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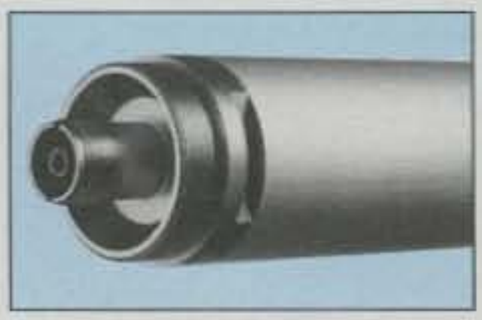

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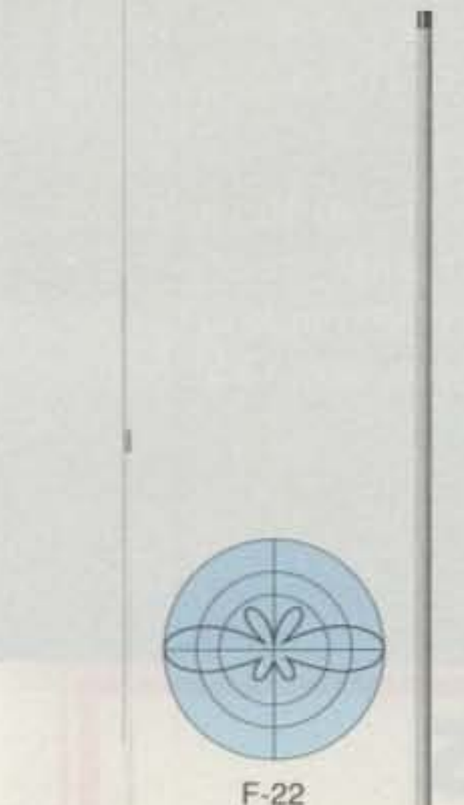
X-50A	144/440	4.5/7.2	200	UHF	5.6	135
X-200A	144/440	6.0/8.0	200	UHF	8.3	112
X-300A	144/440	6.5/9.0	200	UHF	10.2	112
X-510NA	144/440	8.3/11.7	200	N	17.2	90
X-510MA	144/440	8.3/11.7	200	UHF	17.0	90
X-500HNA	144/440	8.3/11.7	200	N	17.8	90+
X-700HA	144/440	9.3/13.0	200	UHF	24.0	90
X-2200A	144/222	6.0/7.8	150	UHF	11.5	112
X-3200A	144/222/440	6.0/7.8/8:0	100/200	N	10.5	112
X-6000A	144/440/1240	6.5/9.0/10.0	100/100/60	N	10.5	112

BAND: 144=144 - 148MHz. 222=222 - 225MHz. 420=420 - 430MHz.
430=430 - 440MHz. 440=440 - 450MHz. 1240=1240 - 1300MHz.
* X510NJ :144 - 147 / 430 -440MHz

147MHz

445MHz

RADIATION PATTERNS FOR
X-500HNA/X-500MA/X-510NA

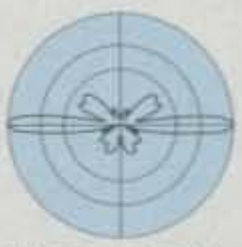


X510

GH/F/U&V series

MODEL	BAND(MHz)	GAIN(dBd.)	WATTS	CON N.	HT. Ft.	RATED WIND/ MPH
DP-GH62	50	6.0	200	UHF	21.0	78
F-22A	144	6.7	200	UHF	10.5	112
F-23A	144	7.8	200	UHF	15.0	90
F-142A	222	5.5	200	UHF	6.0	110
F-718A*	440	11.5	250	N	15.0	110
F-1230A	1240	13.5	100	N	10.5	90
U-200A	440/1240	8.3/11.7	100	N	5.9	135
U-300A	440/1240	8.6/13.2	100	N	8.3	110
U-5000A	144/440/1240	4.5/8.3/11.7	100	N	5.9	135
V-2000A	50/144/440	2.1/6.2/8.4	150	UHF	8.3	110

*F-718A:440 - 450MHz, F-718J:430 - 440MHz, F-718L:420 - 430MHz



U-300A 440MHz

F-22

U-300A 1200MHz

F22 U5000 GH62

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Things aren't always what they seem. Sometimes what you think you know isn't what you should know. In the ten years since the enactment of PRB-1, for the most part things have not gone our way.

Antennas and The Law, 1994

. . . Where We Stand Today, A Decade After PRB-1

BY WAYNE OVERBECK*, N6NB

After having the same antenna up for nearly ten years, a friend of mine recently received a threatening letter from City Hall. Apparently, someone had complained to the city about his antenna, and a city "code enforcement officer" discovered that he didn't have the required permit for it. Even worse, his antenna (a modest tribander on a 50 foot tower) was in violation of the city's 35 foot height limit.

My friend—who will remain nameless here—was told to apply for a *conditional use permit* ("CUP") or take the antenna down immediately! To apply for this permit, he had to pay a $500 application fee, submit engineering drawings, and invite every property owner within 300 feet to attend a public hearing concerning his antenna application!

No one had ever complained to my friend about his antenna, but on the night of the public hearing, a lot of his neighbors showed up at City Hall and urged the city council to free them of this eyesore, this blight in their midst. Several also complained about interference to their telephones, television sets, and other electronic gadgets.

When his turn came, my friend told the city council he was shocked by the testimony he had just heard, because none of these people had ever complained to him. With support from other amateurs, he also described his public service activities and mentioned "PRB-1," the Federal Communications Commission policy that says local governments must *reasonably accommodate amateur communications*.

After the public hearing ended, one council member asked the city attorney about "this PRB-1 thing."

The city attorney had done her homework. "Yes," she said, "the FCC issued a *limited* federal preemption order about ten years ago, but the courts have generally held that it does not require a city to allow any particular amateur operator to have any particular type of antenna." She also said a "federal circuit court of appeals" had ruled that a 17 foot height limit was a reasonable accommodation of amateur radio, and another circuit court had held that a city could reject an amateur's antenna application altogether if the amateur was unwilling to go along with the city's requirements to conceal the antenna from public view.

The council members then rejected my friend's permit application and ordered him to take down his antenna. The mayor suggested that he could apply for a permit for a 35 foot high antenna that had "less visual impact."

My friend was shocked; he had no idea a city could do that in spite of PRB-1. "How can a city ignore federal law?" he asked.

I told him that unfortunately the city wasn't really ignoring federal law. The city attorney was right: several important court decisions have limited the impact of PRB-1. Nevertheless, I said he could sue the city in federal court, but it would probably cost a *lot* of money, and there was no certainty he would win. I also told him that even if he did win, he could not recover his attorney's fees from the city because one of the landmark court decisions had virtually precluded the award of attorney's fees in PRB-1 lawsuits.

In the end, my friend took down his 50 foot tower and put up several small, low-profile antennas.

Recent PRB-1 Court Decisions

Sad to say, this story is not unique. Many other amateurs have had similar experiences in recent years. Going in, almost all of them assumed they had a federally protected right to put up a substantial antenna because of PRB-1.

Just where does PRB-1 stand today, about ten years after it was adopted by the FCC?

The short answer is that PRB-1 has been badly weakened by recent court decisions. To explain the importance of those court decisions it is necessary to describe the judicial pecking order in America. As every high school civics student knows, the nation's highest court is the U.S. Supreme Court. But just below the Supreme Court there are a dozen U.S. Courts of Appeals, each serving a geographic region of the United States, called a *circuit* (see fig. 1). For example, the *second circuit* includes New York, Connecticut, and Vermont. The *ninth circuit* includes California and eight other western states. In each region the circuit court of appeals is the final authority on all federal legal matters that have not been ruled on by the Supreme Court. When any of these circuit courts establishes a legal precedent, lower federal courts throughout the region are obliged to follow that precedent (by deciding similar cases in the same way). Although decisions of one circuit court are not binding precedents in other circuits, they still carry considerable legal weight.

This is an important point, because the Supreme Court has never ruled on PRB-1, but three different federal circuit courts have recently ruled against amateurs in lawsuits based on PRB-1. On the other hand, one appellate court (the eighth circuit U.S. Court of Appeals) recently handed down a decision that strengthened PRB-1 in seven midwestern states. In much of the United States, though, PRB-1 has not fared well in the federal appel-

*14021 Howland, Tustin, CA 92680

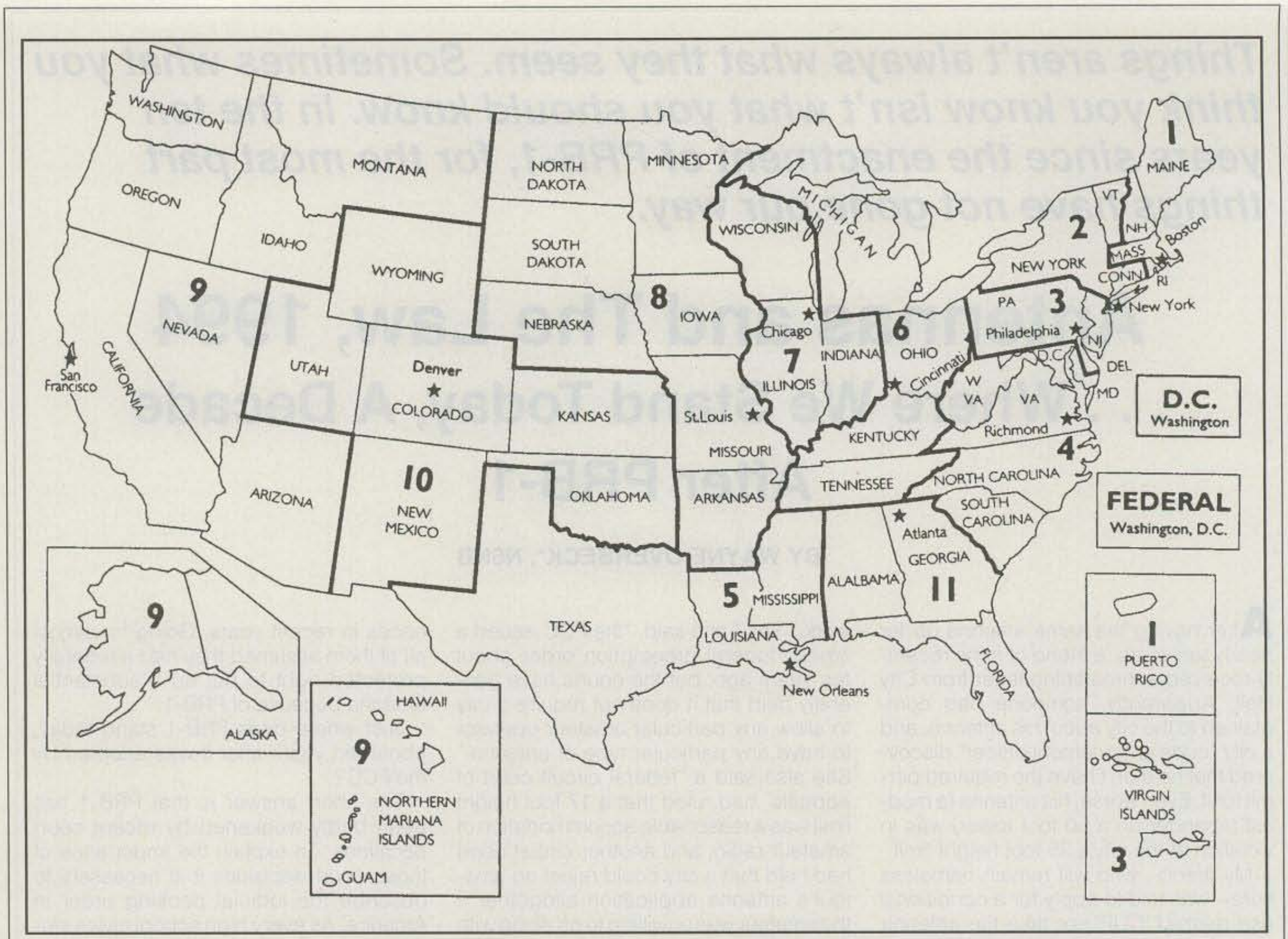

Fig. 1– This map shows which states fall into the various federal judicial circuits. In the absence of a Supreme Court decision, the "Circuit Courts of Appeals" have the final say on federal law in their "circuits." Four different Circuit Courts of Appeals have ruled on radio amateurs' antenna rights recently; three ruled against amateur radio.

late courts. For example, in 1991 the ninth circuit U.S. Court of Appeals decided a case called *Howard v. Burlingame*[1], which established a very bad legal precedent for amateurs seeking antenna permits in the western states.

Howard v. Burlingame began when Vernon Howard, W6ERS, applied for a permit for a 51 foot tower in Burlingame, California. According to the summary of the case in the appellate court's written opinion, Howard was initially given a permit, but his neighbors appealed to the city council, which revoked the permit. Howard then sued in federal court, contending that the city had violated PRB-1 by denying him an effective antenna. A federal judge ruled that the city did have to accommodate Howard in some fashion, and suggested 0possible compromises.

Rather than pursue the matter further, the city then granted Howard's permit. But Howard went back to court, seeking a court order requiring the city to pay his attorney's fees. That request was denied by a federal judge, and Howard appealed to the ninth circuit U.S. Court of Appeals. The city responded by appealing the ruling that PRB-1 required the city to accommodate Howard's request for an antenna permit.

The resulting decision was a disaster for amateur radio. In essence, the appellate court handed down a precedent-setting decision that said a city could deny an amateur an antenna permit altogether. PRB-1 does not guarantee any particular amateur the right to put up any particular type of antenna, the court held. The court said PRB-1 requires nothing more than a balancing of the city's interest in promoting aesthetics and safety against the amateur's desire for an effective antenna. If no suitable compromise can be worked out with a particular amateur, his request for an antenna can be rejected outright.

But that wasn't all. The court went on to say that inasmuch as there is no federally protected *right* to erect an antenna, an amateur who sues under PRB-1 and wins is not entitled to have the city pay his attorney's fees. This directly contradicts the conclusion of the federal court that decided the widely publicized early PRB-1 case of *Thernes v. City of Lakeside Park*.[2] And the *Howard* case is a binding precedent in nine western states, rendering the *Thernes* decision irrelevant there. It also seriously weakens the *Thernes* case as a legal precedent elsewhere.

In the end, the ninth circuit Court of Appeals—a court just one notch below the Supreme Court in judicial authority—said that a city need not do more under PRB-1 than consider an amateur's antenna application, investigate the matter fully, and attempt to negotiate a compromise that takes into account the city's zoning concerns as well as the amateur's desire for a substantial antenna.

Although the *Howard* case was bad news for radio amateurs, it was not the only bad news. Perhaps even worse—for amateurs living in the mid-Atlantic states, anyway—was a 1990 decision of the fourth circuit U.S. Court of Appeals, *Williams v. City of Columbia*.[3] In that case, John Williams, KE4BR, requested a "spe-

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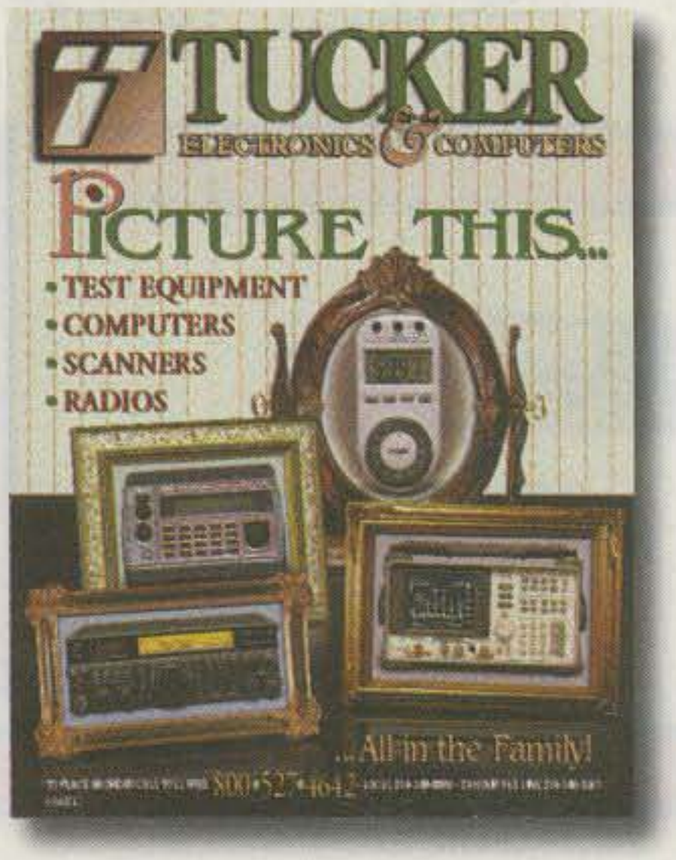

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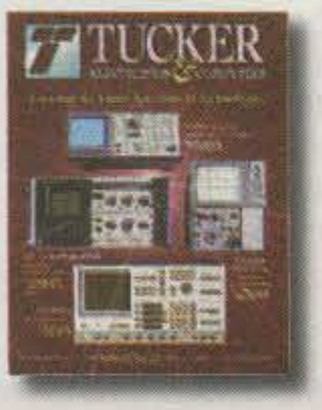

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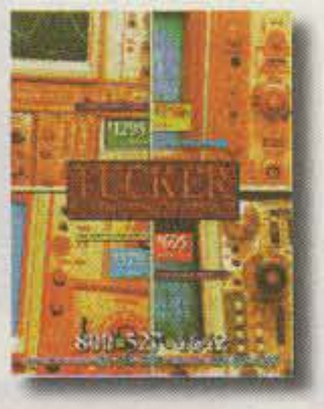

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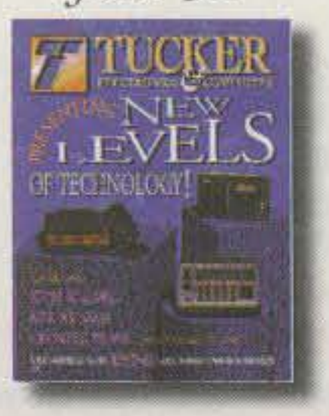

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cial exception" to the city's 17 foot height limit so he could erect a 65 foot telescoping tower. He was turned down by the zoning board in Columbia, South Carolina. He sued in federal court, and the court ordered the city to reconsider his application in light of PRB-1. The city did that, and the zoning board offered to grant the permit if Williams would agree to keep the tower fully nested (at 28 feet) except at night. Williams rejected that compromise. He also said he was not involved in emergency communications—an admission that proved to be unfortunate later. The city then denied his permit again, and he went back to court.

Williams's case was eventually decided by the fourth circuit Court of Appeals, which upheld the city's position. The court concluded that the city had adequately weighed Williams's need for an antenna against the city's legitimate concern about neighborhood aesthetics. Given the fact that the city and Williams could not reach a compromise, the court held that PRB-1 was not violated by the city limiting Williams to an antenna height of 17 feet! The appellate court in essence agreed with the city's conclusion that because Williams used his amateur radio station only for "recreational purposes" and because there were other amateurs in the area who did provide emergency communications, Williams did not have any right to a 65 foot high antenna under PRB-1.

In adopting PRB-1, the FCC never said that amateurs must engage in regular emergency preparedness work to have antenna rights. However, in the *Williams* case a federal appellate court interpreted PRB-1 in that fashion, thereby undercutting DXers, contesters, and others who would be happy to make their stations available in a real emergency, but who don't routinely take part in emergency drills.

In addition to the *Howard* and *Williams* cases, there has been another adverse decision that established a very bad legal precedent: *Evans v. County of Boulder.*[4] In this case, the tenth circuit Court of Appeals rejected an appeal by David "Doc" Evans, NQØI, for an antenna higher than 35 feet—the maximum that officials in Boulder County, Colorado would allow on his *1.28 acre* lot! In effect, the court held that a 35 foot high antenna on a 1.28 acre lot in a semi-rural area is an adequate accommodation of amateur radio under PRB-1.

The *Evans* case bounced back and forth between county authorities and the federal courts for six years before the ultimate ruling against Evans in 1993. In that 1993 ruling—which received little coverage in the amateur radio press—the court dismissed PRB-1 as a "vague federal regulation" that should not be given much weight against "precise, specific local ordinances." The *Evans* decision was sweeping enough—and bad enough for amateur radio—that at least one FCC official said publicly that PRB-1 needed to be rewritten and strengthened. However, the Commission had not done that at this writing.

Evans first requested a permit for a 125foot tower in the mid-1980s, but several neighbors opposed his application early on. For his part, Evans made some excellent arguments. As a native of the U.K., he needed reliable international communications capability to keep in touch with family members who were amateurs there. And as an astrophysicist with a Ph.D. degree, he had legitimate research interests that required a substantial antenna. Evans even offered to compromise in various ways, such as by accepting a smaller tower, but the county never approved any compromise that Evans could live with. County officials contended that Evans lived in a unique area with spectacular mountain views—views that would be impaired by a large radio tower. The county didn't seem to notice that the mountain views were already obstructed by large power lines in the area. Another complicating factor was the fierce winds that sometimes roar down those beautiful mountainsides, ren-

dering the typical self-supporting crank-up tower impractical there. (In some view-conscious communities amateurs have won the right to have substantial antennas by agreeing to use crankup towers and keeping them cranked down most of the time.)

When the *Evans* case ended up in the U.S. Court of Appeals, the county argued that other amateurs were able to live with the 35 foot height limit. Also, county officials said there were other less view-sensitive areas in Boulder County where they would allow a larger tower. But in Evans's circumstances, they were unwilling to allow anything more than 35 feet for aesthetic reasons. After years of protracted litigation, the tenth circuit Court of Appeals eventually upheld the county's position, PRB-1 notwithstanding.

In early 1994 still another federal Court of Appeals ruled on PRB-1, but this time the case went the other way: an amateur actually won one of these precedent-setting cases! In *Pentel v. City of Mendota Heights*[5] the eighth circuit Court of Appeals ordered Mendota, Minnesota officials to reconsider an application by Sylvia Pentel, NØMRW, for a 68 foot crank-up tower. The court did not order the city to grant the permit, but the court did say that the city had to do more than merely allow Pentel to keep a vertical antenna that she already had on her roof.

Pentel had erected the vertical without a city permit, but the city eventually offered to give her a permit for that antenna after she applied for a permit for the 68 foot tower and beam antenna. However, the city flatly denied her application for the tower and beam without providing any justification for its decision. She sued, but she lost in a federal district court (a trial court). She appealed, and the Court of Appeals ruled in her favor.

The appellate court pointed out that the city's denial of Pentel's application seemed arbitrary, since the city had shown no factual basis for its decision. On the other hand, Pentel had presented considerable evidence in the city hearings to explain why she needed something better than her vertical antenna for reliable long-distance communication. Pentel also offered evidence of her public-service work to buttress her application. Moreover, there were other large towers in the city, but the city would not authorize hers. In the face of all this evidence, the appellate court concluded that the city had not made a reasonable accommodation of her need for an adequate antenna, as required by PRB-1. The city was directed to reconsider her application for a tower. Significantly, this federal court said that the city had to *accommodate* the amateur in some fashion; a *balancing* of the city's interests against the amateur's interests was not enough. This legal distinction could prove important in future cases.

Why did Pentel win in a high federal court when other amateurs had lost? There are several possible reasons, including the luck of the draw: not all judges will reach the same conclusion, even given the same facts and the same legal arguments. Pentel's case was obviously heard by a sympathetic three-judge panel of the Court of Appeals. But Pentel also had an exceptionally strong case. She had a good record of public service, and she wasn't asking for a tower bigger than others in her area. The court was clearly influenced by her argument that she needed a directional antenna to facilitate her public-service work. Nor was the city in a position to make the kind of aesthetic arguments about mountain views that were so persuasive to the court in the *Evans* case. In fact, the city council made no factual findings to justify rejecting Pentel's permit. City Hall just said no! The result: Pentel won, whereas several other amateurs lost in the federal appellate courts—establishing legal precedents that are bad for other amateurs seeking antenna permits.

Even the *Pentel* decision, which is clearly the most important victory of this decade for an amateur in an antenna lawsuit, had its dark side. The court dismissed the city's concerns about potential RFI problems with this observation: " . . . (T)he city had no reason to fear that

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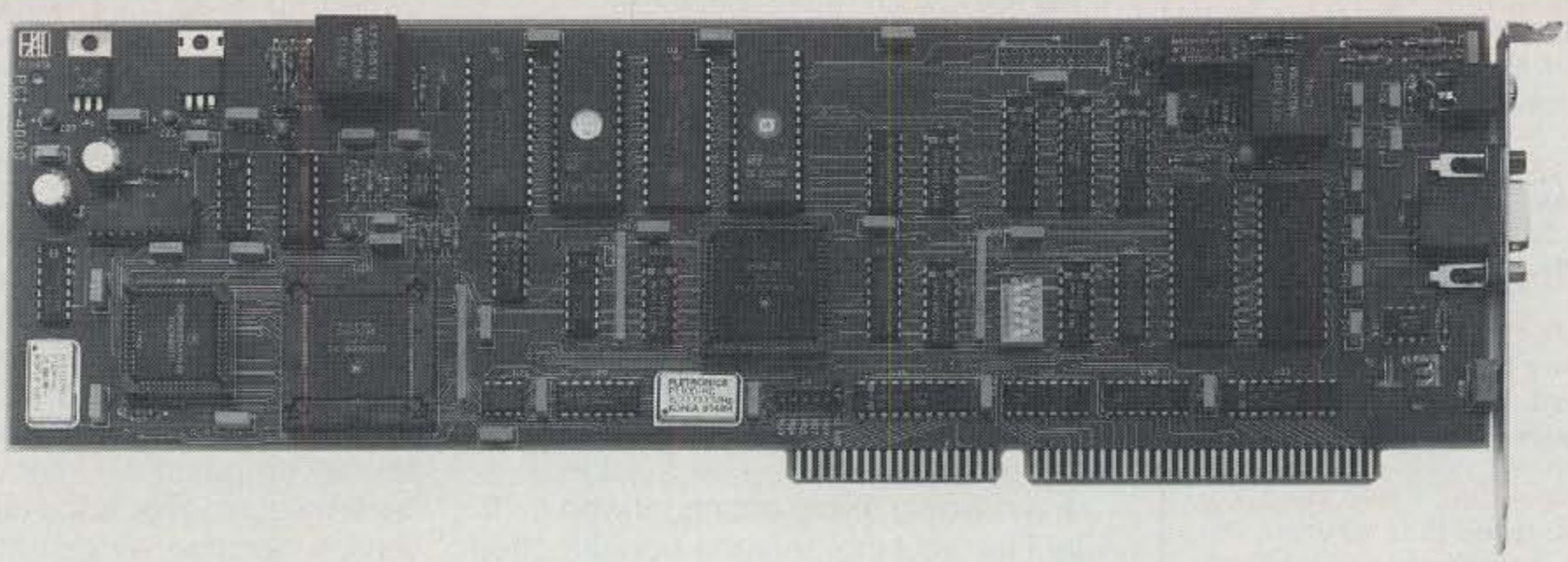

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the antenna would interfere with other residents' television and radio reception; the city's planning report states that Pentel was prohibited by the FCC from causing, and that she could lose her license if she failed to correct, such a problem."

Under the FCC's rules the responsibility for resolving RFI problems is not nearly as clear as the language in the *Pentel* case suggests. The last thing amateurs facing RFI problems need is precedent-setting federal appellate court decisions that misstate the law on RFI responsibility.

Taken together, these four appellate court decisions illustrate how difficult it can be for an amateur to win an antenna case in the face of strong local opposition. Federal appellate courts are often reluctant to overrule local elected officials about local land-use issues, which is what an amateur really has to ask the court to do. As the law stands today, local officials who turn down an antenna application have some major legal precedents to back them up.

Even worse, radio amateurs who go to City Hall seeking antenna permits often assume that their legal position is stronger than it really is in light of the recent court decisions—because the adverse court decisions have received so little publicity. On the other hand, any city attorney who is even marginally competent can find out about these federal appellate court decisions in a few minutes, thanks to the power of legal databases such as Lexis and Westlaw. Amateurs often underestimate the obstacles they face when they apply for an antenna permit, while city officials are becoming more and more sophisticated about finding legal ways around PRB-1.

Nevertheless, many amateurs obtain antenna permits without any great difficulty. And of the amateurs who are denied an antenna permit, only a small percentage hire lawyers and sue in federal court. Many amateurs who lose a battle with City Hall either move elsewhere or put up an antenna small enough to be acceptable to local officials. However, the cases that do end up in an appellate court often go badly, establishing legal precedents that can make life harder for other amateurs.

Deed Restrictions and PRB-1

If local governments were the only obstacle standing between amateurs and their antennas, the problem would be difficult enough. In many communities, however, government regulations are not even the main problem. More and more housing tracts (not to mention condominium developments) have deed restrictions that forbid all outdoor antennas. Unfortunately, PRB-1 is of little value in these situations.

Deed restrictions (often called *restrictive covenants or covenants, conditions and restrictions*—CC&Rs) seem to be showing up almost everywhere. Studies in several major metropolitan areas have shown that virtually all new developments have these covenants.[6]

They are prepared by real estate developers, often with the strong encouragement of local governments and lending institutions, in an attempt to protect property values and prevent neighborhood deterioration. They often require all homeowners to keep their homes and yards attractive, and they may impose restrictions on excessive noise. Farm animals are often prohibited, and there are sometimes restrictions on the number of domestic pets as well. Sometimes boats, travel trailers, motor homes, and inoperable cars cannot be stored in driveways or anywhere else where they can be seen. In some tracts there are even restrictions on the types of shrubs and trees that may be planted, and on the colors that houses may be painted. Unfortunately for radio amateurs, ever since cable television service became widespread, radio and television antennas have also been a prime target of deed restrictions.

Deed restrictions are said to *run with the land.* That is, they are binding on all future homeowners unless they are revoked, waived, or abandoned. Often the task of enforcing the restrictions is given to a homeowners' association, which has the power to sue violators. Associations usually have the right to collect their attorney's fees from the homeowner if a lawsuit is necessary to enforce the rules. Individual property owners also have the right to sue to halt alleged violations, should the association fail to act.

There are various legal defenses in lawsuits over alleged covenant violations. Among other things, the law in many states requires deed restrictions to be reasonable.[7] And if the rules have been ignored for years and are widely violated, a court may declare that the deed restrictions have been waived or abandoned. However, it usually requires a full-blown lawsuit—and thousands of dollars in legal expenses—to get a court to declare them invalid. Also, the odds of winning in court are not high: deed restrictions are often upheld by courts.

PRB-1 specifically rules out any federal preemption of deed restrictions. The FCC said they are *voluntary* land use restrictions. In the FCC's view people should be free to live in a neighborhood without cows, broken-down cars, or amateur radio antennas if they so choose! The only real problem with the FCC's reasoning is that at a time when virtually all newer neighborhoods have deed restrictions forbidding antennas, the rules cease to be voluntary: many homebuyers don't have much of a choice.

Does that mean the courts are willing to overturn deed restrictions forbidding antennas? Unfortunately, that doesn't happen often. In one notable 1992 California case, a state appellate court upheld the FCC's determination that PRB-1 should not apply to deed restrictions. In *Hotz v. Rich*[8] the court ruled that a radio amateur in Foster City, California was not freed from his tract's restrictions by PRB-1. The court upheld the right of neighbors to sue to prevent a tower from being erected in defiance of the rules. However, the appellate court did return the case to a lower court to consider whether such an across-the-board ban on antennas might be *unreasonable*.

That might offer some hope for amateurs in California, at least, because another California appellate court did rule that a restrictive covenant forbidding all satellite antennas was unreasonable when it was enforced against a homeowner whose backyard dish was so well screened by landscaping that it could not be seen from the street or from anyone else's property. That happened in a case called *Portola Hills Community Assn. v. James.*[9] Of course, it isn't often possible to completely screen a typical amateur radio antenna from public view without seriously degrading its performance. Also, this is a fairly unusual court decision that turned out as it did at least in part because the court thought the homeowners' association had acted in bad faith.

Because courts often uphold deed restrictions, homeowners who challenge them risk ending up deeply in debt. They may have to pay not only their own attorney's fees, but also those of the homeowners' association. On the other hand, if there is no homeowners' association, an amateur may have a better chance of getting away with ignoring the rules. For instance, I know of one new neighborhood in southern California where outdoor antennas are strictly forbidden, but there is no association to enforce the rules. As soon as the last home was sold and the developer went away, an amateur put up an antenna, and he has gotten away with it for several years now. At first he only had a small loop antenna on his balcony, but when nobody said anything about that, he put up a tribander on a 40 foot tower. Oh, the neighbors grumble behind his back (I know; I own a house down the block as an investment, and nobody there knows I'm an amateur), but no one is angry enough to hire a lawyer and sue him to make him take down his antenna. Not yet, anyway.

"Undocumented" Antennas, Hidden Antennas, Etc.

As antenna restrictions have proliferated in recent years, more and more amateurs have found that they have only two choices: (1) forget having an amateur radio station at home or (2) ignore the rules and put up some kind of hidden or "bootleg" antenna.

Actually, the word "bootleg" has bad connotations among radio amateurs, so let's not use it here. Although government officials routinely refer to anything that is built without the proper permits as being "bootlegged," let's use a term that is more politically correct these days. We'll just call antennas erected without permits *undocumented antennas*, not bootleg antennas! That gives this the proper "spin," doesn't it?

Basically, undocumented antennas fall into two categories: outdoor antennas erected without permits, and antennas hidden indoors or in an attic. For obvious reasons, no one knows how many undocumented amateur radio antennas are in use today, but the number must be enormous. At one time or another almost all of us have put up some sort of antenna without getting all of the proper permits.

Unfortunately, hidden antennas may create problems that almost nobody thought about until recently. Aside from the fact that indoor antennas are often so badly obstructed by buildings or landscaping that they perform poorly, there are also growing concerns about the electromagnetic radiation hazards they may pose. New studies of the effects of low-level electromagnetic fields (EMFs) are being published in medical journals almost weekly now. It seems certain that

when the health effects of EMFs are fully understood, hidden antennas may turn out to be hazardous in some circumstances because they are often placed in inhabited areas. Unless the transmitter power is very low (say 10 watts or so), an indoor or attic antenna is likely to expose the amateur and perhaps other persons to high EMFs. Nevertheless, thousands of amateurs must be using hidden antennas on a regular basis at this point. There are simply too many amateurs living in places where antennas are banned for that not to be the case.

From a safety standpoint, undocumented outdoor antennas are a different matter. They can be just as safe as any other antenna; they're just erected without official approval. Given the enormity of the regulatory hurdles that exist today, probably half of all the towers and beam antennas that are erected these days go up sans permits! But that, too, creates some potential problems. For one thing, if an undocumented antenna should come down and cause property damage, a homeowner's insurance policy may not cover the losses. And, of course, the owner of an undocumented antenna has to be prepared to take it down—or else fight City Hall—at any time.

Fortunately for amateurs with undocumented antennas, few local governments have enough resources to send code enforcement officers out scouring the community for undocumented antennas on a *pro-active* basis. ("Pro-active" is bureaucratese. It means to go out looking for code violations without waiting for someone to complain.) Most often, undocumented antennas are ignored until someone does complain, typically because of an RFI problem. Once the local authorities receive a complaint, though, an enforcement action is likely. The amateur can expect to receive a letter directing him either to take down the antenna or to apply for the proper permits within 30 days or less. If the antenna disappears quickly, that is usually the end of the matter; few cities file criminal charges against code violators who correct the violation promptly, except in egregious cases.

