer.

Up until recently there were actually two examination programs in the Amateur Service. For decades beginning "Novices" were tested informally by two volunteer examiners selected by the applicant. Since 1984 the Technician through Amateur Extra Class applicants, however, have been tested under the VEC System, which uses teams of three approved volunteer examiners (VEs) to conduct the examinations. The VEs are managed by a VEC who acts as the link between the FCC and the volunteer testing community. Since all VEC System examination teams are known, it is a relatively

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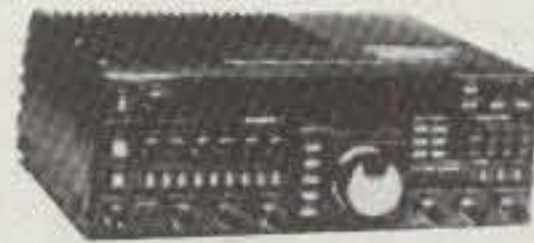
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simple administrative job to keep the VE teams up to date.

More than a year ago the American Radio Relay League's ARRL-VEC and the W5YI-VEC, which together account for 85% of all VEC testing, asked the FCC to also include Novice Class testing under the VEC System. For one thing, errors are less frequent in the VEC System, while Novice applications have an error rate approaching 10%. Error handling is not only costly to the Government, but the errors slow down license issuance since the applications must be returned for correction. It is far more efficient for the FCC to deal with 18 VECs than it is with for them to deal with hundreds of Novice examiners, many of whom have been unable to keep up with testing changes.

The data on the Novice system was also incomplete, since the FCC has no idea how many people fail the exam, unlike the VEC System where the passing rate is closely monitored as one of its vital signs. Having only one testing system also allows the separate certification section and Novice instructions to be eliminated from the FCC Form 610 application. And the safeguards in the VEC System minimize the potential for fraud.

The single biggest advantage, however, is that the Novice level volunteer examiner can be kept current on test questions and procedures, since their identities will be known to the VECs who are charged with administering the amateur testing program.

The FCC acknowledged "Our experience with the VEC System and with the current Novice examination system indicates that the VEC System is the superior system. The infor-

mal ad hoc Novice system is inefficient and susceptible to various irregularities." The Commission pointed out that all Novice examinations are currently being administered in the VEC System as a part of other classes of operator licenses.

On May 3, 1993 the FCC agreed to include the responsibility for the preparation and administration of Novice Class operator license examinations under the VEC System with the same conditions that apply to the four higher classes of licenses. These conditions include requiring each VE to be accredited by a VEC, three VEs for the administration of an examination, coordination by a VEC of each examination session, issuance of a Certificate of Successful Completion of Examination (CSCE) to every examinee who scores a passing grade on an examination element, and expense reimbursement (a test fee) authorized to the testing community.

The FCC also authorized General Class VEs to conduct Technician Class examinations, since this examination requires more examiners. The use of General Class licensees to serve as VEs for the Novice and Technician Class was also approved. The new rules went into effect on July 1st. There is now only one examination program in the Amateur Service—the VEC System.

A controversy developed over charging a test fee for the Novice level examinations. In response to a question posed by the ARRL in their formal comments, the FCC advised the League in their Report and Order that all classes of examinations must carry a test fee when expense reimbursement accounting is by the "annual method." This procedure permits a

VEC to accrue all expenses over a year's time and to divide by the number of applicants. If that figure exceeds the maximum allowable test fee, then only the maximum amount may be charged an applicant.

The FCC ruled that no waivers of the fee could be allowed. This is because the amount of the expense reimbursement "... is premised on accepting reimbursement from each examinee at each session throughout the year," a quotation from the FCC Order. But the League has elected not to charge a test fee for the Novice examinations, or when an applicant upgrades from Novice to Tech Plus by passing a 5 wpm Morse code test. This appears to be in direct conflict with the instructions from the FCC Commissioners.

By the way, the maximum allowable test fee for 1994 is \$5.75. Expense reimbursement is computed annually by the FCC every October by adding a percentage to the existing maximum test fee. This Consumer Price Index (CPI) percentage is based on inflation. Expense reimbursement started at \$4.00 in 1984 and has been increased every year since then.

Novice & Tech Question Pools Elements 2 & 3(A) Revised

Section §97.523 of the Amateur Service rules requires that "All VECs must cooperate in maintaining one question pool for each written examination element. These question pools must contain at least ten times the number of questions required for a single examination. Each question pool must be published and made available to the public prior to its use for mak-

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ing a question set." That's the law. The VECs Question Pool Committee began reviewing all Element 2 (Novice) and Element 3A (Technician) examination questions during the summer of 1992.

All exam questions and multiple choices for all five written Amateur Radio operator license tests are revised on a four-year cycle. The amateur community participates in this process by submitting their recommendations for examination topics and questions. Novice and Technician are reviewed together, since they are the sole requirement for the new no-code Technician license. Volunteer examiners began using the new questions in their examinations on July 1st.

The new questions contain approximately 10% less questions. There were 695 questions in the previous pools; there are only 645 in the current set. (A list of all questions, multiple choices, and answers in the new Element 2 and 3A pools may be obtained from The W5YI Group, P.O. Box 565101, Dallas, TX 75356 for \$3.50 postpaid; VISA, MasterCard call 1-800-669-9594 toll free.)

All license preparation publishers agreed to have their new Codeless Technician study manuals available in the publishing marketplace during May 1993. The newly revised Element 2 and 3(A) question pools began showing up in all Novice and Technician written exams administered after June 30, 1993. All VECs and VEs use exactly the same word-for-word questions, multiple choices, and answers.

The VECs Question Pool Committee has just now completed the process of revising the General Class questions. The QPC is scheduled to release the new Element 3B question pool by year end 1993. The new General Class questions must be used in all examinations effective July 1, 1994. Then the QPC will begin revising the Element 4(A) Advanced Class questions. New Advanced Class questions will take effect on July 1, 1995, and Amateur Extra Class on July 1, 1996.

VHF/UHF Rules Changes To Affect Novices

The American Radio Relay League requested in two rulemaking petitions that a new subband be created at 222.0 to 222.15 MHz for weak-signal and experimental communications, and that Novice frequency privileges be extended to the entire 222-225 MHz band. The ARRL believes that the weak-signal subband should be decided by regulation rather than local frequency coordinators. Dr. Michael C. Trahos, KB4PGC, also petitioned the FCC to allow Novices to be control operators of repeaters at 222 and 1270 MHz.

The FCC combined these three petitions and said that they believed they all had merit. A Notice of Proposed Rule Making has been issued looking toward adopting the three proposals. The FCC is now analyzing input from the public and working on a Report and Order.

Repeater users seem to be up in arms over the possibility that repeater spectrum which is used by thousands may be reduced to permit experimental and weak-signal work by a relative few. And there is an objection to inexperienced Novices being allowed to install and control repeaters. There seems to be little opposition, however, to allowing Novice operators to have access to the entire 1.25 meter

band. Final action is expected in early 1994.

Licensing of Visiting Foreign Amateurs

This rulemaking suggests a novel licensing scheme whereby all foreign licensed amateur radio operators temporarily visiting the United States would be able to operate their amateur radios for up to 60 days. It would more or less replace the current reciprocal licensing procedure.

The FCC issues about 2100 one-year reciprocal permits annually to amateurs from the countries whose governments have signed reciprocal agreements with the United States. The only way an amateur from a country that does not have the reciprocal agreement can get on the air in the United States or its possessions is to pass the exams. Both of these procedures are time consuming.

A new rule being considered would complete the whole process during one quick visit to a VEC System exam session. It would work like this: VE teams would determine the extent of a foreign amateur's operating privileges and determine how this most closely corresponds with U.S. privileges. A 20-question multiple-choice test on FCC rules and regulations (pass rate 90%) would then be administered to the visiting foreign amateur. A VE team issued CSCE (Certificate of Successful Completion of Examination) would validate immediate 60-day operation. The VECs would keep track of these authorizations by maintaining a database of all 60-day temporary operating permits.

Comments closed on this NPRM some time ago and final FCC action is expected shortly. The ARRL is on record as opposing the procedure. They would rather see the United States work toward a common licensing program of radio amateurs throughout the world.

Automatic Control Of HF Packet

Several amateur stations have been operating high-frequency digital communications under a Special Temporary Operating Authority (STA) for more than five years! The one-year authority has been extended five times, which the FCC said they would not do again. The

American Radio Relay League has now proposed permanent rules governing HF data operation under automatic control.

The current rules do not permit automatic networking below 50 MHz, and third-party traffic must use the AX.25 packet protocol. The big concern about HF packet is the potential for "robot" stations to interfere with HF amateur band operation. HF packet appears to work well, and "tons" of messages move along the network.

It is generally agreed that any HF packet operation should be conducted on specific subbands rather than being allowed on entire bands. A compromise plan to permit semi-automatic control was criticized as unworkable and unacceptable by HF packeteers.

An IARU (International Amateur Radio Union) Region 2 General Assembly meeting produced an HF band plan which provided for automatically controlled data communications. These segments include all bands between 80 and 10 meters and provide for all digital modes including new Clover and Pactor systems. Any HF data operation outside these segments must be under local control.

The League is now recommending that: "Consistent with the frequency privileges and other operating limitations applicable to the license class of the operator, any amateur station may be operated under automatic control using any accepted protocol for data transmission within the following frequency segments: 28.120-28.189 MHz, 24.925-24.930 MHz, 21.090-21.100 MHz, 18.105-18.110 MHz, 14.095-14.0995 MHz, 14.1005-14.112 MHz, 10.140-10.150 MHz, 7.100-7.105 MHz and 3.620-3.635 MHz.

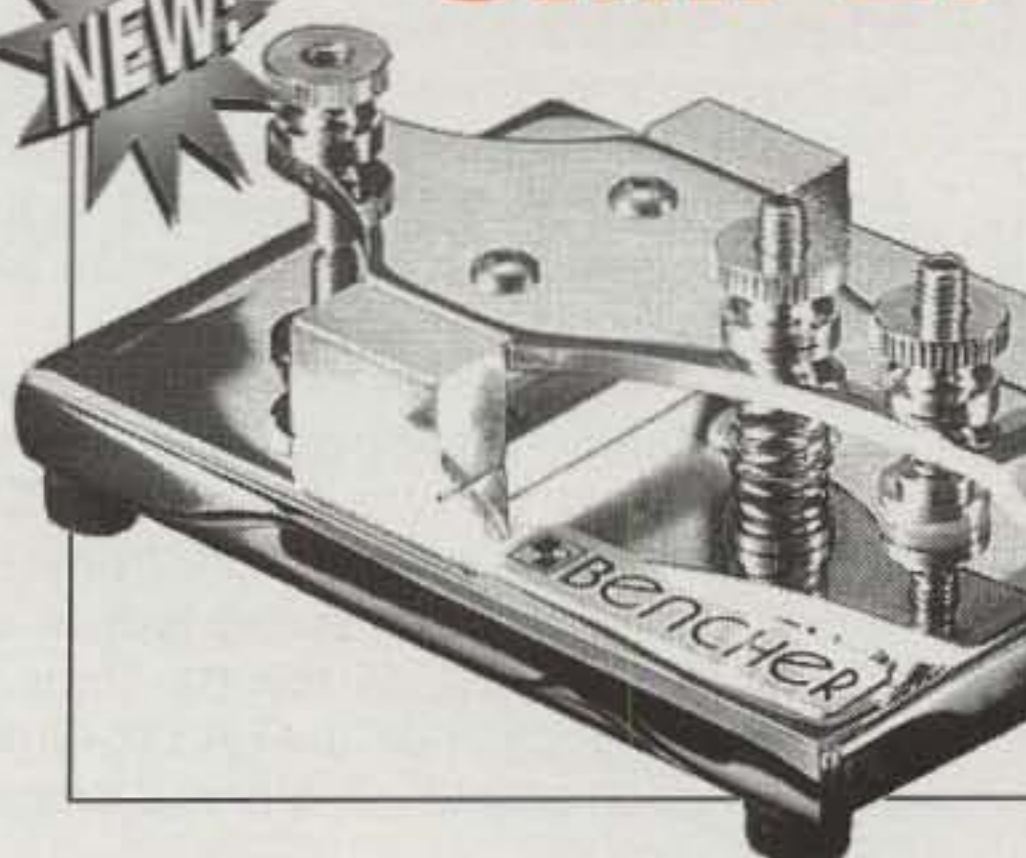
"Such stations should be equipped with means to limit transmissions to no more than five minutes in the event of an equipment malfunction or interruption of contact with another station. Third-party communications may be transmitted under automatic control using any authorized emission code, provided that the retransmitted messages must originate at a station that is being locally or remotely controlled. HF data operation should be permitted outside these specified subbands as per current rules, but only under local (or remote) control."

The FCC accepted the ARRL petition and is in the process of issuing a Notice of Proposed Rule Making on HF packet communications.