If, on the other hand, the antenna owner decides to seek the proper permits retroactively, the process could be painful. If the antenna complies fully with the local codes, it might be a routine matter of providing suitable plans and drawings, paying the normal permit fee plus a penalty, and getting the permit signed off. More often, though, the amateur is directed to apply for some kind of special permit that is expensive and requires notice to neighbors. If what triggered the enforcement action was a complaint from a neighbor, there will probably be an ugly scene at a public hearing if the amateur tries to legalize an undocumented antenna by seeking a variance, conditional use permit, or similar special dispensation from City Hall, because the neighbors will probably come out in force. If a permit can be obtained prior to antenna-raising day—*before* anyone in the neighborhood is angry—the amateur is surely better off.

While some amateurs are unlucky enough to get caught up in a hassle over an undocumented antenna, many amateurs with undocumented antennas never hear from their local authorities. I once had five towers on a half-acre property within the Los Angeles City limits, all sans permits. My antenna farm was hard to miss, as four of the towers were higher than 70 feet. Although two of them were on tower trailers and could have been removed quickly, I worried about the potential for conflicts with City Hall. However, I also knew I would only be living there a few years, so I took my chances. Sure enough, I never heard from the city, and I took my antennas down—voluntarily—when I was ready to sell the property. Frankly, that took more *chutzpah* than I have now (almost 20 years later), but I know amateurs who still do have that much *chutzpah*—and who have gotten away with it so far.

In rural areas, of course, there is a lot less risk of running into a code enforcement officer. I have several towers up now in a place so isolated that almost nobody there even bothers to get building permits for their *houses*, much less for antennas. Not long ago my nearest neighbor there (who is a quarter of a mile away) built a beautiful new house, complete with a large deck overlooking the valley below, without a single permit. It's one of the nicest bootleg (oops, sorry, undocumented) houses I've ever seen.

Given the deed restrictions and municipal ordinances that we now face in urban areas, the easiest way to have a big signal these days may be to head for the boondocks. There are all sorts of places where land is still cheap and nobody seems to care if you put up a tower or two—or three or four! Those places just aren't in the cities where most of us live.

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5. Pentel v. City of Mendota Heights, 1993 U.S. App. Lexis 35367.
6. In 1987, the author conducted studies of the deed restrictions governing new housing tracts in greater Los Angeles, San Francisco, and Dallas-Ft. Worth, and found that almost all new housing tracts had rules prohibiting amateur radio antennas.
7. For example, see California Civil Code Section 1354.
8. Hotz v. Rich, 4 Cal.App.4th 1098 (1992).
9. Portola Hills Community Association v. James, 4 Cal.App.4th 289 (1992).

About The Author

Wayne Overbeck, N6NB, is a professor of communications at California State University, Fullerton and a former communications attorney. He holds Ph.D. and J.D. degrees and has published five books, including two college textbooks on communications law. ■

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CQ REVIEWS:

The HAL Communications RVM-100 Radio Voice Mail Controller

BY BUCK ROGERS*, K4ABT

I'm hooked on useful gadgets. I suppose that is one of the traits of an amateur. We amateurs are always looking for a new way to make life easier, or a new widget that will help us out-gadget the next gadgeteer.

A few weeks ago I met Bill Henry (I still think his name is HAL) at the Charlotte, North Carolina hamfest. When I see Bill Henry demonstrating a new piece of amateur "technology," it immediately captures my attention, because where Bill is concerned it is more than a novelty!

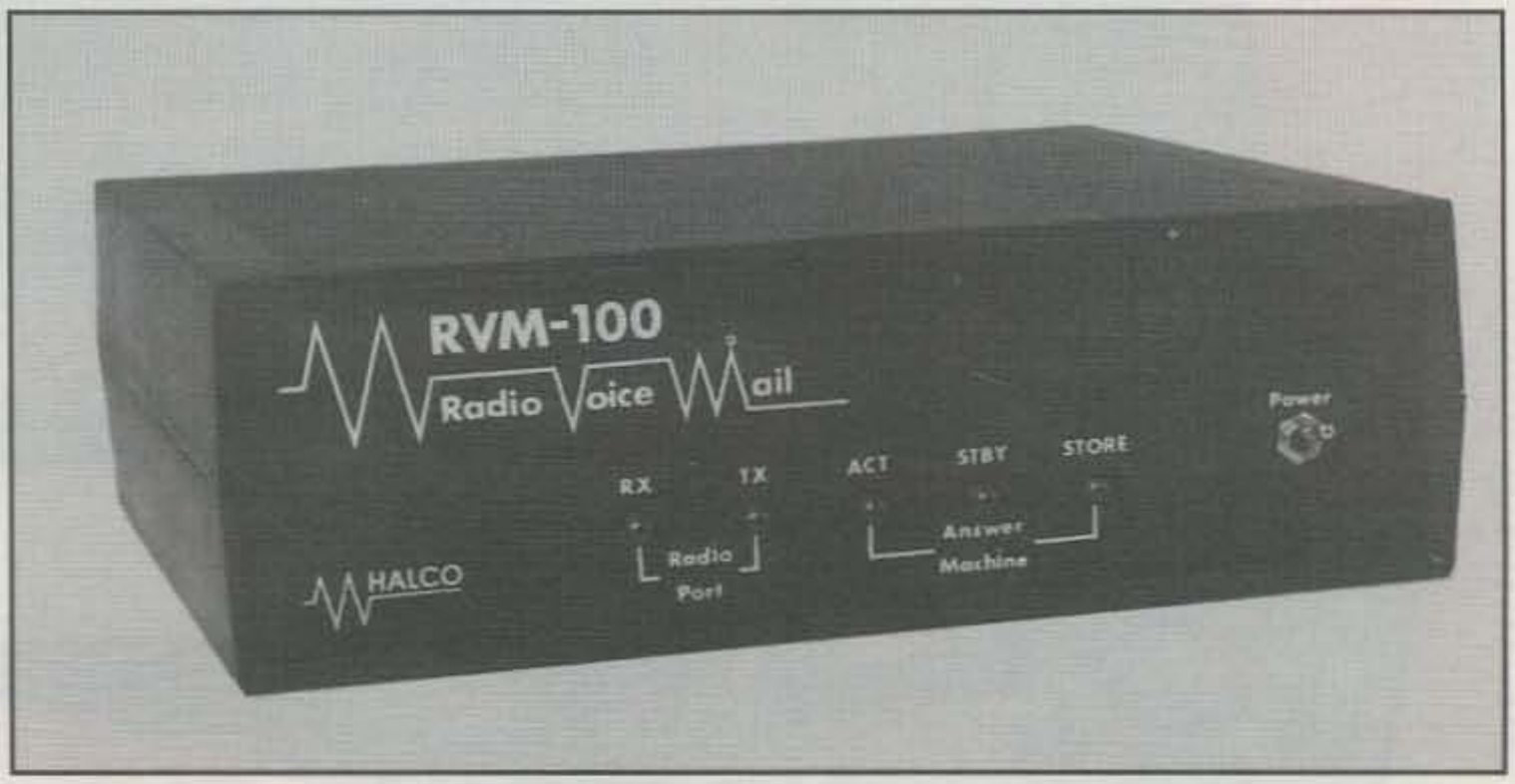
The new device we are about to review here is something I've had dreams about. As a matter of fact, I've "needed" this device forever. Well, don't we first develop a need for a gadget before we tell our wives how much we "need" it?

The device is the brain-child of another one of Bill's very high-tech brainstorms. It is appropriately called the "Radio Voice Mail Controller," or the HAL model RVM-100. One of the reasons why Bill developed the RVM-100 is to support the DXer who tries to call his buddy on the telephone, only to find his line is in use (busy). The RVM-100 serves as an adjunct to the telephone for such "emergencies." Here is how.

The RVM-100 is an interface control unit that is connected between a VHF transceiver and an economical telephone answering machine, very similar to the way you would interface a packet TNC (see fig. 1). The answering machine I use is the Radio Shack model 43-752 (TAD-514), which is priced at $49.95. There are others that are priced lower, but the Radio Shack unit carries a full year warranty, so I opted for a few more bucks and the added warranty protection.

Bill's demonstration of the unit went something like this. He pressed the PTT of his hand-held transceiver and entered the pound sign plus a three-digit (user programmable) code. Then he released the PTT. A moment later a message came back to him from the hand-held speaker identifying the voice mail answering station. The message then instructed him to send a message to the voice mail (RVM-100), and at the end of his message he was to press the pound (#) key to terminate and store the message. After Bill had placed the message, he pressed the pound key, identifying his station as he signed off.

As I watched all this taking place, my brain was going into "hair-smoke" warp speed. Since it uses a storage technique, the RVM-100 makes use of only one frequency. To say it in simple terms, it allows the use of a "simplex" frequency. Moreover, the time used on the frequency is



The HAL RVM-100 radio voice mail controller.

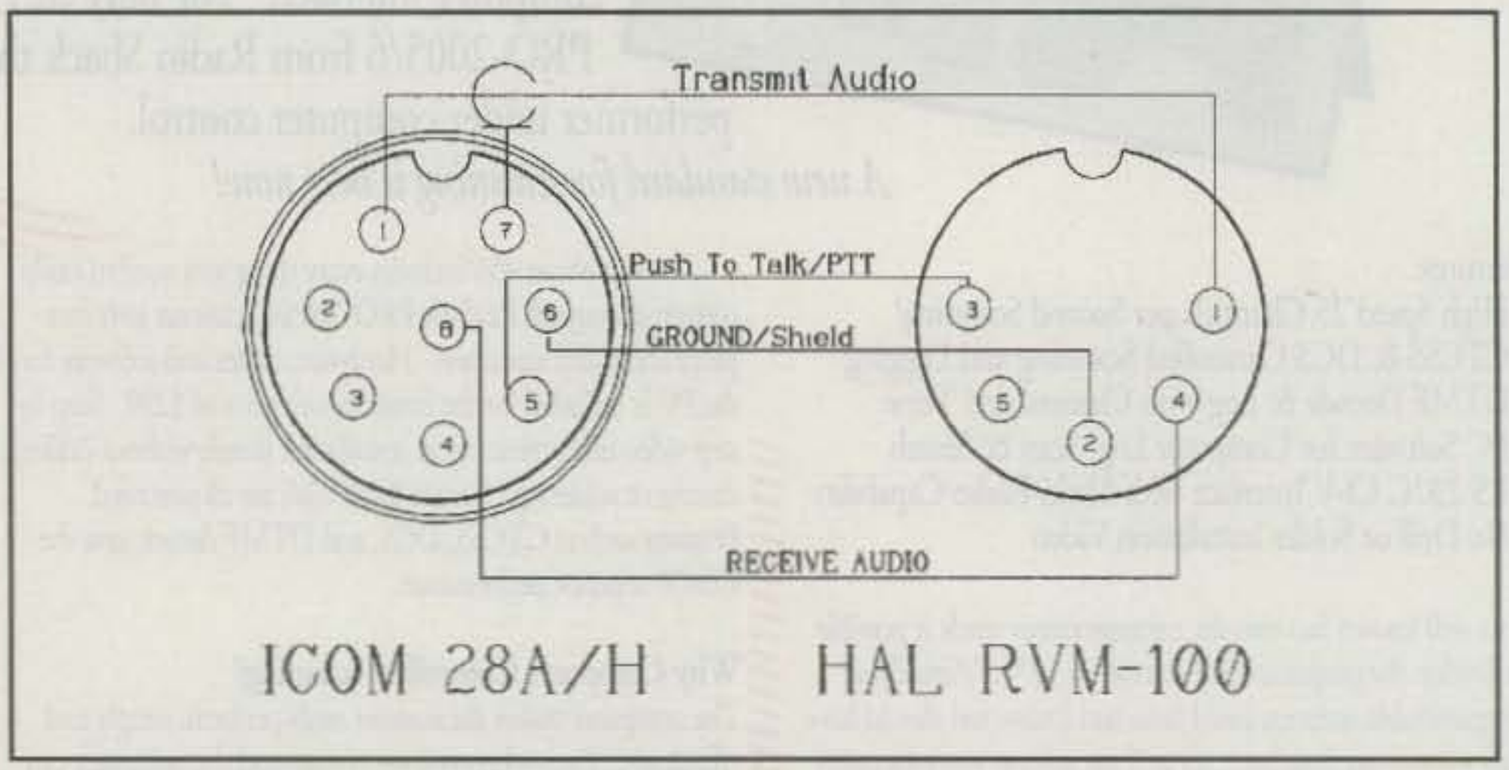


Fig. 1– The RVM-100 is connected in much the same manner as a typical TNC.

*211 Luenburg Dr., Evington, VA 24550

always less than two minutes.

Also as I watched I came up with the following ideas:

•Use it to leave my wife, WB4EDZ, messages as to where I would be after work this afternoon.

•Give the pound and three-digit code to all my friends so they can leave me messages to be read later when I return to the QTH.

•Let Jean Ann, WB4EDZ, leave me messages to let me know which mall she will be late coming home from.

•Use it when I work field day from the home QTH and we are sharing numbers with other stations within simplex range.

•The RVM-100 makes the amateur frequency look like a telephone line. Bill, you are a wizard!

•The connections to the RVM-100 are the same as all my TNC, 5-pin DIN connectors. This makes it simple to unplug the 5-pin DIN from the TNC and plug it directly into the RVM-100. Presto, the radio connection is made!

•The telephone answering machine comes with an RJ-11 plug ready to plug into the RVM-100. This makes everything easy to "plug and play."

Needless to say, I left the Charlotte hamfest with an RVM-100 under my arm.

Since I connected the RVM-100 to my radio and put it on 146.460 simplex, I've not had many days without its use. What did I do before the RVM-100? If you are passing through Lynchburg, Virginia on US 460, QSY to 146.460 and PTT, then press pound (#) 110 and release the PTT. Follow the simple instructions that come next and leave me an amateur radio voice mail message.

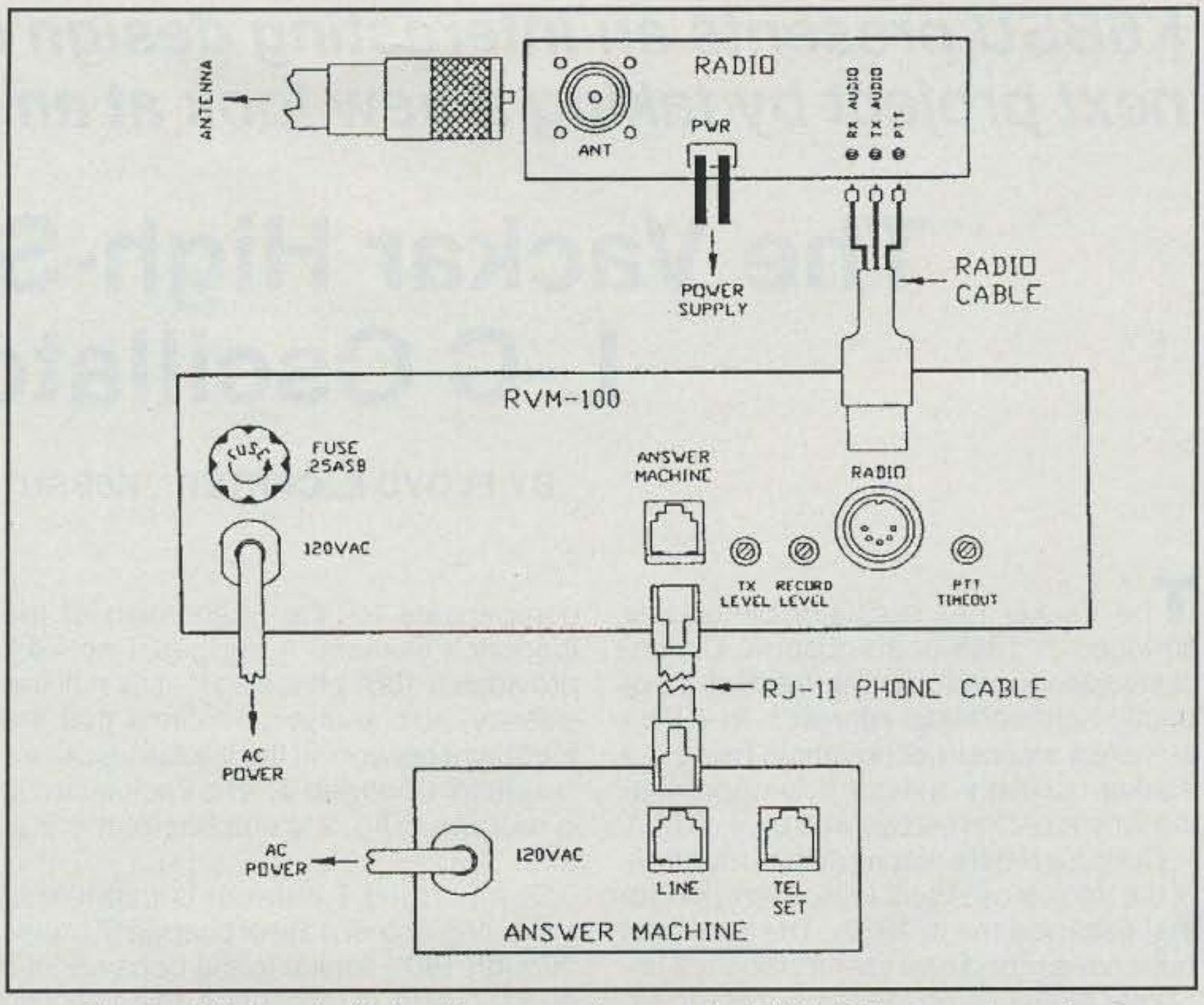


Fig. 2– This basically is all you need to get the RVM-100 up and running.

The RVM-100 is priced at $169.95 and is available from HAL Communications Corporation, P.O. Box 365, Urbana, Illinois 61801 (phone 217-367-7373; FAX 217-367-1701). ■

K6BSU presents an interesting design element for your next project by taking a new look at an old idea.

The Vackar High-Stability L-C Oscillator

BY FLOYD E. CARTER*, K6BSU

The Vackar L-C oscillator circuit first surfaced in 1949 in an obscure Czechoslovakian journal, but its modest introduction created little interest.[1] In 1978 I authored a construction article using the Vackar oscillator without fully appreciating why it performed as well as it did.[2]

During a recent resumption of my study of the Vackar oscillator I discovered a fact that escaped me in 1978. The Vackar is better described as a low-impedance oscillator circuit using the familiar Bridged-T null network as its feedback element. To explain this connection it is instructive to review the Barkhausen oscillation criteria. Fig. 1 shows the block diagram of a basic oscillator with its two main elements—an amplifier element and a feedback element.

The Barkhausen criteria requires that the total phase shift around the oscillating loop be 0° or 360°. When the feed back element provides a 180° phase shift at the oscillation frequency, then the amplifier element must also provide a 180° phase shift plus sufficient gain to compensate for the attenuation of the feedback element. A Bridged-T network provides a 180° phase shift at its null frequency, and analysis confirms that the feedback network in the Vackar oscillator is indeed a Bridged-T. The Vackar circuit is redrawn in fig. 2 to emphasize this feature.

The Bridged-T network is capable of exhibiting a steep rate of change of phase through 180°, similar to the behavior of a quartz crystal at resonance. In addition to providing a stable oscillation frequency, this feature enhances the phase noise performance of the oscillator, because the phase shift occurs over a narrow frequency span.

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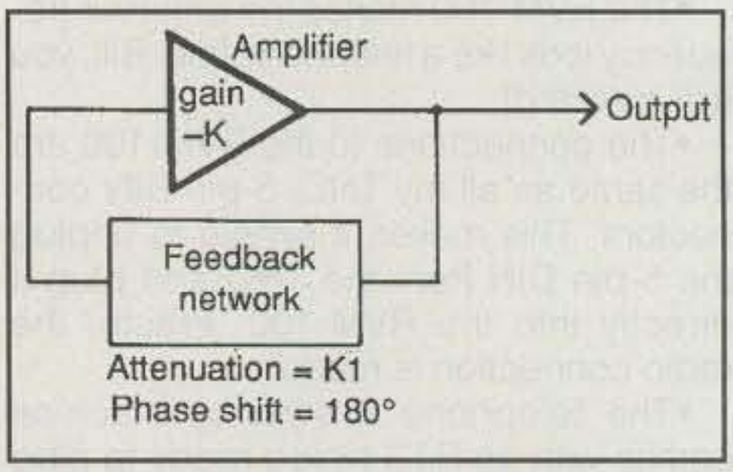


Fig. 1– Oscillator block diagram consisting of an amplifier element and a feedback element to illustrate the Barkhausen criteria for oscillation.

Circuit Parameters

The Bridged-T null network shown in fig. 2 has a simplified voltage transfer function given by[3]:

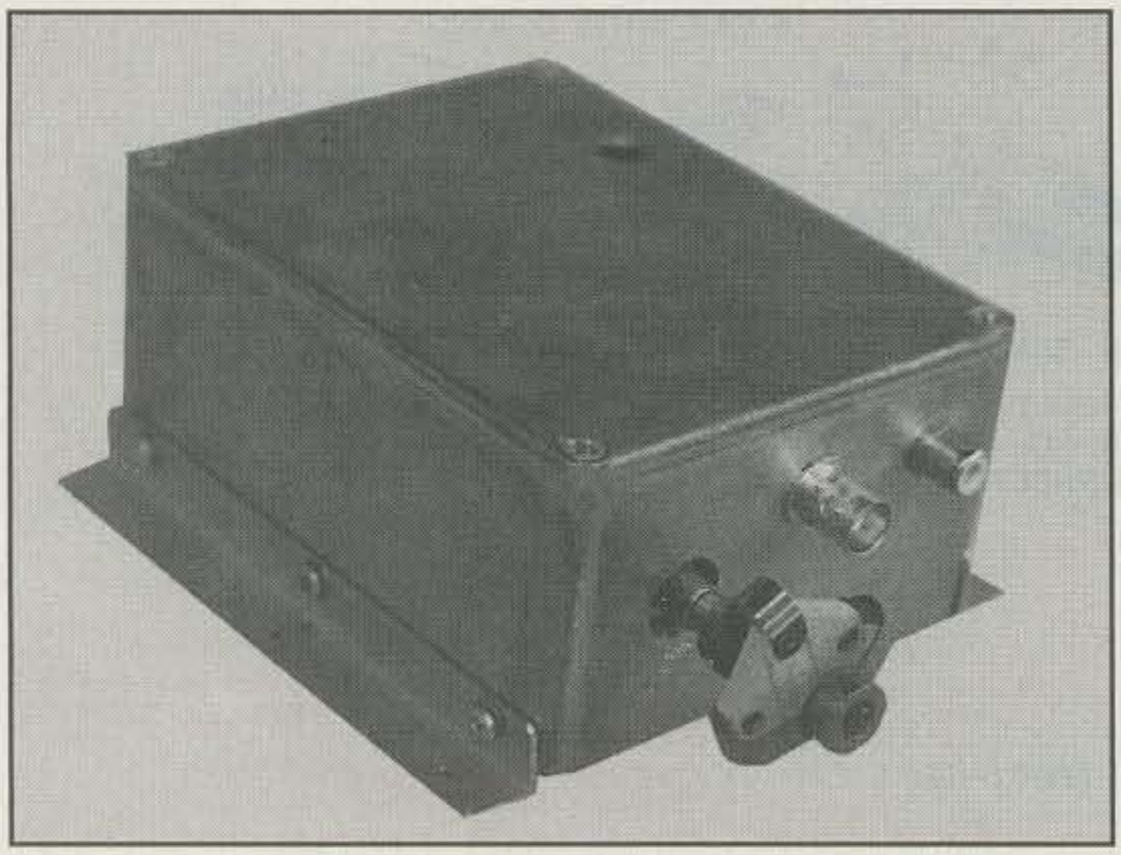
$$\frac{E_0}{E_i} = \frac{\omega_o^2 R_1 R_L C_1 C_2 - 1}{1 + \omega_o^2 R_1 R_L C_1 C_2}$$

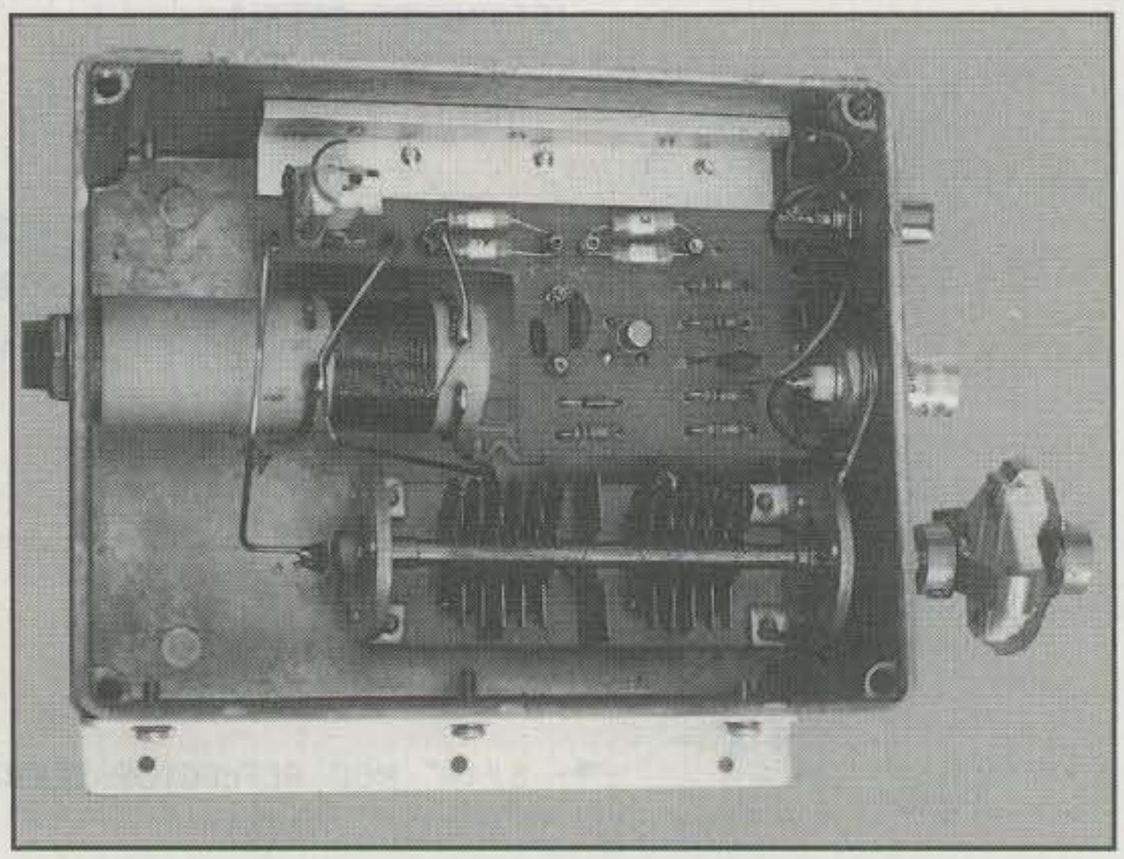
where $\omega_o = 2\pi f_o$

It can be seen that when

$$R_1 R_L = \frac{L}{\sqrt{C_1 C_2}}$$

the transfer function becomes zero (the null frequency of the Bridged-T), and the transfer function changes between positive and negative, indicating a transition between a positive and negative phase shift.Since R_L is an inherent property of the inductor, this leaves only R_1 as a





The Vackar oscillator is built as a shielded modular unit for the author's HF amateur-band receiver. Total power consumption of the oscillator is about 40 milliwatts.

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design variable for the depth of the null. Resistor R1 in fig. 2 determines the sharpness of the phase change, and also the depth of the attenuation notch at the null frequency. Large amounts of Bridged-T null attenuation will not work here, because the amplifier has only limited gain to compensate for network loss. Therefore we must compromise a bit on the sharpness, or "Q," of the network in favor of a moderate null that can be offset by the gain of the amplifier stage. The same R1 in the Bridged-T circuit is represented as the unbypassed MOSFET source resistor in the Vackar circuit. Its value influences both the DC operating point and the AC gain of the transistor amplifier. Therefore, the value of R1 is a compromise between the necessary amplifier gain and the depth of the Bridged-T attenuation null, and consequently the slope of the phase angle change. With the circuit values shown in fig. 3, the overall attenuation of the Bridged-T feedback element is 22.1 dB, requiring an amplifier voltage gain of 12.8 V/V. This is more voltage gain than a junction FET amplifier stage can normally provide, so a dual-gate MOSFET transistor is used for the necessary stage gain. A JFET could be used if the ratio of C4/C5 in fig. 3 is lowered to about 1:5 to increase the coupling of the Bridged-T network to the transistor.

The series combination of C4 and C5, in parallel with the variable tuning capacitors C2 and C3, all together make up what is shown as C2 in the Bridged-T network of fig. 2. Like the familiar Colpitts and Clapp oscillator circuits, the Vackar variable tuning capacitor is quite small when compared to the large capacitance values shunting the transistor.

Drift in Oscillators

If all components in an oscillator circuit could be made absolutely independent of temperature and independent of changes in parasitic capacitances, then the oscillator would exhibit no drift. The temperature behavior of discrete L and C components can be controlled to a large extent by careful selection of parts to exhibit minimum temperature dependence. The normally positive TC of the inductor can be compensated by a matching negative TC in the tuning capacitor. The temperature dependence of the transistor can be minimized by using a transistor with low parasitic capacitance to start with, and then by surrounding the transistor with large values of fixed capacitance, as this circuit provides. Then any temperature-induced change in the transistor parasitic capacitance will result in a small percentage overall capacitance change. The *RCA Transistor Handbook* reports that the MOSFET transistor is superior in the area of capacitance

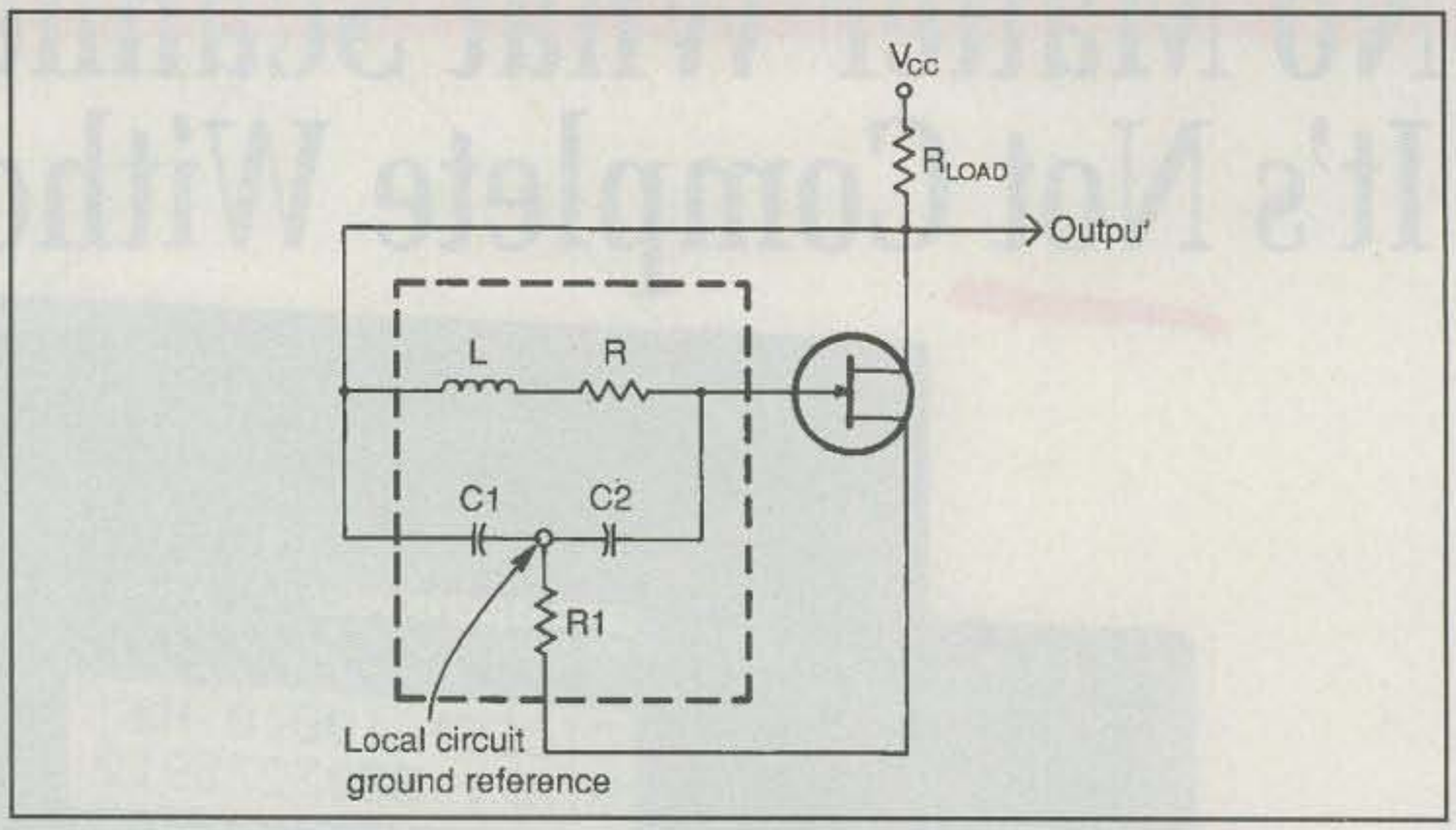


Fig. 2– The Vackar oscillator circuit drawn to show the Bridged-T network as the feedback element.

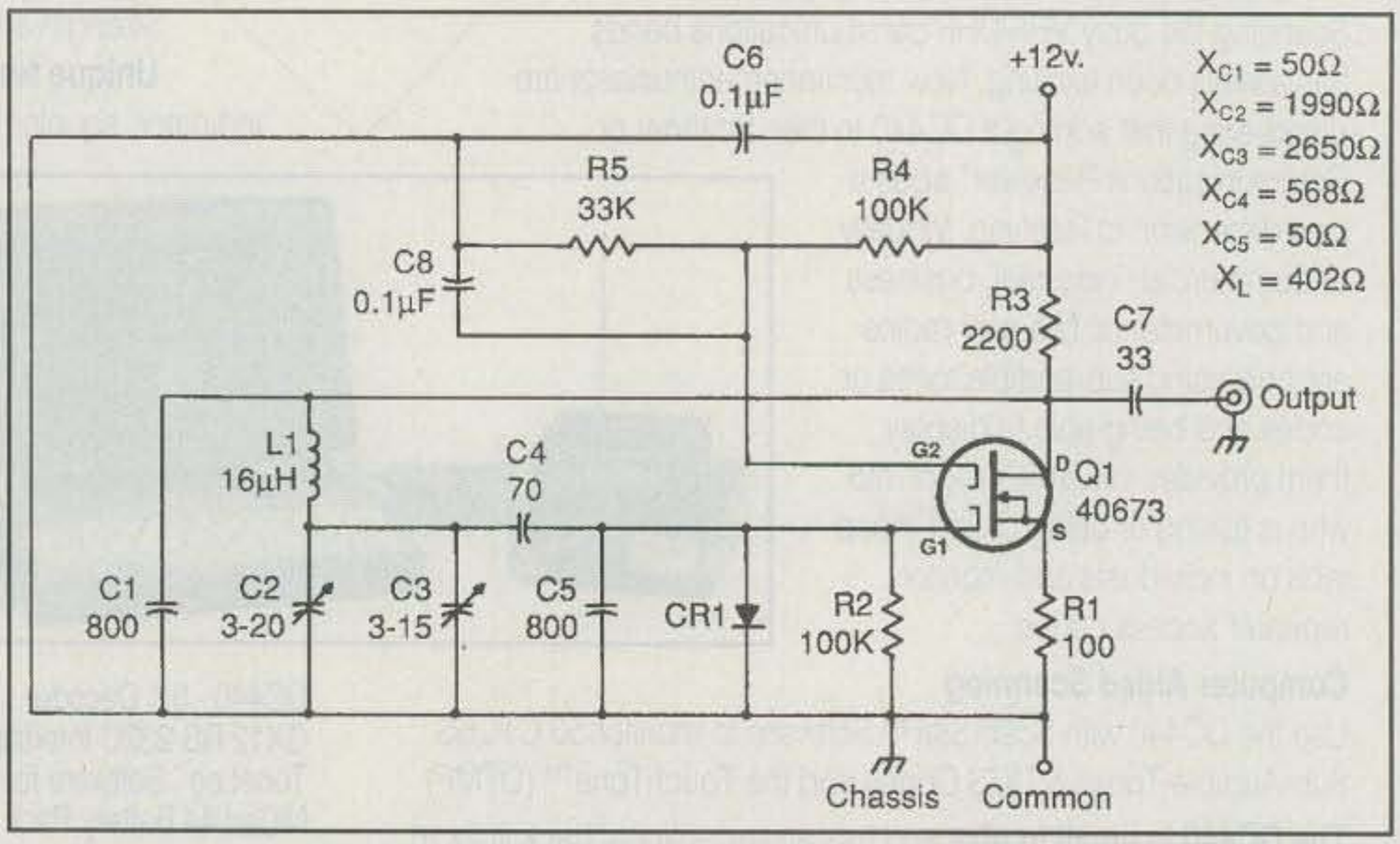
stability with temperature. This alone indicates a marked improvement in performance over a bipolar transistor.

Scaling For Other Frequencies

The Vackar circuit can be adapted for other frequencies in the HF range, but it is best to operate L-C oscillators below about 6 or 7 MHz. For higher frequencies, multiplication or mixing will yield the most stable results. The circuit values shown in fig. 3 will tune the oscillator between 4.0 and 4.3 MHz. Other frequencies may be obtained by scaling the L and C components so that their reactances remain approximately the same as indicated. To convert the circuit shown to cover a full 500 kHz, from 4.0 to 4.5 MHz, L1 must be decreased slightly in number of turns, and the main tuning capacitor, C3, increased in maximum value. The many circuit variables will never permit an exact calculation of L and C values for a given frequency span, but the values given will be very close so that a frequency counter or calibrated receiver can be used to fine tune the upper and lower VFO frequency limits.

Oscillator Performance

These days amateur radio operators who design and build their own transmitting oscillators are most likely to communicate



C1, C5—800 pF polystyrene (see text)
C2—20 pF air variable trimmer (calibrate)
C3—15 pF air variable (main tuning)
C4—70 pF NPO ceramic + silver mica (see text)
C7—33 pF NPO ceramic
C6, C8—0.1 uF 25V monolithic capacitor
Q1—RCA 40673 or SK3050 dual-gate MOSFET
CR1—1N4153 or 1N914 silicon signal diode
L1—16 uHy 34T #26 enam. on 3/4 inch diameter ceramic form.
No slug core is used. Winding length is 0.6".
All resistors are 1/4 watt 5%.

Fig. 3– The Vackar oscillator schematic diagram. Component values shown tune 4.0 MHz to 4.3 MHz.

with others who are using synthesized phase-lock receivers and transmitters. The frequency stability of modern commercial radios is essentially that of a crystal oscillator, and operators nowadays are not accustomed to tolerating stations that drift in frequency. For this reason, the home constructor must try to produce the most stable oscillator possible. Room temperature tests of this Vackar oscillator at 4 MHz were conducted using a frequency counter. After stabilization, the long-term frequency drift did not exceed 5 Hz. This excellent stability of about 1 PPM approaches crystal oscillator performance.

Construction Notes

This Vackar oscillator was constructed in a die-cast metal box to provide mechanical stability, RF shielding, and some measure of temperature isolation. For maximum temperature stability, both the voltage regulator and the buffer amplifier, described below, were added externally to the oscillator enclosure. The main tuning capacitor, C3, should be a high-quality double-bearing air variable. I used a Hammarlund HFD-15X dual unit having ceramic insulation and 15 pF per section. Only one section was necessary to cover the required band spread. Trimmer capacitor C2 is also a ceramic-base air variable.

C1, C4, and C5 are made up of parallel capacitors which add up to the values shown. The use of multiple capacitors enhances frequency stability. Because RF currents divide between the capacitors, it follows that the RF heating of the dielectric in each individual capacitor is reduced. C1 and C5 are each implemented from two polystyrene capacitors, while C4 is a combination of an NPO ceramic and a silver mica. By introducing a silver mica capacitor as a small part of C4, a slight negative TC is provided to offset the positive TC of L1. The exact amount of negative TC required in C4 must be determined by experiment. It is only fair to say that complete temperature compensation of this or any oscillator is a tedious process, so the constructor must be prepared to spend as much time with capacitor selection as is required to build the oscillator initially. The results, however, are worth the effort. Solder posts were installed on the circuit board to facilitate selection of final values for C4. The final values for C4 in this prototype Vackar were: NPO ceramic = 62 pF, and silver mica = 8 pF.

As in other FET oscillators, CR1 stabilizes the operating point of the transistor by generating a rectified negative AGC voltage at gate 1. The AGC action is degenerative in that it reduces and stabilizes the stage gain before any amplifier saturation takes place. A high-speed signal-switching diode, such as a 1N4153 or 1N914, is recommended for its low reverse bias capacitance, which appears as a small but unwanted part of the tuned circuit.

To obtain a high Q, L1 was wound on a 3/4 inch ceramic form. This coil form had a tuning slug which was removed, also in the interest of maintaining a low TC and a high Q.

Instead of the usual Zener diode voltage regulator, I used an LM 317 adjustable IC regulator set at 12 volts. Like most oscillators, the Vackar oscillator is slightly sensitive to supply-voltage change, so the best regulator you can use will be to your advantage. The Vackar circuit as shown starts and operates reliably with a supply down to about 7 volts, but frequency stability doesn't seem to improve using this lower supply voltage. For maximum load stability, the Vackar oscillator should be buffered by a high input impedance Class A amplifier, which is common practice following any L-C oscillator. A suitable buffer circuit may be found in the *ARRL Handbook*, or in the ARRL publication *Solid State Design for the Radio Amateur*.

Adjustment

Inexpensive MOSFET transistors have a wide specification tolerance on Idss, which affects the operating current. The Vackar power supply current under oscillating conditions should to be 3 to 4 ma. There is the possibility that a particular MOSFET may operate at the edge of its specification limit, so that selection of another MOSFET of the same type might be required, although the circuit will operate very nicely if the power-supply current turns out slightly under or over this target value. After a reasonable value of operating current is verified, calibration of the oscillator range can proceed.

To set the low frequency limit of the oscillator, adjust the turns of L1. In this step set C2 to about one half capacitance and set C3 fully meshed. This adjustment will be faster if L1 is first wound with extra turns, since it is easier to remove turns than to add them. C2 is adjusted to exactly calibrate the low frequency limit. The minimum capacitance of C3 will then determine the high frequency limit. After L1 is set, coat the coil with Q-dope, or polystyrene cement. Q-dope is difficult to find these days, so I made my own by dissolving a styrofoam ball (craft item) in lacquer thinner.

Whether you use the Vackar oscillator as the basis for a transmitter VFO, local oscillator, or BFO in your next project, you will enjoy the maximum possible freedom from oscillator drift without any increase in circuit complexity over the other popular oscillator circuits.

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1. Vackar, Jiri, "LC Oscillators and Their Frequency Stability," *Tesla Technical Reports* (Czechoslovakia), Dec. 1949.

2. Carter, Floyd, "Meet the Remarkable but Little-Known Vackar VFO," *QST*, Sept. 1978. p. 15. Also reprinted in *QRP Classics*, ARRL, 1990, pp. 119–122.

3. Landee, Albrecht, Davis, *Electronic Designer's Handbook*, McGraw-Hill, 1957, section 16.2a. ■

CQ REVIEWS:

The Create CLP 5130-1 Log Periodic Antenna

BY JOE LYNCH*, N6CL

Log periodic antennas are popular with amateur radio operators because of their broad frequency coverage. They have been around in amateur radio use in some form or another since the 1960s. Over the years amateur radio publications have contained in excess of 40 articles on their construction and theory of operation. In addition, *The ARRL Antenna Book* devotes a chapter (27 pages) to the design and construction of these antennas.

While they represent a compromise in gain, they make up for it in versatility. Additionally, the low overall SWR and good front-to-back and front-to-side patterns are pluses for log periodic antennas.

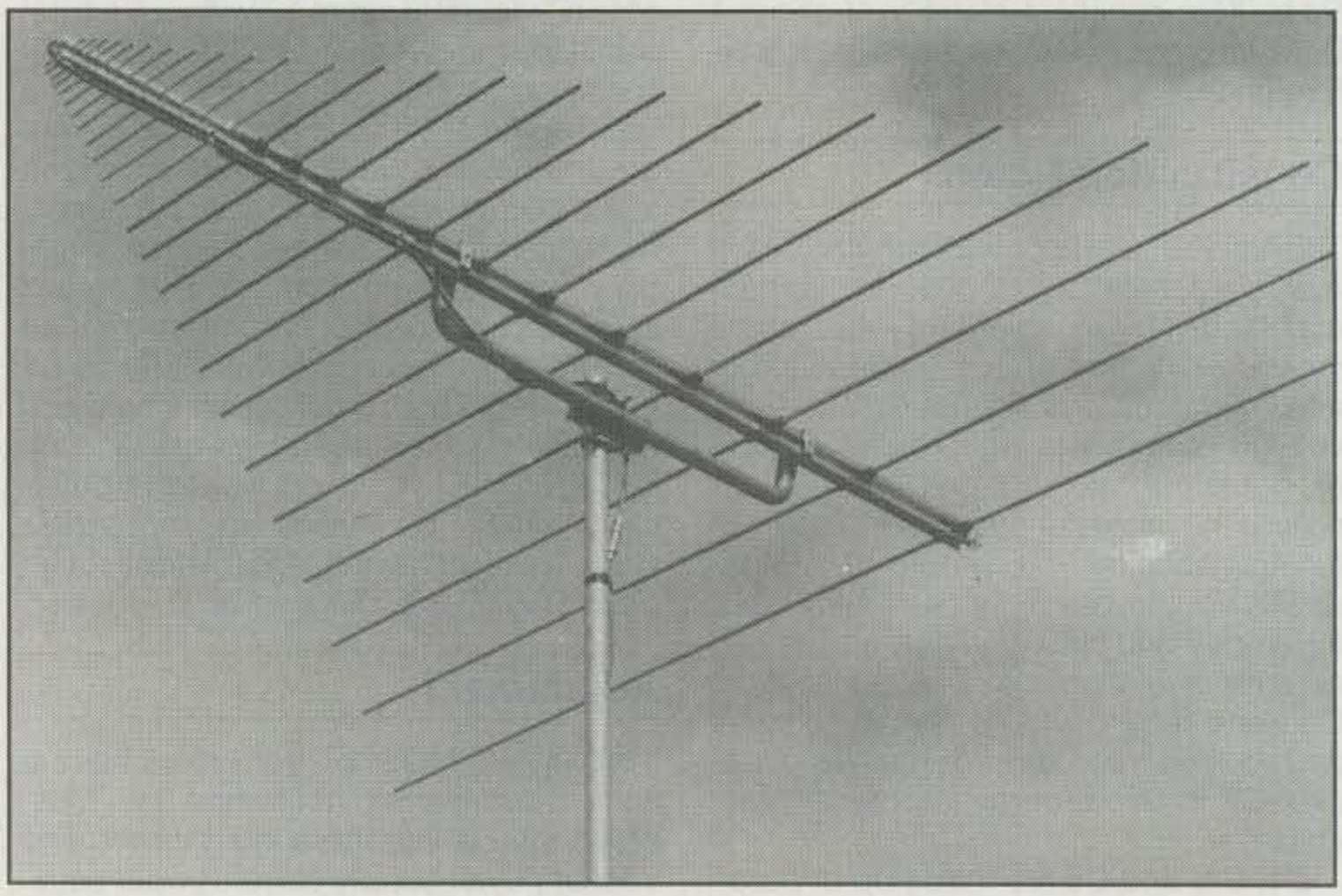
Typically, insofar as gain, the log periodic operates similar to a 3-element Yagi antenna over a given frequency range. The gain you can expect, however, is a bit lower than that of a 3-element antenna. It is, at the most, around 6–7 dB over a dipole antenna.

Because of the broad frequency coverage in one antenna, log periodics have become popular with the VHF+ amateur and SWL. In fact, most people's exposure to the log periodic antenna is by way of their TV antenna.

Enter a log periodic for amateur radio VHF+ use. For more than a year the Create CLP 5130 series VHF/UHF log periodic antennas have been available to U.S. buyers. There are two models that are imported by Electronic Distributors Co. They are the 5130-1, which covers 50–1300 MHz, and the 5130-2, which covers 105–1300 MHz.

After hearing that a growing number of my fellow VHF+ operators had obtained the 5130-1 model, particularly for their Rover operations, I decided that I also had to have one. I ordered mine, and it came on a cold winter's day here in Oklahoma. Not wanting to venture outside to assemble it, I took a chance that it would not be too large, fully assembled, to fit into the living room.

Upon opening the box, I found that everything was packed in a logical, organized manner. The hardware was packed inside various sealed plastic bags. I unpacked everything and laid out the parts on the carpet. I then emptied the hardware into separate bowls that I previously had obtained from the kitchen. So far, so good.



If you can have only one antenna for VHF/UHF operating, you should consider buying the Create CLP 5130-1 log periodic.

Next I read the manual. I found it to be adequate. It was skimpy on detailed instructions, which left a bit of the construction to my imagination. And I caught a few grammatical errors and misspellings. However, it was full of cautions concerning the installation of the antenna, and I was quite pleased to see that. It also had one curious sentence, and I have not been able to figure out where this information came from. It states: "Height limitations are placed on antenna installations by the FCC, normally at 20 meters above ground or 10 meters above a building for amateurs." This is the only bit of misinformation that I found. Nevertheless, after reading the manual I forged ahead.

The first item to construct was the front boom section. This part comes in two sections, with each containing 12 of the elements (elements 2–13) folded back onto each boom section for shipping. My job was to fan out these elements to a 90° position and lock them into place with the appropriate screws and nuts.

After assembling the front boom, I bolted the two sections of it together at the appropriate place using the appropriate screw, lock washer, nut, rubber spacers, and plastic sleeve and temporarily set it aside.

The next section to construct was the rear boom section. It is composed of two rails that are held together by rubberized insulators that also hold the elements. This section comes bolted together at each end. You must position and then bolt in place the remaining ten insulators using the same type of spacers, screws, washers, and nuts as applied in the front boom section. *Note:* Perform this assembly before you start inserting the elements. I forgot and found it a bit challenging to reach around or between the elements in order to hold the nut in place while turning the screw.

Next comes the assembly of the elements. They are slid into the holes of the rubber insulators and attached to the rails with a self-tapping screw. They go in fairly smoothly. However, after inserting the element, I found that I needed to use a small Phillips-type screwdriver blade or awl poked into the hole on the rail and into the insulator in order to align the hole on the element prior to driving in the self-tapping screw.

The next assembly was the joining of

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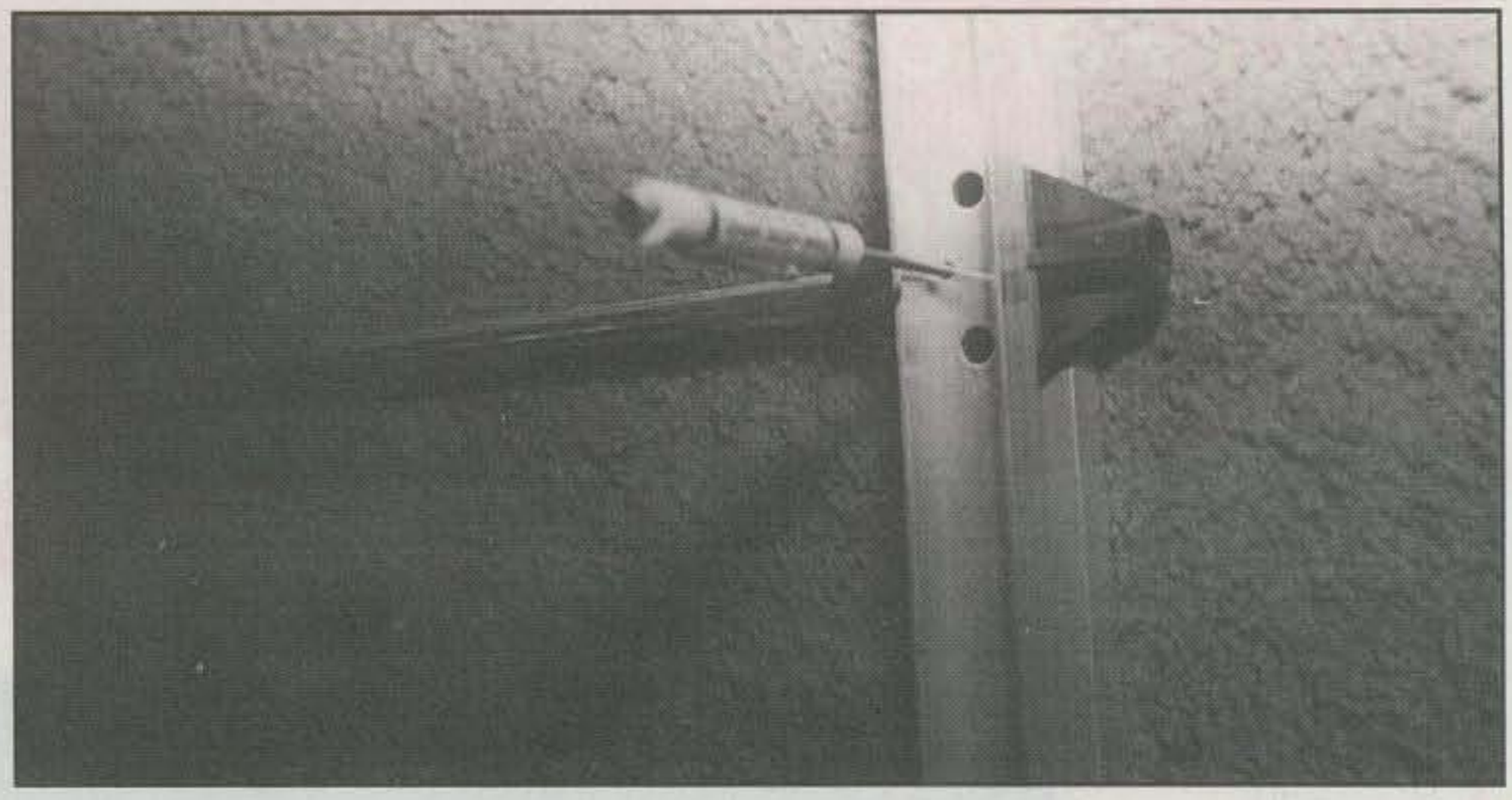
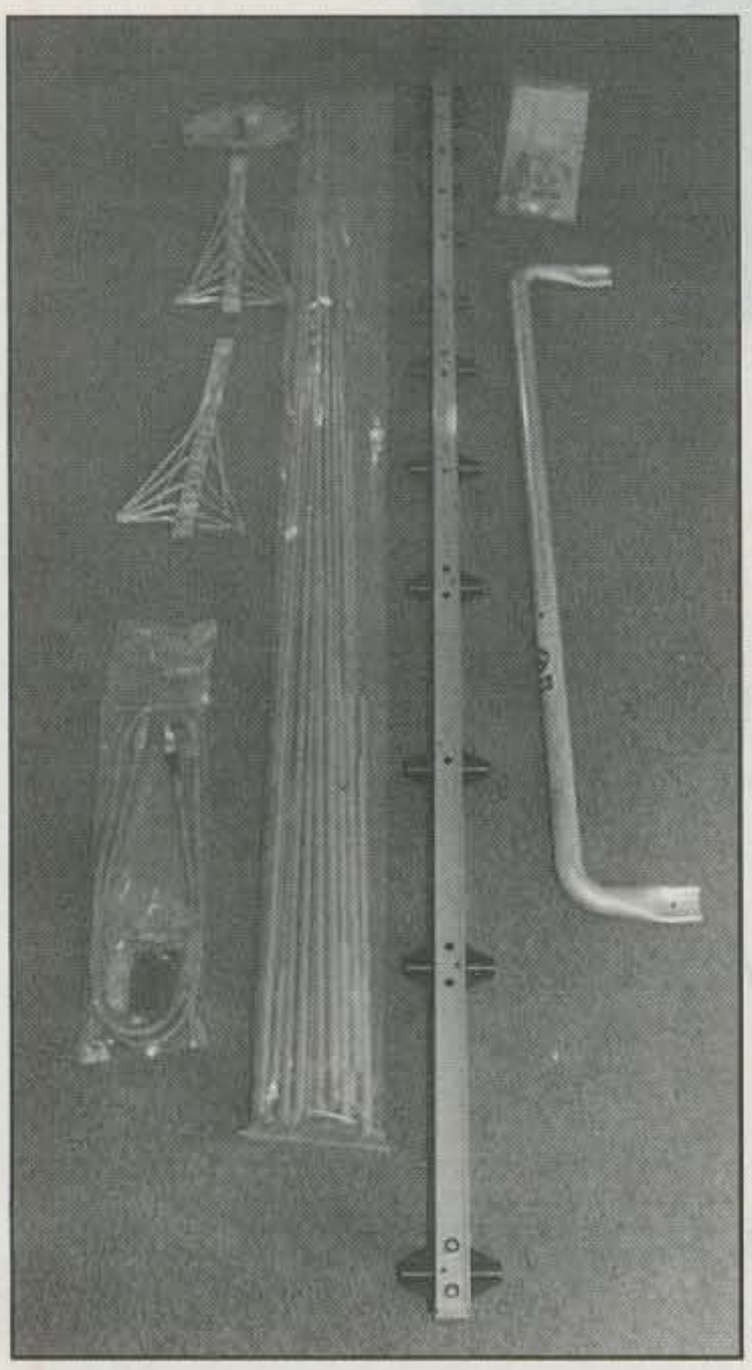
Number of elements	25
Polarization	Horizontal (vertical possible)
Forward Gain	10–12 dBi (claimed)
F/B Ratio	15 dB
Impedance	50 ohms
Half Power Point	70–60 degrees
VSWR	2.0:1 or less
Power Rating	500W PEP
Boom Length	6'8" (2.0 m)
Element Length	Max. 9'10" (3 m)
Mast Size	1'1/2–2" (38–50 mm)
Weight	11 lbs. (5 kg)
Wind Survival	90 mph (40 m/sec.)

Table I– Manufacturer's specifications for the Create log periodic CLP 5130-1.



I used a small Phillips-type screwdriver to align the holes of the element, insulator, and boom before driving in the self-tapping screw.



All the parts for the Create CLP 5130-1 log periodic antenna were neatly boxed. Here they are placed on the living room floor ready for assembly.

the two booms. This is done simply by sliding the front boom into the grooves on the front of the rear boom and attaching the front boom to the rear boom with two lock washers and screws. There are nuts welded to the under side of each of the front boom sections, so there is no necessity to fumble around and hold a nut in place while driving in the screw.

The antenna is fed from the very front of the boom. It uses a specially designed section of coax that contains feeder plates on one end and a type-N female connector on the other. The feeder plates are held in place by two screws each which pass through the feeder plate and then attach to the first elements of the antenna. Again, there is no need to fumble with holding nuts between the rails of the front boom while driving the screws, because the holes in the elements are threaded.

Once attached to the front of the boom, the coax is then routed toward the center of the boom and held in place by three plastic clamps. The design of the rails of the boom is such that no matter to which side you attach feeder plates, there are corresponding holes along the rails for the screws and nuts to attach the plastic clamps. *Note:* While the illustration shows the nut on the outside of the rail, I found that it was easier to secure the screw and nut by having the screw on the outside.

The next assembly was that of the boom clamp. There are four rubberized spacers that go on each side of the rails. The boom clamp is attached so that it is on the same side of the antenna as the coax cable.

On one side of the rails and the spacers you attach the boom clamp. On the other side you attach the plates. The boom is situated just in front of the eighteenth element (called E-17 in the illustration) and about 2½ inches behind the twenty-third element (called E-22 in the illustration).

Once the boom clamp is attached, the boom-to-mast plate is installed. There are four "U" clamps, two of each size supplied. For convenience and reference (see further on in this article for orientation of the plate for polarization of the antenna) I attached the larger "U" clamps at this time. Next I attached the plate to the boom clamp using the two smaller "U" clamps and the nuts and lock washers.

Here is where you determine the polarization orientation of the antenna. Before you tighten the nuts, determine whether you will orient the antenna horizontally or vertically. For my installation I chose horizontally.

If your choice is horizontally, swing the plate around so that the larger "U" clamps are directly underneath the boom. If if you choose a vertical orientation, swing the plate around so that the larger "U" clamps are perpendicular to the antenna elements. *Note:* If you choose a vertical orientation, once the plate is secured, notice which side of the antenna elements are pointing upward when the antenna will be installed. Then plug the ends of these elements with the supplied rubber plugs.

The last item to be attached is the arrestor coil. It is secured to the rear of the boom through two holes. However, this is an item that you may want to wait to attach until you are just about ready to install the antenna. If you are like me, you may want to lean the antenna against something (like the back of a van or the side of the house). If you do so with the arrestor coil in place, you can very easily crush it. So wait to install it, but don't forget it because it provides an electrical short of the two rails of the boom and is necessary for the proper operation of the antenna.

Every time I write a review of an antenna I caution you about installing it. This review is no exception. **Warning: High voltage lines can kill you.** The minimum clearance between an antenna and an overhead power line is 10 feet. This antenna is small and light enough so that you can install it almost anywhere—even in your attic. If you cannot find a safe place outdoors, then put it in your attic. Even then, avoid poking the elements into power lines running through the attic.

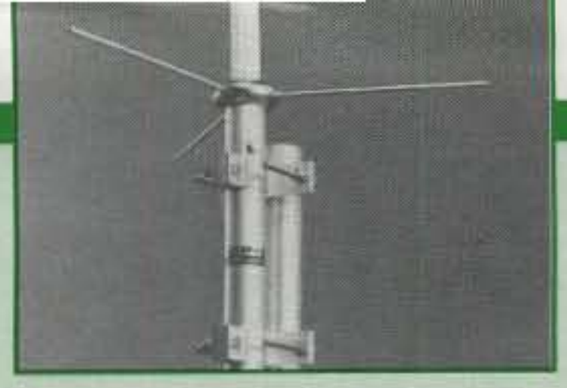
If you are installing the antenna on the outside, then make sure that the mast is clear of power lines and power company service drops into your house should the mast fall to the ground. Above all, in your antenna installation play it safe.

What about the practicality of this antenna? With its frequency range you can cover 6 and 2 meters, as well as 135, 70,

COMET

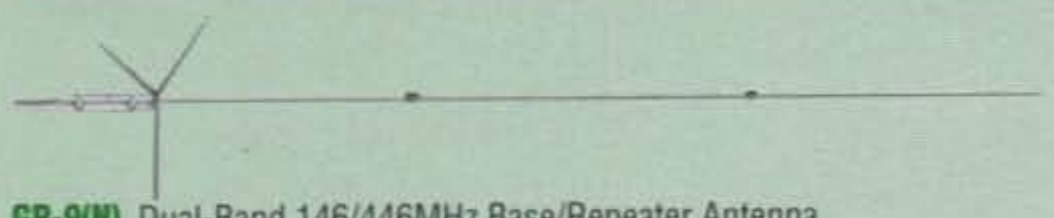
MODERN, MULTI-BAND ANTENNA SYSTEMS

BASE/REPEATER ANTENNA PRODUCTS

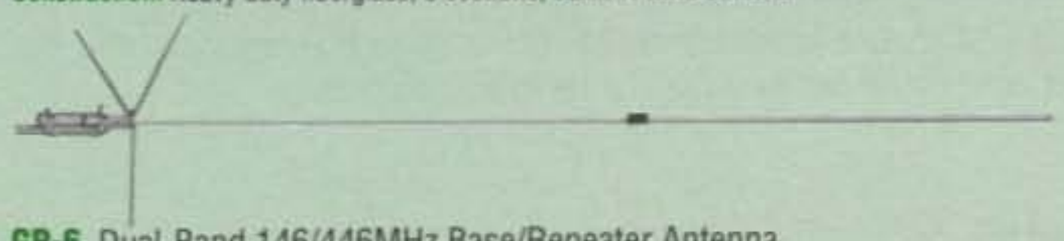


Featuring the COMET exclusive SLC System. The SLC actually increases the gain of the Dual/TriBand Antennas. A completely pre-formed phasing coil and phosphorous copper element produces a low-loss, highly effective, high gain antenna. All COMET antennas are pre-tuned and come complete will all mounting hardware. Simply mount to your mast and experience incredible COMET performance!

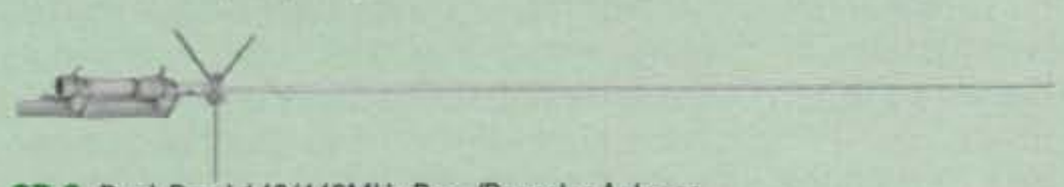
COMET DUAL-BAND



GP-9(N) Dual-Band 146/446MHz Base/Repeater Antenna
Gain & Wave: 146MHz 8.5dBi 5/8 wave x 3 446MHz 11.9dBi 5/8 wave x 8 **VSWR:** 1.5:1 or less **Length:** 17' 8" **Max Power:** 200W PEP **Weight:** 5lbs. 11ozs.
Connector: SO-239 (GP-9), N-type (GP-9N) **Mounts to Mast Size:** 1.25"-2.50"
Construction: Heavy duty fiberglass, 3 sections, 92MPH wind survival



GP-6 Dual-Band 146/446MHz Base/Repeater Antenna
Gain & Wave: 146MHz 6.5dBi 5/8 wave x 2 446MHz 9.0dBi 5/8 wave x 5 **VSWR:** 1.5:1 or less **Length:** 10' 2" **Max Power:** 200W PEP **Weight:** 3lbs. 8oz.
Connector: Gold-Plated SO-239 **Mounts to Mast Size:** 1.25"-2.50"
Construction: Heavy duty fiberglass, 2 sections, 112MPH wind survival



GP-3 Dual-Band 146/446MHz Base/Repeater Antenna
Gain & Wave: 146MHz 4.5dBi 5/8 wave 446MHz 7.2dBi 5/8 wave x 3 **VSWR:** 1.5:1 or less **Length:** 5' 10" **Max Power:** 200W PEP **Weight:** 2lbs. 9ozs.
Connector: Gold-Plated SO-239 **Mounts to Mast Size:** 1.25"-2.50"
Construction: Single piece fiberglass, 130MPH wind survival

COMET MONO-BAND

CA-ABC23 Mono-Band 146MHz Base/Repeater Antenna
Gain & Wave: 146MHz 7.8dBi 5/8 wave x 3 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
Connector: SO-239 **Length:** 14' 12" **Weight:** 3lbs. 8 ozs.
Mounts to Mast Size: 1.25"-2.50"
Construction: Thick-wall aluminum, 3 sections, 70MPH wind survival

CA-712EF Mono-Band 446MHz Base/Repeater Antenna
Gain & Wave: 446MHz 9dBi 1/2 wave x 12 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
Connector: N-type **Length:** 10' 5" **Weight:** 2lbs. 12ozs.
Mounts to Mast Size: 1.25"-2.50"
Construction: Heavy duty fiberglass, 2 sections, 105MPH wind survival

CA-62DB Mono-Band 6 Meter FM Antenna
Gain & Wave: 52MHz 6.5dBi 5/8 wave x 2 **VSWR:** 1.5:1 or less **Max Power:** 500W PEP
Connector: SO-239 **Length:** 21' 8" **Weight:** 5lbs. 11ozs.
Mounts toMast Size: 1.25"-2.50"
Construction: Thick-wall aluminum, 5 sections, 100MPH wind survival

COMET products are available from most major dealers. For customer service, or a complete catalog, please call us at 800/962-2611. We're confident COMET products and accessories will enable you to enjoy Amateur Radio to its fullest!

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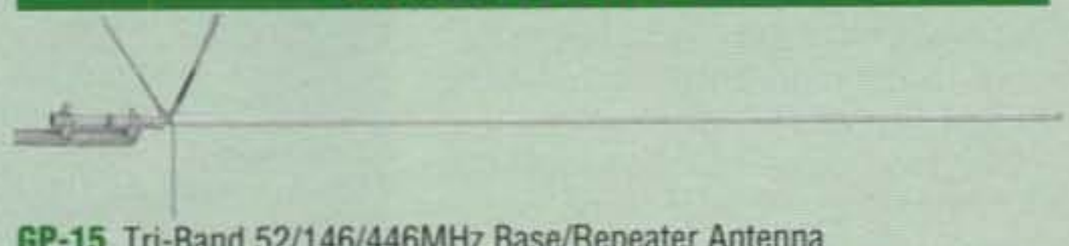
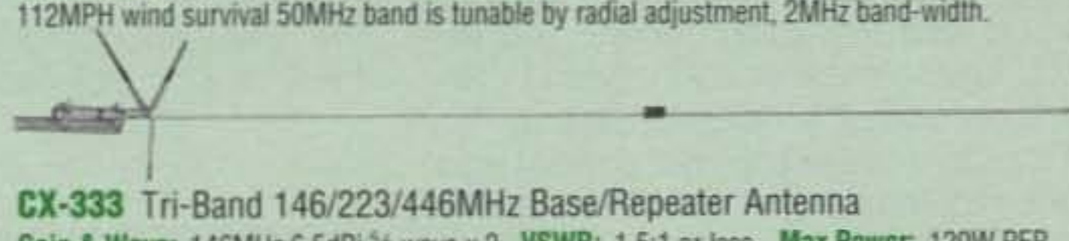
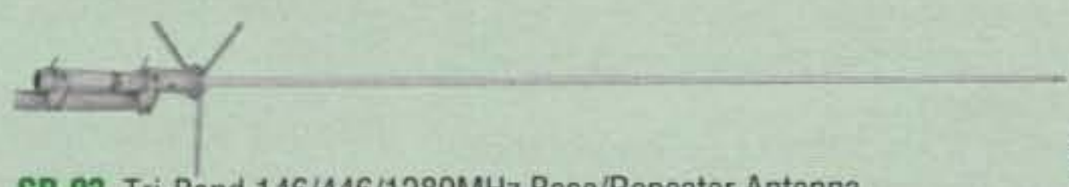
COMET TRI-BAND



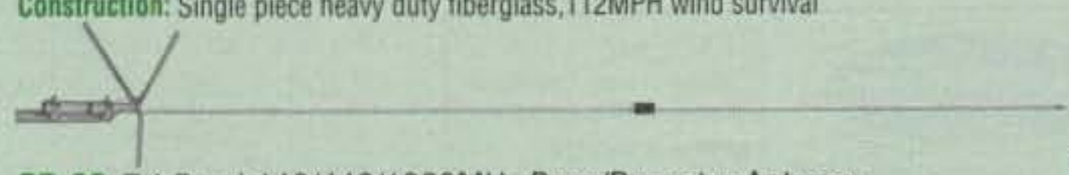
GP-15 Tri-Band 52/146/446MHz Base/Repeater Antenna
Gain & Wave: 50-54MHz 3.0dBi 5/8 wave 146MHz 6.2dBi 5/8 wave x 2 446MHz 8.6dBi 5/8 wave x 4 **VSWR:** 1.5:1 or less **Length:** 7' 11" **Max Power:** 300W PEP **Weight:** 3 lbs. 1 oz.
Connector: Gold-Plated SO-239 **Mounts to Mast Size:** 1.25"-2.50"
Construction: Single piece heavy-duty fiberglass, 112MPH wind survival 50MHz band is tunable by radial adjustment, 2MHz band-width.