73, Fred, W5YI



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NEWS OF COMMUNICATION AROUND THE WORLD

Peter I Island

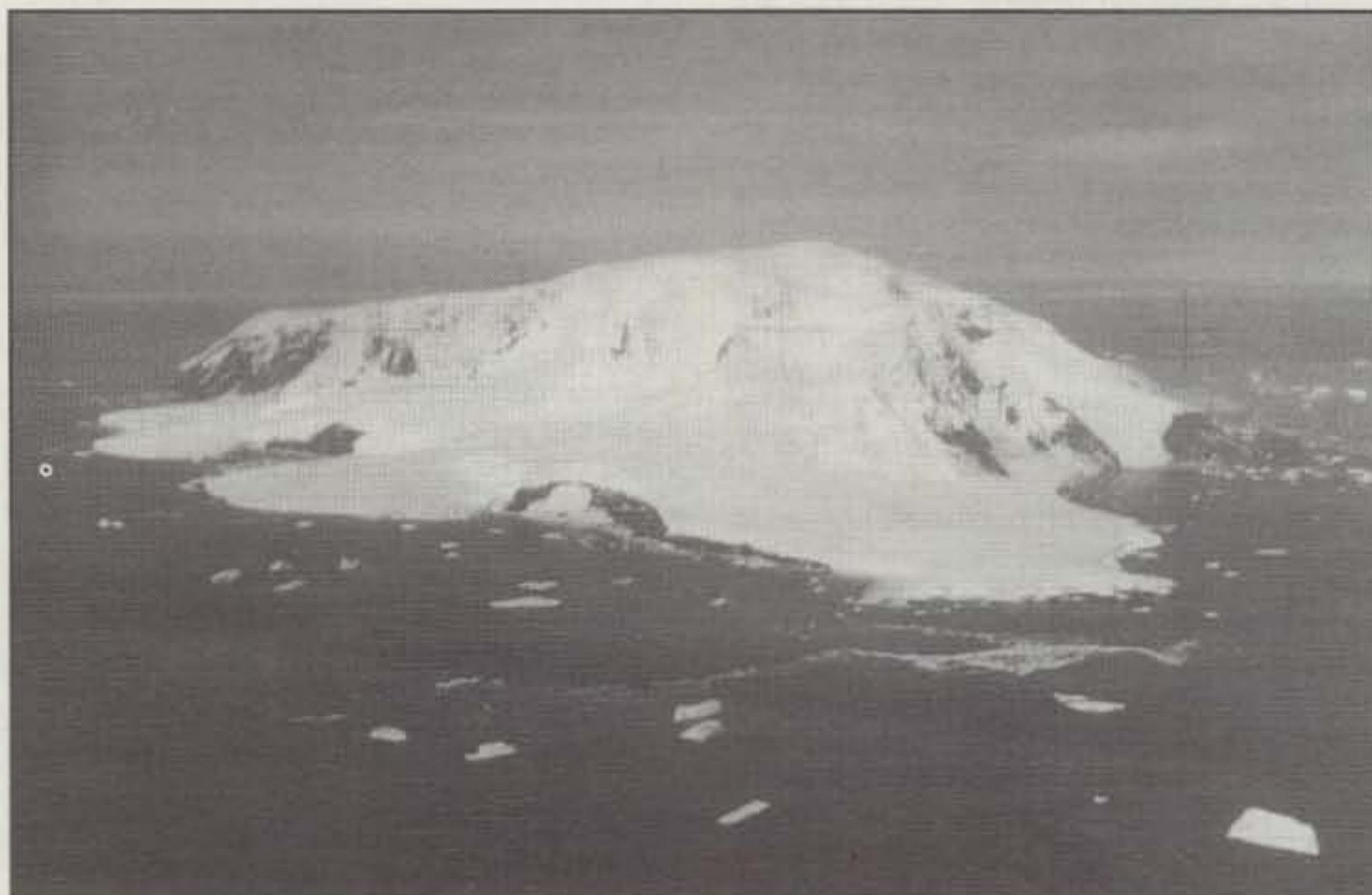
The amateur bands are scheduled to explode the first two weeks of next month. The Number One Most Wanted country in the world will be on the air in a big way, as a ten-member DXpedition team descends on Peter I Island 3Y.

Peter I Island is a Norwegian possession located about 210 miles due west of the Antarctic continent, at about 68 degrees south latitude. The island is about 15 miles long and 6 miles wide, capped by the mile-high mountain Lars Christensentopp. The island is completely covered in ice and snow except where it is too steep for the ice to cling to the bare rock. High cliffs surround much of the island, but large glaciers spread out over the northern half of the island to the Antarctic Ocean.

Peter I Island was first sighted in January 1821 by Fabian Gottlieb von Bellingshausen. Bellingshausen was a Russian aristocrat and naval officer who was appointed by Russian Czar Alexander I to explore the Antarctic regions. He circumnavigated Antarctica, but never actually saw the continent during his two-year expedition due to ice surrounding the continent. He named the first island he discovered after the Russian Czar Peter the Great, or Peter I. Bellingshausen never landed on Peter I Island, as pack ice prevented him from getting closer than a few miles from it. He continued on around Antarctica toward the South Shetlands, discovering another Antarctic island, which he named Alexander I land. (Alexander lies too close to Antarctica to count as a separate country for DXCC.)

The Russians never followed up on their Antarctic voyages, and Peter I Island was not even sighted again for 90 years. It was not visited again until January 1927, when Norwegian Captain Anderssen sailed his whaling vessel around the island. He was unable to put ashore, due to the heavy swell. The first time anyone actually set foot on Peter I Island was on February 1, 1929, when a scientific party from the Norwegian research ship *Norvegia* landed on the west side, near Cape Ingrid Christensen. The *Norvegia* spent about a week exploring Peter I Island and the surrounding waters. More important, however, the landing became the basis for Norway's claim to the island.

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Peter I Island on a rare clear day. The 1994 team will set up their stations on the glacier in the front right, on the northern end of the island.

Over the next 60 years several Antarctic vessels circumnavigated Peter I Island, but heavy pack ice prevented any more landings. Peter I was an obvious target for a new DXCC country, as its Norwegian sovereignty and remote location easily fit the country criteria. However, a country isn't added to the DXCC Countries list until the first accredited operation. Peter I remained in the limbo of a pre-approved country awaiting the first amateur radio operation until the mid-1980s.

Norway had good reason to return to Peter I Island, as its 60-year-old claim could be contested by another country that "developed" the island. The desire of amateurs to put a new country on the air for the first time dove-tailed with Norway's desire to re-raise its flag on the island. However, it took a third element to turn these desires into reality: a woman who wanted to ski to the South Pole!

Monica Kristensens owned *M/V Aurora*, an Antarctic-equipped research vessel that could carry a helicopter. She wanted financial assistance from her native Norway for her skiing tour to the South Pole. At last all the participants were working together: the LA-DX-Group of Norwegian amateurs, Monica Kristen-

sens, and the Norwegian government. Norway leased the *Aurora* for its re-visit to Peter I Island, sold transportation to the LA-DX-Group, and helped put Ms. Kristensens ashore on the Antarctic continent for her shot at the South Pole.

The LA-DX-Group had little time to prepare for their operation. The most serious hurdle was how to raise the tens of thousands of dollars the organizers would have to pay to transport the operating team to Peter I Island; fly them, their equipment, generators, food, and supplies to the island; and get them safely off a couple of weeks later. CQ DX Hall of Famer Kan Mizoguchi, JA1BK, and the Northern California DX Foundation (NCDXF) got the funding ball rolling in 1986, and other groups soon joined in. The Japanese-based DX Family Foundation, the European DX Foundation, the Danish DX Group, the International DX Association, and many others contributed to the planned operation.

This operation was extremely risky, however, as bad weather could prevent any landing on the island. The DXpeditioners faced the prospect of traveling all the way to the vicinity of Peter I Island and not being able to land and operate. The NCDXF's donation was for \$10,000 re-

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Award of Excellence Plaque Holders with 160 Meter Endorsement: FM5WD, SMØDJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2Ø, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4ØØ3, W1JR, W6OUL, W5AWT, KBØG, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YBØTK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NXØI, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DEØDXM, VE7IG, K9BG, I1EEW, AB9Ø, CT1YH, IV3PVD, KA5RNH, ZP5JCV.

Complete rules and application forms may be obtained by sending a business-size self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to: "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

ardless of the outcome, but fully \$30,000 if the DXpedition netted more than 15,000 contacts.

Fortunately for DXers, the hard work, planning, and fund-raising resulted in a successful DXpedition. Einar Enderud, LA1EE, and Kaare Pedersen, LA2GV, fired up as 3Y1EE and 3Y2GV on January 23, 1987, giving DXers a new country. During their operation on Peter I Island Einar and Kaare made some 16,000 contacts, including more than 9,000 with stateside DXers.

Despite the best efforts of the two courageous Norwegians, such a limited operation did not really satisfy the needs of the world's 25,000 or so active DXers. In 1987, the first year it appeared on *The DX Magazine's* Most Wanted survey, Peter I Island ranked 28th Most Wanted. It has risen steadily up the Most Wanted lists until 1992, when it replaced Albania as the Number One Most Wanted country in the world.

The combination of the Number One Most Wanted status and the political difficulties (as opposed to operational difficulties) of activating other Most Wanted countries focused the DXpedition spot-

light on Peter I Island. Even before the VP8SSI South Sandwich Island DXpedition, members of that team, and others, were planning a major assault on Peter I Island.

During the past year this team, under the leadership of Dr. Ralph Fedor, KØIR, moved steadily ahead, pulling together the thousands of details necessary to successfully (and safely) put Peter I Island on the air for only the second time ever.

In a sense, the actual DXpedition started last October, when some 4000 pounds of supplies and equipment left Bremerhaven, Germany, aboard the *Kaptain Khlebnikov*. The ten-member operating team will rendezvous with the 430 foot icebreaker in the Falkland Islands in mid-January, following a Royal Air Force flight from the United Kingdom. There they will load a like amount of supplies, equipment, gasoline, and propane, and set sail for Peter I Island about January 23rd.

Assuming all goes well, they will arrive at Peter I Island on February 1, 1994, exactly 65 years after the very first landing on the island. Two chartered helicopters will ferry the DXpeditioners and their



Einar Enderud, LA1EE, is one of two DX-ers who has operated from Peter I Island. He is obviously looking forward to the 1994 operation, so that we will have a chance to work the country.

tons of supplies, antennas, and equipment to a large glacier on the northern tip of the island. Once safely on the island, they will set up four special Weatherhaven polar tents designed to survive the prolonged severe winds that plagued the South Sandwich Island operation.

Two 8 x 8 foot tents will house two stations each; a 12 x 12 tent will serve as the command center and mess, and a 12 x 24 tent will provide sleeping accommodations. The crew will use two propane stoves for both cooking and obtaining drinking water. There are no penguins or seals on Peter I Island due to high cliffs, so the snow and ice on the glacier is free of their droppings, and thus suitable for drinking, once melted. Six propane heaters will keep the four tents warmer than the outside temperature, which will hover around freezing, even at the height of the Antarctic summer.

Thanks to the generosity of Kenwood USA and ETO, the operation will have a TS-950, two TS-850s, and a TS-650 available, plus a Kenwood TL-922a amplifier, and the modified Alpha 89 amplifiers that saw service on Howland Island in the AH1A operation. The antenna farm includes two Cushcraft A3S tribanders, Cushcraft monobanders for 15, 20, and 40 meters, a GAP low-band vertical, and a new version of the Battle Creek Special. Since the ice and snow provide a poor ground, and led to RF feedback problems in the previous Peter I Island operation, the 1994 team is carrying eight miles of radials wire, and six rolls of chicken-wire

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13 ON4ACG

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35 W8MHW

RTTY

81 AC4NJ

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4115 HK6AUG 4118 HA7RC
4116 WB1BVO

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7380 W2JDK	7387 WA7BNM
7381 KB4VHW (CW)	7388 OM3TAD
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7383 JA2IVK	7390 W5HTY
7384 AA5QT (CW)	7391 JA7KQC
7385 HK6KKK	7392 DJ9GR (CW)

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4 1/4 x 9 1/2 to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is \$4.00 for subscribers and \$10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

screening for their ground system. The antennas and tents will be anchored to the snow and ice with 100 specially fabricated 3 foot snow anchors.

Thanks to the help of AEA, Dentronics, and HAL Communications, the team will have a digital-mode station on the air much of the time. They'll log contacts with laptop computers, courtesy of K8CLA at Debco Electronics, and select bands with the help of the MiniProp Plus computer program. M² antennas and the North American Satellite Group have provided a station for amateur satellite contacts. Four generators and 800 gallons of fuel will provide electricity for the stations, with two spare 6 KW generators along, just in case!

Among the tons of associated supplies are chairs, tables, sledge hammers to drive in the tent and antenna anchors, ladders, ten 12-foot wooden poles, special dried food, cans of food, snow shovels, and 48 rolls of toilet paper. Each DXpeditioner must supply his own polar clothes, at a cost of nearly \$1000 each.

Speaking of costs, this may be the most expensive DXpedition ever attempted, with the total price running close to \$200,000, or about \$4 per contact. Each operator has paid \$10,000 out of his own pocket, and some of the equipment has been loaned or donated, but the DXpedition still needs to raise a lot more money. Donations may be sent to Jerry Branson, AA6BB, 93787 Dorsey Lane, Junction City, OR 97448. And be generous with your contributions when you send your QSL. QSL SSB contacts to AA6BB at the above address, and CW, digital, and satellite contacts to KA6V, Jerry's wife Joanie, at the same address.

The team will be on Peter I Island until February 17th or so, when a second ship will arrive on its way to Punta Arenas, in southern Chile. (To keep costs within reason, the large icebreaker will not remain at Peter I Island; the DXpedition team will have to deal with emergencies through its own resources.) Once again the team, their equipment, and all their trash will fly by helicopter to the Chile-bound ship. Since inclement weather may prevent this method of getting off the island, the team has an emergency, back-up evacuation plan. They will abandon the equipment, antennas, generators, etc., and rappel down 100+ foot ice-covered cliffs to a tiny, rocky beach. With luck, they'll board small boats for the journey to the supply ship through the iceberg-filled Antarctic ocean. Obviously, this is an emergency plan only, and the DXpeditioners, as well as everyone else, sincerely hope that the departure proceeds smoothly, by air. Once in Chile, the DXpedition members will return home via Santiago or the Falklands, some six weeks or so after they left.

Once the 1994 Peter I Island DXpedition team finishes their operation and leaves the island to the handful of sea birds that make it their home, they will have logged more time on the island than all the previous visits combined! Two of the only three landings on the island will have been by amateur radio teams.

The first Peter I Island operation in 1987 was just a few months after the sunspot cycle bottomed out. Solar flux averaged about 70, just a fraction above the minimum level of about 65. That meant maximum usable frequencies remained low, usually below 21 MHz. While 15 meters produced some contacts, the bulk of the 3Y1EE/3Y2GV contacts were on lower bands, especially 40 and 20 meters.

The 1994 team should see slightly bet-

ter conditions on the higher bands. Solar flux should hover near 110, high enough to provide some 15 meter openings. US DXers should look for Peter I Island on 15 and 18 meters 1600-2100Z, and on 20 meters around 2300Z. West coast DXers should see their 20 meter window to Peter I Island remaining open to about 0200Z. Forty meters should be open between the States and Peter I Island most of their short night: 03-0930Z. On the West coast both 40 and 80 meters should remain open significantly past sunrise on Peter I Island, to as late as 1230Z.

The last time the DX community faced such an Antarctic operation, the poor behavior of self-appointed DX "policemen" and jammers turned 20 meters into a radio sewer. The fallout from the 3Y0B Bouvet operation prompted the ARRL Board of Directors to seek disqualification criteria for DXpeditions. Given the enormous need for Peter I Island contacts, limited frequencies due to low sunspot counts, and the long distances from Peter I Island to anywhere, we may see some of the same problems next month.