CX-333 Tri-Band 146/223/446MHz Base/Repeater Antenna
Gain & Wave: 146MHz 6.5dBi 5/8 wave x 2 223MHz 7.8dBi 5/8 wave x 3 446MHz 9.0dBi 5/8 wave x 5 **VSWR:** 1.5:1 or less **Length:** 10' 2" **Max Power:** 120W PEP **Weight:** 3 lbs. 10 ozs.
Mounts to Mast Size: 1.25"-2.50"
Connector: Gold-Plated SO-239
Construction: Heavy duty fiberglass, 2 sections, 112MPH wind survival



GP-93 Tri-Band 146/446/1280MHz Base/Repeater Antenna
Gain & Wave: 146MHz 4.5dBi 5/8 wave 446MHz 7.2dBi 5/8 wave x 3 1280MHz 10dBi 5/8 wave x 6 **VSWR:** 1.5:1 or less **Length:** 5' 7" **Mounts to Mast Size:** 1.25"-2.50" **Max Power:** 300W PEP (146MHz) 200W PEP (446/1.2) **Weight:** 2 lbs. 8ozs.
Connector: Gold-Plated N-type
Construction: Single piece heavy duty fiberglass,112MPH wind survival



GP-98 Tri-Band 146/446/1280MHz Base/Repeater Antenna
Gain & Wave: 146MHz 6.5dBi 5/8 wave x 2 446MHz 9.0dBi 5/8 wave x 5 1280MHz 13.5dBi 5/8 wave x 12 **VSWR:** 1.5:1 or less **Length:** 9' 8" **Mounts to Mast Size:** 1.25"-2.50" **Max Power:** 300W PEP (146MHz) 200W PEP (446/1.2) **Weight:** 3 lbs. 8ozs.
Connector: Gold-Plated N-type
Construction: Heavy-duty fiberglass, 2 sections, 112MPH wind survival

CROSS NEEDLE METERS

- Separate Meter and RF Sensor allows for convenient placement of the meter.
- Cross Needle Meter provides FWD, REF, and VSWR simultaneously.
- The RF-Sensor is a compact design, and has an extremely low-loss circuit.
- Beautifully illuminated when connected to power supply.
- 6 foot cable standard.
- Optional EKS-3 10 foot extension cable for a total of 16 feet between the sensor and meter.
- Compact Size: (L) 4.75" x (W) 1.75" x (H) 3.5"

CMX-1	CMX-2	CMX-3
1.8-60MHz	1.8-200MHz	140-525MHZ
0-2KW	0-200W	0-200W
30/300/2KW	20/50/200W	20/50/200W

CIRCLE 148 ON READER SERVICE CARD

33, and 23 cm. As mentioned above, friends of mine are already using it for Rover operations.

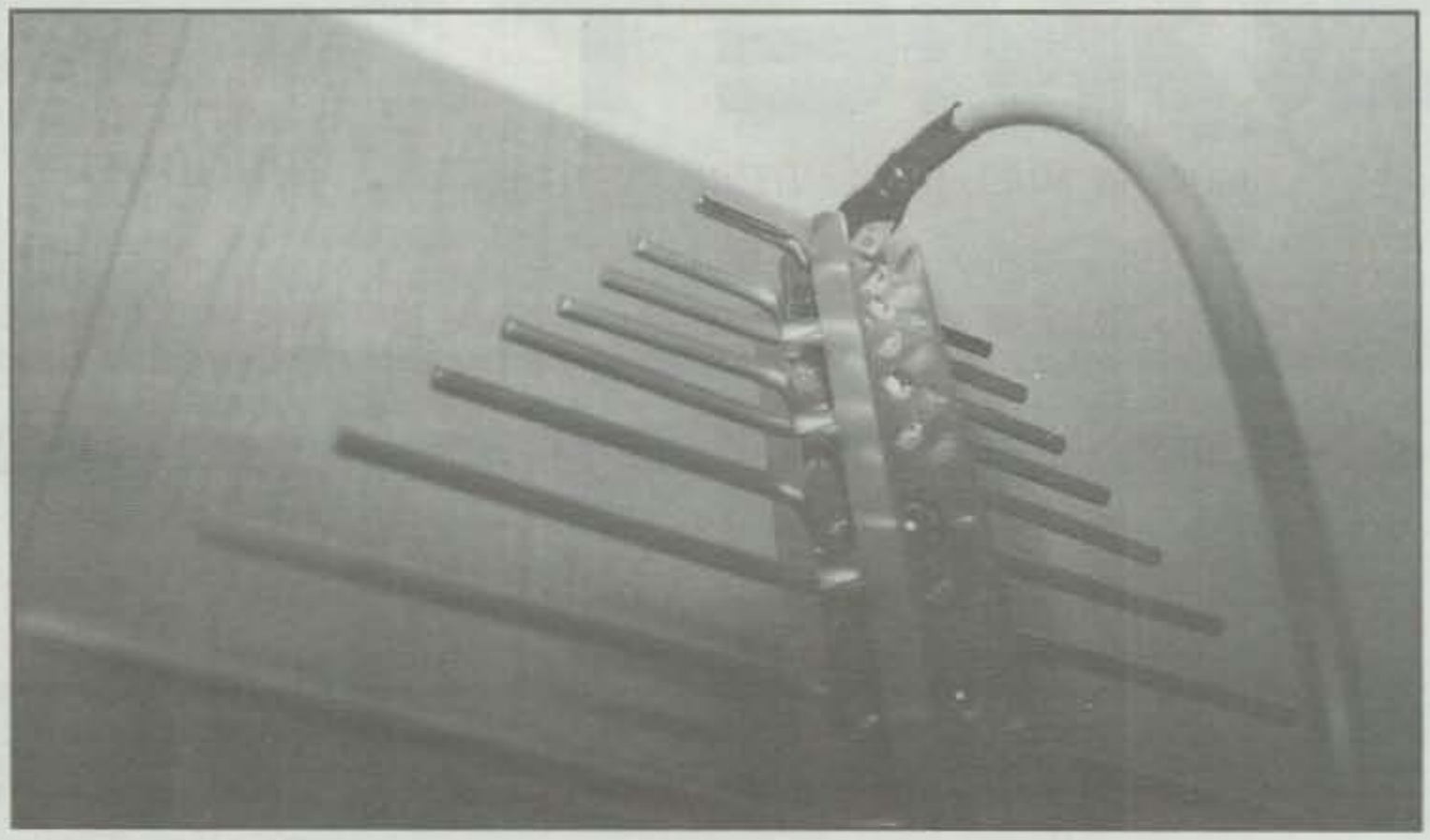
You can use it in the vertically polarized position to work into a local split repeater. For example, with my TM 742 and the Diamond MX-72H duplexer, which combines the two outputs for the separate bands, I can work crossband through a 70 cm input/2 meter output repeater.

Keep in mind, however, that should you orient the antenna vertically, the top portion of the mast must be made from nonconductive material in order to keep the mast "out of the plane" of the antenna. Additionally, the coax should be routed in such a manner that it is also kept "out of the pattern" of the vertically polarized antenna.

I solved this problem by using a piece of PVC-type electrical conduit that was reinforced with a wooden dowel rod inside of it for the mast section. Next I created a loop from the coax by taping the top of the loop to the top of the mast and the bottom of the loop around 5 feet down from the top of the mast. The size of the loop is not critical, just so that there is about a foot at the center of the loop and the loop is facing perpendicularly away from the antenna.

You can also use this antenna for your packet station.

You might want to put up one of these antennas and tell your neighbors that it is a TV antenna, because it can also double as a TV antenna since it covers all the channels, both VHF and UHF.



The specially designed coaxial cable is attached to the front of the log periodic by four screws and the front two (self threaded) elements.

Speaking of TV, this antenna can be used for ATV. Whether you are working simplex or through an in-band repeater or a crossband repeater, the versatility of its frequency coverage makes it practical for any ATV operation on the three most popular ATV bands.

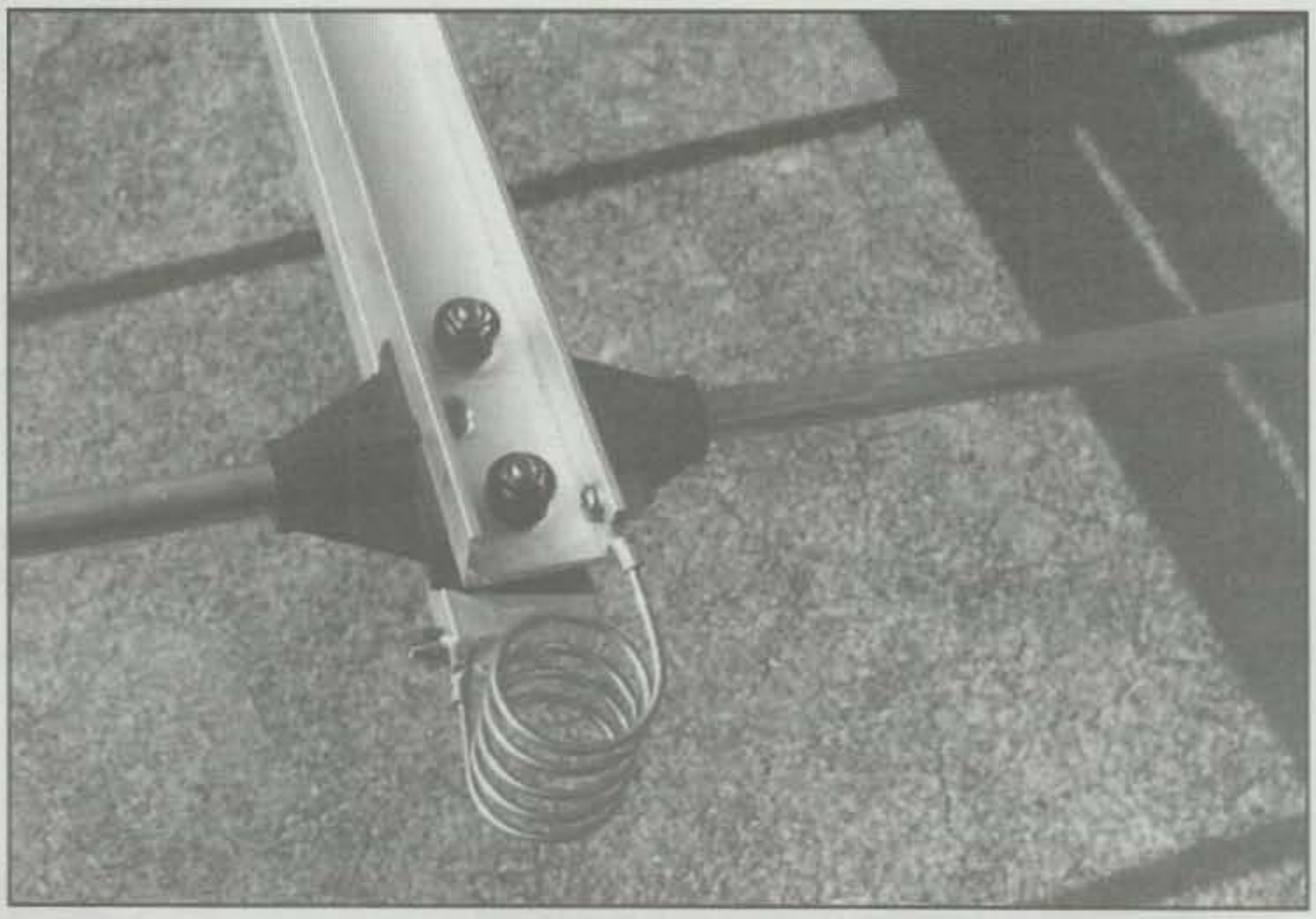
Are you an SWL who likes to monitor scanner frequencies on the VHF/UHF bands? This antenna covers them.

Overall, I found the construction laborious (which is to be expected, considering its complexity). However, the layout of the construction was well organized.

It is important to note that when designing such a complicated multi-element (25 in all) antenna, one must keep in mind the ultimate assembly of it by an amateur builder. For this model I can say that the engineers at Creative Design Company live up to their name.

Incidentally, I was right about my antenna fitting into the living room fully assembled, because fully assembled it fit on the floor just fine and it just slid underneath the door frame as I took it out the front door.

As mentioned above, the antenna is imported by Electronic Distributors Co., P.O. Box 1936, Vienna, VA 22180. You can call 703-938-8105 or FAX 703-938-6911 to find out the name of the dealer nearest you. The suggested retail price of the CLP 5130-1 is $299.95, and the 5130-2 is $199.95. ■



The Arrestor coil is the last item to be installed. You might want to wait to install it just prior to installing the antenna in order to keep from accidently crushing it.

CQ SHOWCASE

Telex Ear-Mike

Telex Communications has announced the Ear-Mike designed to make discreet two-way communications possible for security personnel. The new E-COMM™ EC-100 combines the functions of a microphone and an earphone in one tiny unit. It includes a transducer and an interface module with push-to-talk (PTT) switch, microphone amplifier, belt clip, and a permanently attached radio interface cable. The EC-100 interface module connects to the user's two-way radio via the interface cable. The transducer, which is about the size of a dime, is covered by a foam earbud and fits in the user's ear. To communicate the user depresses the push-to-talk button on the interface module and begins speaking.

Operating power is supplied by an internal AA-size battery. The EC-100 is compatible with the security profession's most widely used portable radios. For information, contact Telex Communications, Inc., 9600 Aldrich Ave. S., Minneapolis, MN 55420 (612-887-5530).

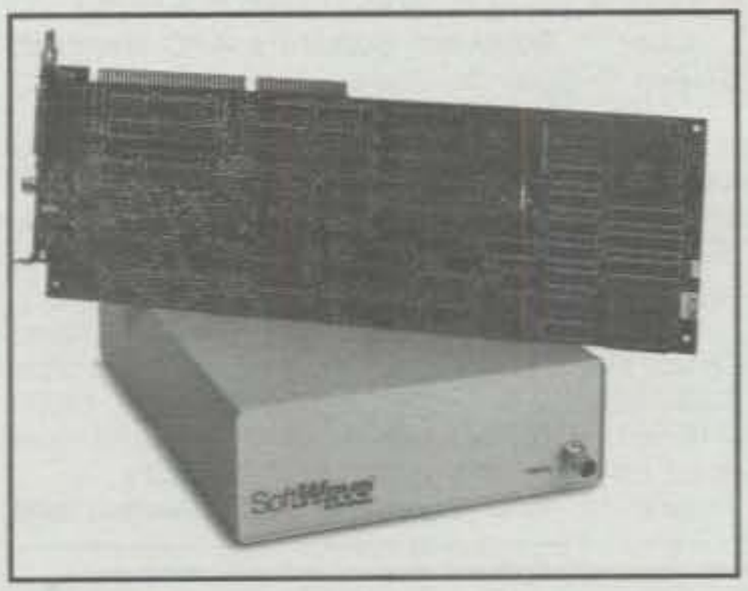
AEA KK-1 Keyboard Keyer

The KK-1 turns any standard PC-compatible 101-key keyboard into a Morse code machine. Using the provided cable, the KK-1 will share a keyboard with your computer. A key combination switches the keyboard between the keyer and your computer. Features of the KK-1 include: separate numeric and cursor control keypads used for accessing the majority of functions; function keys that select the twelve nestable message buffers with one keystroke; short-term memory and message repeat; built-in iambic keyer; and a four-digit LED display with mode indicators.

Suggested retail price for the KK-1 is $199. For more information, contact Advanced Electronic Applications, Inc., P.O. Box C2160, Lynnwood, WA 98036 (206-774-5554; FAX 206-775-2340), or circle number 108 on the reader service card.

SoftWave™ From ComFocus

SoftWave™, introduced by ComFocus Corp., is a digital receiver for Microsoft Windows®. Each SoftWave package contains a receiver module, a DSP card for a standard PC slot, and program disks, plus a cable and manuals. Using a computer mouse the user can choose from a standard AM radio, an HF radio, a VHF scanner, a world radio, a time sync radio, and a spectrum analyzer. SoftWave also includes a Morse code decoder, showing the words per minute, error rate of the transmission, relative quality of the transmission, and relative confidence of the digital decoder.



Since most of SoftWave's computations are done by the DSP, the computer is free to run other Windows applications. SoftWave includes a complete database which is accessible to all of the "personalities." Current program schedules from shortwave broadcasters throughout the world are pre-installed. All power to the receiver module is provided by the RS232 cord from the PC—no power cords.

SoftWave is available for an introductory price of $1495 through July 31, 1994. For more information, contact ComFocus Corporation, 6160 Lusk Blvd., Suite C-200, San Diago, CA 92121 (1-800-763-8983), or circle number 101 on the reader service card.

Kantronics G-TOR™ HF Mode

G-TOR™, a new mode for the KAM Plus and KAM Enhancement Board, is now available from Kantronics. This error-free mode can reliably transmit data more than twice the speed of PACTOR in most band conditions, maker says. G-TOR operates at either 100, 200, or 300 baud, automatically adjusting the speed as necessary based on band conditions. Errors are easily corrected through the combination of Golay forward error correction and full-frame data interleaving.

G-TOR is now standard in the KAM Plus and KAM Enhancement Board at no extra cost and is available as an EPROM upgrade for the KAM Plus or KAM with Enhancement Board. For information, contact Kantronics, 1202 East 23rd St., Lawrence, KS 66046 (913-842-7745; FAX 913-842-2021), or circle 105 on the reader service card.

ANNOUNCEMENTS *(from page 6)*

June 4, **Knoxville ARC Hamfest**, Tennessee Valley Fair Grounds, Chilhowee Park, Knoxville, Tennessee. Contact Ross A. Ramsey, KC4YDR, 790 N. Cedar Bluff Rd., Knoxville, TN 37923 (615-690-1520).

June 4–6, **NZART Annual Conference, "New Plymouth '94," and Amateur Radio Expo**, the Quality Hotel, New Plymouth, New Zealand. The conference will be based around the theme of nostalgia, remembering the early days of amateur radio in New Zealand. Contact: The Secretary, 1994 Conference Committee, P.O. Box 3203, New Plymouth, New Zealand.

June 5, **Newington ARL Ham Radio and Computer Flea Market**, Newington High School, Newington, Connecticut. For info send SASE to Albert Gerke, N1JWF, c/o NARL, 63 N. Washington Ave., Plainville, CT 06062-1921. (Exam info send SASE to Susan Fredrickson, WM1B, P.O. Box 165, Pleasant Valley, CT 06063—no walk-ins.)

June 5, **Central Kansas ARC Annual Hamfest**, 4H Building, Kenwood Park, Salina, Kansas. Contact: Larry White, KBØBH, 336 Sunset Drive, Salina, KS 67401 (913-827-3737).

June 5, **Starved Rock Radio Club Hamfest**, Bureau County Fairgrounds, Princeton, Illinois. For info send SASE to Bruce W. Burton, KU9A, or Debbie Burton, N9DRU, 1153 Union Street, Marseilles, IL 61341-1710, or call 815-795-2201.

June 5, **Contoocook Valley Radio Club Ham Radio Fleamarket**, Contoocook, New Hampshire. Contact John, N1FOJ, 603-746-4817, or Rob, KA1AUA, 603-224-3899.

June 5, **Breezeshooters Hamfest & Computer Show**, Butler Farm Show Grounds, Butler, Pennsylvania. Contact Rey Whanger, W3BIS, RD #2 Box 8, Cove Run Rd., Cheswick, PA 15024-9451 (SASE).

June 5, **Manassas, Virginia Hamfest & Computer Show**, Prince William County Fairgrounds, Manassas, Virginia. Contact Mary Lou, KB4EFP, 703-369-2877.

June 5, **Chelsea, Michigan Swap 'n Shop**, Clelsea Fairgrounds, Chelsea, Michigan. Contact Gary R. Widmayer, 313-428-9398.

June 10–13, **The 8th International Chaverim Convention**, Fallsview Hotel, Ellenville, New York. Contact Arnold L. Halpern, W2GDS, 450 Brighton Ave., Long Branch, NJ 07740 (908-222-3009).

June 11, **SMARTSFEST**, Chaska Community Center, Chaska, Minnesota. Call 612-466-5852. (Exams.)

June 11, **Saturday Ham Radio Auction**, Bozrah Moose Lodge, Norwich, Connecticut. Contact Rick, KD1LC, at 203-376-2216; or Tony, N1MQS, at 203-859-2041.

June 11, **Athens Radio Club Flea Market**, Bishop Park, Athens, Georgia. Contact George Kelley, WB4VNT, 706-546-7713; or Rodney Couch, KE4ANM 1-800-959-8273. (Exams 9 AM.)

June 11, **Bangor Hamfest**, Hermon Elementary School, Bangor, Maine. Contact Roger W. Dole, KA1TKS, RR #2, Box 730, Bangor, ME 04401 (207-848-3846). (Exams.)

June 11, **Winston-Salem Hamfest and Computer Fair**, Dixie Classic Fairgrounds, Winston-Salem, North Carolina. For more information, or pre-registration, send SASE to Don Edwards, WB4KQN, Winston-Salem Hamfest, P.O. Box 11361, Winston-Salem, NC 27116 (910-723-7388). (Exams, must pre-register.)

June 11, **NCARC Superfest XVI Swapmeet**, Larimer County Fairgrounds, Loveland, Colorado. Contact Musser Moore, AAØPB at 303-221-3698. (Exams contact Rick Hubbard, WAØDDC, at 303-353-3577.)

June 11, **Southern Berkshire ARC Hamfest**, Goshen Fairgrounds, Goshen, Connecticut. Contact Sid, K1SS, 203-364-0480.

June 12, **1994 Egyptianfest**, campus of Belleville Area College, Granite City campus, Granite City, Illinois. Contact Larry Walton, NZØP, 314-524-3254. (Exams, preregistration required, contact Eric Koch, NFØQ, 314-723-0840; in metro St. Louis 946-0948.)

June 12, **Lancaster New York Hamfest**, Darien Center Fire Co., Darien, New York. Contact Nick, WA2CJJ, 5645 Genesee St., Lancaster, NY 14086 (716-681-6410); or Luke, N2GDU, 1105 Ransom Road, Lancaster, NY 14086 (716-683-8880).

June 12, **27th Goodyear ARC Hamfest and Family Picnic**, Wingfoot Lake Park, Akron, Ohio. Send SASE to David Hyde, W8LFX, 1821 Cromwell Dr., Apt. B, Akron, OH 44313-5546 (216-796-5685). (Exams, walk-in only, check-in by 10 AM.)

June 12, **Pleasant Hill Computer and Hamfest**, Pleasant Hill Fire Co. carnival grounds, south of Hanover, Pennsylvania. Contact Ralph Stoffel, N3KZS, 5219 Hanover Pike, Manchester, MD 21102, or call 410-239-4918. (Exams 8 AM, contact Bill, NZ3J, at 410-359-7090, or Pat, WW3U, at 410-632-4237).

June 12, **The Northern Kentucky ARC's HAM-O-RAMA 94**, Erlanger Kentucky Lions Park, Kentucky. Contact KC4FET, c/o NKARC, P.O. Box 1062, Covington, KY 41012, or call 606-341-1213.

June 12, **The Six Meter Club of Chicago, Inc. 37th Annual Hamfest**, Santa Fe Park, Willow Springs, Illinois. Contact Mike Corbett, K9ENZ, 606 South Fenton Ave., Romeoville, IL 60441. Dealers, for pavilion reservations, contact Joseph Gutwein, WA9RIJ, 7109 Blackburn Avenue, Downers Grove, IL 60516, or call 708-963-4922.

June 12, **The Central Wisconsin Radio Amateurs, Ltd. 17th Annual Swapfest**, the University Center on the University of Wisconsin-Stevens Point Campus, Stevens Point, Wisconsin. Contact Art Wysocki, N9BCA, CWRA Swapfest Chairman, 3356 April Lane., Stevens Point, WI 54481 (715-344-2984). (Exams.)

June 12, **LIMARC Hamfest**, New York Institute of Technology, Old Westbury, Long Island, New York. Contact Neil Hartman, WE2V, 516-462-5549.

June 18, **12th Annual Cortland International Hamfest**, Cortland County Fairgrounds, Cortland, New York. Contact SARC, P.O. Box 5241, Cortland, NY 13045 (607-756-6550 evenings or weekends). (Exams, registration 9–10 AM, exams at 10 AM, reservations accepted.)

June 18, **Quinte Hamfest and Computer Show**, Dick Ellis Arena, Belleville, Ontario. Contact Don Dalrymple, VE3DQN, at 613-958-9242.

June 18, **Grand Rapids 14th Annual Hamfestival**, Wyoming National Guard Armory, Grand Rapids, Michigan. Contact Tom or Kathy Werkema, KA8YSM/KB8KHZ, 562 92nd St. SE, Byron Center, MI 49315 (616-698-6627). (Exams.)

June 18, **Raritan Valley Radio Club "94 Hamfest,"** Columbia Park, Dunellen, New Jersey. Contact John Manna, WA2F, at 908-722-9045 before 8 PM.

June 18, **Des Moines Radio Amateur Association Ham/Puter-Fest '94**, Valley High School, West Des Moines, Iowa. Contact DMRAA Ham/ Puter-Fest, Attn: Mark, P.O. Box 88, Des Moines, IA 50301 (515-255-6131). (Exams 7:30.)

June 18, **Midland, Michigan ARC Hamfest**, Midland Community Center, Midland, Michigan. Contact MARC Hamfest, P.O. Box 1049, Midland, MI 48641 (SASE), or call 517-832-3053 evenings and weekends. (Exams.)

June 18–19, **Inland Northwest Hamfest**, Spokane Interstate Fairgrounds, Spokane, Washington. Contact Ivan Brown, E. 537 Nebraska, Spokane, WA 99207 (509-489-2667).

June 19, **Monroe Hamfest**, Monroe County Fairgrounds, Monroe, Michigan. Contact Fred Lux, WD8ITZ, 313-243-1053.

June 19, **MIT Radio Society and the Harvard Wireless Club Flea Market**, Cambridge, Massachusetts. Call 617-253-3776.

June 19, **22nd Annual Dad's Day Hamfest**, Lake County Fairgrounds, Crown Point, Indiana. Contact Ken Brown, KE9TC, 918 Chippewa Dr., Crown Point, IN 46307 (219-663-5035). (Exams.)

June 19, **Frederick, Maryland ARC Hamfest**, Walkersville, Firemen's Carnival Grounds, Frederick, Maryland. Contact Frederick Hamfest, P.O. Box 1260, Frederick, MD 21702, or call 301-695-2633, code #6393.

June 19–25, **Englewood Amateur Radio Association Week**, Englewood, New Jersey. An annual test of emergency communications from field locations will be conducted June 25 and 26. This will be the 35th consecutive field day exercise that the Englewood ARA has participated in. For more information, contact the Englewood ARA, Inc., P.O. Box 528, Englewood, NJ 07631-0528.

June 20, **Santa Maria Swapfest**, Unocal's Newlove Picnic Grounds, near Santa Maria, California. Contact KD6VLZ or KD6VMA, or write to Santa Maria Swapfest, P.O. Box 2067, Orcutt, CA 93457-2067.

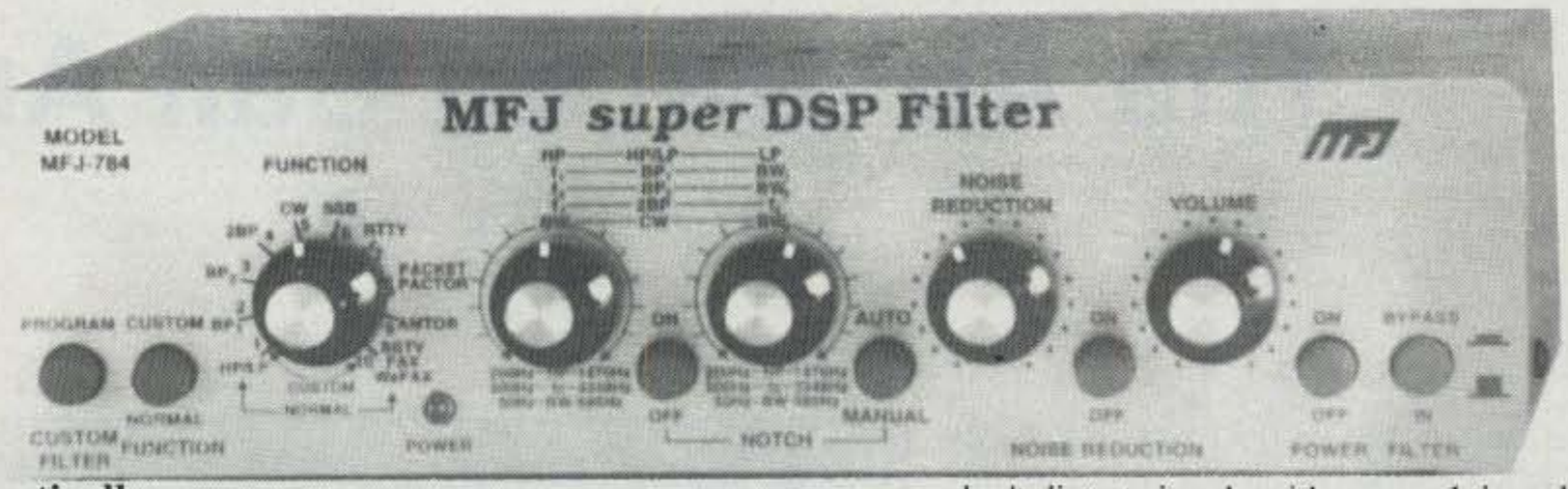
MFJ *super* DSP *filter*

. . . Tunable "brick wall" bandpass, lowpass, highpass, notch filters . . . programmable pre-set filters . . . automatic multiple notch filter eliminates heterodynes . . . adaptive noise reduction reduces noise and QRN . . . for Voice, CW, Data . . .

NEW

MFJ-784

$219.95



MFJ's *super* DSP filter automatically eliminates heterodynes, reduces noise and interference *simultaneously* on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite -- nearly any mode you'll ever encounter.

You get MFJ's *tunable* FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 60 dB attenuation just 75 Hz away.

Only MFJ gives you *tunable* DSP filters. You can tune each lowpass, highpass, notch and bandpass filters and *vary* bandwidth to pinpoint and eliminate interference. The last tunable filter setting is saved -- it's ready to use when you switch back to it again.

Only MFJ gives you 6 *factory pre-set* filters and 10 *programmable pre-set* filters that you can customize. Instantly remove QRM with a turn of a switch!

You get MFJ's *automatic notch filter* that searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much SSB signals sound like a local FM repeater.

The *automatic* notch filter and *adaptive* noise reduction can be used with *all* tunable and pre-set filters.

Automatic notch filter

MFJ's *automatic* notch filter searches for and eliminates *multiple* heterodynes in *all* filter modes -- it's so fast interfering CW and RTTY signals are also eliminated.

If you leave the *automatic* notch filter on during a phone contest, you'll never be worn down by the heterodynes of tuner-uppers.

Voice signals aren't degraded. The *narrow* automatic notch is silently working in the background destroying unwanted tones when they appear.

With up to 50 dB attenuation, you'll copy stations that would otherwise be masked by heterodynes. You'll miss fewer calls and be less exhausted when the contest is over.

When you need to *selectively* remove tones -- like when you're enjoying a CW ragchew and a couple of annoying CW stations appear nearby -- you can use the *two* MFJ *tunable* notch filters to completely knock them out.

Adaptive noise reduction

Pressing the "ON" button silences background noise. Some SSB signals sound like a local repeater! It makes noisy FM and AM signals readable and works with CW, Data and other signals.

It works in all filter modes and on all types of random noise including -- white noise, impulse noise, static, ignition noise, power line noise, hiss and atmospheric noise.

The LMS algorithm gives you up to 20 dB of noise reduction depending on the type of noise. You can adjust the amount of noise reduction to prevent distorting some signals.

Reducing random noise reduces fatigue and makes QSOs more fun -- especially, when the band is full of tiring noise.

Tunable highpass/lowpass filters

For Voice and Data nothing beats MFJ's exclusive *tunable* highpass/lowpass FIR linear phase "brick wall" filters.

You can *tune* the lower cutoff frequency 200 to 2200 HZ and the upper cutoff frequency 1600 to 3400 Hz.

Signals *just 75 Hz* away literally disappear -- they are reduced a *thousand* times, 60 dB!

Unlike other filters, speech clarity is not reduced by envelope distortion caused by unequal time delay.

By adjusting the highpass and lowpass filters you can create *custom* filters for Voice, Data and other modes.

When signals are weak, you can improve copy by removing high and low speech frequencies. They contain little information but are full of noise that reduce readability.

On crowded HF bands, overlapping SSB signals make copying difficult. You can improve copy by slicing off some overlap with razor sharp "brick wall" responses.

You can also highpass filter out hum, pulses, rasp and other irritating low frequency noise.

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in one of MFJ's three *tunable* FIR bandpass filters.

You can *tune* the center frequency from 300 to 3400 Hz. And *vary* the bandwidth from 50 Hz to 680 Hz -- from super tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals just drop out because, just 60 Hz away, they're down by over 50 dB.

You can use *narrower* bandwidths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 50 Hz bandwidth, you'll never have a problem with ringing.

One position gives you *two* tunable filters you can use together on one signal. For example, on RTTY, tune one filter to mark, the other to space and set each bandwidth tight for an incredibly sharp RTTY filter.

16 *pre-set* filters -- use factory set or program your own

With a turn of a switch you can select from *sixteen* convenient *pre-set* filters. You can use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any other mode you can think of.

If you don't like our *pre-set* filters, you can define your own filter by programming bandpass center frequency and bandwidth, lowpass and highpass cutoffs. *An MFJ exclusive*!

Only MFJ gives you the best of both worlds -- *tunable* filters to eliminate nearly any QRM and fast convenient *pre-set* filters customized for any mode.

Plus more . . .

A push-button quickly bypasses your filter so you can hear the *entire* unfiltered signal and see if anyone is calling you.

Built-in two watt amplifier. Has volume control, input level control, speaker jack, headphone jack, accessory jack, PTT line and PTT sense and line level output. 9x2½x6 in.

It plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95.

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You get MFJ's famous one year No Matter What™ *unconditional* guarantee. That means we will repair or replace (at our option) your MFJ-784 *no matter what* for a full year.

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Automatically eliminate heterodynes, reduce noise and QRM on Voice, CW and Data. Call your favorite dealer for your *best* price and order your MFJ *super* DSP filter today!

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CIRCLE 156 ON READER SERVICE CARD

Australia and its territories represent several DX countries and a great deal of globe hopping. The next VK you hear may be almost anywhere on the globe, as VK9NS explains.

The Australian Call Areas

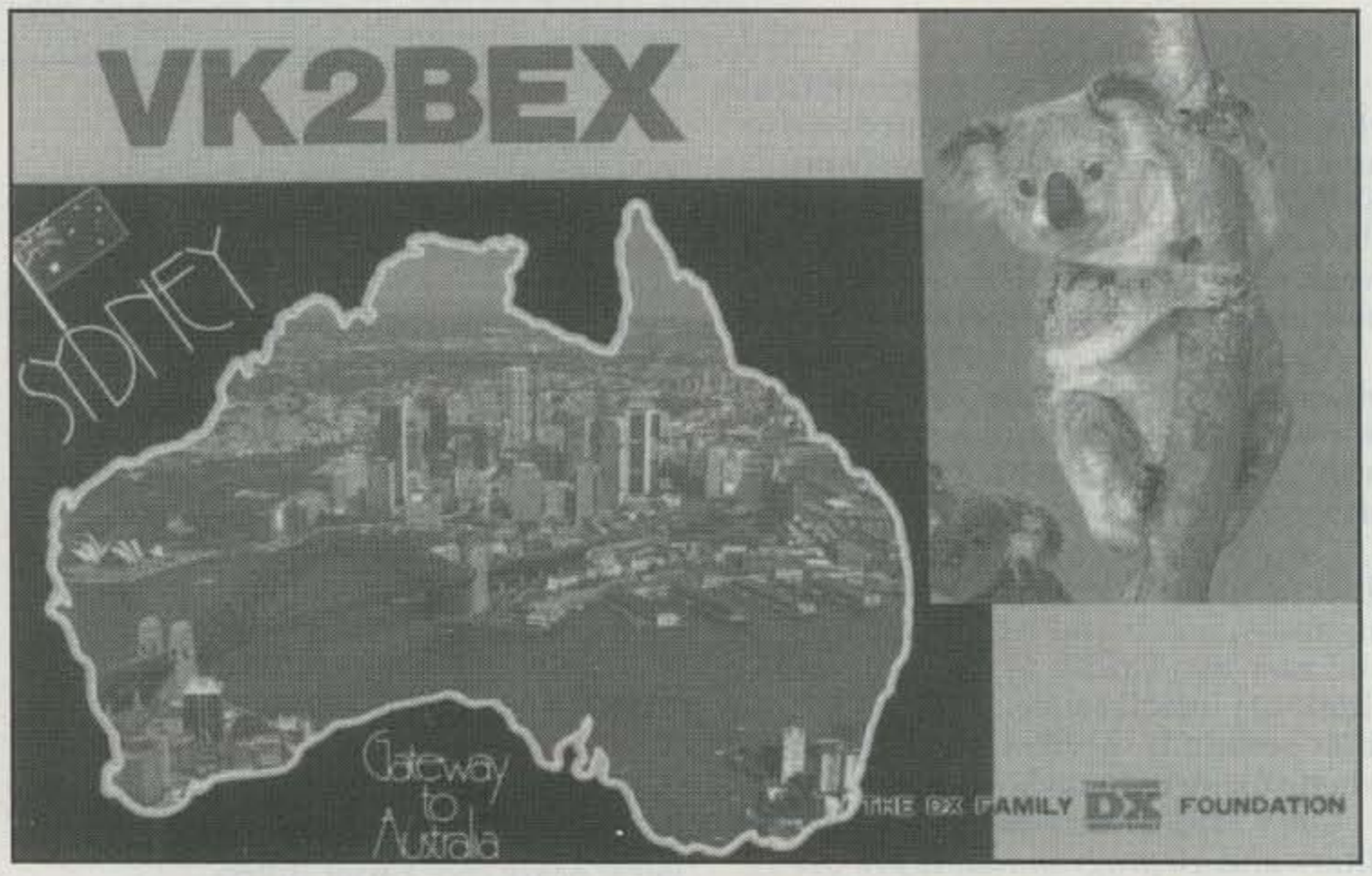
BY JIM SMITH*, VK9NS

In this part of the world there are "fun" maps which show Australia and Pacific areas at the top of the map instead of the more usual "down under" approach of conventional mapping. Everyone knows that north is top and south is bottom, right? However, gradually over the years I have come to regard the Pacific area as my neighbor. There is a tendency to put my own northern European oriented geography more and more to one side. Being resident on Norfolk Island for over 13 years has pushed me permanently into the VK, ZL, and Pacific sphere of the world.

This article will take you on a wide, sweeping look at the VK call areas of Australian amateur radio. In fact, it will take you from Norfolk Island in the east, to Heard Island lying deep in the southern Indian Ocean far to the southwest. The total distance covered is many thousands of miles.

The Australian callsigns are based on a fairly rigid structure of the VK prefix, followed by a number which designates the state or area of operation. Other prefixes such as VI and AX are available for special activities. As will be seen later, this structure is changing somewhat. On the mainland proper, however, the system remains intact. One must also remember in reading this that it is written by a relative newcomer to the area. I have never resided on mainland Australia for any length of time. However, I have visited every state and many of the external areas.

Let's take a look at the callsign structure then. Mainland Australia consists of several individual states. Each state has its own basic government intact, its own prime minister, etc. The Federal government, based in Canberra, oversees everything. It is often difficult for an outsider to come to grips with the state system. There are wide differences in state laws, and each state is fiercely partisan. The callsign structure is as shown in Table I. Shown are the states proper. Note that the numbers given are approximate, a ball-park figure derived from call book information. The numbers cover all licenses—Novice, Full, and limited callsign holders.



The QSL of Atsu Asahina, VK2BEX (ex-JM1MGP), from Sydney, Australia.

The external Territories and areas are covered by the VK9 and VKØ prefix are given in Table II. Radio amateurs in these areas are few and far between.

Amateur radio licensing is vested in the Department of Transport and Communications (DOTC). They run an efficient system, and Australia has reciprocal arrangements with many countries. These days the new name is Spectrum Management Agency, and it is still based in Canberra.

There are several strange outlooks. However, again I stress that they are strange to an outsider. The state system is jealously guarded, with each state responsible for issuing licenses within the state and for its own Radio Inspector system and so on. Of course, the state system acknowledges licensing conditions and decisions made at Federal level in Canberra. Licensing is mostly computer controlled, with reminders being sent out, collection of licensing fees, and so on being done by computer. A few years ago they allocated the VK9AA–VK9ZZ series for short-term licenses for use in the Territories. As a result, the VK9N, VK9L convention is not followed, VK9AD being issued to my son during his visit to Norfolk Island. A few weeks ago, however, a reissued VK9N call was issued to a visiting G station who stayed a few days.

It also seems strange that one has to apply for a VK4 license and then has to

VK1	Australian Capital Terr.	A.C.T.	400
VK2	New South Wales	N.S.W.	5000
VK3	Victoria	VIC.	4000
VK4	Queensland	QLD.	2800
VK5	South Australia	S.A.	1800
VK6	Western Australia	W.A.	1500
VK7	Tasmania	TAS.	600
VK8	Northern Territory	N.T.	250
Total amateur population about 16,000			

Table I– Callsign structure and aproximate number of amateurs in each of the states of mainland Australia.

P.O. Box 90, Norfolk Island, Australia 2899

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75 /80 Meters.

You get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR and it handles 1500 watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

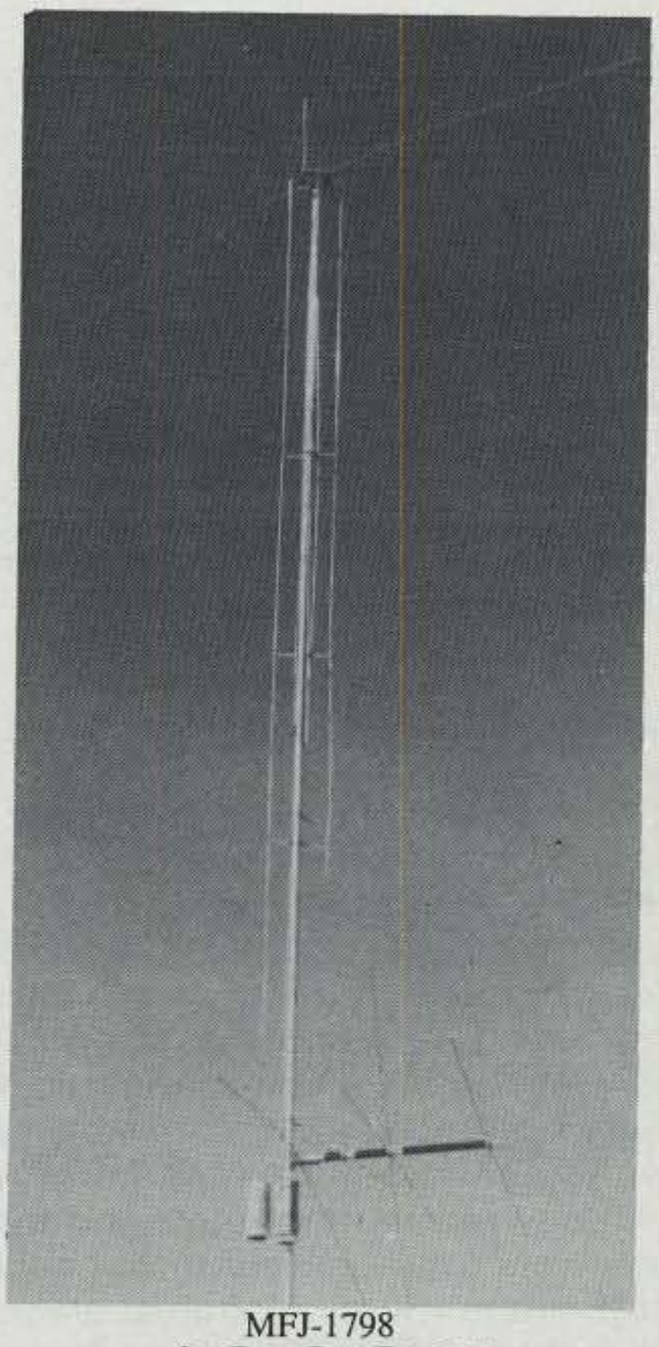
It's easy to tune because adjusting one band has minimum effect on the resonant frequency of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

Separate *Full Size* Radiators

***Separate** full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.



MFJ-1798
$269.95

This forms a very large equivalent radiator and gives you incredible bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with Teflon® coax and *can't* saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant Teflon® covered wire.

Teflon® is registered trademark of Dupont

MFJ *Super Hi-Q Loop*™

MFJ-1786
$299.95

MFJ's *tiny* 36 inch diameter *high efficiency* loop antenna lets you operate 10 to 30 MHz *continuously* -- including the WARC bands!

It's ideal where space is limited -- apartments, small lots, mobile homes, attics, motor homes.

Enjoy both DX and local contacts when you mount it vertically. You get *both* low angle radiation for excellent DX *and* high angle radiation for local close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ-1786 *Super* Remote Control has *Auto Band Selection*™. It auto-tunes to your desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune push buttons and built-in two range *Cross-Needle* SWR/Wattmeter lets you quickly tune to your exact frequency.

All *welded* construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter *round* radiator -- not a lossy thin flat-strip -- gives you highest possible efficiency.

Each plate in MFJ's *superb* tuning capacitor is welded for low loss and *polished* to prevent high voltage arcing. It's welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches and a continuous *no-step* DC motor for *smooth precision* tuning.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects it.

MFJ-1782, $269.95. Same as MFJ-1786 but remote control has only fast/slow tune buttons.

Super 80/40M Vertical

MFJ-1792
$159.95

Designed as a *high performance* antenna for 80 and 40 Meters, the MFJ-1792 features a *full size* quarter wave radiator for 40 Meters - - that's a full 33 feet of ruthless radiating power.

End loading -- the most efficient form of loading -- is used for 80 Meters. It's accomplished by a virtually lossless 4½ foot capacitance hat and a high-Q coil wound with Teflon® wire on a *low-loss* fiberglass form.

The *entire length* radiates power.

High strength 6061-T6 aluminum tubing, super strong solid fiberglass insulator, *Frequency Adaptive L-Network*™, heavy duty *swing* mount. Handles 1500 watts PEP. Requires guying and radials, counterpoises or ground screen.

MFJ-1793, $179.95. Same as MFJ-1792 but includes *full size* 20 Meter quarter wave radiator.

Box Fan Portable Loop

MFJ-1780
$229.95

No, it's not a fan -- it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

Carry it like a suitcase, tuck it in a corner of your car or check it as baggage on a plane.

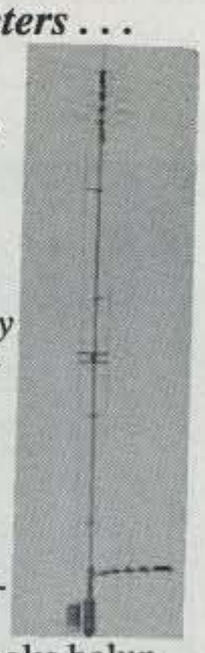
When you get there, set it on a table or desk and enjoy ragchewing or DXing.

All welded construction, covers 14-30 MHz *continuously* including WARC bands, handles 150 watts. Remote control has fast/slow tune buttons. Separate control cable not needed.

MFJ *halfwave* Vertical

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

MFJ-1796
$199.95



Operate 6 bands -- 40, 20, 15, 10, 6 and 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! Mount it anywhere from ground level to tower top -- on apartments, condos, small lots, even motor homes. Perfect for vacations, field day, DX-pedition, camping.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

Automatic bandswitching, low radiation angle, omni-directional, handles 1500 watts PEP. Goes together in an afternoon.

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The Lord Howe Island QSL of Ronald "Bing" Crosby.

relinquish a VK2 call (even if it has been held for 30 years) when moving to Queensland (VK4) from N.S.W. (VK2) on retirement. The U.S.A., for example, long ago ceased the rigid number structure of a callsign/location. Once an amateur radio license is issued in the U.S., it can be used in any state or territory.

In addition, in Australia old callsigns are readily re-issued, the two-letter call being in particular demand. This is not usually done in the U.K. and elswhere. One can tell how long someone has been licensed by knowing the callsign structure. This is not the case in Australia.

The population of Australia is about 16 million. All mainland VK call areas of course are populated. However, certain states have a much larger population than others. In amateur radio terms it can be difficult to work a VK1, VK7, or VK8. A glance at the numbers in each state in Table I quickly explains the reason.

Having traveled in and around Australia, I can better understand the sheer size of the island. In the Northern Territory, Alice Springs lies in the heart of Australia. It is miles from anywhere else. With its relatively small population, there are only a few active radio amateurs. Far to the north, Darwin lies in the tropics and again has a very small amateur radio population. Both the VK6 and VK8 areas are special to the DXer in another way; they are in Zone 29 of the *CQ* Worked All Zones Award (WAZ).

The Wireless Institute of Australia (W.I.A.) lays claim to being the oldest amateur radio society in the world. It even "pips" the RSGB by a year or so. Less than 50 percent of the Australian amateurs are members of the W.I.A. Here again, the organization in a sense is divided by the state structure, with each state having its own president, and so on. Membership dues are paid to the state, and a portion is allocated to Federal level mainly to support the monthly magazine *Amateur Radio*. In many ways it can be seen to be a tremendous waste of resources for such a small group of radio amateurs. There is a great deal of duplication and triplication of effort.

It is difficult to see how the state system could be integrated into a more Australian society, for example. However, an honest attempt is now being made to update the whole structure of the W.I.A. It is timely, as membership has been falling steadily for many years. Federal office is apparently completely out of touch with the membership. There have been too many instances of the left hand not knowing what the right is doing. In many cases, at state level members are a law unto themselves.

To be honest, though, a totally Australian representation is difficult to implement, in many cases simply due to the immense distances involved. Maybe it is hard for a VK6 radio amateur in Perth to equate with the Federal office, which is in Victoria, 2000 miles to the east.

The radio amateur in Australia is lucky in many respects. It is not a backwards area. There is a reasonable component and electronics market in place. One can buy most of the usual electronic bits and pieces. Much of the material is manufactured in Australia. There are several good amateur radio outlets, and these outlets are likely to have an agent in each state. There is a major source of aluminum tubing, and like many other countries the equipment market is dominated by the latest high-tech Japanese transceiver. Local manufacturing is more or less confined to antennas, power supplies, etc. However, in the commercial area there is a thriving computer industry, and there are have been many solid achievements by Australian engineers in the communications field.

VK9L	Lord Howe Island
VK9N	Norfolk Island
VK9X	Christmas Island (Indian Ocean)
VK9C	Cocos (Keeling) Island
VK9M	Mellish Reef
VK9W	Willis Island
VKØ	Antarctic Continent
VKØ	Heard Island
VKØ	Macquarie Island

Table II– External Territories and areas covered by the VK9 and VKØ prefixes.

Clayton Hansen, VK4ICU, has this Warwick, Queensland, Australia QSL.

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .

MFJ-259
$219.95

If you work with antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29**, $19.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $219.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249
$199.95

MFJ-249 *HF/VHF SWR Analyzer*™ has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209
$109.95

MFJ-209 *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

Carrying Pouch

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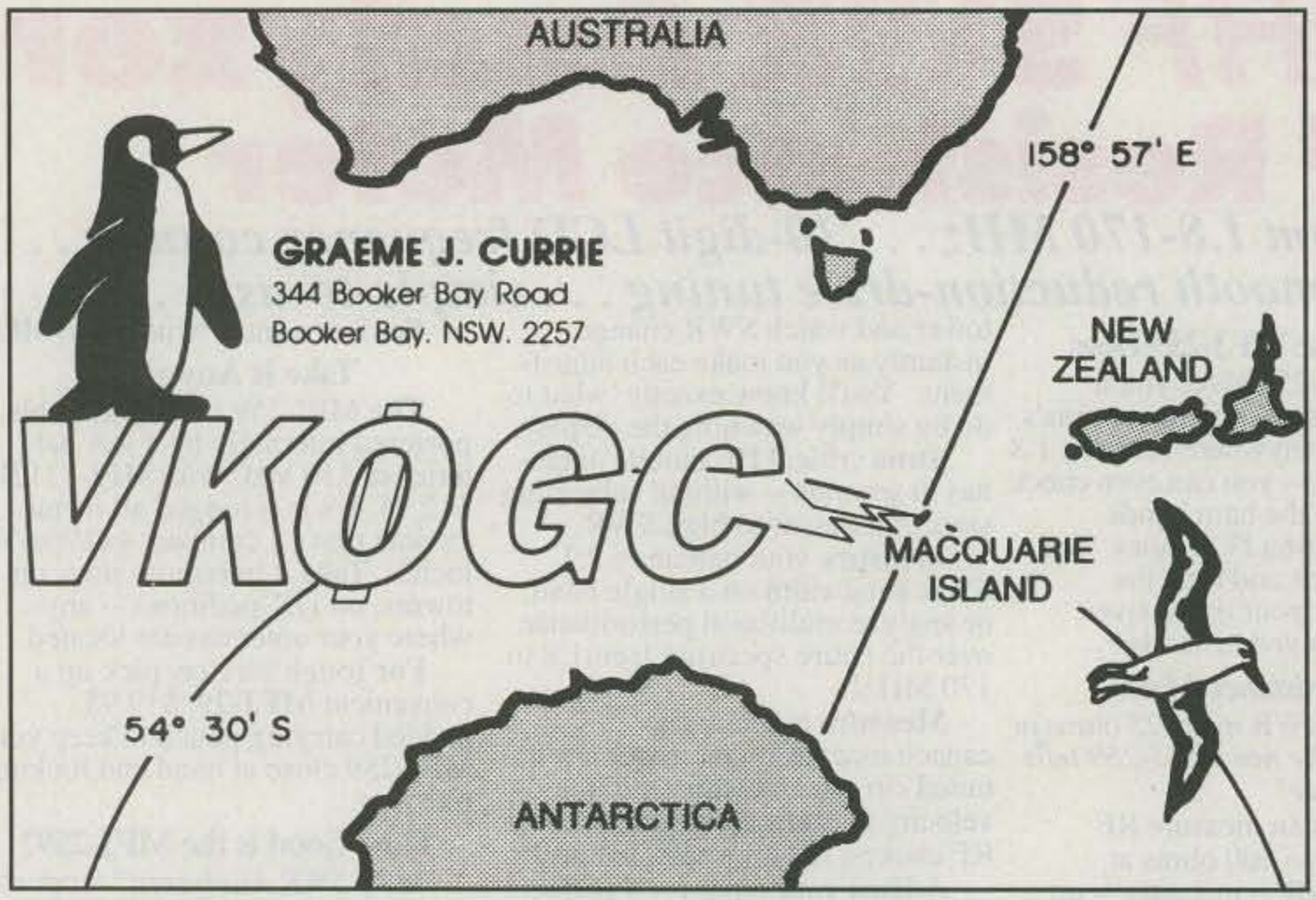


Graeme Currie spent three years (1983, '85, and '87) as VKØGC on Macquarie Island. His job there was as a radio technician maintaining the communication equipment and antennas. He is also a life member of the H.I.D.X.A.

The external Territories are, of course, of great interest, especially to the DXer. Most are separate DXCC countries, and maybe a few words on each would be of interest to the reader. It might also be a good idea to start with Norfolk Island, as I am here right now.

Norfolk Island VK9N

This tiny island, with a population of around 1800, is a mere speck of land measuring 3 miles by 5 miles. It lies about 800 miles east of Australia, about 700 miles northwest of New Zealand, and about 700 miles south of New Caledonia. The island is certainly isolated. However, there is good airline service on a more or less daily basis and an adequate sea freight service. Telecommunication facilities are excellent.

It could be said that it is an island paradise, and many say just that. The island is very dependent on tourism, and that is a fickle game. The island's economy goes through the boom and bust cycles on a regular basis. It is really better not to be too dependent on this source of income, but in many cases there is no choice.

Norfolk Island was famous, or infamous, as a penal colony during an era of man's injustice to man. The remains of those days are the finest collection of Georgian buildings in the Southern Hemisphere. They have been carefully preserved and repaired, and they are worth visiting.

A later claim to fame came as a result of the island being vacated at the end of the convict era (at least as far as Norfolk Island was concerned).

The island then formed a unique relationship with the *Bounty* mutiny as the whole population of Pitcairn Island was resettled here in 1856. True, some did return to their beloved Pitcairn, homesick for their island. The Adams, Christians, and Quintals in our telephone book can all claim direct lineage right back to one or more of the *Bounty* mutineers. Of course, all the mutineers ended their days in hiding on far off Pitcairn. It is a tremendous story retold over and over again with endless variations. There aren't many tales that have the real-life drama of the mutiny and the aftermath.

The islanders do speak their own language (amongst themselves). This is a quaint mixture of old English and Tahitian.

There are only five radio amateurs (Full call) on the island, so we are usually in great demand whenever we are active. We are VK9JA, VK9ND, VK9NI, VK9NL, and VK9NS.

Willis Island VK9W

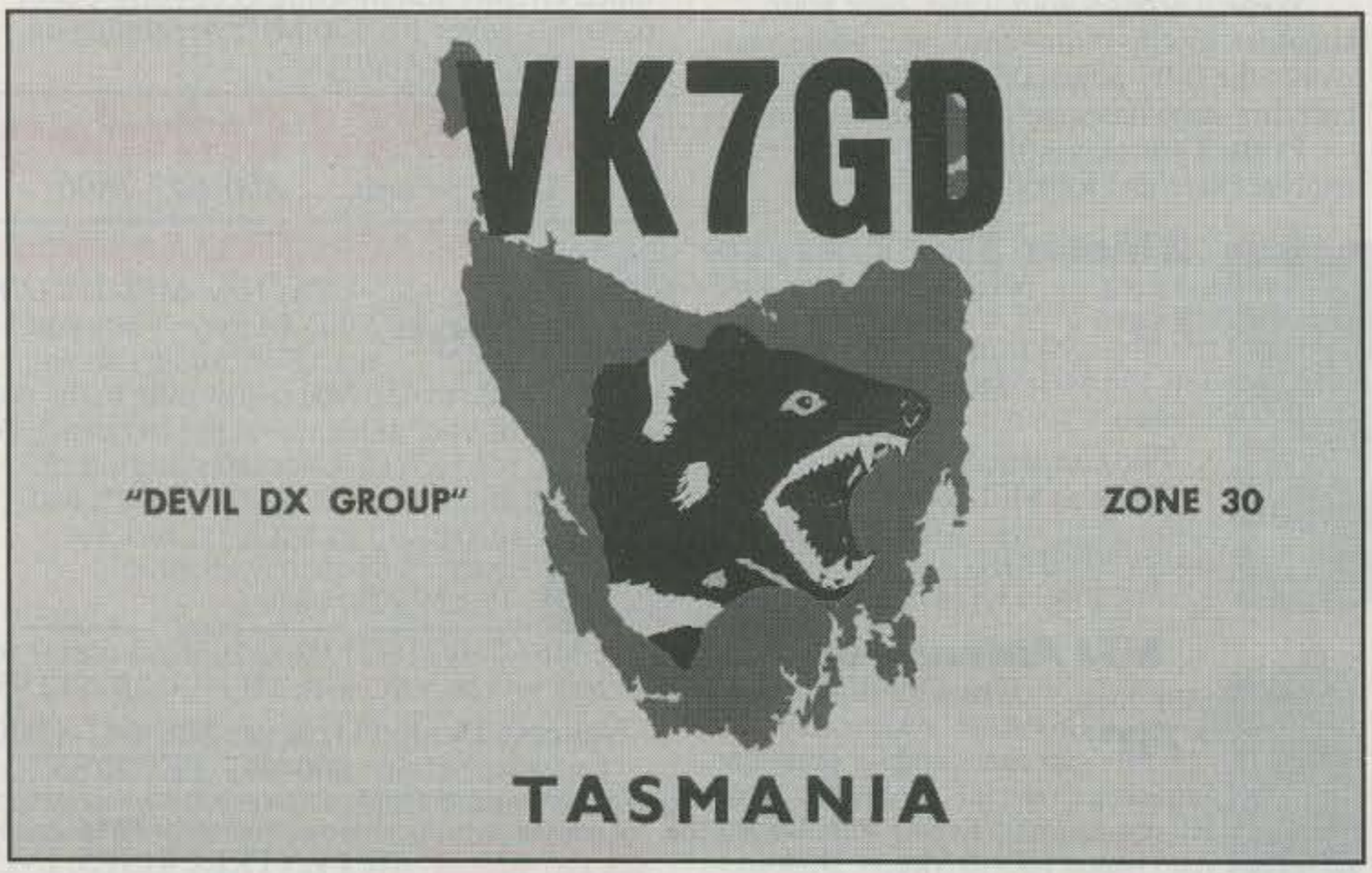
Tiny Willis Island lies about 1200 miles to the northwest of Norfolk Island. It is occupied more or less all year by a small group of meteorologists. Being in the cyclone area, they can provide valuable data for mainland Australia, which lies a few hundred miles to the west. It is really a matter of luck as to whether or not there is a radio amateur in the group.

There have been times when Willis Island was very active, only to be followed by a long period of inactivity. Since Willis Island is classified as a separate DXCC country, it follows that this island is also in high demand. The stay on the island is usually limited to about six months, and then a further change-over takes place.

A year or so ago I organized a small DXpedition to Willis Island, where we signed VK9WW. I can vouch for the fishing, snorkeling, sea shells, and bird life to be found in the area. All these make any stay something to remember.

Mellish Reef VK9M

This small reef is about 500 miles from Willis and a few hundred miles east of the mainland. It is unoccupied except for thousands of sea birds, which have breeding areas on the reef. True or false, it is said that one can smell the reef long before one can see it. Once again, being a DXCC country makes it known to the



This is the Tasmania "Devil DX Group" QSL of Graham Johnson, VK9GD.

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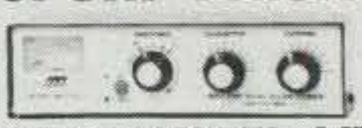

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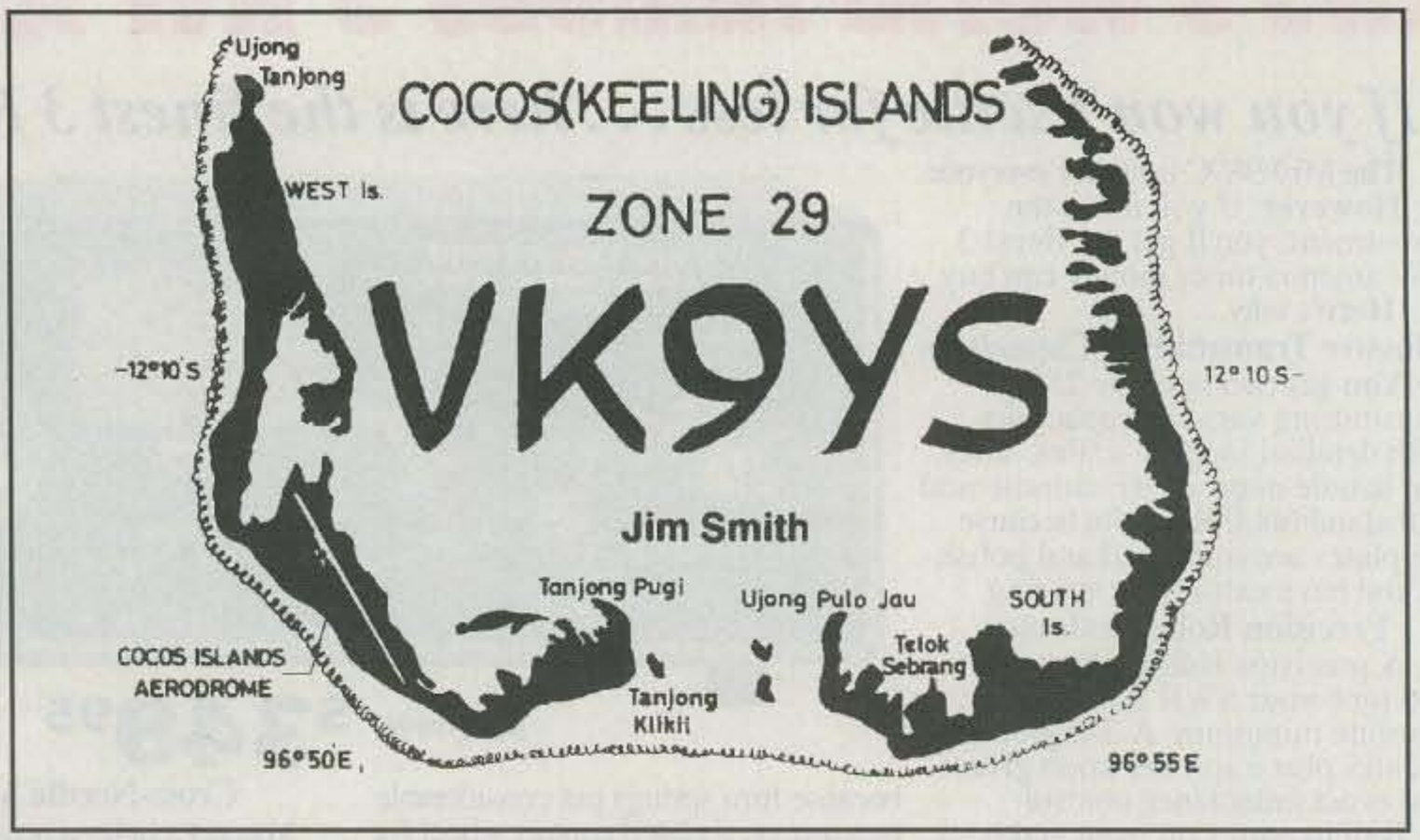

The author's VK9YS Cocos (Keeling) CQ Zone 29 QSL.

radio amateur interested in DXing. From time to time DXpeditions are mounted to put a party on the reef for a few days. Needless to say, it is always in great demand when it is activated. The last DXpedition organized by VK4CRR and others was only a few months ago. The callsign used was VK9MM.

Lord Howe Island VK9L

We return to Norfolk Island briefly before continuing our journey. Lord Howe Island lies 400 miles to the west of Norfolfk Island and is much smaller than Norfolk. The island was settled about 150 years ago, and the small population of about 60 islanders has a unique situation. The island, for administrative purposes, is considered to be part of N.S.W., and until fairly recently used the VK2 prefix. There are also a number of unusual circumstances on the island. The islanders have a matriarchal society, and all can readily trace their lineage back to when the island was first settled. There is no freehold land; it all belongs to the Crown. Declared a national park many years ago, there are no new settlers, no new migration, and with only one fairly recent notable exception, no new people have been allowed to stay. The government is in the awkward position of not being able to kick everyone out. As a result, the community is a close-knit society.

Like other areas it is also dependent on tourism, and the island is really beautiful. Two high mountains of Gower and Lidgbird dominate the island, and nearby Balls Pyramid is a real freak of nature.

Amateur radio operation has always been minimal. For a long time there were only two resident amateurs, and both were able to hide themselves under the blanket of using a VK2 (N.S.W.) callsign. Dick, VK2AGT, was perhaps the most active. Since Lord Howe Island counts as a separate country in DXCC, an application was made and accepted to allocate the VK9L prefix to the island. Dick, incidentally, is now VK9LH, and the island is always in great demand on the amateur bands.

Macquarie Island VKØ

As we travel farther south-southwest through the roaring 40s, into the screaming 50s, to 55 degrees south, Macquarie Island lies dead ahead. For many years the island was part of the determined elephant seal, fur seal, and whale extermination program carried out in the name of a barrel of oil, not to mention profit. Happily, those days have more or less gone, but there are many reminders of those days on the island. A strong feral cat population survives and continues to do a great deal of damage to the bird life. Continued attempts have been made to exterminate the cats, but there are many in-accessible spots, and total erradication seems an impossibility.

These days the island has "year round" residents in the form of scientists and technicians from the Australian Antarctic Division with its headquarters in Hobart, Tasmania (A.N.A.R.E.). Studies are done on the breeding habits of the elephant seal, fur seal, bird population, and so on. Other studies into radio propagation, the earth's magnetic field, the ozone layer are all carried out on this rugged and remote outpost.

It could therefore be said that the chances of working Macquarie Island in an amateur radio sense are usually very good. With a large party wintering there and with the substantial facilities on the island, there is nearly always a radio amateur in the group. He may be the weath-

er man, radio technician, and so on, but it does tend to keep Macquarie Island available on the amateur bands. At the moment of writing, though, Macquarie Island is badly needed by DXers, as it has been quiet for some time.

Antarctica VKØ

The name Antarctica conjures up an image of endless ice and freezing winds often of blizzard strength. As we head farther southwest from Macquarie Island, there is little choice, and we must eventually bump into this vast continent. Australia lays claim to a vast area and maintains a presence in three distinct areas: Casey Base at 110 degrees east, Davis Base at 80 degrees east, and Mawson at 60 degrees east. All bases lie below 65 degrees south. Here again the bases are manned all year.