5 Band WAZ

As of September 30, 1993, 367 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:
IK8CNT

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	IK2GNW, 199 (1)
K6YRA, 199 (34)	W9CH, 199 (26)
PY7ZZ, 199 (34)	AC0M, 199 (34)
K0CS, 199 (34, 40m)	G3MXJ, 199 (12)
AA4KT, 199 (26)	IK8BQE, 199 (31)
K7UR, 199 (34)	SM6AHS, 198 (12, 31)
NA0Y, 199 (26)	K1ST, 198 (19, 26)
VE7DX, 199 (34)	4X6DK, 198 (4, 6)
W0PGI, 199 (26)	AB0P, 198 (23, 34)
W2YY, 199 (26)	UA3AGW, 198 (1, 12)
W9WAQ, 199 (26)	KL7Y, 198 (34, 36)
K6EID, 199 (34)	VO1FB, 198 (19, 27)
W1JR, 199 (23)	W6TC, 198 (34, 37)
WBSEY, 199 (26)	EA5BCX, 198 (27, 39)
N7RT, 199 (34)	KZ4V, 198 (22, 26)
VE7AHA, 199 (34)	K4PI, 198 (23, 26)
W1FZ, 199 (26)	G3KDB, 198 (1, 12)

The following have qualified for the basic 5 Band WAZ Award:

SM3PZG, 173 Zones	K4PI, 198 Zones
W4YV, 181 Zones	G3KDB, 198 Zones

Endorsements:

DJ8WD, 170 Zones	IK8CNT, 200 Zones
------------------	-------------------

854 Stations have attained the 150 Zone level as of September 30, 1993.

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and \$1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all CQ awards is \$4.00 for subscribers (please include your most recent CQ mailing label or a copy) and \$10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

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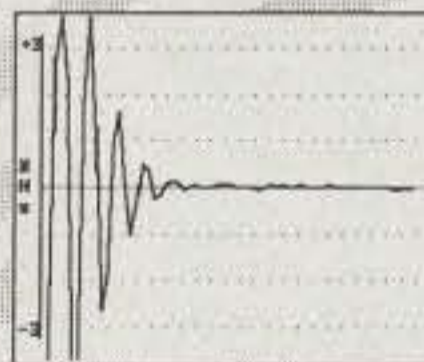


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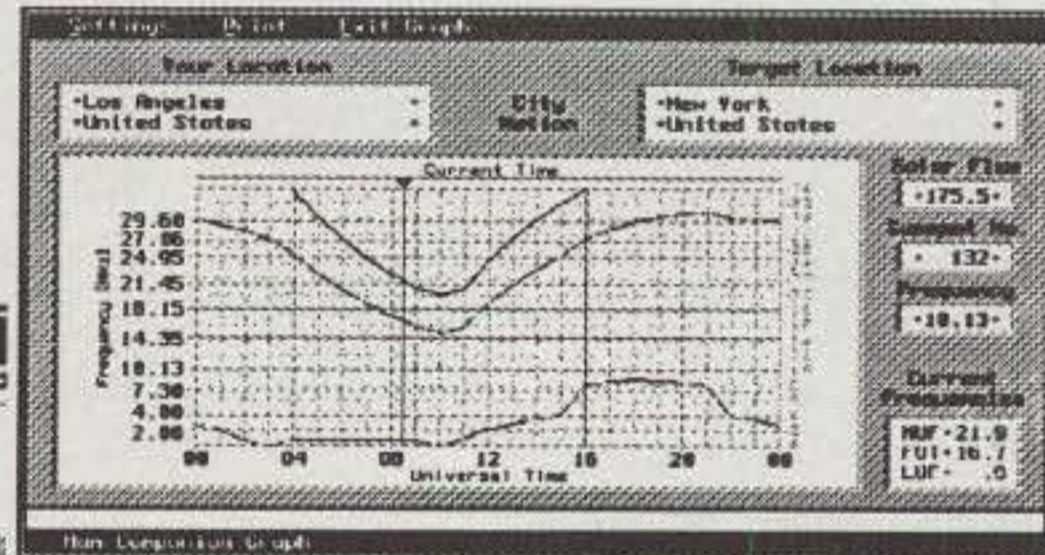
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K1MEM	328	K2OWE	328	K6LEB	323	W9WAO	320	AA5NK	316	OH3NM	311	KB9XG	303	KB3X	289	HA5NK	278
W9DWQ	328	K4CEB	328	N4KG	323	DL8CM	320	WA8DXA	316	VE7CNE	311	NY5L	302	VE1RJ	288	WB6OKK	277
K6JG	328	K8NA	328	PA8XPO	323	WB4RUA	320	K2JF	316	K4CXY	310	K9DDO	302	WG5G/ORPp	288	KA3R	277
N4MM	328	WA4IUM	327	W6PT	322	K4IQJ	320	Y33VL	316	KU8S	310	WA4DAN	302	W1WLW	288	W3HQJ	276
K2FL	328	K8LJG	327	K9QVB	322	F3TH	320	W3BBL	315	AA2X	310	KA2DIV	301	W7IIT	287	WF9K	276
DL1PM	328	W0IZ	327	K9AB	322	N6AV	319	W5OG	315	K2JLA	309	VE7DX	301	WA9RCQ	286	DF3FJ	275
K3UA	328	IT9TGO	326	IT9QDS	322	SM3EVR	319	N4AH	315	W6DN	308	G3KMQ	301	K0HQW	286	4N7ZZ	275
K9BWQ	328	K9IW	326	IT9ZGY	322	KB8DB	319	WB5MTV	315	KB4HU	308	WA8YTM	300	CT1YH	284	N5FG	275
K9MM	328	W0SR	325	W7CNL	322	AA6AA	319	I5XIM	314	W9RY	307	W6YQ	300	N4OT	284	K7JYE	275
N6AR	328	I4EAT	324	W4BQY	321	DJ2PJ	319	W1NG	314	IK2ILH	307	YU2TW	300	WB4UBD	284		
W2FXA	328	W7ULC	324	K4XO	321	N5FW	318	KQ9W	314	K1VHS	306	G2FFO	300	HB9DDZ	284		
YU1HA	328	KZ4V	324	OK1MP	321	N6CW	318	I8WY	314	KA7T	306	NN4Q	299	KP4P	283		
K2ENT	328	EA2IA	324	N2KW	321	W8XD	318	WD9HC	313	W8URM	305	KA5TOF	295	AG9S	282		
SM6CST	328	N7MC	324	G4BWP	321	N7RO	318	I2QMU	313	SM6CTQ	305	WD9IX	295	KF5PE	282		
AA4KT	328	WA4JTI	324	VE3HO	321	KD8V	317	WA2HZR	312	K4JLD	305	OZ5UR	295	N3DQN	280		
N4JF	328	W0HZ	324	IT9TQH	321	K9TI	317	W4OEL	312	N8MC	303	N1HN	294	W2LZX	279		

SSB

K4MZU	328	W0YDB	327	N4KEL/M	324	LA7JO	322	K1UO	319	W9RY	314	CE7ZK	309	AB4UF	300	XE1IL	283
K2TQC	328	K3UA	327	W2SUA	323	OA4ED	322	WB6OKK	319	KU9Z	314	PY2DBU	309	I8IGS	299	EI6FR	283
K2FL	328	F9RM	327	OZ3SK	323	I4WZK	322	KF5AR	319	HR1KAS	314	KP4EQF	309	K5DUT	299	K2EEK	283
W9DWQ	328	W7OM	327	VE3XN	323	K8YVI	322	KD5ZM	319	A92BE	314	WD9HX	308	I2ZGC	299	WA9BXB	282
W9SS	328	VE3GMT	327	K6WR	323	I8SAT	322	I1POR	319	XE1OX	314	YV2EJO	308	N1CWA	299	WK3N	282
WA4IUM	328	W0SFU	327	YU1AB	323	W6DN	322	KA9ABC	318	OH5KL	314	N3ARK	308	NW5K	299	YB3CEV	282
KZ2P	328	K9BWQ	327	I0ZV	323	IK1GPG	322	KQ9W	318	WD0DMN	314	W4BQY	308	WB6GFJ	299	YC3OSE	282
K6YRA	328	VE3MR	327	W4JVU	323	KE5PO	322	WB6PSY	318	ZS6A00	314	W8URM	308	Y33VL	299	YV1JV	282
DJ9ZB	328	VE3MRS	327	W9OKL	323	CT1FL	321	WB3CQN	318	F6BF	314	N6AV	307	KB2FC	298	WB2NQT	282
K6JG	328	IT9ZGY	327	OA4OS	323	WS9V	321	9H4G	318	W5GVP	314	WA2FKF	307	SV8CS	298	VE4MT	282
WA6OET	328	N4JF	327	W3AZD	323	A18S	321	KB1JU	318	N6PTI	314	WD5P	307	WA8TKJ	298	VE3NUP	281
VE1YX	328	AA4KT	327	K4XO	323	K8CSG	321	I4ZSQ	318	K4LR	313	T12TEB	307	KF5DX	297	KA1LMR	281
WB1DQC	328	EA4DO	327	ZL1AGO	323	VE4AT	321	G4CHP	318	I2EOW	313	VE3DLR	307	NP4CC	297	KD5ZD	281
N4MM	328	KC8EU	327	N4KG	323	IK8CNT	321	K1HDO	318	W1NG	313	KX5V	307	VE3CKP	297	WA8QII	281
DL9OH	328	KM2P	327	DL6KG	323	ON5KL	321	ZL1BIL	318	W1LQQ	313	WA2MID	306	KJ6HO	297	VU2DVP	281
XE1AE	328	YU1HA	326	WA3HUP	323	IK8BOE	321	WA6DTG	318	I8INW	313	XE1MDX	306	XE1OW	296	WB/DL2SCA	281
CX1TE	328	W4UW	326	K9HDZ	323	WA4DAN	321	NC9T	318	W5XQ	313	VK3JF	306	EA5RJ	296	LU6FAZ	281
K5OVC	328	KF7SH	326	K0GT	323	AA6AA	321	YV5IVB	318	K8CMO	312	EA2AOM	306	HP1JC	296	KB5MRT	281
EA2IA	328	K2JLA	326	K4MQG	323	K7LAY	321	N4CRU	317	T12KD	312	4X4JO	306	VE3XO	294	NX8I	280
AA6BB	328	KZ4V	326	OK1MP	323	KB3X	321	XE1XM	317	K8NWD	312	N4KE	305	EA3KW	294	YU1TR	280
KA6V	328	K2JF	326	W4UNP	323	KE4HX	321	KB3OQ	317	KC4MJ	312	K3LUE	305	W0YR	294	WN5K	279
K5TVC	328	WB5TED	326	YV5CWO	323	WD8PUG	321	KU9I	317	ZS6BBY	312	WA6DTG	305	KJ6GC	294	WB8TLI	279
YS1GMV	328	ZL3NS	326	T12HP	323	KJ3L	321	YV1CLM	317	N6CGB	312	WF9K	305	WB4UHN	294	K5AOL	279
I8ACB	328	W6BCQ	326	VE7WJ	323	KR9O	321	LU7HJM	317	WA9IVU	312	NI5D	305	WD9HC	293	4X6DK	279
YV5AIP	328	PA8XPO	326	I8XTX	323	VE3HO	321	K4JLD	317	KA5TOF	312	G4NXG/M	305	IT9VDQ	293	VU2CVP	278
N6AHU	328	WB4UBD	326	I8YRK	323	XE1MD	321	OE7SEL	317	K3NEE	312	ZL1BOQ	304	W8AXI	293	VE7HAM	278
K9MM	328	VE2WY	326	N5FW	323	KB2MY	321	I8LEL	316	WD0BNC	312	WA1DHM	304	OA4QV	293	K4BYK	277
N6AR	328	PY4OY	326	T12CC	323	K9QVB	320	W6SN	316	N5ORT	312	AC8A	303	AA2FN	293	WA9BDX	277
4Z4DX	328	W2CC	326	VE7DX	323	KB5FU	320	AG9S	316	I3ANE	312	KB9LN	303	T12LA	292	WB0UFL	277
N7RO	328	W4EEE	325	K4POV	323	W3GG	320	K8ZZU	316	4N7ZZ	312	KB0SY	303	K9EC	292	WN5MBS	277
KS0Z	328	WB3DNA	325	I4LCK	323	AA4AH	320	DU9RG	316	F1OZF	312	AB4PY	303	KE7UL	292	KG9N	277
W2FXA	328	I4EAT	325	VK4LC	323	NJ2C	320	KV2S	316	K1VHS	312	I4CSP	303	SV1JG	291	I8WYD	277
YU1HA	328	K9IW	325	N2KW	323	G4GED	320	N4WF	316	I2MQP	311	N6RJY	303	CP5NU	290	KA9I	277
K2ENT	328	W0SR	325	I2QMU	323	NJ0C	320	YT7DX	316	NN4Q	311	KA4RAW	303	CT1EEB	290	CT1AHU	277
WA4JTI	328	KB8DB	325	AA5NK	323	K7EHI	320	WA9RCQ	316	IK2GNW	311	RA3YA	302	I4UFH	289	KG6LF	277
WD8MGQ	328	IK0IOL	325	OE2EGL	323	NY5L	320	WE2L	316	N1ALR	311	W2LZX	302	W9TA	288	YB1RED	277
OZ5EV	328	SV1ADG	325	WA4WTG	323	EA1QF	320	KB9OC	316	XE1ZLW	311	XE1KS	302	YB2OK	288	W0IKD	277
XE1L	328	IT9TQH	325	K0HQW	323	W6NLG	320	KB80	316	KD5ZM	311	N5HSF	302	T15RLI	287	EA5GKE	276
W6EUF	328	WZ4I	325	SM6CST	323	IK8GCS	320	WB2JZK	316	KF8VW	311	KB7IVU	302	OK1AWZ	287	NX4Y	275
K8LJG	328	KE4VU	325	K2ARO	323	W5LLU	320	EA3EQT	316	KA5RNH	310	WB4TGB	301	EA8TE	287	WA4PGM	275
ZL1AGO	328	WA4ECA	325	I8KCI	322	N5FG	320	VE2GHZ	316	T12JP	310	VE6PW	301	IK8BMW	286	HP6AYV	275
KA3HXO	328	K9HQM	325	ZS6LW	322	W6MFC	320	KB2HK	315	I8IYW	310	NO4J	301	N8BJO	285	T12SD	275
KB4HU	328	KC5P	325	I0AMU	322	WB4PUD	320	W0LSD	315	ZL1BOQ	310	WP4AFA	301	W6SHY	285	KA5YCM	275
YV1AJ	328	A18M	324	K4CXY	322	K4SBH	320	IK7DBB	315	W3SOH	310	WA5SUE	301	NZ7D	284	KI4FW	275
YV1KZ	328	VE2PJ	324	I8AA	322	W7ULC	320	KC2FC	315	N6AHV	309	YU2TW	300	KB5RF	284	WA4OPW	275
K8NA	328	XE1CI	324	K9AB	322	KB7VD	320	W0ULU	315	I5EFO	309	WT4T	300	KD9CN	284	AB4NS	275
OE3WWB	328	W2FGY	324	KS2I	322	CX1TE	319	WASHWB	315	KP4F	309	W7KSK	300	NU4Y	283	DK5WQ	275
CX4HS	328	W5LLU	324	KD8V	322	W9JT	319	WB4DBB	315	XE1MD	309	VE3FJE	300	KB9AIT	283		
W4NKI	327	W7FP	324	G4ADD	322	K9TI	319	YV5DFI	314	WA8YTM	309	WB4NDX	300	VE3IMO	283		

RTTY

K2ENT	307
WB4UBD	275
N14H	252
KE5PO	226

DXers tempted to contribute their unwanted comments on the operation should remember that the FCC will be paying particular attention to the amateur bands during the Peter I Island DXpedition. With their new computer software the FCC can identify an individual transmitter from even a short transmission. To avoid fines ranging into thousands of dollars, and potential loss of amateur privi-

leges, these so-called DXers should get a pillow to punch or a bullet to bite in their frustration, and stay off the air. Everyone will be better off if they keep their mouths shut and transmitters off.

Meanwhile, DXers can practice their split-frequency techniques and reschedule vacation and business travel so that they are at home and tuned up for this 1994 major DX operation. And don't for-

get to be generous with your contributions, both before and after the DXpedition.

January DXpeditions

The Quannapowitt Radio Association of Massachusetts is mounting a DXpedition to Aruba P4 January 10-17. Operators Mike Rioux, NW1J, Jim Fisk, W1HL, and



1993 Most Wanted survey, so he will be popular.

DXCC News

Bill Kenamer, K5FUV, DXCC Specialist, reports the following operations are accredited for DXCC, as of the given start date: **4S7/OH2VZ** (13 August 1993); **5R8DP** (12 March 1993); **9ER1TA** (19 October 1992); **9ER1TB** (19 October 1992); **A35HX** (25 February 1993); **E31A** (2 August 1993); **E35X** (31 May 1993); **HS0ZBJ** (1 October 1993); **J3/CT3FN** (21 May 1993); **S21ZD** (5 September 1992); **S21ZL** (7 March 1993); **T5YOU** (3 September 1993); **ZF2VA** (28 April 1993); **ZK19HX** (19 July 1993); **ZK2XH** (26 July 1993).

QSL Notes

FO5BI sends his logs to QSL manager F6HSI but once a year; please be patient.

QSL **7P8SR** and his special-event call of **7P27SR** direct to Ray Shankweiler, P.O. Box 333, Maseru 100, Lesotho. Use this address for any leftover **JY9SR** requests as well. (Mail addressed to Ray's stateside calls of W3FYT and NY3N is no longer forwarded.)

QSL **5V7GL** and **TU2ZB** via Frank, EA5GPA, P.O. Box 865, Elda 03600 Alicante, Spain.

QSL the Finnish **/OH-** operations of Javier Campos AH6MM via his parent's address: 1061 York St., San Francisco, CA 94110.

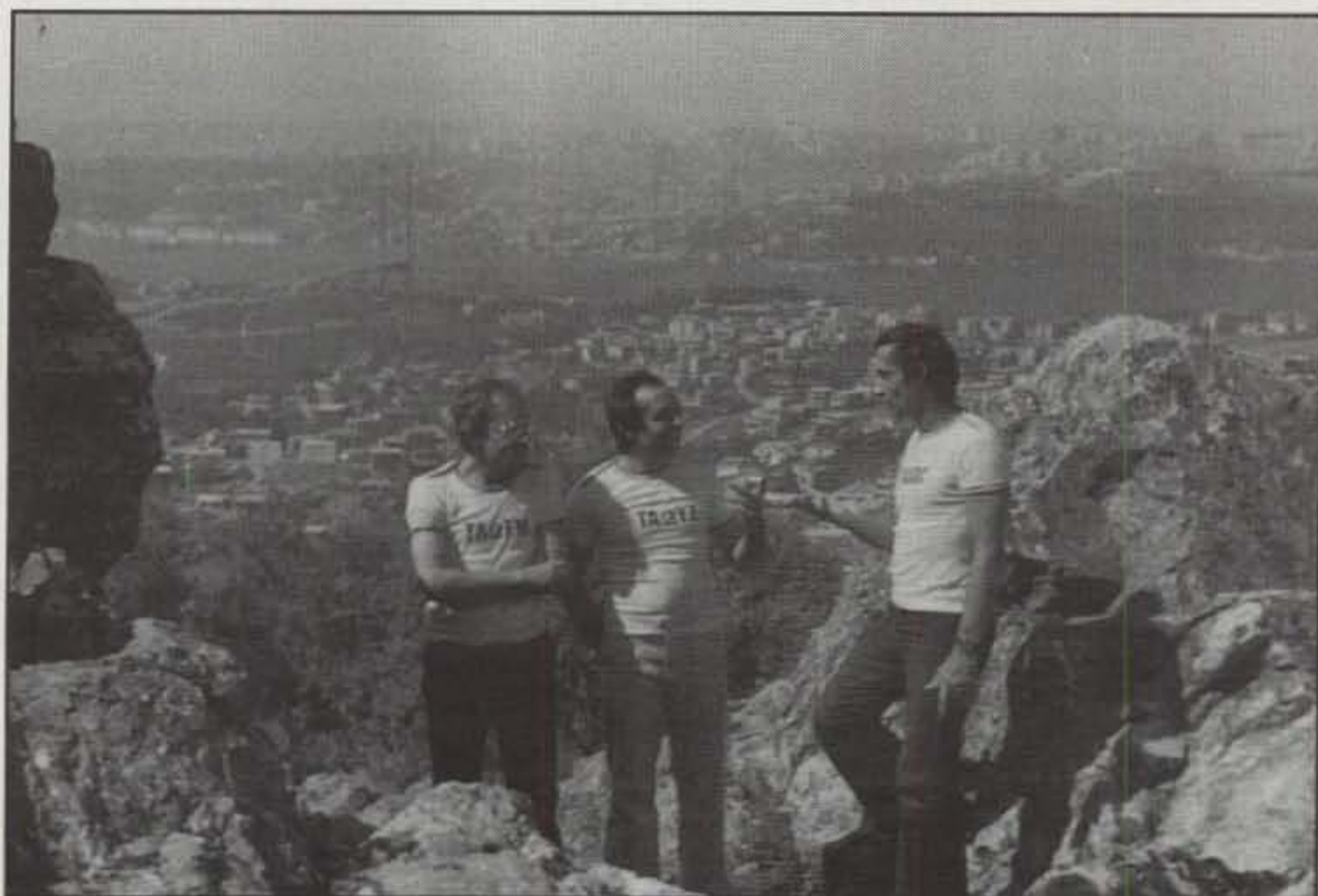
QSL **4F2IR** via Rene Aguinaldo, DU3DO, 89 T. Bugallon St., Aurora Hill, Baguio City, Philippines 2600.

Kan, JA1BK, a member of the CQ DX Hall of Fame, helped get the 1987 Peter I Island DXpedition rolling.

Bob Reiser, AA1M, will operate as **P4/W1EKT** on all bands 160-6 meters, on CW, SSB, and the digital modes. QSL to Bob Reiser, AA1M, 6 Savin Street, Burlington, MA 01803.

Stu Stephens, K8SJ, returns to Montserrat as **VP2MFA** this month, concentrating on CW on the low bands, and on the new bands. QSL to Stu via the W8 bureau, or direct to him at P.O. Box 266, Girard, OH 44420-0266.

And Henri, **FR5ZQ**, is scheduled to spend a week or so on Tromelin FR/T this month. Tromelin ranked eighth in the



TA2FM, TA2YZ, and TA2DC high above one of the three DXCC countries that lie in more than one continent—Turkey. Can you name the other two?

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2049	KC5P	2052	KG5VI
2050	AC4NJ	2053	N5VWM

RTTY

17	K2ENT
----	-------

SSB Endorsements

320	K8LJG/328	310	VE2GHZ/316
320	CX4HS/328	310	WB2JZK/316
320	KA3HXO/328	310	K1VHS/312
320	K8NA/328	300	KA4RAW/303
320	KC8EU/327	300	WA5SUE/301
320	KC5P/325	275	AA2FN/293
320	K9HQM/325	275	VE7HAM/278
320	WA4ECA/325	275	WB1KD/277
320	KE5PO/322	250	IK2PZG/261
320	XE1MD/321	200	AC4NJ/225
320	KB2MY/321	150	N5VWM/199
320	KB7VD/320	150	DU1CHD/152

CW Endorsements

320	W2UE/328	320	F3TH/320
320	K4CEB/328	310	WB5MTV/315
320	K8NA/328	310	AA2X/310
320	K8LJG/327	300	IK2ILH/307
320	W0IZ/327	275	K7JYE/275
320	W0HZ/324	250	KE5PO/250
320	W7CNL/322		

RTTY Endorsements

300	K2ENT/307
200	KE5PO/228

Total number of active countries is 328. The basic award fee for subscribers to CQ is \$4. For non-subscribers, it is \$10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. 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 CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

QSL **9Q5PL** via Peter Laschan, OE7MCJ, P.O. Box 1, A 5013 Salzburg, Liefering, Austria.

QSL the IARU and CQ WW contest call **ZF2JI** via Chris Williams, KG6AR, 1117 South Del Mar Ave., San Gabriel, CA 91776.

QSL the special event call of **VK2WAH** via VK2KAA. VK2WAH commemorated the 75th anniversary of the first wireless message between the UK and Australia.

QSL the special-event station **V12AUS** via VK2WI.

Sjoerd J. Quast, **CN2AJ**, reports increasing mail theft. He recommends sending a self-addressed mailing label instead of a bulky return envelope, and writing on the back of your QSL what your envelope contains. Or QSL via the bureau. His direct address is P.O. Box 82, Asilah, Maroc (Morocco).

Carl "Mac" McDaniel, W3HCW, handles cards for: **9L3GB, TA4A, CE3MCC, RA0AL, 5N0ASW, 5N0SKO, VK6AJW, EP2HZ (before 1990), EP2MRD, EP2ASZ, EP2HSA, EP2DL, EP2MA, 6T2MG, HC2FN, TR8JH, ED0BOD,**

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3A40ARM to 3A2ARM
 3D2AW to JR2KDN
 3D2HG to JR2KDN
 3D2MT to JR2KDN
 3D2YA to W6YA
 3V8AS to IK5GQM
 3X0DEX to F6IBA
 4J0GAT to DL1VJ
 4J4GAT to DL1VJ
 4J7GWO to DL1VJ
 4K1D to UZ1PWA
 4L0PA to JP1BJR
 4L1AA to CT1CJJ
 4L1AB to UF6AB
 4N1Z to YU1AVQ
 4N7DW to YU7BJ
 4O1V to YU1DX
 4O9S to YU7KMN
 4X0A to DJ6QT
 5B5E to 5B4ES
 5B8DL to JH1CLU
 5H3BMY to HB9BMY
 5H3OT to JO1ALS
 5N0GDE to VE6EEE
 5N2APC to GM3UDJ
 5N8LRG to WA4JTK
 5R8DG to F6FNU
 5R8DL to JH8YZB
 5T5JC to F6FNU
 5W1MM to JE6IBJ
 5W1MW to VK2BEX
 5X1C to WB1DQC
 5Z4JD to F6AJA
 6W1/K7SUE to IK1MCJ
 7Q7LA to G0IAS
 7Q7XX to JH3RRA
 9G1XA to K0EU
 9J1XX to JH3RRA
 9K2ZR to K8EFS
 9K2ZZ to W8CNL
 9O5PL to OE7MCJ
 9U5DX to DJ6SI
 9X5DF to F1LBM
 9Z4PC to VE3FOI
 BT93ARDF to LZ1US
 BV0MM to BV2DD
 C21/KC6DX to JA2NVY
 C53HG to W3HCW
 C91S to W8GIO
 CO2NA to WA4RZL
 CP6RP to I0WDX
 CR1C to DJ8MW
 CW93F to CX7FS
 CY9R to VE3MRN
 D2EYE to OZ1ACB
 EA6/DJ5BD to DJ5BD
 ED8DDT to EA8BGY
 ER1/UB5FBV to LY1FF
 ET3BH to SM3EVR
 ET3IJ to DJ5IO
 ET3JR to FD1OYK
 FG5CP to F6FNU
 FK8GJ to VE3FOI
 FK8KAB/P to F6AJA
 GB100MR to GD3AHV
 GB10TA to G3PMR
 HB0TT to AA5AT
 HH2Z to KA9RLJ
 HL93IWD to HL1IWD
 HL9AX to W3HCW
 HP2DEU to N4YWW
 HP2DFU to WT3B
 HS0ZAK to N4TMMW
 HT1T to SM0KCR
 HV3SJ to I0DUD
 HZ1AB to K8PYD
 IM0YUJ to I6SF
 J28BQ to F5SOZ
 J47AMT to SV7BIV
 J79DX to AA5DX
 JW4WIA to LA4WIA
 JX5EX to LA5NM
 KG4CB to WD9APE
 KG4DX to K0IEA
 KG4MK to N1OHV
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 R200ED to UA6ABD
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 VQ9KC to AA7AN
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 VQ9UN to W5UNY
 W58OS/NH8 to W58OS
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 Z32KO to YU5FSO
 Z39QRQ to YU5DRS
 ZA1J to I2MQP
 ZA1ZT to I2MQP
 ZC4ML to G4LSL
 ZD8VJ to G4ZVJ
 ZD9CQ to ZS6AS
 ZD9SXW to G3SXW
 ZF2VA to K6URI
 ZK2XX to ON4QM
 ZK3DM to ON4QM
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THE SCIENCE OF PREDICTING RADIO CONDITIONS

1994: Fewer and Fewer Sunspots Expected

The new year, 1994, will mark the beginning of the *ninth* year of sunspot cycle 22. On the average, the life of a sunspot cycle is approximately 11 years.

Cycle 22 began its life during September 1986 with a count of 12. It grew rapidly to a peak of just under 159 during July 1989, with a secondary peak a shade under 158 occurring during November of the same year. Cycle 22 is the third most intense solar cycle observed in the nearly 250 years in which records have been kept.

Since November 1989 the cycle has been declining slowly but steadily towards its demise, which is expected to take place during 1996.

For HF propagation analysis, a sunspot cycle can be broken down into the following phases:

Solar Phase	Smoothed Sunspot Number Range
Intense	>120
Very High	90-120
High	60-90
Moderate	30-60
Low	<30

HF propagation conditions remain more or less the same within a given solar phase, but can vary considerably from one phase to another.

The new year is expected to begin with a smoothed sunspot number of approximately 47, which would still be in the moderate phase, as was much of 1993. By September, however, it is very likely that the cycle would have passed through the 30 level on its way down, marking the beginning of the *low phase* of solar activity. By year's end the cycle is expected to have dropped into the low 20 range.