Scientists continue to have dozens of projects, many similar to those on Macquarie Island. There is great interest in the mineral wealth under the ice. Very deep core samples of the ice can give data on the atmosphere of Earth thousands of years ago from the gasses remaining locked and compressed in the ice, deep under the surface. En route to these Antarctic bases at change-over time marine scientists and their studies reveal Krill count, iceberg size, and many other factors of interest to the scientific world. There is no shortage of volunteers to be part of the A.N.A.R.E. scientific program. As a result, Australian Antarctica (to coin a phrase) is usually available on the amateur radio bands. With a fair degree of certainty, at least one of the bases will have a radio amateur in the team. As all DXers know, the whole of Antarctica is one DXCC country. Using the terms of presence on the continent, no country has sovereign rights of any area.

Heard Island VKØ

Our quick journey overland, westward across the Australian Antarctica via the three bases, has us now heading out to sea on a northeast course from Mawson Base. Heard Island is a mere 1600 miles away, lying deep in the southern Indian Ocean. If the weather is kind, the island is readily found. Its position at about 53 degrees south and 73 degrees east is accurate on all charts.The highest point of the island is the still active volcano Big Ben, which is 9000 feet high. In fact Big Ben is the highest point in all Australia and its Territories.

In the same era as Macquarie, Heard Island also witnessed the slaughter of its wildlife. The elephant seal and the fur seal were brought to the edge of extinction. When the seals ran out, the penguin was

pressed into service, again for those few barrels of oil, which made many extremely rich. Only a few inaccessible beaches held a few in precarious safety, and it was these survivors which have provided the breeding stock for today's numbers.

Heard Island is majestic and once again now abounds with birds, elephant seals, fur seals, and penguins. These days they seem hardly the worse for the experience, but it was a close call. There are many reminders of those days gone by. In one area, can still be found staves, rusting barrel hoops, and parts of lids for those barrels ready to be filled with oil. The stone storage building is neglected. It is a tough climate, and even this cannot withstand the fury of some of the storms in these southern oceans.

In a radio sense, Heard Island is probably the hardest one to work. It is not often active. The island is visited infrequently. In the late 1940s and early 1950s it was a bit different, as Heard Island was manned on an around the year basis. Again there was always a radio man in the team, and he was often a radio amateur. In 1992, after many years, a small group of scientists wintered on the island. Visits are therefore confined to the few short summer months around December, January, and February of each year. The word "summer" is used in its widest possible sense. It is one of the highlights of my life that I visited Heard leading a multinational DXpedition back in 1983.

Cocos (Keeling) VK9C

Our journey back to the Australian mainland now takes us on another long sea voyage to VK9C, Cocos (Keeling). The island is 3000 miles to the northeast, and it would certainly be a round-about way to go. However, it suits our purpose and reminds us of the distances involved. This low-lying atoll, only a few feet above the sea level, is easily missed.

At one time the atoll was the private Kingdom of the Clunies Ross family. After discovering the atoll, Clunies Ross returned with a group of Malays and founded his dynasty, based on the coconut palm and copra. Those days have now gone, and the Cocos Malays, the descendents of the original group, now have a measure of independence. Their council now has a major say in the running of the island's affairs. Islanders can apply for an Australian passport and can visit the Australian mainland. Many have left for good, drawn by the lure of the better life which a steady job and income bring.

For a visitor to Cocos (Keeling), however, it is hard to understand why anyone would want to leave this beautiful atoll with its ever-changing lagoon. The color of the water ranges from white to deep purple, and the coral sand on the beaches is almost pure white. The atoll does lie in the cyclone area, though. Vicious storms do occur, and damage to the fragile coconut plantations can be considerable. A fairly recent addition to the island was a cyclone-proof shelter built at the cost of several million dollars.

Amateur radio activity has always been sporadic and was usually the result of one of the Australian government staff being a radio amateur. A good example would be the radio technician who takes care of the aiport facilites, Nav-aids, etc. Occasionally one would be a radio amateur. In recent years it has been activated by several DXpeditions, and as a result many have this one worked and confirmed.

I activated Cocos on two occasions using the callsign VK9YS, which I held for several years. For many years VK9Y was used for Cocos (Keeling).

At the time of the writing of this article there was no resident radio amateur.

Christmas Island VK9X

It is time to change to a plane as our means of travel; it is faster and certainly more comfortable. If we now leave Cocos (Keeling) and head more or less east, a landing will be made on Christmas Island, some 600 miles away. This is a large island also with a history.

At one time the island was linked to the Clunies Ross family by means of concessions for phosphate. However, most of the recent history revolves around the mining of rich phosphate, until very recently a very lucrative business. To mine the deposits the Phosphate Company hired foreign labor. It was cheaper, but in addition there was no resident population of "Christmas Islanders" ready to be tapped into service. As a result, all of the population of the island is connected with the phosphate industry. Workers were recruited from Hong Kong and other countries; there are many Chinese on the island. Hard working, they have no claim to the island, although they may have worked there for many years. Until very recently they resided in company housing, shopped at company stores, and sent their kids to company schools. There seems to be no possibility of residency, as once again there is no freehold land. One cannot immigrate to Christmas Island, open up a business, and build a house.

These days things are changing. For one thing, the phosphate is running out and world demand is less. The workers, in many cases, have no desire to return "home." For many, the island is home. So there are problems, with the Australian government more or less taking back control of the island from the Phosphate Company. With the recently opened casino, the rather new tourist industry is the way things are going.

As a general rule Christmas Island was almost always available to radio amateurs until recently. Many of the communications technicians lived and worked on Christmas Island for many years. There was an active radio club with its own premises, station, and callsign (VK9XI). Most of the older radio amateurs, interested in DXing, will have a VK9XI QSL card in their collection.

Back To Australia

It is time to head back to Australia. The 1600 mile flight back to Perth, in western Australia, with a short stop at Cocos (Keeling) is uneventful. Here we will make our official entry into Australia, complete with visa requirements, customs formalities, etc.

Tomorrow morning, leaving Perth our flight will get us back to Sydney, over 2000 miles to the east. With a bit of luck there may be a stop at Yullarah, near Alice Springs, deep in the Australian outback. The remainder of the journey to Sydney is usually very comfortable and laid back.

Hopefully, if the weather is okay over Norfolk Island, we leave Sydney the morning after. The two hour flight from Sydney will have us back on Norfolk Island, skimming low past Philip Island, lying a few miles to the south, before landing.

It has been an exhausting trip, and I am ready for a break. How about you? ■

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A 150 watt HF XCVR with dual in-band receive, all mode digital signal processor, microprocessor controlled automatic antenna tuner with memories, built in power supply, high stability crystal oscillator, CW keyer, 100 memories, and more! An excellent performer ... **Call**

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A 100 watt HF XCVR with DC input, 100 memories, IF shift, pass band tuning, CW keyer, notch filter, and more. Optional all mode digital signal processing unit. The AT model includes an automatic antenna tuner. Both radios are great performers ..... **Call**

TS-450SAT / TS-450S
A 100 watt HF XCVR with DC input, 100 memories, IF shift, notch filter, and more. Optional all mode digital signal processing unit. Optional filters can be installed in two IFs- just like the TS-850. The AT model comes with an automatic antenna tuner. Great mobile rigs ... **Call**

TS-50S
A tiny 100 watt all mode HF XCVR with 100 memories, general coverage receive, IF shift, RIT/XIT, multifunctional hand microphone, mounting bracket, and much more! Optional external automatic antenna tuner. The TS-50S is the smallest HF radio in the world. A top notch HF mobile performer ..... **Call**

TM-742
A 45 watt 2m / 70cm FM mobile radio with 100 memories per band, CTCSS encode, and more. With one open slot for an optional 10m, 6m, 220MHz, or 1.2GHz band module. Using the optional remote kits, the radio can be separated into three different parts. The most versatile mobile rig around ..... **Call**

TH-22	2m tiny hand held	**Call**
TH-28	2m hand held	**Call**
TH-78	2m / 70cm hand held	**Call**
TM-241	2m FM mobile	**Call**
TM-251	2m FM mobile	**Call**
TM-733	2m / 70cm mobile	**Call**
TM-255	2m all mode mobile	**Call**
TS-60	6m all mode mobile	**Call**
TS-140	HF mobile XCVR	**Call**
TS-690	HF / 6m mobile XCVR	**Call**
TS-790	2m / 70cm base XCVR	**Call**
UT-220	220MHz mod. (TM-742)	**Call**
UT-1200	1.2GHz mod. (TM-742)	**Call**

Please call on other Kenwood items

AEA

Isoloop HF loop antenna	**329**
MM-3 / PK-232	**169/315**
PK-900 / PK-88	**449/139**
PCB-88 / SWR-121	**149/359**

ASTRON

MODEL	AMPS	ICS	PRICE
RS-20A	16	20	**90**
RS-20M	16	20	**112**
RS-35A	25	35	**144**
RS-35M	25	35	**162**
VS-35M	25	35	**179**
RS-50A	35	50	**219**
RS-50M	35	50	**239**
VS-50M	35	50	**249**

A=Plain M=Meters V=variable DC

KANTRONICS

KAM+	all-mode TNC	**309**
KPC-3	tiny packet TNC	**110**

Please call for Kantronics software.

rf CONCEPTS

2-23	2m amp (2-30)	**129**
2-315	2m amp (30-40>150-170)	**259**
2-417	2m amp (45>170)	**249**
2/70	2m/70cm amp (2>30)	**219**
2/70H	2m/70cm (20>200/125)	**729**
4-110	70cm amp (10>100)	**330**
4-310	70cm amp (30>100)	**310**
VHF160	2m amp (1>60)	**229**

AMERITRON

AL-80B / AL-82	**1049/1695**
AL-811 / AL-811H	**585/695**
AL-1500 / AL-1200	**2150/1695**
ALS-500M / ALS-600	**695/1120**

MFJ

207 / 208 / 249 / 346	**79/89/179/169**
401 / 407 / 422B / 451	**49/69/119/79**
490 / 492 / 493 / 564	**149/89/129/49**
815 / 817 / 901B / 941E	**69/89/59/99**
945D / 948 / 949E	**89/119/139**
962C / 986 / 989C	**209/259/299**
1224 / 1268 / 1284	**89/49/25**
1278B / 1270B / 1289	**259/119/59**
1728 / 1786 / 1796	**24/219/165**

Please call for other MFJ products.

COMET

B10 / B20 / B20NMO	**36/49/49**
GP3 / GP9	**99/189**
GP6 / CA712EF	**149/129**
FL62S / FL67S	**75/89**
SB5 / SB5NMO	**57/57**
SB7 / SB7NMO	**75/75**

DIAMOND

F142A / F22A / F23A	**120/99/145**
NR770HA / NR770HNMO	**57/60**
NR770RA / NR790A	**57/85**
X200A / X300A	**133/149**
X500HNA / X510MA	**219/179**

BUTTERNUT

HF2V / HF6VX / HF5B	**149/159/259**
HF9VX 80-6m, 9 band vertical	**199**

• New! Butternut CPK add on kit •
No radials for HF6VX / HF9VX 49

M² ENTERPRISES

2M7 / 2M12 / 2MCP14	**89/116/143**
2M5WL / 2MCP22	**159/199**
2M18XXX / 432-9WL	**206/135**
440-18 / 436CP30	**99/206**

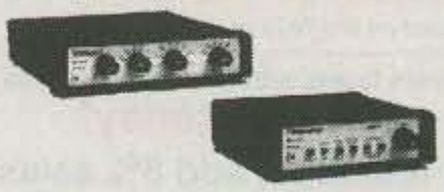
MIRAGE

B108G / B215G	**179/289**
B1016G / A1015G	**289/319**
B2530G / B2560G	**549/879**
D1010N / D3010N	**329/309**

ALINCO

DJ-180T / DJ-580T	**Call**
DR-130T	**Call**
DR-600T / DR-1200T	**Call**

TIMEWAVE



DSP-9+	standard DSP filter
DSP-59+	deluxe DSP filter

U.S. TOWERS

- **All steel construction.**
- **Towers all self-support.**
- **Highest quality, best selling crankups available.**

MODEL	MIN.	MAX.	WINDLOAD	PRICE
MA-40	22'6"	40 FT.	10 SQ. FT.	679.00
MA-550	22'1"	55 FT.	10 SQ. FT.	1069.00
MA-770	23'10"	71 FT.	10 SQ. FT.	3129.00
MA-850	24'6"	85 FT.	10 SQ. FT.	3389.00
TX-438	22'6"	38 FT.	18 SQ. FT.	989.00
TX-455	21'0"	55 FT.	18 SQ. FT.	1489.00
TX-472	23'8"	72 FT.	18 SQ. FT.	2449.00
TX-489	24'4"	89 FT.	18 SQ. FT.	4269.00
HDX-538	22'6"	38 FT.	30 SQ. FT.	1279.00
HDX-555	22'0"	55 FT.	30 SQ. FT.	2239.00
HDX-572	23'8"	72 FT.	30 SQ. FT.	3859.00
HDX-589M	24'8"	89 FT.	30 SQ. FT.	7689.00

In CA add 6% sales tax, please call for an accurate shipping quote.

ROTATORS

Orion OR-2300 (35 Sq.')	**Call**
Orion OR-2300D (35 Sq.')	**Call**
Telex HAM IV (15 Sq.')	**355**
Telex Tailtwister (20 Sq.')	**420**
Telex HDR300 (25 Sq.')	**900**
Yaesu G500 (elevation)	**259**
Yaesu G800SA (21 Sq.')	**309**
Yaesu G800SDXA (21 Sq.')	**379**
Yaesu G1000SDXA (23 Sq.')	**459**
Yaesu G2700SDXA (34 Sq.')	**879**
Yaesu G5400B (az. / el.)	**479**
Yaesu GS-23A RS232 Control	**299**
Yaesu GS-232B RS232 Control	**475**

Please call for other rotator prices.

CUSHCRAFT

13B2 / 17B2 / 26B2	**Call**
10-3CD / 10-4CD	**Call**
12-4CD / 40-2CD	**Call**
15-3CD / 15-4CD	**Call**
20-3CD / 20-4CD	**Call**
A3S / A4S / AP8A	**Call**
A449-6 / A449-11	**Call**
AR-6 / AR-10 / AR-270	**Call**
ARX-2B / ARX-450B	**Call**
CS-28M / CS-147M	**Call**
CS-270M / CS-450M	**Call**
D3W / D40	**Call**
R5 / R7 / AV5	**Call**

Please call for Cushcraft prices.

TELEX / HYGAIN

TH11DXS	5 band beam	**850**
TH7DXS	3 band beam	**650**
TH5MK2S / EX-14		**530/410**
218S	satellite system	**325**

Please call for Hygain crankup towers.

ALUMINUM

6063-T832 DRAWN TUBING

O.D.	WALL	I.D.	COST
.375"	.058"	.259"	.35/Ft.
.500"	.049"	.402"	.45/Ft.
.500"	.058"	.384"	.50/Ft.
.625"	.058"	.509"	.55/Ft.
.750"	.058"	.634"	.65/Ft.
.875"	.058"	.759"	.75/Ft.
1.000"	.058"	.884"	.80/Ft.
1.125"	.058"	1.009"	.90/Ft.
1.250"	.058"	1.134"	1.10/Ft.
1.375"	.058"	1.259"	1.20/Ft.
1.500"	.058"	1.384"	1.40/Ft.
1.625"	.058"	1.509"	1.60/Ft.
1.750"	.058"	1.634"	1.80/Ft.
1.875"	.058"	1.759"	1.90/Ft.
2.000"	.058"	1.884"	1.95/Ft.
2.125"	.058"	2.009"	2.05/Ft.

In 6' and 12' lengths; 6' ship by UPS, 12' ship by truck or air freight collect.

6061-T6 EXTRUDED TUBING

.188"	Solid	---	.15/Ft.
1.125"	.058"	1.009"	.70/Ft.
1.250"	.058"	1.134"	.85/Ft.
2.000"	.120"	1.760"	2.60/Ft.
2.000"	.250"	1.500"	4.10/Ft.
2.500"	.120"	2.260"	3.25/Ft.
3.000"	.065"	2.870"	2.20/Ft.
3.000"	.120"	2.760"	3.85/Ft.

In 6', 12', and 24' lengths; 6' ship by UPS, 12' and 24' ship truck or air freight collect.

ROHN TOWER

25G / 45G / 55G	**65/149/197**
A25AG2 / 25AG3 / 25AG4	**94/94/95**
45AG2 / 45AG4	**180/186**
AS25G / AS455G	**30/74**
EF2545 / EFBX	**375/399**
FK2548' / 58' / 68'	**1350/1450/1485**
FK4544' / 54' / 64'	**1775/1950/2075**
GGK25G2 / GGK45G2	**325/350**
HBX40 40' tower (10 sq.')	**325**
HBX48 48' tower (18 sq.')	**450**
HBX56 56' tower (10 sq.')	**589**
HDBX40 40' tower (18 sq.')	**429**
HDBX48 48' tower (18 sq.')	**579**
TB3 / TB4	**75/90**

COAX & CABLE

ANDREW HELIAX®
1/2" ..... **2.49/Ft.** 7/8" ..... **5.99/Ft.**
connectors: 1/2" .. **32.00** 7/8" **78.00**

COAX

9086 (9913 equivalent)	**.49/Ft.**
9096 (stranded center 9086)	**.65/Ft.**
RG-213/U (8267 equivalent	**.39/Ft.**
RG-8X (mini RG-8/U)	**.25/Ft.**
RG-58C/U	**.24/Ft.**

BARE COPPER WIRE

14 gauge stranded	**.10/Ft.**
14 gauge flex-weave	**.15/Ft.**

ROTOR CABLE

7 conductor (2-#18, 5-#22)	**.20/Ft.**
8 conductor (2-#18, 6-#22)	**.25/Ft.**
heavy duty 8 (2-#16, 6-#18)	**.45/Ft.**

PHILLYSTRAN

NONCONDUCTING GUY CABLE

HPTG1200I (1200#)	**.42/Ft.**
HPTG2100I (2100#)	**.52/Ft.**
HPTG4000I (4000#)	**.75/Ft.**
HPTG6700I (6700#)	**.95/Ft.**
end kits 2100/4000/6700	**4/5/6**

GUY HARDWARE

3/16EHS guywire (3990#)	**.18/Ft.**
1/4EHS guywire (6700#)	**.21/Ft.**
3/16CCM cable clamp	**.55**
1/4CCM cable clamp	**.65**
1/4TH thimble	**.55**
3/16 preformed big grips	**2.29**
1/4 preformed big grips	**3.49**
500D guy insulator	**2.29**
502 guy insulator	**4.49**
3/8EE turnbuckle	**8.95**
3/8EJ turnbuckle	**9.95**
1/2X9EE turnbuckle	**11.95**
1/2X9EJ turnbuckle	**12.95**
1/2X12EE turnbuckle	**13.95**
1/2X12EJ turnbuckle	**14.95**
GAR30 / GAS604 Anchor	**30/20**
Klein safety belt (S M L XL)	**69.95**

CARBON STEEL MASTS

WALL	5'	10'	15'	20'
.12	29	55	82	99
.18	49	95	139	179
.25	–	129	–	249

Don't be fooled by aluminum masts! The typical yield strength of our 2" O.D. galvanized steel masts is 87,000psi.

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TECH INFO **(214) 422 - 7306**

ORDER TOLL FREE **(800) 272 - 3467**

FAX LINE **(214) 881 - 0776**

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A Division of Texas RF Distributors, Inc. 1108 Summit Avenue, Suite #4 Plano, TX 75074

C.O.D.
MC / VISA

M-F: 9AM-5PM
SAT.: 9AM-1PM

SAVE TWO WAYS!

F I R S T

Forget About List Prices! Texas Towers' Prices Included HUGE Discounts Off The Manufacturer's List Prices. Texas Towers Offers Savings As Big As Texas!

S E C O N D

Kenwood Is Offering Discount Coupons For Every Radio Featured On This Page. These Are Applied At The Time Of Purchase For Even Greater Savings! These Kenwood Coupons Are Valid Through June 20, 1994.

-950SDX ..... Call For Special Pricing!

50W RF Out • All Mode DSP • Auto Tuner
ual RX • RM-1 Included • More!

$100 COUPON FOR ADDED SAVINGS!

-450S / SAT ..... BIG SAVINGS!

AT Model Includes Automatic Tuner • 100 W Out
ptional Filters For Two Separate IFs • More!

$50 COUPON FOR ADDED SAVINGS!

I-742A ..... Please Call For Big Specials!

m/70cm Mobile XCVR. One Band Module Can Be
ded For 10m, 6m, 220MHz, Or 1.2GHz Operation.

$40 COUPON FOR ADDED SAVINGS!

TH-78A ..... Please Call!

- 2m/70cm Hand Held Transceiver
- 10-Memory Autodialer (15-digit)
- 50 Multifunction Memories
- AM RX
- Back-Lit Display And DTMF Pad
- CTCSS Decode
- CTCSS Encode
- DTMF Paging
- DTMF Squelch
- Dual RX
- Dual In-Band RX
- Extended RX (118-174 MHz)
- Multiple Scan Modes, Dual Scan
- ME-1 Option Adds 200 Memories

$30 COUPON FOR ADDED SAVINGS!

TS-850S / SAT ..... Special Pricing!

•SAT Model Includes Automatic Tuner • 100 W Out
• CW Keyer • VBT/IF Shift • More!

$50 COUPON FOR ADDED SAVINGS!

TS-50S ..... Call For Your Special Price!

The World's Smallest 160-10m All Mode HF XCVR
• 100 W RF Out • Mobile Bracket • Remote Mic

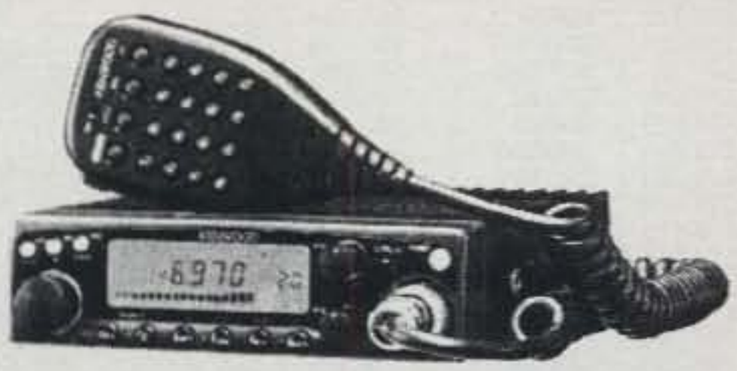
$50 COUPON FOR ADDED SAVINGS!

NEW!

TM-733A ..... NEW- Please Call For Price!

• 2m/70cm XCVR • 45/35W Output • Dual RX
• CTCSS Encode • Packet Jack • More!

$20 COUPON FOR ADDED SAVINGS!



TM-241A ..... Call For BIG Savings!
TM-251A ..... Now Available- Please Call!

•2m Mobile XCVR • 45W RF Output • AM RX
• CTCSS Encode • DTMF Mic • More!

$30 COUPON FOR THE TM-241A

TH-22AT ..... Call For Price!

- Tiny 2m Hand Held Transceiver
- 40 Multifunction Memories
- Automatic Power Off
- CTCSS Encode
- Optional TSU-8 CTCSS Decode
- EPROM Memory Backup- No Battery To Replace!
- Multiple Scan Modes
- Wireless Memory Cloning
- With NiCad Battery, Belt Clip, Wall Charger, And Wrist Strap.
- DTP-2 Option Adds DTMF Paging, DTMF Squelch, And 5-Memory Autodialer (15-digit).

NEW!

$20 COUPON FOR ADDED SAVINGS!

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CALL TOLL FREE **(800) 272-3467**

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TEXAS TOWERS

HOURS:
M-F 9AM-5P
SAT 9AM-1P

M/C - VISA - C

DEALS!

KENWOOD

The 1993 CQ WW CW Contest High-Claimed Scores

WORLD ALL BAND

EA8EA	12,782,592
P4ØW	11,284,480
PYØF	11,071,680
P4ØN	10,711,785
TI1C	9,338,272
ZD8Z	9,312,660
6V6U	9,075,800
9Y4H	8,392,648
HD9N	8,051,968
JY8VJ	7,271,968
7Q7OO	7,242,750
P4ØJ	6,989,004
ZS6EZ	6,924,175
ZB2X	6,249,848
K1ZM/2	5,810,508
K1KI	5,716,932
K5ZD	5,599,440
VP5RX	5,205,519
N2NT	5,019,948
9K2ZZ	5,014,159
K3ZO	5,013,120
N2LT	4,981,658
N6BV/1	4,941,490
4S7/N6ZZ	4,575,420
PJ2/WJ2O	4,176,428
K4VX/Ø	3,840,165
W2SC/1	3,823,806
XE1/AA6RX	3,758,225
G4BUO	3,719,916
KT3Y	3,695,880
K4PQL	3,629,774
K5GN	3,519,425
YS1X	3,512,151

28 MHz

CV5A	951,044
CX5BW	708,760
S51AY	77,405
K4XS	66,600
F5NBX	45,360
JA3XOG	39,336
HK3YH	37,962
K7QQ	34,675
K5LZO	34,316
JA6WIF	33,920
W3GN	32,973

21 MHz

ZPØY	1,891,556
ZD8VJ	1,687,599
ZX5CW	1,151,010
KP2A	986,272
9Y4VU	955,932
CX3ABE	765,855
VK2AYD	652,795
GW8GT	601,160
K1ZZ	574,224
TM2O	545,160
K1RU	531,139
S58A	500,066

14 MHz

PZ5JR	1,388,162
KM1H	1,035,075
OHØDX	923,352
K2SS/1	850,429
S5ØA	836,600
CH7SZ	827,442
VE1ST	790,444
IB9T	747,775
IT9A	742,417
OK5A	735,301
CW5W	696,384
4X6FR	617,872
S51AW	600,682
YT7A	585,904
LZ5W	576,034
DJ7AA	554,274
GM3WOJ	542,336
G4CNY	505,180
F6KBF	503,426

7 MHz

C41A	1,346,020
PJ9Y	1,194,606
FG5BG	1,042,294
S5ØS	998,224
ED6XXX	975,068
LX4B	748,995
OM3RM	736,016
W1RR	727,308
CH7SV	693,792
OK1AYP	662,375
OH7MA	651,672
9A3IQ	599,589
S59WA	592,179
UB4HO	589,844
RZ6LJ	589,472
5K1R	572,330
SP6YAQ	564,469
K3WX	553,860
A22MN	544,688
GØIVZ	531,522
N6RO	527,758
HA3UU	512,316
PA6A	510,720

3.5 MHz

ON4UN	650,832
SN3A	535,059
OM3NA	405,108
W1MK	372,939
UN2L	366,938
OM3PA	360,410
OJØ/OH1VR	357,753
S51OJ	346,598
TK5NN	346,236
LY3BS	322,432
I3JSS	305,148
YL1WW	304,569
S54CW	294,300

1.8 MHz

4X4NJ	167,184
GW3YDX	166,756
VO1NA	165,690
OY9JD	128,847
DK6WL	109,484
GIØKOW	86,802
OH1MA	71,604
KH6CC	68,250
9A2TW	67,456
IT9ZGY	66,992
I3VHO	63,072
S57AV	61,273
F6CWA	59,563
IV3PRK	56,356
SM6DOI	53,534

LOW POWER ALL BAND

EL2PP	2,630,761
NH6T	2,502,192
A7ICW	2,494,580
RB5QDP	2,329,640
NP2I	2,237,868
K2ZJ	2,040,520
K2SG	1,974,047
S5ØL	1,921,198
TM6GG	1,640,712
KC1SJ	1,467,504
DL6KVA/6Y5	1,341,714
XR1X	1,302,525
XM4VV	1,203,840
WD5N/HC8	1,185,340
WS1E	1,128,834

28 MHz

VK4XA	126,025
PY2NQ	114,400
LW4DIR	61,248
T93M	37,694
9A2LH	19,275
S59ZA	16,948

21 MHz

CX6VM	631,806
LU4FD	294,372
U5WF	251,482
N4MO	243,740
HA8RH	225,776
EC8AXM	224,640
S51QZ	217,722
WB4TDH	208,925
YB6TI	193,452
IT9AF	175,161
DL1YAW	155,832

14 MHz

VO5SF	277,500
YL2GN	261,702
UV3HD	258,876
K9KU	231,768
JH7JVJ	223,250
JR2BNF/1	167,356
JH4JNG	164,929
OH6LBW	160,140
VK4TT	140,556
UB4IBF	140,280
UB3IQ	136,680
IR6A	133,875
I3JTE	131,193
LU1ICX	129,600

7 MHz

4N7N	609,738
ZL7FD	432,200
CH7AHA	384,300
UAØJQ	354,311
TA2BD	297,528
RAØFA	273,921
PA3AAV	217,605
EA8NQ	205,485
VK3APN	140,900
N4IJ	127,020
SP2FAP	120,612
SP9NLK	106,425

3.5 MHz

S59CAB	147,486
HA8FW	122,580
YTØT	120,712
UAØSMM	82,368
RA1ZA	75,636
HA8IB	74,918
HA8RJ	72,300
SV2BOH	70,092
RB5PE	58,256

1.8 MHz

HA8EK	67,014
UA9AT	47,334
SP2FOV	37,329
SV2BFN	34,740
SP9GDB	25,048
DL3JSW	23,754
ES1AR	23,040
OM3TQX	17,613

QRP

7Z2AB	2,942,275
AA2U	821,745
UB4FXX	792,816
G4BWP	786,799
K5RX	636,660
K1CGJ	560,604
JA6GCE	420,549
SM3CCT	333,132
KW2P	318,108
KA1CZF	314,632
DL6RDR	312,550
XE2KB	306,132
UAØSAU	297,774
UA9SG	282,172
KP4DDB	267,344
UB4IM	263,030

ASSISTED

VE3EJ	6,193,110
4X/S59PR	5,792,562
K3WW	5,124,336
K1DG	4,640,232
K5NA/2	4,581,100
4U1ITU	4,207,060
W2UP/3	4,072,308
DK3GI	4,044,870
AA2DU/1	3,620,925
W1PH	3,558,248
K2WK	3,187,504
KC1F	3,184,954
K2SX/1	2,905,254
NN3Q	2,430,792
AA3B	2,399,572
WØCG/8	2,369,184
DJ2YA	2,356,200
K8MFO	2,257,200
W3FV	2,224,750
ND3A/4	2,166,395
DL2MEH	2,123,758
K2BU	2,060,792

MULTI-OPERATOR SINGLE TRANSMITTER

J6DX	12,183,712
4M5I	11,578,320
VP9AD	9,746,848
ZF2WW	8,739,805
V31KF	8,445,301
IQ4A	8,323,293
KC1XX	7,960,031
UW2F	7,712,156
K1TR	7,349,100
HZ1AB	7,107,600
TM9C	7,077,114
Z3ØM	7,017,138
CR3W	7,004,628
LZ9A	7,004,232
GB5DX	6,391,700
IR2W	6,385,365
K2WI	6,204,696
DFØHQ	6,091,566
G3LNS	5,867,130
OH2X	5,859,659
ED3KU	5,812,344
OM3KFF	5,576,585
OK5W	5,523,910
OM3KAG	5,434,509
EA5WU	5,102,400

MULTI-OPERATOR MULTI-TRANSMITTER

EA9EO	28,625,841
AHØK	21,626,228
HG73DX	16,344,884
W3LPL	15,996,236
K1AR	15,437,600
9A1A	15,213,070
K3LR	13,194,968
VS6WO	12,631,437
UR8J	10,622,640
ZL2K	9,658,500
KY3N	9,571,584
RU1A	9,033,443
KY1H	9,010,400
KØRF	8,488,540
AA6TT	8,231,505
NL7G	8,072,160
N3RS	7,893,463
K8CC	7,188,900

USA ALL BAND

K1ZM/2	5,810,508
K1KI	5,716,932
K5ZD	5,599,440
K3ZO	5,013,120
N2LT	4,981,658
N6BV/1	4,941,490
K4VX/Ø	3,840,165
W2SC/1	3,823,806
KT3Y	3,695,880
K4PQL	3,629,774
K5GN	3,519,425
AA1K/3	3,372,720
N5RZ	3,069,627
W1WEF	3,042,105
K8GL	2,869,867
W9RE	2,854,551
W4RX	2,802,442
K5MR	2,550,274
N4AR	2,511,028

28 MHz

K4XS	66,600
K7QQ	34,675
K5LZO	34,316
W3GN	32,973
AH9B/W5	11,501
W9GIL	9,331

21 MHz

K1ZZ	574,224
K1RU	531,139
WZ3Q	406,512
N4CT	386,550
K8OQL	318,525
W6YA	310,453
K2MT	302,577
K8JM	294,831
W6QHS	290,655
W5VX	288,840
N4IR	258,115
AA5ZQ	210,042
W8FN	184,950
K9OM	179,732

14 MHz

KM1H	1,035,075
K2SS/1	850,429
KN6M/5	451,520
K9BGL	407,160
NQØI	321,328
WA8DXB	308,256
N9KAU	305,320
K9CAN	294,350
N6JKQ	244,464
K6OY	219,329
N8LXS	218,226
W9OF	209,129

7 MHz

W1RR	727,308
K3WX	553,860
N6RO	527,758
WA4CTA	405,142
K4JPD	380,281
NW6N	341,348
AB4RX	200,976
KØOD	197,658
NX7K	187,625
WA7BPI	177,684
K5NU	160,599
K5KT/6	141,247
K3BSY	132,928
NK9G	112,890
K6PJY	103,056
N5UD	100,815

3.5 MHz

W1MK	372,939
WE3C	241,879
W9LT/8	204,472
K4PI	192,384
N4CC/9	140,300
WA4PGM	105,462
K2RR/1	98,670
K1WGM	93,636
WI9C	55,100
W4NL	50,700

1.8 MHz

W1BYH	48,552
WB9Z	46,314
W1CKA	36,992
KVØQ	28,161
K4TEA	27,115
W2FCR	19,610
N6SS/7	19,548
KG7D	8,352
K3UA	7,956
AA4VV	5,445

LOW POWER ALL BAND

K2ZJ	2,040,520
K2SG	1,974,047
KC1SJ	1,467,504
WS1E	1,128,834
WA2SRQ	1,046,045
KM1X	1,017,423
KX3Y	838,000
K5KLA	837,936
W6JTI	820,017
N5AW	725,642

28 MHz

KV8Q	14,941
KQ1V	13,054
N6EE	11,041
WDØAVV	9,900
KB5JJB	7,803
KK4SM	7,446

21 MHz

N4MO	243,740
WB4TDH	208,925
W9HLY	144,493
NI5M	124,344
WV5S	111,684
W5VGX	107,760

14 MHz

K9KU	231,768
KA7T	120,640
KB9S	118,560
W9JOO	76,035
KD5IA	65,988
WIØR	60,770

7 MHz

N4IJ	127,020
K9MMS	58,206
KJØB	55,836
K9UIY	55,045
KO9Y	48,124
NI6G	47,124

3.5 MHz

W8WEJ	1,326

1.8 MHz

W2VO	11,832

MULTI-OPERATOR SINGLE TRANSMITTER

KC1XX	7,960,031
K1TR	7,349,100
K2WI	6,204,696
WD8LLD	4,383,020
KS9K	4,175,880
AG6D	3,337,768
W9KDX	3,337,200
N2MM	3,308,903
W6BA	3,116,880
K8LX	2,986,140
W3GG	2,897,650
N6CQ/3	2,827,440
K9UWA	2,632,342
AB2E	2,566,863
NCØP	2,536,975