What does this mean for HF propagation during 1994?

HF Propagation—1994

Compared to last year's moderate level of solar activity, conditions expected on the HF bands during 1994 are very likely to be similar for the first half of the new year. By September, however, conditions are likely to be noticeably different than they were at the same time last year, particularly on the higher frequency bands. Here is a thumb-nail revue of conditions

11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for January 1994

Propagation Index.....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 5, 9, 18, 23	A	A	B	C
High Normal: 3-4, 6, 10, 13 19, 22, 30-31	A	B	C	C-D
Low Normal: 1-2, 7-8, 11-12 16-17, 20-21, 24, 27-29	B	C	D	D-E
Below Normal: 14, 25	C	C-D	D-E	E
Disturbed: 15, 26	C	D	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, 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 date of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair (C) on January 1st and 2nd, good (B) on the 3rd and 4th, excellent (A) on the 5th, good (B) on the 6th, etc.

expected during 1994 on each amateur band between 6 and 160 meters.

6 Meters: Very few F-2 layer ionospheric DX openings, but an occasional one might be possible during the equinox months on generally north-south inter-hemisphere paths.

10 Meters: Considerably fewer DX openings are expected on this band during 1994, but it should continue to be a fairly good band to many areas of the world during the daylight hours of the equinox and winter months. During the summer months, east-west DX is very unlikely, but some north-south openings should be possible.

12 Meters: Should behave very much like the 10 meter band, but remain open for DX an hour or two longer than 10 meters.

15 Meters: Despite fewer openings, this is still expected to be a good band for worldwide DX during the daylight hours of 1994, mainly during the equinox and winter months. Few east-west DX openings are expected during the sum-

Flash!

Conditions on the HF bands during the CQ World-Wide DX Contest SSB weekend of October 30 and 31 appear to have been at least as good as the Low Normal to High Normal conditions forecast, and perhaps somewhat better! Initial worldwide observations report at least Low Normal and often High Normal conditions on all bands, with a slight edge in conditions on Sunday, October 31st. The 10.7 cm solar flux level remained at a stable 91 on both days. The sunspot count was 32 on the 30th and increased to 42 on the 31st. The worldwide geomagnetic A-index was a very quiet 5 on the 30th and an almost equally quiet 7 on the 31st. This stable solar-geomagnetic combination resulted in good to very good worldwide propagation conditions on all HF amateur bands 10 through 160 meters during the contest weekend.

mer months, but north-south openings should hold up fairly well, sometimes extending into the evening hours.

17 Meters: Should behave much like 15 meters, but remain open for DX an hour or two longer.

20 Meters: Not too much change from previous years expected on this band during the hours of daylight, with worldwide DX openings possible throughout the year. DX conditions on this band tend to peak for a few hours after local sunrise, and again during the sunset period. During the winter months few nighttime DX openings are expected. During the summer months, however, fairly good nighttime DX should be possible, although it is likely to be more spotty than last year. Twenty meters will probably be the best all-around DX band during the new year.

30, 40, 80, and 160 Meters: These are basically nighttime DX bands, and there is a tendency for propagation conditions to *improve* somewhat as solar activity decreases. Exceptionally good world-wide DX should be possible on 30 and 40 meters between sunset and sunrise, during all seasons, and on 80 and 160 meters during the equinox and winter months.

Sunspot Cycle 22 Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 22 for September 1993. This results in a smoothed running sunspot number of 67 centered on March 1993. A smoothed index of approximately 47 is forecast for

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 parentheses, 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) 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.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, 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 New York 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; 3 hours in the MST zone; 4 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 PM in Los Angeles; 17 or 5 PM 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 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 kw PEP 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 10 dB 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.

CQ Short-Skip Propagation Chart January & February 1994 Local Standard Time At Path Midpoint (24-Hour Time System)

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	10-15 (0-1)	08-10 (0-1) 10-15 (1-2) 15-17 (0-1)
15	Nil	10-16 (0-1)	08-09 (0-1) 09-10 (0-2) 10-15 (1-3) 15-16 (1-2) 15-16 (2-3) 16-18 (0-1) 16-18 (1) 18-19 (0-1)	07-08 (0-1) 08-09 (1-3) 09-10 (2-3) 10-15 (3-4) 15-16 (2-3) 16-18 (1) 18-19 (0-1)
20	Nil	08-10 (0-1) 10-14 (0-3) 14-16 (0-2) 16-18 (0-1)	06-07 (0-1) 07-08 (0-2) 08-10 (1-4) 10-14 (3-4) 14-16 (2-4) 16-18 (1-2) 16-17 (2-4) 18-19 (0-2) 19-21 (0-1)	06-07 (1) 07-08 (2) 08-10 (4) 10-14 (4-3) 14-16 (4) 16-17 (2-4) 17-18 (2-3) 18-19 (2) 19-21 (1)
40	07-08 (0-1) 08-09 (1-2) 09-10 (2-4) 10-16 (3-4) 16-17 (3) 17-19 (1-2) 18-21 (0-1)	07-08 (1-2) 08-09 (2-3) 09-11 (4) 11-15 (4-3) 15-17 (3-4) 17-19 (2-3) 19-21 (1-2) 21-02 (0-2) 02-07 (0-1)	07-08 (2) 08-09 (3-1) 09-11 (4-1) 11-15 (3-1) 15-17 (4-2) 17-19 (3-4) 19-22 (2-4) 22-02 (2-3) 02-07 (1-2)	07-08 (2-1) 08-15 (1-0) 15-17 (2) 17-19 (4-3) 19-22 (4) 22-02 (3-4) 02-04 (2-3) 04-07 (2)

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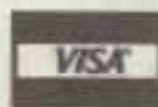
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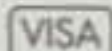
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160	09-17 (1-0) 17-19 (3-2) 19-05 (4) 05-07 (3) 07-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-1) 07-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-1) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (1)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2) 06-07 (1-0)

**ALASKA
Openings Given in GMT#**

To:	10 Meters	15 Meters	20 Meters	40/80* Meters
Eastern USA	Nil	18-20 (1) 20-22 (2) 22-23 (1)	16-22 (1) 22-00 (2) 00-02 (1)	04-13 (1) 07-12 (1)*
Central USA	20-23 (1)	19-22 (1) 22-00 (2) 00-01 (1)	17-23 (1) 23-01 (2) 01-03 (1)	03-14 (1) 07-12 (1)*
Western USA	20-00 (1)	19-22 (1) 22-00 (2) 00-02 (1)	18-20 (2) 20-01 (3) 01-02 (2) 02-04 (1)	04-05 (1) 05-12 (2) 12-15 (1) 15-16 (2) 16-17 (1) 05-12 (1)* 12-15 (2)* 15-17 (1)*

**HAWAII
Openings Given in
Hawaiian Standard Time#**

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	08-13 (1)	06-08 (1) 08-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	06-08 (2) 08-12 (1) 12-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-03 (2) 03-04 (1) 19-21 (1)* 21-01 (2)* 01-03 (1)*
Central USA	07-09 (1) 09-12 (2) 12-14 (1)	06-07 (1) 07-08 (2) 08-13 (3) 13-15 (4) 15-16 (2) 16-18 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	17-19 (1) 19-20 (2) 20-03 (3) 03-04 (2) 04-06 (1) 19-20 (1)* 20-22 (2)* 22-01 (3)* 01-03 (2)* 03-05 (1)*
Western USA	09-11 (1) 11-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	06-07 (2) 07-10 (4) 10-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	16-18 (1) 18-19 (2) 19-22 (4) 22-02 (3) 02-04 (2) 04-09 (1) 19-20 (1)* 20-22 (2)* 22-04 (3)* 04-05 (2)* 05-07 (1)*

*Indicates best time to listen for 80 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.

For 12 meter openings interpolate between 10 and 15 meter openings.

For 17 meter openings interpolate between 15 and 20 meter openings.

For 30 meter openings interpolate between 40 and 20 meter openings.

Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances use the preceding Short-Skip Chart.

#See explanation in "How To Use Short-Skip Charts" in this column.

January 1994. Canada's Dominion Radio Astrophysical Observatory in Penticton, BC reports a corresponding mean 10.7 cm solar flux level of 88 for September 1993. This results in a smoothed level of 121 centered on March 1993 and a predicted level of approximately 115 for January 1994.

Table I is a listing of smoothed sunspot numbers observed to date for Cycle 22, the present solar cycle, and a forecast of activity expected through 1994.

January Conditions

Typically moderate solar activity, winter-time HF propagation conditions are expected to continue through January. Although not as often as last January, maximum usable frequencies are expected to remain relatively high during the daylight hours, dropping to seasonal low values during the hours of darkness. Atmospheric noise levels (static) are expected to be at their lowest values of the year in the northern hemisphere, and signals levels should be exceptionally strong during band openings.

10 and 12 Meters: Some DX openings should still be possible to southern and tropical regions during the daylight hours, with signals peaking during the afternoon. An occasional opening towards Europe and the east may be possible between 8 and 11 AM, and towards the Far East during the late afternoon. Some short-skip openings, between approximately 1300 and 2300 miles, are also forecast for the afternoon hours.

17 and 15 Meters: Generally good 15 and 17 meter DX openings are forecast to many areas of the world during the hours of daylight. Fairly consistent short-skip openings, as a result of regular F-layer reflection, are also expected during the daylight hours for distances ranging between approximately 1000 and 2300 miles.

20 Meters: Good DX conditions to most areas of the world are forecast for 20 meters sometime between sunrise and the late afternoon hours. Signals are expected to peak for about an hour or two after sunrise and again during the afternoon. Good short-skip openings over distances ranging between 750 and 2300 miles should be possible. Occasionally the band should remain open toward southern and tropical areas into the evening hours.

30 and 40 Meters: DX openings should begin during the late afternoon hours, with conditions peaking during the hours of darkness and at sunrise. Atmospheric noise, or static, should remain at low seasonal levels during the month, and signals often may be exceptionally strong. Good short-skip openings are also forecast during the hours of daylight over dis-

Month	1986	1987	1988	1989	1990	1991	1992	1993	1994
January		18	58	142	1511	148	124	71	47
February		20	65	145	151	148	116	69	45
March		22	71	150	152	147	108	67	43
April		24	78	154	149	146	103	64	40
May		26	84	157	147	146	100	62	38
June		28	94	158	144	145	97	61	36
July		31	104	159*	141	146	91	60	34
August		35	114	158	141	147	84	58	32
September	12	39	121	157	142	145	80	56	30
October	13	44	125	157	142	142	76	54	28
November	15	47	130	158	142	138	74	52	26
December	16	51	138	154	144	132	73	50	24

Table I—Progress of Sunspot Cycle 22 and Predictions for 1993–1994. Predicted values are shown in italics. The peak of Cycle 22 is shown with an asterisk.

tances ranging between approximately 150 and 750 miles. As darkness falls, the short-skip range should increase to between 1000 and 2300 miles. Forty meters should be the best DX band during most of the hours of darkness.

80 Meters: With low static levels continuing through the month, fairly good DX openings are expected to many areas of the world during the hours of darkness. During the daylight hours short-skip should be possible up to about 300 miles. During the hours of darkness, the skip should increase, with openings possible between distances of approximately 400 and 2300 miles. It may be a toss-up between 80 and 40 meters for the best DX band openings during the late evening and early morning hours.

160 Meters: A considerable improvement is expected in propagation conditions on this band during January. Fair DX openings are forecast to many areas of the world from a few hours after sundown to shortly before sunrise. Short-skip openings up to 2300 miles should also be possible during the hours of darkness. Because of extremely high solar absorption in this frequency range, even during the periods of low sunspot activity ionospheric propagation generally is not possible on 160 meters during the daylight hours.

Remember the following rule for 30, 40, 80, and 160 meter DX openings. Conditions on these bands maximize as the sun rises on the *eastern* terminal of a path. For example, for openings between North America and Europe, conditions should be optimum as the sun rises in Europe. For openings between the South Pacific and North America, look for the strongest signals as the sun rises over North America.

VHF Ionospheric Openings

January is generally a poor month for VHF ionospheric propagation. Conditions are poorest for sporadic-E and trans-equatorial (TE) openings, and auroral activity is generally at a low seasonal level.

There is a possibility for meteor-scat-

ter-type openings during the first week of the month resulting from the *Quadrantids* meteor shower. This is a major shower which should peak on the third and fourth with about 30 to 40 meteors entering the earth's atmosphere each hour.

Short-Skip Charts

This month's column contains a Short-

Skip Chart for use in the continental United States for distances between 50 and 2300 miles. Special propagation charts centered on Hawaii and Alaska are also included. These charts are valid through February 1994. See last month's column for detailed DX propagation charts for use during January.