MULTI-OPERATOR MULTI-TRANSMITTER

W3LPL	15,996,236
K1AR	15,437,600
K3LR	13,194,968
KY3N	9,571,584
KY1H	9,010,400
KØRF	8,488,540
AA6TT	8,231,505
N3RS	7,893,463
K8CC	7,188,900
N6DX	6,046,425
AA4G	4,800,449
WØAIH/9	4,683,294

EUROPE ALL BAND

ZB2X	6,249,848
G4BUO	3,719,916
DL2NBU	3,183,505
OZ1LO	2,875,698
S51BO	2,776,218
OH1AF	2,599,168
OH6WZ	2,318,342
DL6RAI	2,172,100
LY2IJ	1,913,072
HA8FM	1,912,484
OH2BC	1,899,328
UT6Q	1,810,440
OH4AB	1,711,565
DK5PD	1,670,306
DL7MAE	1,598,352
RB1IZ	1,565,840
OH2PM	1,543,284
ZA/OK2PSZ	1,348,438

28 MHz

S51AY	77,405
F5NBX	45,360
SP5DDJ	10,792
OH5PA	3,225

21 MHz

GW8GT	601,160
TM2O	545,160
G3KDB	481,712
9A5Y	480,655
EA2IA	448,043
OK1ALW	432,798
OHØAM	427,284
YU7BW	406,224
EA7TH	395,922

14 MHz

OHØDX	923,352
S5ØA	836,600
IB9T	747,775
IT9A	742,417
OK5A	735,301
S51AW	600,682
YT7A	585,904
LZ5W	576,034
DJ7AA	554,274
GM3WOJ	542,336
G4CNY	505,180
F6KBF	503,426

7 MHz

S5ØS	998,224
ED6XXX	975,068
LX4B	748,995
OM3RM	736,016
OK1AYP	662,375
OH7MA	651,672
9A3IQ	599,589
S59WA	592,179
UB4HO	589,844
RZ6LJ	589,472
SP6YAQ	564,469
GØIVZ	531,522
HA3UU	512,316
PA6A	510,720

3.5 MHz

ON4UN	650,832
OM3NA	405,108
OJØ/OH1VR	357,753
S51OJ	346,598
TK5NN	346,236
LY3BS	322,432
I3JSS	305,148
YL1WW	304,569
S54CW	294,300
DK2OY	277,611

1.8 MHz

GW3YDX	166,756
DK6WL	109,484
GIØKOW	86,802
OH1MA	71,604
9A2TW	67,456
IT9ZGY	66,992

LOW POWER ALL BAND

RB5QDP	2,329,640
S5ØL	1,921,198
TM6GG	1,640,712
GJ/K2WR	1,097,580
OH3LIM	984,948
G3SWH	916,158
S52OP	863,330
F5JCB	847,735
DL4YBM	793,230
OZ8AE	774,237
DL2OBF	689,310
DJ5GG	679,544
OZ5MJ	677,040
G3SSO	676,506
DF4ZL	649,720
EA2CLU	642,960
EA3AEQ	603,896
DL7VOG	568,516
OK1FPS	560,280
OK1EP	556,325
HAØHW	551,808
SP6NIC	534,540
UB4LCB	528,260
SP6EIY	515,412
UA3DPX	502,222
OK2TBC	501,942

28 MHz

T93M	37,694
9A2LH	19,275
S59ZA	16,948
RA3LB	6,875
OK1XW	6,572
OK1BMW	5,661

21 MHz

U5WF	251,482
HA8RH	225,776
S51QZ	217,722
T9AF	175,161
DL1YAW	155,832
SP5JTR	142,155

14 MHz

YL2GN	261,702
UV3HD	258,876
OH6LBW	160,140
UB3IQ	136,680
IR6A	133,875
I3JTE	131,193

7 MHz

4N7N	609,738
PA3AAV	217,605
SP9NLK	106,425
OH4ML	93,800
I6MU	79,076
I2IFT	77,826

3.5 MHz

S59CAB	147,486
HA8FW	122,580
HA8IB	74,918

1.8 MHz

HA8RJ	72,300
SV2BOH	70,092
RB5PE	58,256

MULTI-OPERATOR SINGLE TRANSMITTER

IQ4A	8,323,293
TM9C	7,077,114
Z3ØM	7,017,138
LZ9A	7,004,232
GB5DX	6,391,700
IR2W	6,385,365
DFØHQ	6,091,566
G3LNS	5,867,130
OH2X	5,859,659
ED3KU	5,812,344
OM3KFF	5,576,585
OK5W	5,523,910
OM3KAG	5,434,509
EA5WU	5,102,400

MULTI-OPERATOR MULTI-TRANSMITTER

HG73DX	16,344,884
9A1A	15,213,070
RU1A	9,033,443
LY7A	6,285,408
4N1Z	6,227,906
DLØKF	3,814,473

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Tape Output: 500 mV P-P @ 600 ohms (nom.)
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CIRCLE 5 ON READER SERVICE CARD

CQ REVIEWS:

The AEA SWR 121 Graphical HF Antenna Analyst

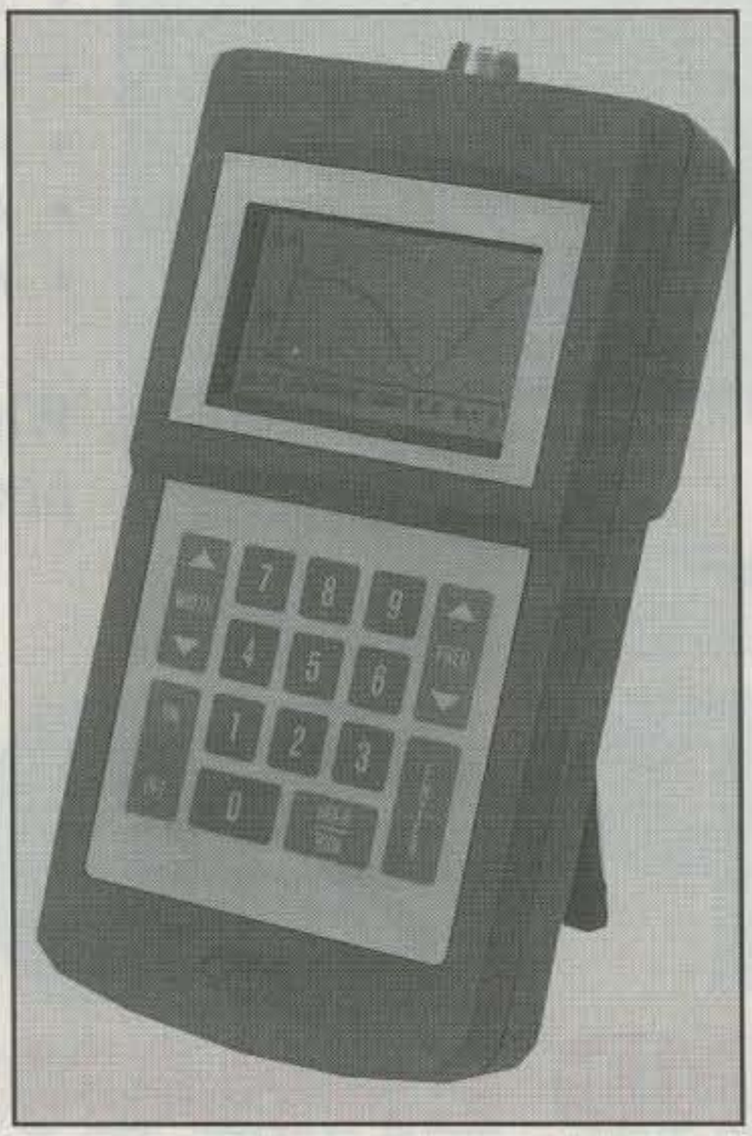
BY PAUL CARR*, N4PC

When building or choosing an antenna for the modern amateur station, SWR curves are a primary evaluation tool. AEA now has an electronic device that will provide a graphical representation of the SWR data from inside the ham shack, or better yet, at the antenna. It is small, light weight, rugged, and has a built-in power supply. It also has all the necessary SWR evaluation circuits. Antennas are one of my hobbies within the hobby, and here is my evaluation of this equipment.

The SWR Analyst is a microprocessor-based circuit designed for use in the HF spectrum. Specifically, it covers from 1.0 MHz to 31.999 MHz. The data can be viewed on a liquid-crystal dot-matrix display measuring 2.75"W × 1.5"H, which is sufficiently large for easy viewing. The data is clearly visible, even in sunlight.

Just a bit about the graphical display itself. Near the left side of the display is a vertical axis where the SWR information is displayed. The lower end of the vertical is marked "1.0," indicating a perfect SWR. The scale of the vertical axis is selected automatically and will range from 1.5 for the best resolution to a value of 9.9 maximum. The horizontal axis has eleven dots either side of the center. Underneath the horizontal axis there is additional information displayed: the resolution of the horizontal axis; Fc, the center frequency of the display; SWR in numerical form; and RL (return loss). Everything you need to know is clearly visible. Now for a brief description of the applications.

Case I: Suppose you want to know the SWR of an antenna at a specific frequency.The procedure is very simple. Connect the antenna and turn on the unit. A logo will appear, and the unit will automatically tune to 10 MHz. Key in the frequency of interest using the keypad, and a horizontal line will appear, accompanied by a pulsing audio tone. The frequency of the audio tone is proportional to the SWR—i.e., the lower the tone, the lower the SWR. This can be a handy feature if you are using the equipment to aid in the tuning of a transmatch. That's it. The SWR value is displayed graphically and numerically on the display. But what if you want to see what the SWR curve looks like across a band of frequencies? Keep reading.



The Advanced Electronic Applications (AEA) SWR 121 Graphical HF Antenna Analyst.

Case II: What does the SWR look like across a particular band? First set the equipment to the center of the band as outlined above. Then enter the resolution for each dot along the horizontal scale and press **Width**. (An entry of 25 kHz will give a total width of ±275 kHz for the display.) The unit will sweep the band, set the scale for the SWR, and draw a graph of the output. It will also display a numerical value of the SWR and the return loss at the center frequency shown on the dis play. But what if the center frequency is not the point of lowest SWR? Well . . .

Case III: Finding the frequency of lowest SWR. Place the unit in the standby mode by depressing the **Hold/Run** key. Next press the **Frequency Up** or **Frequency Down** key and press **Hold/Run** a second time. The unit will now reassign the center of the graph to the point of lowest SWR (consistent with the resolution of the horizontal axis). The horizontal resolution can be changed to provide any desired accuracy.

Case IV: What is the 2:1 bandwidth of the antenna? With our modern transceivers designed to limit power if the SWR exceeds a 2:1 SWR, antenna bandwidth needs to be a part of our station records. Here's how to do it. Connect a 100 ohm resistor in place of the antenna and power up the unit at the desired center frequency and the desired bandwidth. The unit will sweep the band and calibrate the maximum SWR to a value of two. Now place the unit on hold and replace the resistor with the antenna being tested. The next sweep will plot the SWR curve, and if the SWR exceeds 2:1, the graph will stop there and you can read the upper and lower limits of your antenna. It is much easier to do than to write about!

There is an optional utility program package available which allows the Analyst to interface with a PC-compatible computer. This option package was not evaluated.

The instruction manual is well written and easy to follow. The unit carries a one-year warranty, and AEA has "over the phone" help if the need should arise. The unit is ruggedly built and should provide many years of trouble-free service.

The SWR Analyst is manufactured by Advanced Electronic Applications, Inc., 2006 196th Street, Lynnwood, Washington 98036, and retails for $399. ■

*97 West Point Rd., Jacksonville, AL 36265

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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
		2004-A Desk model	430-450 MHz
3K CLassic Mk II	3.5-30 MHz	**3004-A** Console	430-450 MHz
3KD Premier Desk model	1.8-30 MHz	**3006-A** Console	50-54 MHz
3K Premier Console	1.8-30 MHz	**3002-A** Console	144-148 MHz

5K Classic (Not available to U.S. amateurs)

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CIRCLE 174 ON READER SERVICE CARD

CQ REVIEWS:

The MFJ-8100 World Band Receiver

BY PAUL CARR*, N4PC

Wow! Has it really been that long? I can remember forty years ago sitting in front of a regenerative receiver for hours trying to hear a rare shortwave DX station. I would clutch the headphones and stare at the panel, daring to ask myself if I should tweak the regeneration control. Occasionally I would succeed, and the adrenalin would rush through my body. It was through this type of receiver that I discovered amateur radio, and my life was changed forever.

Well, the regenerative receiver is back in tthe form of the MFJ-8100, and I am happy to say that it is better than ever.

The MFJ-8100 world band shortwave receiver.

Just A Bit of History

The regenerative receiver, like the crystal detector, is one of the classic designs of radio. It had its beginnings in the 1920s, and during that decade the magical, whistling, squeaking boxes were found throughout the parlors of homes around the world. That technology soon gave way to a new design—the superheterodyne. However, the "Gennies," as they were known, never lost their appeal. Their simple design seemed to be the proper medium to connect the youth to the outside world, and thousands made this discovery.

How It Works

The regenerative design is basically a TRF (tuned radio frequency) receiver with controlled feedback to minimize circuit losses. It can be used to detect AM, CW, and SSB signals. AM detection occurs just below the point of oscillation, while CW and SSB detection occurs after the circuit begins oscillation. The circuits of the 1920s were extremely critical with respect to control settings, but by applying modern techniques to today's components, many problems associated with the regenerative circuit have been significantly reduced.

The receiver covers the most populated portion of the RF spectrum in five switched ranges. An RF amplifier stage provides excellent sensitivity with only a short piece of wire for an antenna. The regeneration is very smooth throughout the entire tuning range. There is ample audio to drive two pairs of stereo headphones. (Excitement of this magnitude should be shared!) Now on to the construction phase.

Construction and Alignment

Construction consists of six logical, step-by-step phases. With each installation instruction the color code of each component is given. There is also a box to check when the component is installed and a second box to check when the installation is verified. There is plenty of room, so component crowding and solder bridges should not be a problem.

[ ] 1-3. Install L2 (orange-orange-GOLD), 3.3 uH. Be sure not to insert it in the position for R4 between L1 and L2. (Also be very sure not to mistake it for L4, which has yellow-violet-silver bands.

[ ] [ ] 1-4. Install L3 (brown-black-GOLD), 1.0 uH.

[ ] [ ] 1-5. Install L4 (yellow-violet-SILVER), .47 uH.

NOTE: The L5 inductor for Band E is a wind-it-yourself "toroidal coil" (don't worry; it's easy!) which we'll make and install in Phase 5 so that it is not subjected to bumping and bending during other assembly.

[ ] [ ] 1-6. Install R4, 10K (brown-black-orange). Its position is between L1 and L2.

[ ] [ ] 1-7. Install C4, .1 uFd, near L1. (Body marking: 104Z.)

[ ] [ ] 1-8. Install R13, 2.2K (red-red-red). (This is the current limiting resistor for the LED power indicator.)

[ ] [ ] 1-9. Install C3, 47 pF. (Body marking: 470.)

[ ] [ ] 1-10. Install C5, the miniature trimmer capacitor, making sure to orient its body shape just like the circuit board outline. Before soldering, adjust the tuning screw so that its slot is pointed just like the outline on the board.

We've accomplished something important; we got started, and we've made sure that this receiver will tune correctly!

Fig. 1– Typical instructions for building the MFJ 8100 super-regenerative receiver.

*97 West Point Road, Jacksonville, AL 36265

Some components are polarity specific—i.e., they must be installed in a specific manner. Your attention is called to this fact in the form of a bold, black printed statement. There is only one coil to wind, and it is easy to accomplish.

Final assembly, mounting the circuit board in the cabinet, is very easy. There is enough clearance so that no "forcing" is required. The final unit is very rugged and should provide for years of dependable use.

Final calibration is accomplished by tuning WWV at two different points on the bands. I chose WWV at 20 MHz and at 10 MHz. The procedure consists of adjusting a capicator and an inductor until the signals appear at the proper places on the calibrated dial. That's it. It's very easy.

The kit goes together very quickly. My construction time was about three hours, but with the help of a child, I feel this could be extended to about five hours. Get the idea?

Afterthoughts

The Gennies are back, and I'm happy. As I was writing this review, I could not resist tuning across the bands. The antenna was a short piece of wire on the floor. There it was. HCJB, "Voice of the Andes," Quito Ecuador. This was like a visit from an old friend.

The kit is priced at $59.95 and is available from MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762. ■

Radio FUNdamentals

BY BILL ORR, W6SAI

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

Do You Want A Kilowatt?

It's easy to put a kilowatt (or more) on the air these days. All you need is a credit card, or an arrangement for time payments at your friendly amateur radio store, and you have your very own amplifier, complete with manual, ready to go!

The home constructor, on the other hand, can find plenty of information in handbooks and magazines on how to build his own linear. Tubes are readily available; components can be found at hamfests and flea markets. A maximum power afterburner can be built with a modicum of knowledge and minimum cash outlay.

But it wasn't always thus!

48 Campbell Lane, Menlo Park, CA 94025

The Hard Road To A Kilowatt

Amateurs have been running high power since "Day One." When regulations were easy (before the 1927 Radio Conference), some amateurs ran up to 5 kilowatts in power oscillators. But it was a tough struggle. Power tubes were hard to come by, circuit design was a black art known to only a chosen few, and components were expensive.

In the early 1930s only a few transmitting tubes were available to the would-be high-power amateur. RCA had a virtual monopoly and strangle-hold on tube and circuit development as well as tube sales, and as many manufacturers found out (deForest and Heintz & Kaufmann, for example), the manufacture and sale of power tubes not licensed by RCA brought about a nasty letter from the vast staff of RCA attorneys threatening all sorts of dire consequences.

As late as 1933 the only tubes available to amateurs through proper channels for high-power work were the RCA 852 and the 204A. They were expensive and not very good performers. A few knowledge-

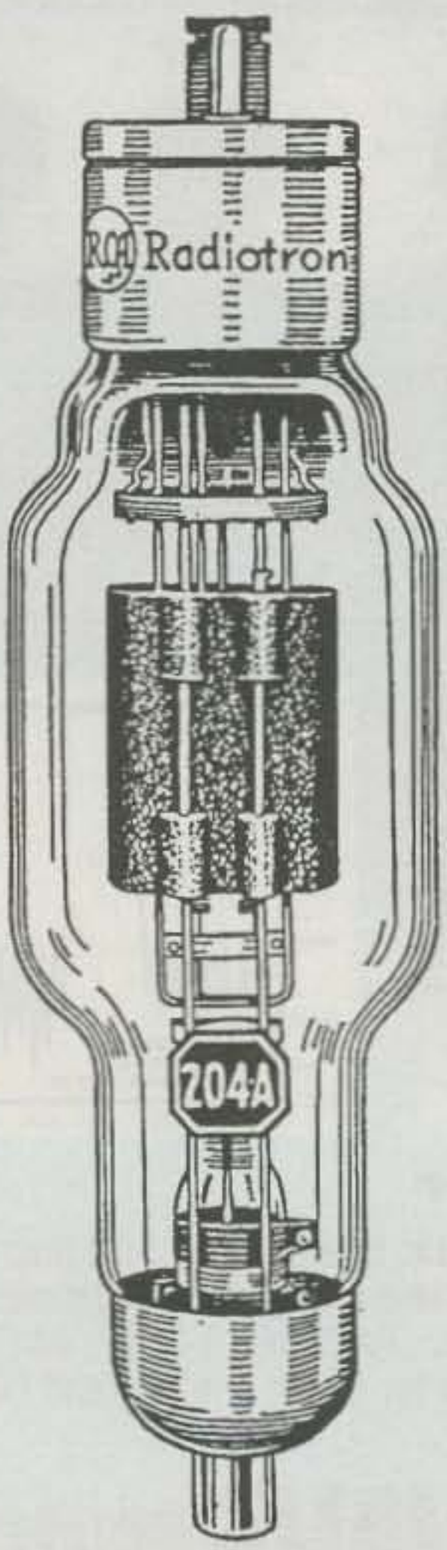
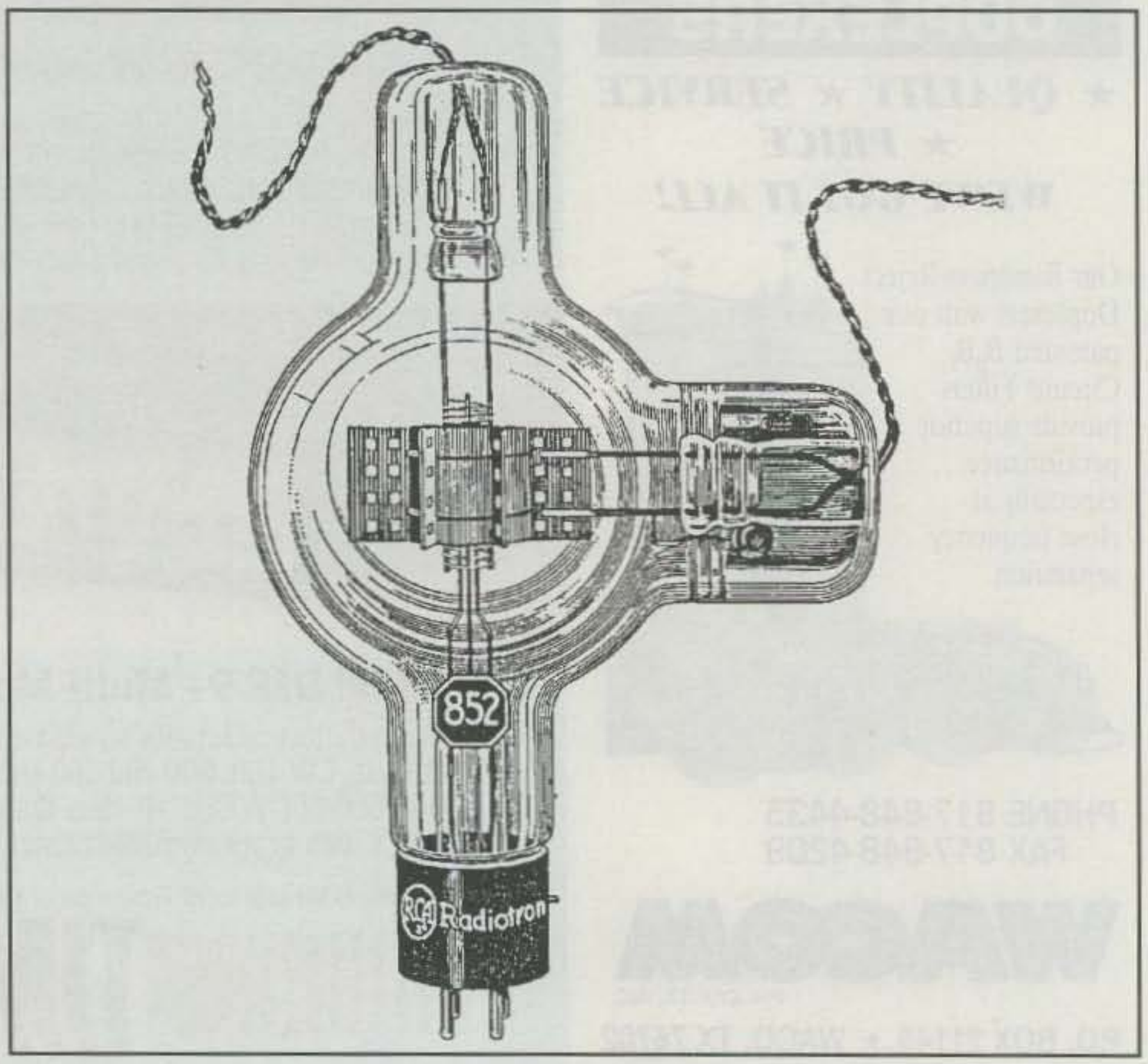


Fig. 1– Late-model RCA 204A. Note the tube is designed to be mounted in an inverted position, filament and grid connections at the top and anode connection at the bottom. Most amateurs mounted the tube in a horizontal position.

Fig. 2– The RCA 852. No grid or anode caps on this tube! Long internal leads and wide grid-filament spacing made this tube hard to drive at high frequencies. Until the HK-354 and 150T came along, it was the only game in town.



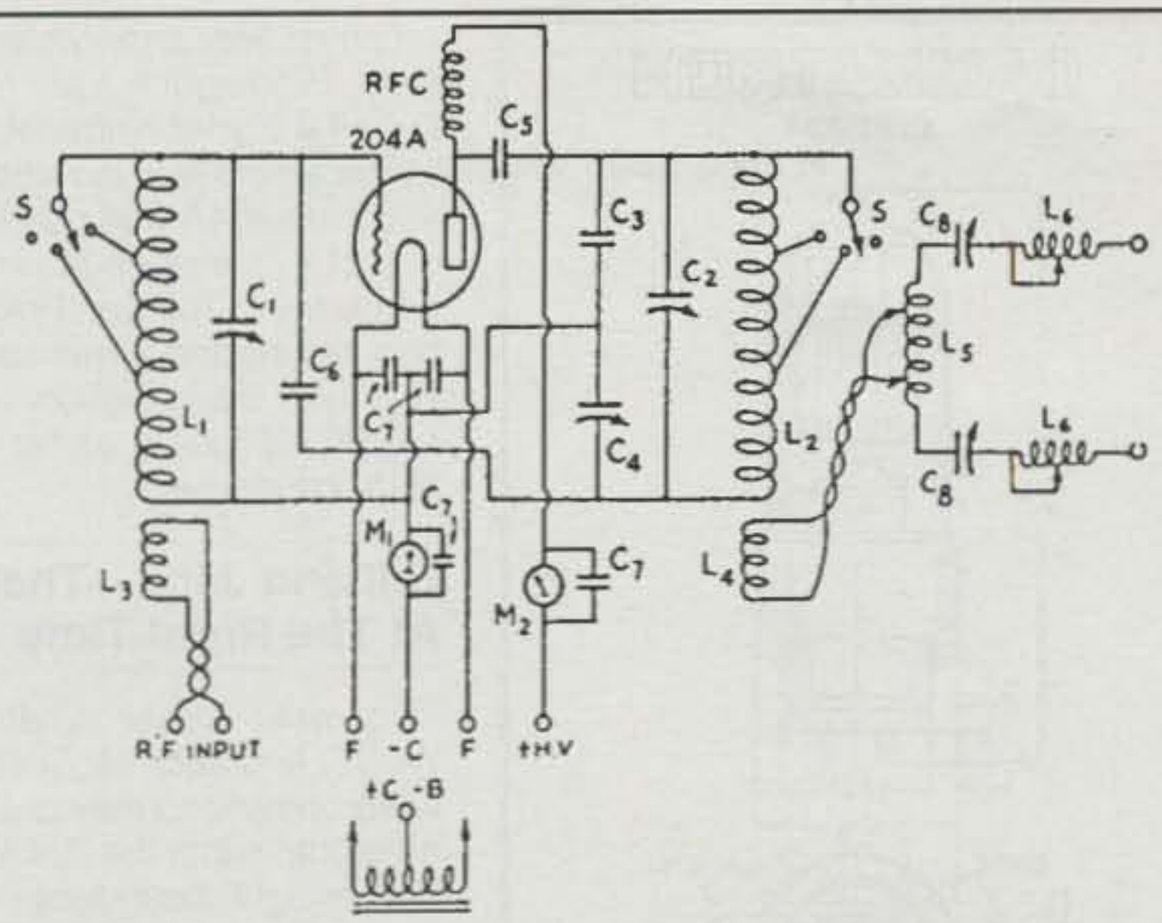


Fig. 3– An early attempt at designing a kilowatt, one-tube amplifier. A touchy design, with no parasitic suppression. The "state of the art" for 1935. (Drawing courtesy QST)

able amateurs considered them "dogs," but most would have killed to own one.

The close cooperation between circuit and tube designers that exists today was virtually unknown in the '30s. Most circuit engineers thought of high power in terms of a lot of voltage and a minimum of plate current. This made amplifier and power-supply construction a very costly undertaking. It also resulted in tubes that were difficult to drive.

The 852 Power Tube

The old 852 triode is a perfect example of the old design concept (fig. 1). Viewed from these days, the 852 had low transconductance, inadequate plate dissipation, and a bizarre internal structural design. It was hard to drive. Moreover, it had exceptionally long leads and an ungainly physical layout.

The first RCA ads for the 852 extolled its use as a VHF oscillator, but later ads stressed amplifier use below 30 MHz. Maximum input in Class C service was 255 watts (3000 volts at 85 mA). Hams were quick to check out how far the tube could be pushed beyond the data sheet.

The tube was really given a smoke test by Charlie Perrine, W6CUH, who designed and published an article on a mammoth amplifier built around two push-pull 852s. The beast was driven by another 852, and the three tubes operated at 4500 to 5000 volts. W6CUH was coy about the input power run by the amplifier. The reader was left to infer that plate current for the two tubes was limited to 200 mA to provide about a kilowatt input.[1] Those who duplicated the amplifier quickly found that it was possible to run 400 to 450 mA, for an input of 1800 to 2000 watts if the plate voltage was high and the 852 driver was providing about 200 watts to the amplifier stage! Circuit efficiency was high enough so that the tubes, rated at only 100 watts plate dissipation each, didn't blow up, but they ran white hot. There wasn't much margin for error in tuning the amplifier! Things could get out of hand very quickly. At a kilowatt, however, the tubes ran pretty cool once the amplifier was properly loaded. A slight slip in tuning, however, could wipe out an 852 in the wink of an eye!

Still, it took three tubes to do the job, plus the high-voltage supply, all of which was not cheap. And rumors abounded about the killer amplifier that destroyed the expensive tubes.

But there was another possible solution for the high-power addict.

The 204A Tube

Amateurs eyed the RCA 204A with envy (fig. 2). It had 250 watts plate dissipation capability. It was a large, sturdy looking bottle. Operated at a maximum rated plate potential of 2500 volts, it would churn out 450 watts with only 15 watts grid drive, or so the data sheet said. And perhaps it could gently be pushed to a kilowatt input!

It had three major faults, however: it cost nearly $100, it could only be purchased directly through RCA representatives who had little interest in selling transmitting tubes to amateurs, and the small print on the 204A data sheet warned the user that the tube was rated at full input only up to 3 MHz!

Other problems with the tube revolved around the internal construction, replete with element struts and braces, which resulted in high values of internal capacitance. The 204A had an 11 volt filament

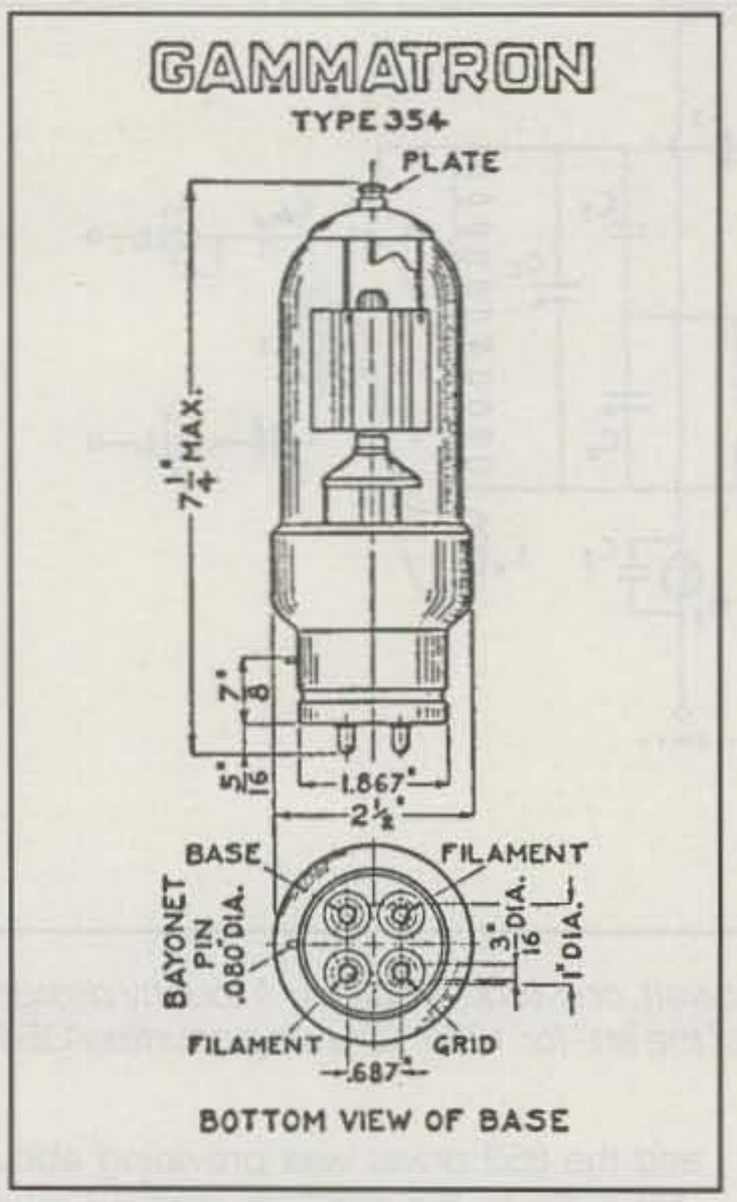


Fig. 4– The HK-354 "Gammatron." The first of the modern, high-gain triodes designed for high-frequency operation. Gammatron was a trade name for a whole line of tubes made by Heintz & Kaufman of South San Francisco.

and a proper transformer was hard to find and expensive. Worst of all, the early 204As had a long, slender internal grid lead. Working the tube at 20 meters, for example, could result in the grid lead melting within the tube, thus breaking connection to the grid element!

(Some knowledgeable amateurs in the San Francisco bay area had expertise in glass work and bought defunct 204As with open grids. They punctured a hole in the envelope, put in a new, heavy grid lead, sealed the tube, and repumped it!)

In any event, the expensive 204A tube had a questionable reputation. It was used only because nothing better was available.

QST published a feature article on a "kilowatt" amplifier using the 204A (April 1935 issue, pp. 8–13). This was a band-switching affair for 80, 40, and 20 meters (fig. 3). Reading the article nearly 60 years after it was written, it became apparent that the circuit design was as full of technical holes as a Swiss cheese. The amplifier described obviously had never been tested at more than 2000 volts, at which potential it was impossible to run a kilowatt without grossly exceeding the plate current rating of the 204A. Circuit bypassing techniques were poor, and a tricky plate circuit RF choke, said to be very critical, was never described. All in all, it seemed questionable to me that the amplifier was ever tested at the kilowatt level. Hindsight is very helpful in criticizing an early technical achievement.

The article was too little and too late. By 1935 the 204A was no longer a desirable object in the eyes of amateurs. A small company in the San Francisco Bay area had developed a radically new transmitting tube design and was gearing up to eat RCA's lunch, as far as power tubes were concerned!

Bill and Jack—The Right Guys At The Right Time

Two west coast amateurs—Bill Eitel, W6UF, and Jack McCullough, W6CHE—were convinced they could build a better tube than either the 204A or the 852. They had bought these tubes and were unimpressed. Why must it take 4 to 5 kV to run a kilowatt? Why couldn't it be done at 2000 or 2500 volts? The idea was to combine high gain, low drive power, and low plate voltage.

The two amateurs worked at a small manufacturing outfit called Heintz & Kaufmann, which supplied transmitters and special "Gammatron" power tubes, primarily to the Dollar steamship line. They convinced Ralph Heintz, W6XBB, the president of H&K, that they could build a real transmitting tube for amateurs that would operate at low voltage, yet deliver the goods. Ralph got the reluctant okay to go ahead from the Robert Dollar company, provided a minimum cash outlay was expended.