73, George, W3ASK

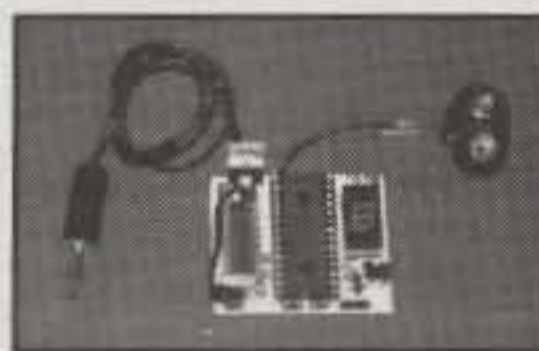
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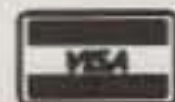
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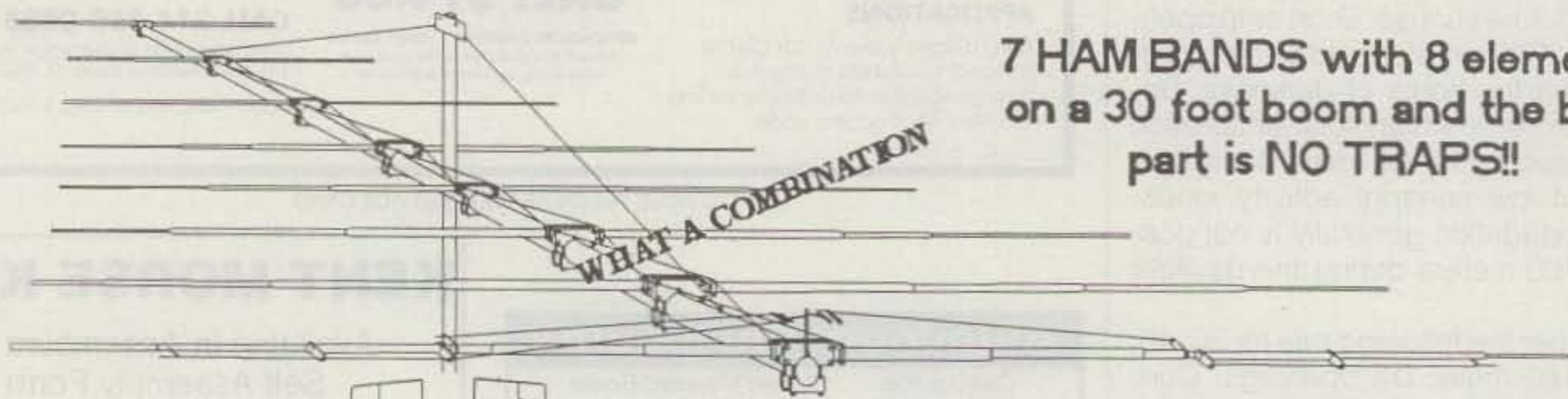
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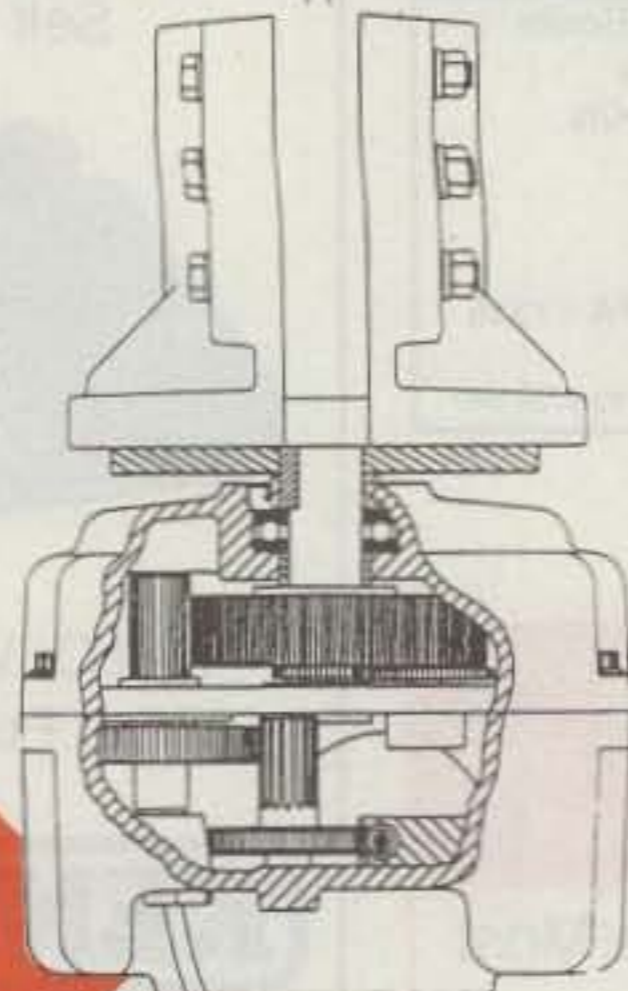
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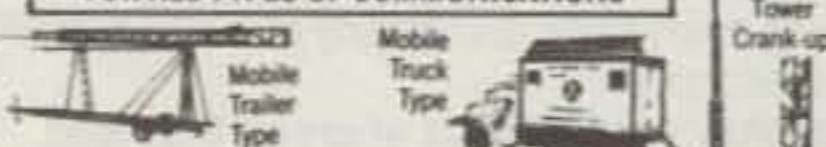
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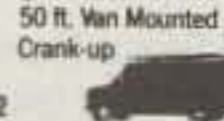
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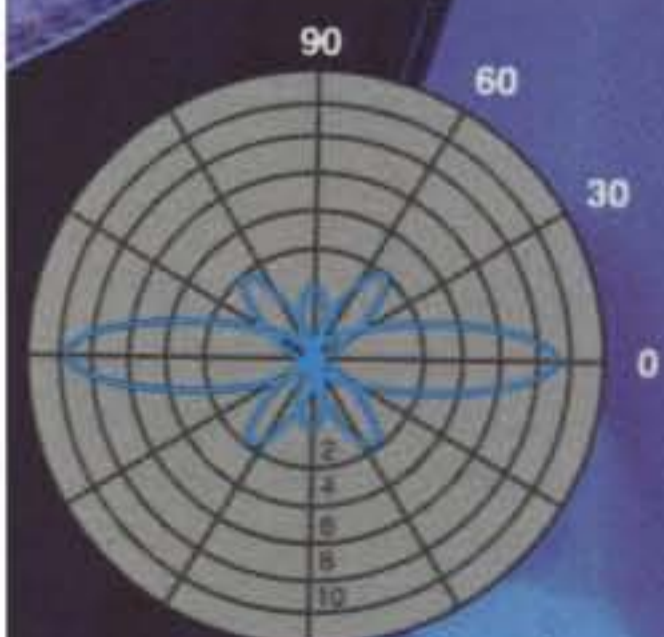
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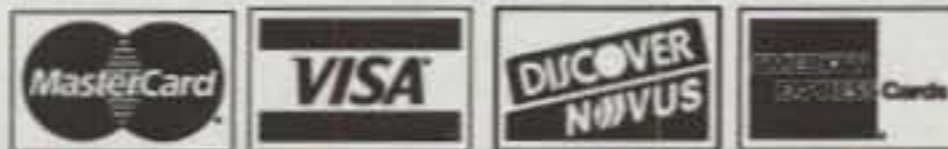
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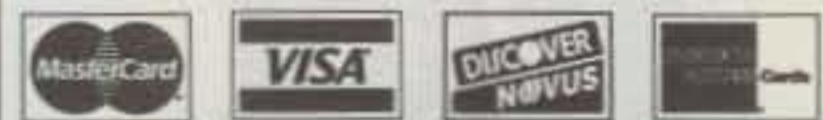
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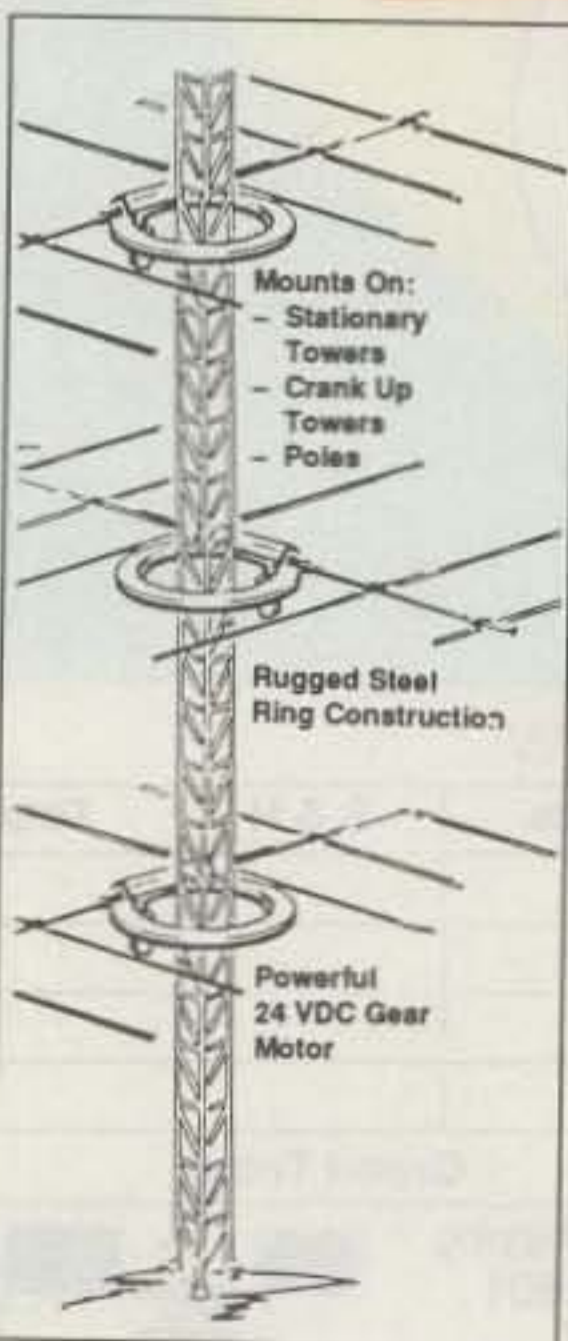
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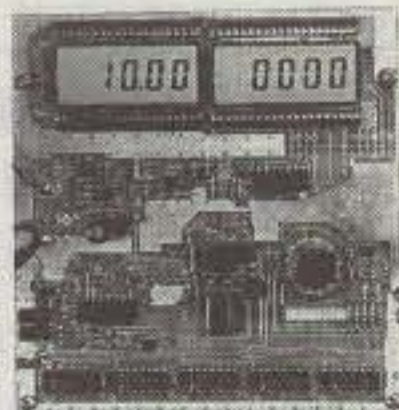
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CIRCLE 120 ON READER SERVICE CARD

150 • CQ • January 1994

WANTED: Heathkit HW-22A 40 meter transceiver to use in my shack. If you have one and would like to sell it, please contact me KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. All inquiries will be answered.

WANTED: Drake R4A PTO and manual. For sale PK-88 complete. Neil, NB7Q, POB 190012, Boise, ID 83719.

WANTED: Heathkit Ultra-Pro HD 8999. T.N. Colbert, WA8MLV, 13609 Colony Lane, Burton, OH 44021.

NEEDED: Information for disabling the PL decode mode on a Heath HWS-2 HT with the optional PL encode/decode board. KB5AYO, 584 Central Ave., Reserve, LA 70084.

WANTED: Pre-WWI Telegraph Keys. Joel Wisotsky, N2LA1, 31 Cow Lane, Great Neck, NY 11024.

WANTED: Older receivers and transceivers made in the 1950 to 1975 era like the Collins, Hammarlund, or Hallicrafters. Will consider any model. Please write KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. All inquiries will be answered.

R/S Pro-34 programmable 200-ch handheld scanner comes with A/C adapter, manual, & carry pouch. \$150.00, no trade. Also Drake TR-3 10-80 meter transceiver (tube), comes with manual & mic \$300.00. More info on above items send SASE to: P.O. Box 518, Whitehouse, FL 32220.

FOR SALE: TS-830S mic, 500 cycle filter, \$500. Sam, 516-744-3870.

TWO METER RECEIVER, portable, \$99.95. Good backup. Rose Communications, P.O. Box 7589, Chula Vista, CA 91912.

WANTED: Vibroplex Vibrokeyer and Vibroplex iambic paddle. Also alignment instructions for Ten-Tec Century 22. KB5AYO, 584 Central Ave., Reserve, LA 70084.

RA4UDP help to receive and to send QSL cards in Russia and ex-USSR. I want friends from different countries. Write English to: Vasily Tatjanin, UL Volodarskogo 92A-10, 430003, Saransk, Russia.

TRADE: Drake T4X transceiver, R4A receiver AC/MS, spare set tubes, good condition, for Kenwood TS-530 transceiver, good condition. Phone 1-314-264-4313, W9MZJ, 721 E. Third St, Scott City, MO 63780.

QUITTING COLLECTION MANIA: 20 years of collections—tubes, transformers, crystals, ham magazines, relays thermal and others, panel meters, knobs, sockets, coils, chokes, high-wattage resistors, caps, plus much more such as CW filters for FT-101, FT-747, R388, \$35. Prefer selling in a single lot, but will respond to volume buyers. Call 209-255-8967. N6DBH, 750 N. Garden, Fresno, CA 93727.

WANT: Vibroplex Presentation Model Bug. Bill, W6PRI, 408-996-7624.

FOR SALE: ICOM 725 xceiver, used very little, 712-542-4715, Clarinda, IA W0FSY.

FOR SALE: Datong multi-mode model FL3 filter \$130. U ship. Call 716-655-4162, or write W2FXA.

WANTED: 6 meter rig. I am looking for an older 6 meter rig like the Heathkit SB-110 or Yaesu FT-620B or something like that to use in my shack. If you have one and would like to sell it, please contact me at KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. All inquiries will be answered.

WANTED: Collins 312B5, 516F2; Alpha 86; Kenwood TS-130S, Ameritron RCS-8V (Red Ind.) W2DU-HF Balun. K0MK (218-865-6541).

WANTED: Marine radio clock with silent period labeling, EBY PCK20 transmitter. Sever, 1701 Harcourt Drive, Leesburg, FL 34748.

ICOM 735 w/SM6 mike \$625, SB-610 monitor scope \$50. All mint cond. U pay shipping. AH6CJ, Francis, 808-839-2428.

FOR SALE: Drake R-4C, T-4XC, MS-4, AC-4. T-4XC has 10 meter problem, R-4C has AGC problem. Otherwise, works fine. \$350. Ken Lowrey, KF8BC, 513-779-4148.

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

HARD TO FIND Heath, Drake (etc.) Parts and manual copies. SASE for quotes. Murch UT-2000B, 160-10M, 2KW, exc., \$225. List \$1 & SASE. Joe Bedlovies, POB 139, Stratford, CT 06497.

FOR SALE: ICOM 725 xceiver, used very little, 712-542-4715, Clarinda, IA W0FSY.

AEA ISOLOOP HF 10-30 MHz antenna. Cheap! Bill, KQ4GC, 904-282-9925.

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

SELL OR TRADE: Nikon/Nikomax Camera f 1.4 with assorted lens & cases in mint condition for Kenwood Ham Gear or linear. Jim Lowe, W6JVK, 1521 Scenic Drive, Pasadena, CA 91103 (818-793-7374).

WANTED: 8 mm sound movies. Just got old working projector at hamfest. Now want to try it out. KA1EAP, 36 Charles, O.O.B., ME 04064.

WANTED: Two new 6146's. K5TVC, Q.R. Galbraith, 4303 Kingsway, Farmington, NM 87402.

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

GVC DATA MODEM 2400B Internal 2400 baud modem, PC/XT/AT compatible \$15.00. Walt Grosch, KZ9F, 1735 Stoneway Ct., Richfield, WI 53076 (414-628-1558).

WANTED: Hints and Kinks, vol. 12 and AUTEK QF1-A good condition. I refund your offers. IK8GJX, Maggiorino "Maggi" Guida, P.O. Box 32, 80069 Vico Equense (NA) Italy.

SELL: CQ/HR/QST/73 Magazines. Send SASE for list. KA1VY, E. Guimares, 401 Bedford St., Lakeville, MA 02347.

AL80A w/10M \$599, Commodore 64 \$65, Disk Dr. \$65, HT1200 \$115, T4XB/PS \$225, UT2000B \$200. All Exc. List: \$1 & SASE. Joe Bedlovies, POB 139, Stratford, CT 06497.

HEAVY-DUTY MOTORIZED rotating four-section crank-up tower. Will handle 30 sq. ft. at 100 mph extended! \$3495 FOB Oakhurst, Calif. WA6NWP, Sid, 209-642-3363.

SELL: Ten-Tec Triton digital, matching power supply with VOX, mic, in excellent condition. Ten-Tec Triton IV non-digital, 262G power supply, mic, in excellent condition. Call Donn, KA0SOH, 1-314-832-1241.

WANTED: Defective Fluke 8022A or 8022B digital multimeter. Hand-held type. Call 606-236-6510. WQ4Z, George Griebel, 650 Chestnut, Parksville, KY 40464-9624.

WANTED: Cardwell 54 receiver, Supreme AF-100 transmitter. KD2HW, 101-23 Lefferts, Jamaica, NY 11419.

WANT one or more 13 ft. fiberglass spreaders for Maco Quad. Widely sold in 1960s. Pick up in southwest states. W6IWR, 17811 134th Ave., Sun City West, AZ 85375. CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843.

WANTED: Round S-meter and coils for National HRO-5, HRO-W, HRO-M. J-Series coils OK; will consider non-working RCVR. Larry, K9ARZ, 708-377-0860.

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KLM MULTI-2700, 2m XCVR w/OSCAR 10m dnlnc, \$250. Heath SB-110 6m XCVR w/SP/PS, \$150. Shipping inc. Harry Tracy, 6103 Royal Point, San Antonio, TX 78239.

WANTED: Digital N.R., H.F. Pre-Amp, VHF Tuner, Mobile VHF/UHF and HF. Send prices, condition, info to: J. Vallone, 1050 E. 85 St., Brooklyn, NY 11236.

SELL: ICOM AT-500 Automatic Antenna Tuner, mint cond., \$350. Call 716-655-4162 or write to W2FXA.

YAESU FT-530 Dual-Band HT. Absolute mint, in box. Under warranty. \$375. I ship. Gerard, N2BFL, 212-873-9659, after 7 PM EST only.

WANTED: Round S-meter and coils for National HRO-5, HRO-W, HRO-M. J-Series coils OK; will consider non-working RCVR. Larry, K9ARZ, 708-377-0860.

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Say You Saw It In CQ

ANNOUNCEMENTS

•**Dayton ARA 1994 Scholarships** – The Dayton Amateur Radio Association is offering eight scholarships of \$2000 each to amateurs graduating from high school in 1994 and going on to an accredited college or technical institution. Awards are based on a combination of financial need, scholastic achievement, contributions to amateur radio, and community involvement. For an application write to DARA Scholarship Committee, 45 Cinnamon Court, Springboro, OH 45066-1000. Completed applications must be postmarked no later than May 15, 1994.

•**Veterans Benefits for Merchant Mariners** – Full veteran status has been granted by the government to Merchant Marine servicemen who served during WW II. Benefits to survivors and their families include disability compensation, VA medical care, pensions, VA home loan guarantees, and burial rights in a National Cemetery. For application form DD 2168 and details, send a business-size SASE to Joan Haber, Combat Merchant Mariners WW II, 14 Castle Drive, Chestnut Ridge, NY 10977. (Veterans Benefits toll-free number is 1-800-827-1000.)

•**Fallbrook Amateur Radio 10M Net** – This net meets on 28.340.00 ±QRM at 0300 or 2000Z local time. Net controls are W6LKC (Monday–Friday) and WBØYCQ and KD6AKT (Saturday–Sunday).

•**The Northeast Repeater Net** – The 8575 Group invites operators to check in to this net every Tuesday evening at 8 PM. Call net control KB2IPL, Joe, on WB2CPE—448.575 North Manhattan, WB2BQW—145.25 Harri-man NY, and N2HDW—443.600 Park Ridge NJ. Features include Newsline®, Hamfest calendar, and repeater tech forum.

•**Minnesota Frostbite Falls Beach Party** – Sponsored by the St. Paul ARC, 1800–2400Z January 8. Minnesota stations work non-Minnesota stations and vice versa. Minnesota stations exchange county and current Celsius temperature; others exchange state or country and current Celsius temperature. Work stations once per band and mode. CW 3.540, 3.690, 7.040, 7.140, 14.040, 21.040, 28.040, 28.140. SSB 3.850, 7.250, 14.250, 21.350, 28.350. Score one point SSB, two points CW. Final score is QSO points plus average temperature worked (sum of temperature reports/total QSOs). Minnesota station with highest score wins; non-Minnesota station with lowest score wins. Work five Minnesota stations for FFBP certificate or work all counties for SPRC Worked All Minnesota Counties Award. Send logs to Ed Van Cleave, AAØHI, 2700 16th St. NW, St. Paul, MN 55112. (SASE for info and sample log.)

•**W9AZ Special Event** – The Kankakee Area Radio Society will operate W9AZ from 0000–0600Z and 1400–2400Z on the lower portion of the General bands. For a certificate or QSL (specify) to honor Sir Thomas Crapper, send QSL and SASE to Willis Bowser, 1210 North Riverside Drive, Momence, IL 60954.

•**V73AX Special Event** – V73AX will be on the

air commemorating the 50th anniversary of the battle for Kwajalein Atoll, operating from the Kwajalein ARC, Republic of the Marshall Islands, from 1745Z January 31 to 1920Z February 5. SSB, CW, RTTY on HF and 6 meters, conditions permitting. For QSL send your QSL and SASE or IRC to KARC, P.O. Box 444, APO AP 96555 USA.

•**The following hamfests, etc., are slated for January:**

Jan. 8–9, **Fort Myers Florida ARC Hamfest**, Araba Shrine Temple Hall, Ft. Myers, Florida. Admission \$5.00 advance (SASE), \$6.00 door. Tables for two days \$12; tailgating \$5.00/day (plus admission both). VE exams Saturday 1:30 PM; Sunday 10:30 AM (no preregistration). Forums, ARRL, traffic handling, RACES/ARES, antenna demo, packet, more. Talk-in 147.345+ MHz. For tickets send SASE to FMARC, P.O. Box 061183, Ft. Myers, FL 33906. For more information contact Jerry Deutscher, KQ4UW, 813-472-5130, or Dale Hardin, KD4UAO, 813-275-8360.

Jan. 9, **22nd Annual Midwinter Swapfest**, Waukesha County Expo Center Forum, Waukesha, Wisconsin. Admission \$3.00 in advance, \$4.00 at the door. Table space \$4.00 per 4 foot section, \$5.00 at door (if available). Electrical outlet \$5.00 as available. Advance reservation deadline Dec. 24, 1993. Exams at Red Carpet Lanes 9 AM. Sponsored by the West Allis RAC. For tickets or information contact with SASE WARAC Swapfest, P.O. Box 1072, Milwaukee, WI 53201.

Jan. 15, **Northwest Missouri Winter Hamfest**, Ramada Inn, St. Joseph, Missouri. Talk-in on 146.85 and 444.925. FCC exams, major exhibitors, fleamarket, free parking. Admission: preregistration \$2.00 (3/\$5.00); \$3.00 at door (2/\$5.00). Preregistration requests received after Jan. 4 will be held at the door. Swap tables \$9.00 each first two tables. For details write to Northwest Missouri Winter Hamfest, P.O. Box 182, Cameron, MO 64429.

Jan. 15, **1994 Hammond, Louisiana Hamfest**, SLU University Center, Hammond, Louisiana. Admission free. VE exams, door prizes, MARS, ARRL, QCWA meetings. Limited number of free swap tables. For more information, contact Tyrone Burns, 504-294-5839, or Bob Priez, 504-542-1470, or write to P.O. Box 1324, Hammond, LA 70404.

Jan. 15, **Naval Postgraduate School ARC Hamfest**, Monterey Peninsula College Armory, Monterey, California. Free admission. Seminars, indoor fleamarket, outdoor tailgate fleamarket, VE exams, exhibits, more. Information contact Doug McKinney, KC3RL, 408-663-6117, evenings/weekends; Pat Carter, KA6IRS, 408-649-4444, ext. 20, weekdays.

Jan. 16, **Electronic Fleamarket, Massachusetts**, Knights of Columbus Hall, Mattapoisett, Massachusetts. Admission \$1.00, tables \$10.00 (there are 40 tables). For more information, call 508-993-3993.

Jan. 16, **Yonkers NY Electronic Fleamarket**, Lincoln High School, Yonkers, New

York. Sponsored by Metro 70CM Network. Free parking, indoor fleamarket only. VE exams, door prizes. First table \$15.00, \$10.00 each additional. Donation \$5.00, kids under 12 free. Talk-in 440.425 MHz PL 156.7, 223.760 MHz PL 67.0, 146.310 MHz, 443.350 MHz PL 156.7. For more information or registration call Otto Supliski, WB2SLQ, 914-969-1053.

Jan. 22, **1994 Gallatin, Tennessee Hamfest**, Volunteer State Community College, Highway 31E between Gallatin and Hendersonville, Tennessee. VE testing, packet forum. Talk-in 147.90/30, 114.8, and .442.600+ rpt. Reservations and info send SASE to Bill Ferrell @ 1120 Douglas Bend Rd., Gallatin, TN 37066 (615-452-3962).

Jan. 22, **NCARC Winterfest Swapmeet I**, Larimer County Fairgrounds, Loveland, Colorado, 9 AM to 3 PM. VE exams contact Trent Hays, WBØHZL, 303-484-8315. More information call Musser Moore, NØUMN, 303-221-3698.

Jan. 23, **Dutch Country Computer and Communications Show**, Lancaster Host Resort and Conference Center, East Lancaster, Pennsylvania. Manufacturers, retailers, computers and peripherals, software, books, amateur radio equipment, and more. Admission \$5.00 at door, children under 12 free. Talk-in 146.715. For more information, contact Dutch Country Computer and Communications Show, P.O. Box 682, East Petersburg, PA 17520-0682 (717-560-2072).

Jan. 29, **Sarasota Hamfest & Computer Show**, Sarasota County Fairgrounds, Sarasota, Florida. Computer and radio exhibits, tailgating, forums, VE exams, RV spaces available. Talk-in on 146.31/91, 146.13/73. Admission \$5.00 advance, \$7.00 door. Contact Gene Marino, W1IDH, 813-355-0675 or Val Lopez, KC4YAY, 813-951-1072.

Jan. 29, **St. Louis, Missouri Winterfest 94**, St. Charles Exposition Hall, St. Louis, Missouri. New and used equipment, commercial exhibitors, fleamarket, exams (preregistration required), prizes. Talk-in on 146.94 and 442.100. Contact St. Louis Repeater, Inc., P.O. Box 50202, St. Louis, MO 63105 (314-567-8777).

Jan. 29, **Lockport NY Auction**, Lockport, New York. Doors open at 3 PM. Talk-in on 146.820 plus or minus offset. Contact Lockport ARA, 199 Ontario Street, Lockport, NY 14094.

Jan. 30, **Tusco ARC Hamfest**, Ohio National Guard Armory, Dover, Ohio. Contact Howard Blind, KD8KF, 6288 Echo Lake Rd. NE, New Philadelphia, OH 44663 (216-364-5258).

Jan. 30, **Post Holiday Swapfest & Fleamarket**, Odenton Fire Hall, Odenton, Maryland. Maryland Mobileers ARC. Donation \$3.00. Tables advance \$5.00. VE exams preregister Jerry Gavin, NU3D, 7801 Overhill Rd., Glen Burnie, MD 21060 (410-761-1423). Info contact Tom Wilkison, KA3OMU, 592 Eason Dr., Severn, MD 21144 (410-969-2639 evenings).

OUR READERS SAY (from p. 8)

this research is to build working models for the display at the museum.

P. Pansegrouw
55 Mauritius Crescent
Stellenberg 7550
Republic of South Africa

**Western Washington
A Friendly Place**

Editor, CQ:

I can't respond to W3GXX's request (September 1993 CQ) for a reason as to why KH6-ers gave him a cold shoulder on the repeaters over there. But I could invite him to come up here to western Washington, where prices are reasonable and the people are friendly.

Paul Kiesel, K7CW
Tahuya, WA

See You In The Contest!

Editor, CQ:

I would like to take the time to thank you and Bob, K3EST, and Larry, N6AR, for the time, effort, and hard work you put into contests such as the CQ World-Wide.

I received my certificate from the 1992 contest for the First in VE3, and I was both surprised and elated. I never thought that my little station would qualify for a certificate, and to date I have been happy just to see my name and callsign in the listings. The certificate is fantastic and is hanging on the wall with my other firsts: my license, my first contact QSL, my first DX contact QSL, and a most cherished accomplishment—my wife's amateur license.

As I write this letter (fall 1993—ed.) my wife,

Lynn, VE3FNY, is studying the rigs and working stations, practicing for the contest. In the last three years since I became interested in contesting she has been by my side, encouraging me, rubbing my back during breaks, and holding the flashlight when things didn't quite work out. Last year she was bitten by the bug and decided that she was going to get her ticket so she could participate instead of just watch. In our club participation in Field Day I set up the 20 meter station and let her run it. A contester was born that day. She now runs my station, and I sit back and grin. Sometimes she even lets me log. This year (in the 1993 contest—ed.) we will either run as a single op low power all band, or as a multi-op single transmitter, but I know we will be using her call.

If it sounds like I'm taking a back seat, don't believe it. I'm training her as a second operator. We plan to start running multi-multi in 1994.

Thank you for the WW DX Contest. Your efforts are appreciated up here in Ontario.

Kevin Lemon, VE3RRH
St. Catharines, ON, Canada

A Tower Texas Style

Editor, CQ:

Enclosed you will find a picture of a tower Texas style. It is entirely homebrew and hinges at the base (oil rig style). The tower is 31 inches square at the base. It is 32 feet to the top of the tower, but the rotator is located at the bottom, turning the TH6DXX via 32 feet of 1.5 inch gas pipe up through the center of the tower (which raises and lowers, oil rig style), thus making the antenna capable of any height from 35 to 60 feet. I used a worm drive boat winch to raise and lower the center mast, but may replace it with an electric winch in the future.



Mounted on top is a dual-band 7.5 dB gain antenna that our club uses as a repeater antenna (simplex, I might add).

Homebrew is my hobby, and I feel cheated if I can't build it. It took a couple of weekends to build the tower and elevation assy. It holds me at the top quite well, and I am very large.

I feed the beam with a Kenwood TS-830S and a single 4-1000 linear powered by a pole pig. I need it rarely, but it is nice to have.

Bobby Broyles, WBØDJJ
The Colony, TX

The ears have it!



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Editor's Choice
Passport to World Band Radio
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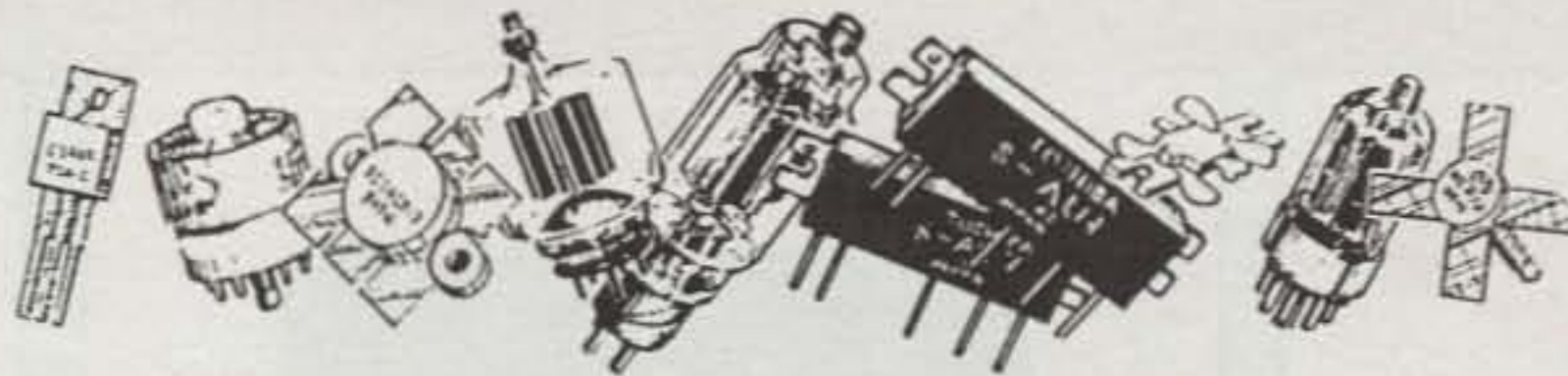
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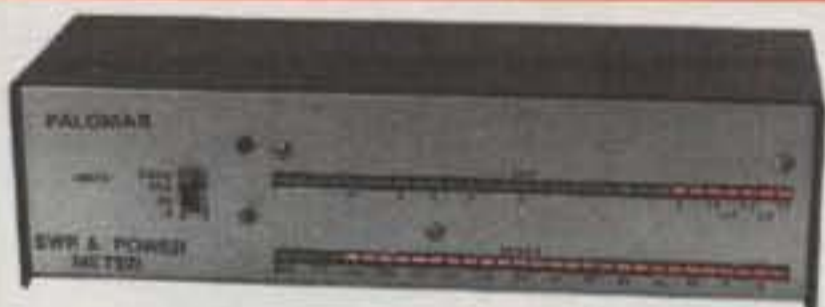
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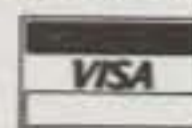
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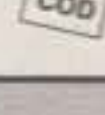
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YAESU

HOLIDAY SPECIALS

\$100.00 off



FT-1000D/FT-1000



Plus
Special Bonus
Limited Edition
Embroidered
Jacket
(\$169.00 Value)

GOOD
OCT. 15
1993
THROUGH
JAN. 10
1994



FT-990/FT-990DC

\$50.00 off

\$35.00 off



FT-890AT/FT-890



FT-767GX,
FT-736R



FT-840



FT-747GX

FT-5100



FT-5200/6200



FT-530



FT-470



G-2700SDX
G-1000SDX
G-800SDX

\$25.00 off

\$15.00 off



FT-2400H



FT-2200



FT-416/816

FT-411E

CUSTOMER: Surrender this coupon at time of purchase to your authorized Yaesu dealer for discount. Limit one coupon per purchase. Coupon is non-transferable and can be only used for products as advertised in this ad and for the discounts as stated. Offers only good at authorized U.S. and Canadian Yaesu dealers. DEALER: Send this coupon along with a copy of sales receipt to YAESU U.S.A., Sales Dept., 17210 Edwards Rd., Cerritos, CA 90701.

CHECK BOX

- \$100 OFF FT-1000D/FT-1000
FREE also with purchase of FT-1000D or FT-1000, Limited Edition Embroidered Yaesu Jacket. Dealer will provide redemption coupon for jacket.
- \$ 50 OFF FT-990DC/FT-990
- \$ 35 OFF FT-890AT/FT-890, FT-840, FT-767GX, FT-736R, FT-747GX
- \$ 25 OFF FT-5100, FT-5200/6200, FT-530, FT-470, G-2700SDX, G-1000SDX, G-800SDX
- \$ 15 OFF FT-2400H, FT-2200, FT-416/816, FT-411E

MODEL PURCHASED _____

SERIAL NUMBER _____

DATE OF PURCHASE: _____

YOUR NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

PHONE: _____

CALL SIGN: _____

DEALER NAME/STATE: _____

Coupon offer valid in USA and Canada only. Offer void where prohibited by law. Coupon has no cash value. Limit one coupon per purchase. Not valid with any other Yaesu offers or discounts. Offers not applicable to purchases made prior to October 15, 1993 or after January 10, 1994.

COUPON VALID FOR PURCHASES MADE BETWEEN OCT. 15, 1993 AND JAN. 10, 1994.



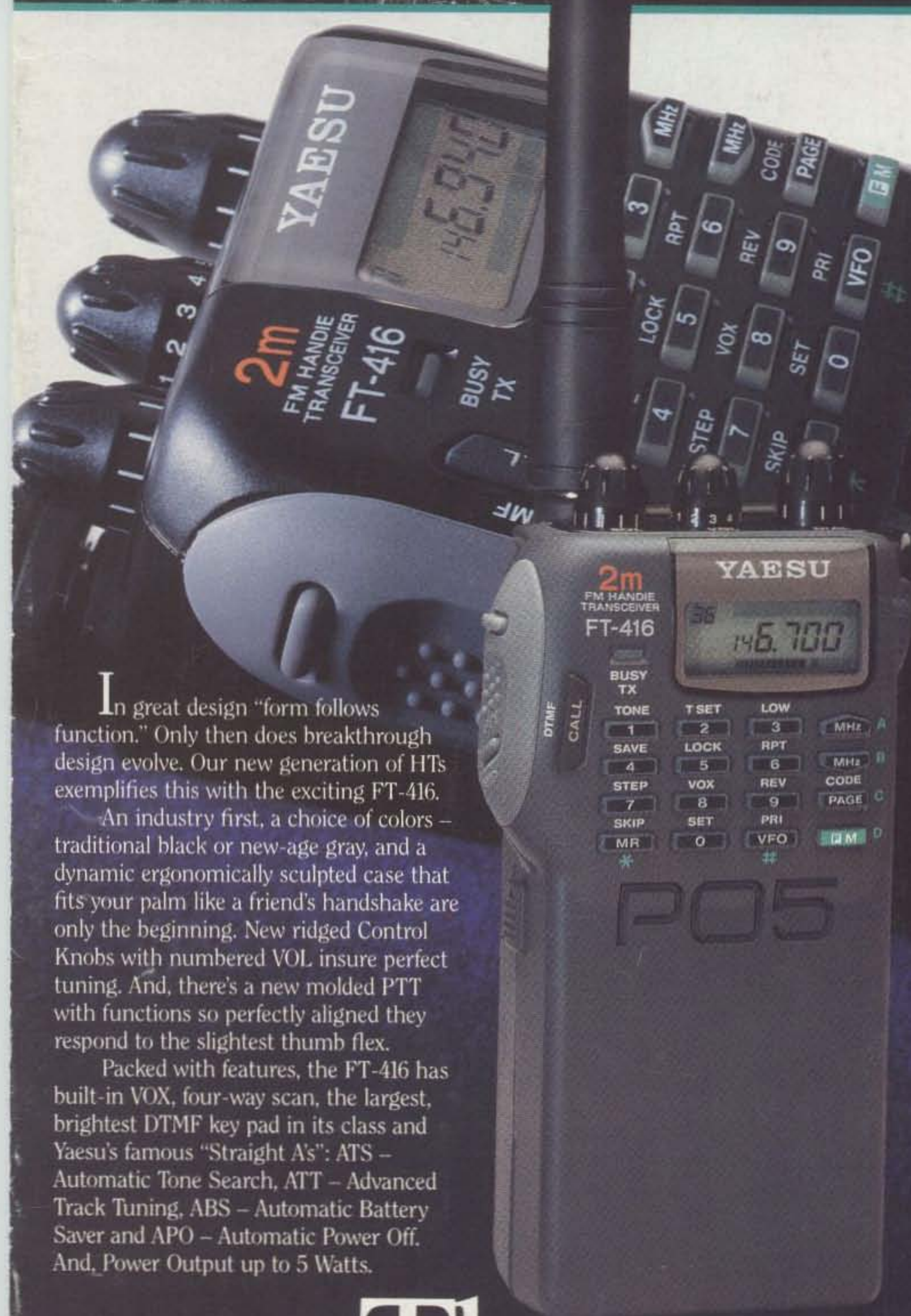
"The FT-416 comes in black – or gray!"

"New sculpted design, built-in VOX, back-lit DTMF pad, Yaesu's "Straight A's"! Wow!"

"Yaesu did it again!"

FT-416/816 2-Meter/70cm Handheld

- Frequency Coverage
FT-416:130-174 MHz RX
144-148 MHz TX
FT-816:430-450 MHz RX/TX
- 41 Memories (Odd splits on any channel)
- 4 TX Power Levels
w/FNB-25 2.0, 1.5, 1.0, 0.5W
w/FNB-27 5.0, 3.0, 1.5, 0.5W
- CTCSS Encode/Decode
- ATS, Automatic Tone Search
- ATT, Advanced Track Tuning
- ABS, Automatic Battery Saver
- APO, Automatic Power Off
- Direct 12V DC Input (5 Watts Output) 5 Watts w/FNB-27 Battery
- Back-lit Keypad and Display
- DTMF Paging and Coded Squelch
- Built-in VOX
- **Accessories:**
Compatible with most FT-530 and FT-415 Series accessories. Selected batteries in gray.



In great design "form follows function." Only then does breakthrough design evolve. Our new generation of HTs exemplifies this with the exciting FT-416.

An industry first, a choice of colors – traditional black or new-age gray, and a dynamic ergonomically sculpted case that fits your palm like a friend's handshake are only the beginning. New ridged Control Knobs with numbered VOL insure perfect tuning. And, there's a new molded PTT with functions so perfectly aligned they respond to the slightest thumb flex.

Packed with features, the FT-416 has built-in VOX, four-way scan, the largest, brightest DTMF key pad in its class and Yaesu's famous "Straight A's": ATS – Automatic Tone Search, ATT – Advanced Track Tuning, ABS – Automatic Battery Saver and APO – Automatic Power Off. And, Power Output up to 5 Watts.

During testing amateurs found this newest evolution in design remarkably unique. "You have to try it to believe it!", they said. So we invite you to do just that. Contact your Yaesu dealer today and find out what true evolution in design means to you.



YAESU
Performance without compromise.™

The newest evolution in design.

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Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

NEW

"What a great field radio. Mobile, too! I couldn't afford an HF rig until now."

"What a great price! Terrific features, high performance – and within my budget."

"Yaesu did it again!"



FT-840 Compact HF Transceiver

- Direct Digital Synthesis (DDS)
- Frequency coverage:
RX: 100 kHz-30 MHz
TX: 160-10 m
- IF Shift
- 100 Memory Channels (Independent TX/RX per memory)
- Twin Band Stacking VFOs
- FM* Repeater Operation Automatic 10-Meter Repeater Offset w/Selectable CTCSS Encode
- CW Reverse Feature
- Choice of Two Optional Antenna Tuners:
FC-10 Matching External Antenna Tuner
FC-800 External Remote Antenna Tuner
- **Accessories:**
Contact your Dealer for full details.
- * Optional

It's a small price to pay for such a wealth of features.



If you're trading up from an older rig, but have a budget, you want the most you can afford in top-notch HF. Then the FT-840 is for you. It's right on the money! Considering a mobile HF or field radio and doubt the quality and features of tiny HF rigs? Then the FT-840 is for you. It won't disappoint you!

Built to handle rigorous field operation, the new intense LCD display affords sharp visibility in bright sun-

light. Die-cast heat sink and internal thermally switched fan keep the FT-840 running cool. Modular design circuit boards ensure operating efficiency – manufacturing excellence you'd expect in much higher priced radios.

For high performance, the FT-840 features a low noise front end that uses the latest in FET RF amplifier design. Two DDSs and magnetic encoder for silent, smooth tuning and fast switching. Twin band-stacking VFOs. And,

automatic 10-m FM (optional) repeater offset with selectable CTCSS. Even two optional external antenna tuners to customize your rig.

Top of the line quality and features at a remarkably low price. Just what you'd expect from Yaesu! For high-tech performance, and a wealth of features that won't break your budget ask your dealer about the FT-840.

YAESU

Performance without compromise.SM

Save Instantly When You Purchase Any One Of These Popular ICOM Radios Through December 31, 1993!

OFFER EXTENDED
for a Limited Time!
Take advantage of these great savings while they last!

ICOM[®] INSTANT CASH COUPONS

COUPON AMOUNTS:

IC-P2AT..... **\$20 Off!**

IC-2iA..... **\$20 Off!**

IC-2SAT..... **\$20 Off!**

IC-W2A..... **\$40 Off!**

IC-W21AT..... **\$65 Off!**

IC-229H..... **\$45 Off!**

IC-3230H..... **\$60 Off!**

IC-2410H..... **\$70 Off!**

IC-707..... **\$40 Off!**

IC-737..... **\$100 Off!**

ASK YOUR DEALER FOR DETAILS!



CHRISTMAS BONUS!

When you buy any ICOM radio between now and December 31, 1993, you are also entitled to a special Christmas gift exclusively from ICOM and friends!

Our **Christmas Coupon Book** is stuffed full of valuable coupons from your favorite suppliers. Save on antennas, classes, books, magazines, accessories, software, seminars, memberships and more! See your dealer for details.

The Instant Cash Back from ICOM promotion we ran last spring was so popular that we decided to bring it back just in time for Christmas!

What better time to experience extra savings on your favorite ICOM products. Combined with our Christmas Coupon promotion, you can drive home with a sleigh full of values on your favorite ICOM products!

So stop by your local dealer today and cash in on *instant savings* exclusively from ICOM!

How To Enjoy Instant Savings, Exclusively From ICOM:

1. Purchase one of the radios listed above from your local ICOM dealer.
2. Tell your dealer that you want to save instantly with ICOM.
3. Your dealer has the coupons and will deduct the specified amount from your purchase price. Right at the store! You save instantly!

That's it! No need to mail a coupon or wait for a check. Simply enjoy instant savings on your favorite ICOM radios!

For free product information, call our brochure hotline: (206) 450-6088

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