After a few false starts, a brand-new tube design was developed which came close to meeting the designers' criteria: the HK 354 (fig. 4). It had all the virtues that the 852 lacked: short, heavy internal leads, good filament emission, high perveance, and low interelectrode capacity. It was announced to the world in the January 1934 issue of *Radio* magazine in a feature article.

Regardless of the virtues, the tube was not an instant success. There were no distributors to handle the product, and H&K was reluctant to spend money advertising the 354. After a full-page ad in an issue of *QST*, the 354 was left to sink or swim on its own.

The upshot was that Bill and Jack soon left H&K to set up their own tube company: Eitel-McCullough. They would make and sell their own tube designs under the brand name EIMAC.

The 150T

Borrowing a few thousand dollars, Bill and Jack rented an empty butcher shop in San Bruno. Their new product was the 150T triode, an improved version of the HK354. Clayton Bane, W6WB, made up an ad for the tube to run in *QST* (fig. 5).

Fig. 5– The first ad for the 150T was written by Bud Bane, W6WB, and ran in 1934 QSTs. This tube was the pioneer of a long line of heavy-duty transmitting triodes.

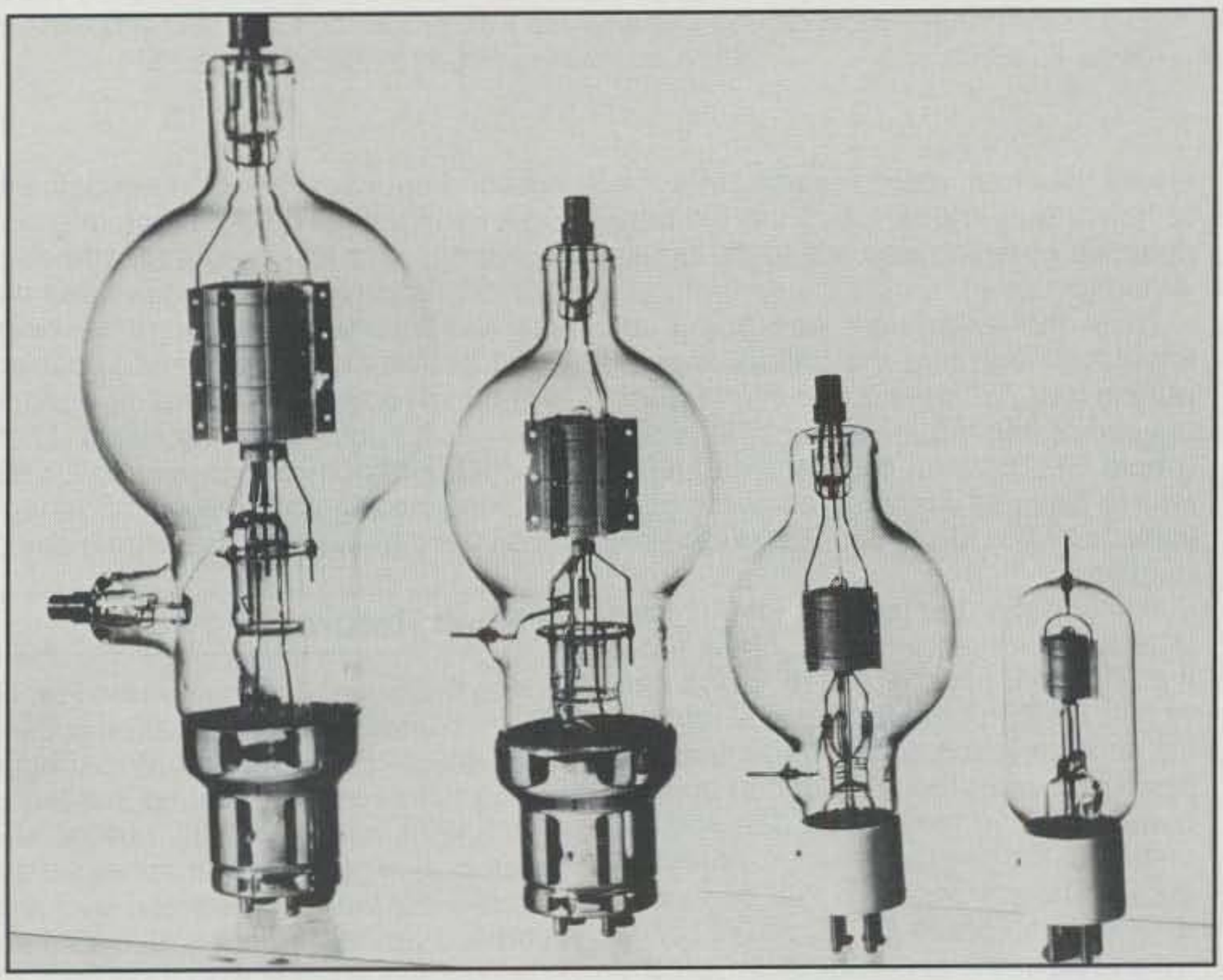


Photo A– Pioneer line of EIMAC triodes. Left to right are the 300T, 150T, 100TH, and 35T. Some amateurs ran two 35Ts at a kilowatt input on CW!

The first batch of six tubes looked good, and the two partners took some of them to the Sacramento ARRL Convention in 1934 to show them to the amateur community. They hoped no sharp-eyed amateur would notice the tubes were duds, due to cracked stem structures!

As the weeks went by, Bill and Jack solved production problems and eventually were producing up to a dozen tubes a week. In addition, they developed a small version of the 150T, the 50T triode which seemed to be a modest success. Gradually, the tubes were accepted by amateurs who realized they were vastly better than the venerable 852 and 204A

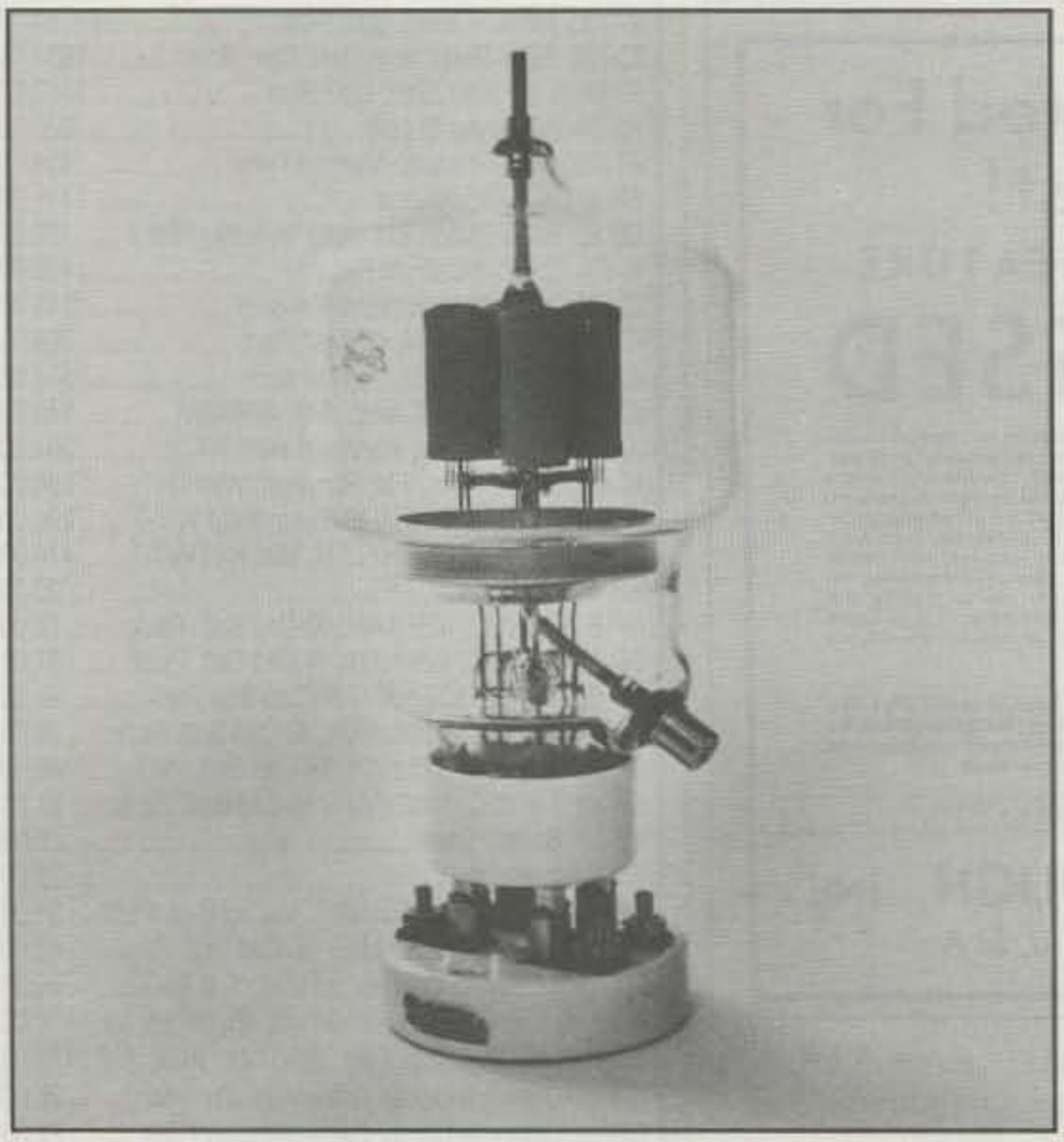


Photo B– Still in production, the 304TL design has lasted on the market for over 50 years. Available as surplus stock after the war, the 304TL could be bought for as little as 75 cents.

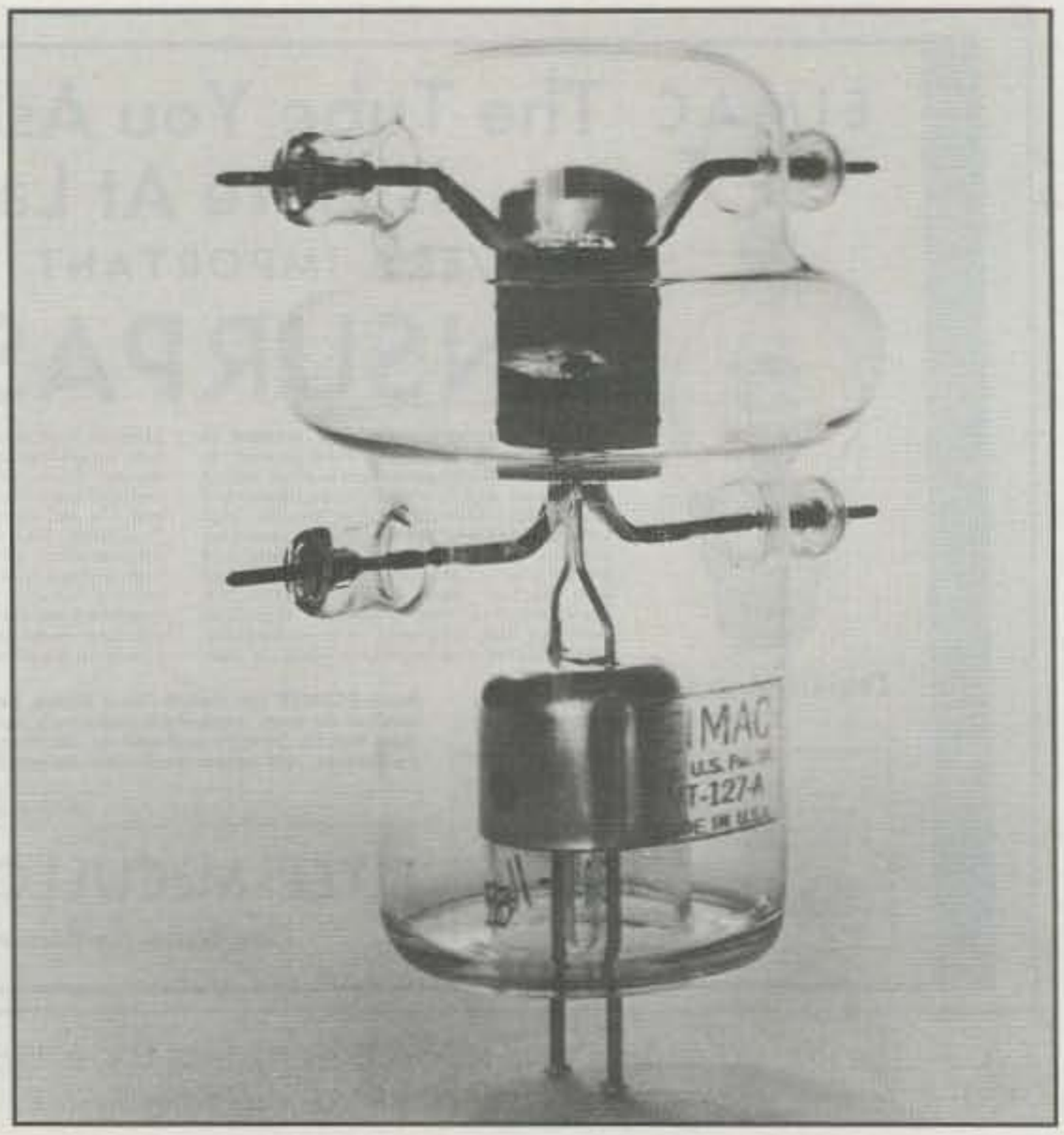


Photo C– The hybrid VT-127A was designed as an early radar tube. Of little use after the war, production stopped and remaining tubes were sold on the surplus market.

types still advertised and sold by RCA, who viewed the brash start-up California company with a thin verneer of contempt.

Eitel-McCullough Becomes A Viable Company

In early 1935 some 150Ts and 50Ts were sold to the U.S. Naval Research Laboratory for use in a revolutionary, experimental radar set that worked near 200 MHz. At the same time an equally small number of tubes were sold to the the U.S. Army Post at Fort Monmouth, New Jersey for possible use in a searchlight control radar operating near 120 MHz. The experimental Monmouth radar (SCR-268-T-1) was designed and built on a $40,000 grant from Congress.

The military quickly found out that the EIMAC manufacturing techniques used to make a great amateur tube were those needed to make a successful radar tube! The 50T and 150T were tested in pulsed oscillators working in the 100–200 MHz region, providing tens of kilowatts of RF power in short-pulse service.

Concurrent with the radar tests, Eitel-McCullough upgraded the 150T to the 250T, and the 50T to the 100T. The new tubes were available in both high- and low-amplification designs. At about the same time, a 35T, 75T, and 300T were placed on the market. The 300T was soon upgraded to the 450T.

All of this tube development happened in less than four years, resulting in a line of heavy-duty triode tubes the ultimate potential of which was still to be determined (photo A).

While the radar work was going on, Eitel-Mcullough had the brilliant idea of putting four 75T assemblies in one glass envelope, thus creating the 304T triode (photo B). This new tube arrived just in time to serve as a modulator-switch tube in the SCR-268 radar, soon to go into production.

Working with the military, EIMAC then quickly designed a radically new tube, the VT-127A, for specific RF pulse service. In brief, this interesting tube had the filament emission of the 250T and the physical size of the 100T. It had special dual plate and grid leads designed to mate with the ring oscillator proposed for the up-and-coming SCR-268 and other VHF radars (photo C). Eight VT127As were to be used in each oscillator, pulsed by four 304TLs. Two 250TLs, connected as diodes, were used in the modulator to absorb kick-back from pulse operation.

Eitel-McCullough In The Big Time!

The block-buster came in 1940 when the company received its first big war order for the delivery of 10,000 tubes for radar service! Up until then an order for 50 tubes was cause for celebration! Converting from hand methods to mass production kept everyone working day and night for months, sent the hiring rate skyrocketing, and tossed out all standard methods and routines. By July 1941 the staff was ten times larger then it had been a year earlier. The plant size was doubled and soon another plant was opened in Salt Lake City, Utah. By 1945 Eitel-McCullough had grown to over 1800 people, and nearly 3500 tubes of various types were being manufactured a day!

"I Shall Return!"

During the height of the war in the Pacific an urgent message was received at Eitel-McCullough from General MacArthur's headquarters in Australia. He was short of VT-127A tubes for his radars and needed a large shipment immediately! The request was emphasized by hard-eyed individuals from the Government Procurement agency who rode herd on the company, as it went into a frantic 24 hour day, 7 day week production schedule to complete the order on time.

Finally, with a sigh of relief, the employees watched as the tubes were carefully tested, boxed, and packed in large military crates that were carted off to the Oakland air terminal to meet up with special C-54 transport planes that would fly the priority tubes off to MacArthur. Rumor had it that the tubes would be used in the coming invasion of the Philippine Islands.

As the war wound down and things

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← Format & Edit stored MSG's here

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PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

BY BUCK ROGERS, K4ABT

More X1 Fun From PUN (Packet User's Notebook)

Dave Roberts, G8KBB, and Neville Pattinson, GØJVU, are at it again. The X1J has drawn much attention, and now the authors are giving us more to savor in the X1J2. In addition to support for the DEViation meter, the most recent X1J2 node ware (April 1994, Release 2) now supports a temperature sensor, a signal strength indicator, and a much needed site voltage monitor.

Now that I have your attention, I need to cover a small problem regarding the manner in which a few readers handled the requests for the X1J firmware last year. Many readers requested the software and drawing package I compiled for the X1J and now the X1J2 (release 2) node ware. I received SASEs that were too small for the amount of information I had to send, or once I had packed all the disks, drawings, etc., into the supplied envelope, there was not enough postage provided for the return envelope. In a few cases the reader sent nothing more than a note requesting a disk of the X1J software—no formatted MS/DOS disk, no self-addressed envelope, and no postage. In that case, "file 13, the circular file."

I am more than happy to provide these drawings and software, but please meet me half way by providing a formatted MS/DOS disk, enough postage, and a 9" × 12" manila envelope. The amount of postage to deliver the full package of drawings and disk is about $2.00, US mail only.

I also include a set of drawings with the software. Therefore, it is necessary that enough postage be included to cover the weight of the disk you supply and eight to twelve sheets of standard paper.

If you prefer, you may obtain the firmware directly from the authors in England. Contact Dave Roberts, G8KBB, 7 Rowanhayes Close, Ipswich, IP2 9SX England; or Neville Pattinson, GØJVU, 10 High Hall Close, Trimley St Martin, Felixstowe, Suffolk, IP10 0TJ England.

Once you have obtained the disk of zipped files, first read the OVERVIEW documentation text file. There are other text files, and they too should be read so you have a clear understanding of the X1J2 software and firmware.

Choices

With the release of X1J2 comes the best code yet. So far it seems to function better than earlier versions of theNET nodes I've operated. From what I see there are some bug fixes, plus the addition of the new features.

In the other articles I've written about the X1J node I supplied most of the information to build these add-on beasts. Later MFJ Enterprises gave us an easy way to "plug and play" by manufacturing the MFJ-52. This enabled us to get the X1J going much sooner, since the add-on PC board was already assembled and tested.

As of this writing, PacComm has developed their model AD4 hardware PC board with the features that we discussed in this month's "Packet User's Notebook." The PacComm PC boards

*211 Luenburg Drive, Evington, VA 24550

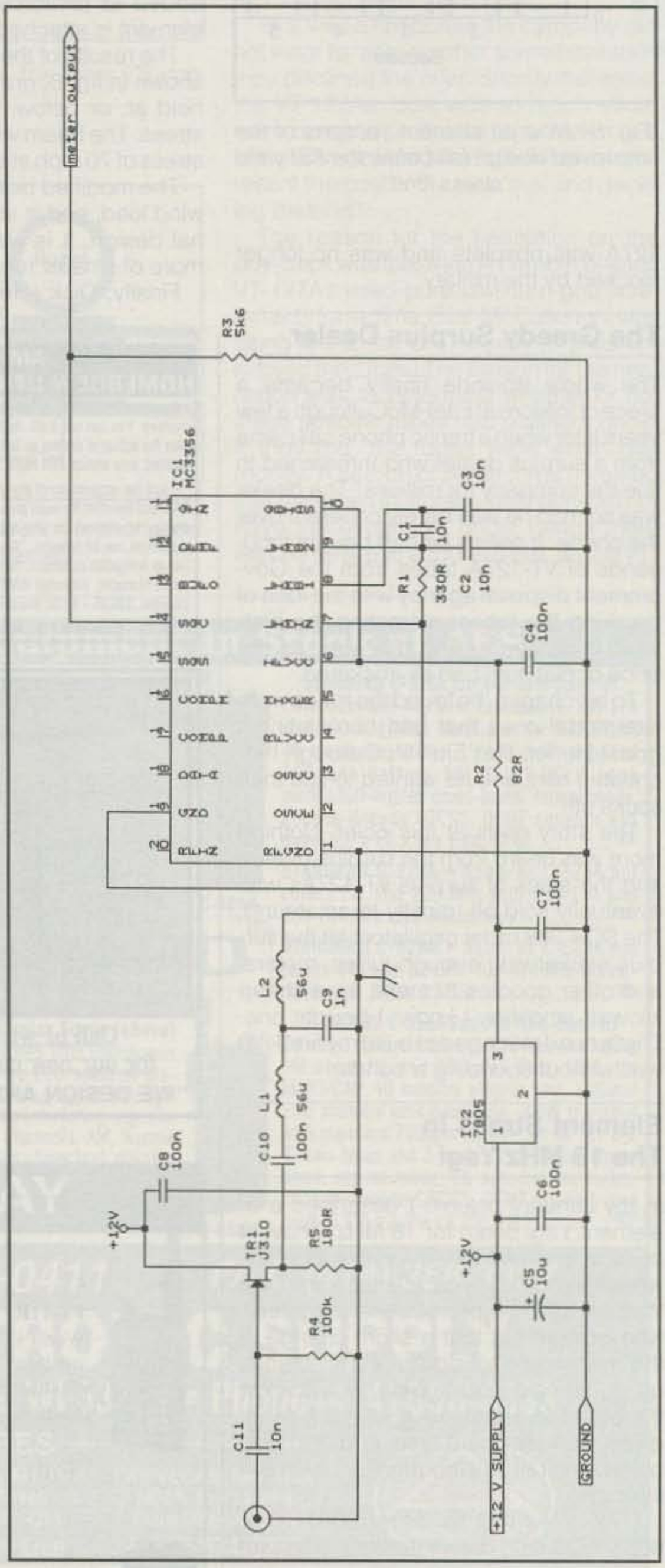

Fig. 1– S-meter circuit input to channel 2 of ADC0844 (see fig. 2). Additional instructions are on the X1J2 firmware disk.

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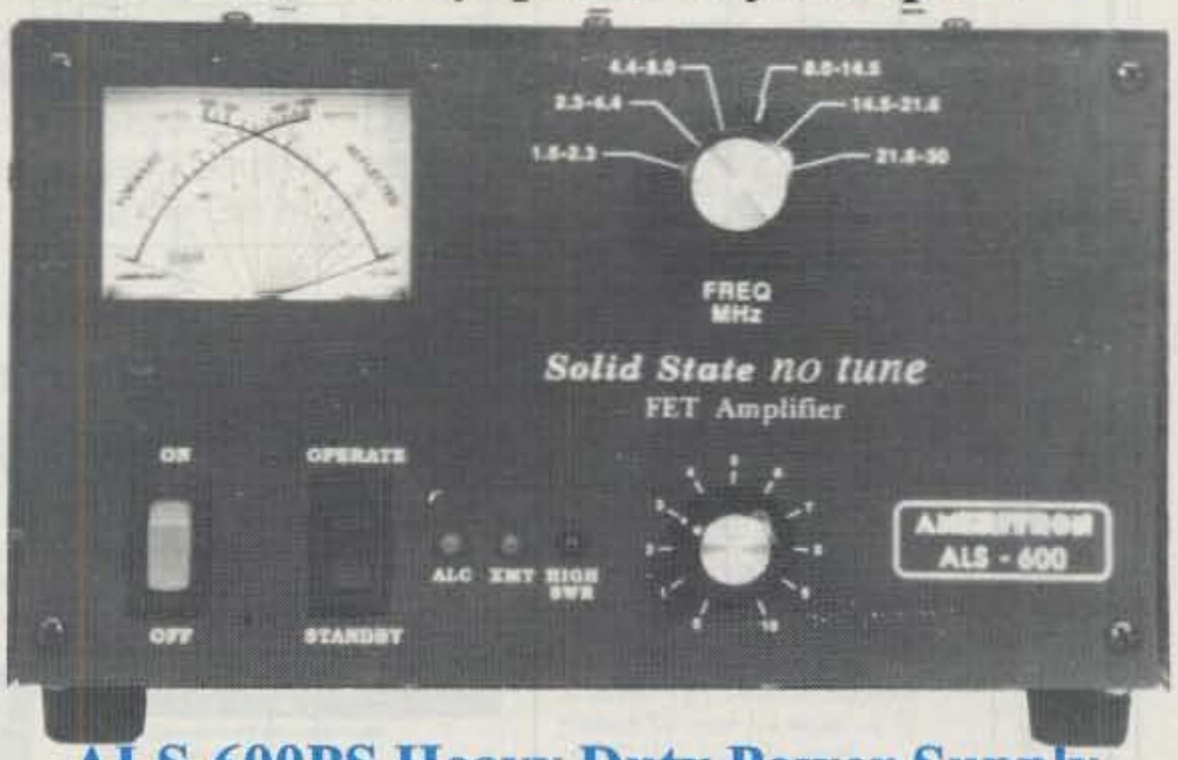

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VHF PLUS

BYJOE LYNCH, N6CL

ALL ABOUT THE WORLD ABOVE HF

Eight Minutes With The Shuttle Endeavor

VHF PLUS CALENDAR

June 2	Last quarter moon.
June 4–6	ARRL June VHF QSO Party, 1800 UTC 4 June to 0300 UTC 6 June.
June 5	Poor EME conditions.
June 6	Apogee.
June 7	*Arietids* meteor shower predicted peak.
June 9	New moon.
June 10–12	ARRL National Convention, Arlington, Texas.
June 12	Moderate EME conditions.
June 16	First quarter moon. June *Lyrids* meteor shower predicted peak.
June 18–19	SMIRK 6 meter contest, 0000 UTC, 18 June to 2400 UTC 19 June.
June 19	Moderate EME conditions.
June 21	Perigee.
June 23	Full moon.
June 26	Poor EME conditions.
June 25–26	ARRL Field Day.
June 29	*Beta Taurids* Meteor Shower predicted peak.
July 1	Last quarter moon.

Sixteen sixth graders from Anthony Elementary School of Anthony, Kansas spent eight minutes in a space QSO with Astronaut Linda Godwin, N5RAX, on a Sunday afternoon this past April. Sounds simple and exciting, but as Paul Harvey says, "Here is the rest of the story."

As part of the Shuttle Amateur Radio Experiment, or SAREX, program astronauts regularly communicate with students from schools in various parts of the world during selected missions of the Space Shuttle *Endeavor*. For the STS-59 mission Astronaut Godwin, along with Jay Apt, N5QWL, was responsible for these communications.

Weak signal VHF enthusiast Gary Gerber, KBØHH, is the principal of Anthony Elementary School. He is also an Educational Advisor, an ARRL appointed position, and as such is on the mailing list for the Educational Activities Department newsletter.

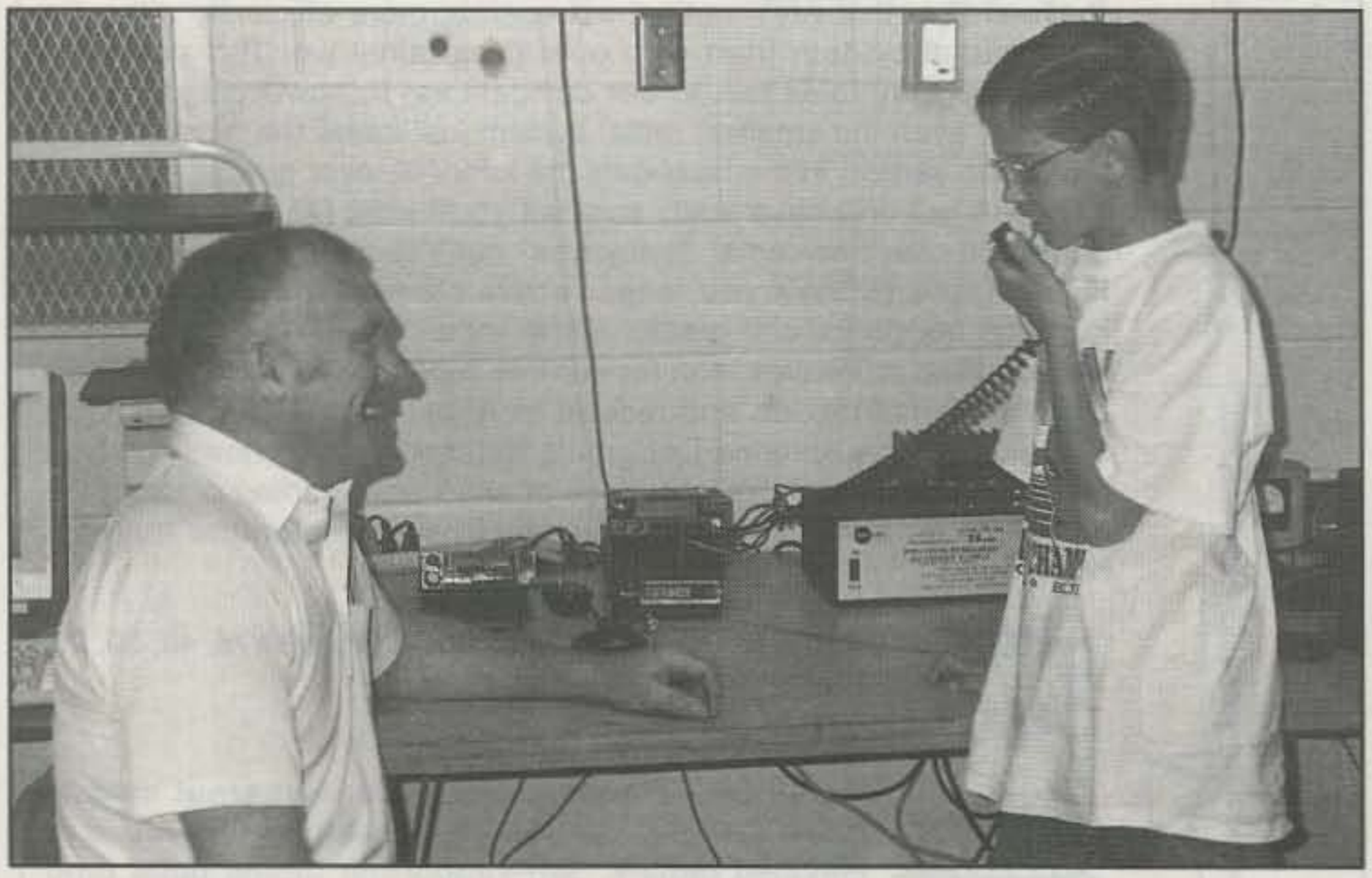
As Gary often does, once he finishes reading the newsletter he gives it to Shirley Gaug, his fifth and sixth grade science teacher. About a year ago the newsletter contained an article on signing up schools to participate in the program. Shirley read that article and thought that just maybe her school could qualify and be selected for the program.

Shirley and Gary filled in the application and waited—for a year! Finally word reached them that they were tentatively selected for the program. They would be part of the STS-59 mission that was scheduled for launch in early April of this year.

John, WD5EEV, and Karen, WD5EEU, Nickel of the SAREX program contacted Gary to interview him in order to determine whether or not he had the wherewithal to successfully participate in the program. Once satisfied that he had the expertise (remember, he is a weak signal operator, and smart in the right areas!), the facilities, and the equipment, they worked with him to make the arrangements for the involvement of the school.

Among the arrangements was the gathering of the equipment. The SAREX program

P.O. Box 73, Oklahoma City, OK 73010



One of the sixth grade students of Anthony Elementary School is shown here talking to Dr. Linda Godwin, N5RAX, aboard the Shuttle Endeavor, *while Gary Gerber, KBØHH, the school's principal, looks on.*

Gary, KBØHH, adjusting the antenna for the upcoming SAREX contact with STS 59. (Photo courtesy Anthony Republican)

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prefers a complete backup station to the one that is to be used. Gary gathered an Alinco 590 and a 170 watt brick amplifier for the station. He assembled a 22-element Cushcraft right-hand circularly polarized Yagi, complete with azimuth and elevation rotators, on a 30 foot tower for the main antenna. As part of the installation the tower was temporarily attached to the side of the gymnasium exterior wall. The back-up station consisted of a Heath HW 24 and a "J-pole" antenna that was built right out of the *ARRL Handbook*.

As with any station, the antenna is the last item to be added to it. This station was no exception. Because of time constraints and weather, Gary could not get the antenna in the air until a week before the scheduled date. This caused some consternation for John and Karen, but Gary was able to assure them that it would be operational in plenty of time. And it was!

In order to allow for the maximum participation of the sixth grade science class, Shirley conducted a contest. Each of the 50 students was to submit a question that was not philosophical, but could easily be answered by the astronaut. From the 50 questions submitted, Gary and Shirley selected 23 of them. These winners comprised the list of students who would be able to speak to the astronaut and ask their questions.

Among some of the questions to be asked were the following: How fast are you traveling? How many miles up are you? Is there a doctor aboard? How much sleep did you get the night before? How do you stay in shape? Can you see the hole in the ozone? Can you see any pollution? Does it get darker when you go up higher? What is the temperature out there? How does it feel to be in micro gravity? How long did it take to prepare yourself for the mission? Do you have to have straight "A's" to be an astronaut?

On several days before the event at his school, Gary got up at 5 AM to tape the launch and to play with the Instatrack software (supplied to him by AMSAT for the event). Once he received the Keplerian numbers and programmed them into the software program, he found that he could track the Shuttle by copying signals from the on-board packet station, thereby confirming that the program was working to perfection.

On Sunday, 10 April Gary set up the equipment plus two computers (remember the 100% backup), a television set, and the VCR in the school gymnasium. In front of the assembled crowd of more than 200 of the 2500 townspeople (plus a few out-of-town guests), Gary started the program. He replayed the video tape of the launch and talked about the hobby of amateur radio. Shirley talked about the questions that were going to be asked by the students. And then it was time.

At about 3:05 PM, right on schedule according to the software, Gary heard Linda call "KBØHH, this is N5RAX." After a couple of seconds of conversation between the two of them, Gary put the first student on the microphone. He asked his question and turned it over to Linda. She in turn called the student by name and gave a quick response to the question.

Altogether sixteen students queued up to the mike to ask their questions, each one beaming at having talked with someone in space. Toward the end of the time the Doppler shift started moving Linda's signal out of Gary's receiver's passband. And then, in 15 seconds, it was over—except for the memories!

The Space Shuttle came to small town America on a Sunday afternoon. For a brief time the people of this small Kansas town were able to forget what might have been troubling them and experience something beyond them. The young people were able to experience an event that they will remember for the rest of their lives. And their families and the rest of the adults were able to reflect on the future, knowing that positive experiences such as this were the foundation for solid adult lives for these young people.

In the course of my interviewing him, Gary pointed out to me that he could not have accomplished this task alone. Locally, he had the help of the following amateurs: John Hall, KAØKUY, who controlled the antenna rotators; Larry England, WCØX, who helped the students with the mic; and George Washburn, KB5IHD, who kept the students in their line and checked them off as they completed asking their questions. Incidentally, all three of these gentlemen are on the VHF+ frequencies.

At League Headquarters Gary had the irreplaceable support of Rosalie White, WA1STO. Locally, he also had support from his teachers, the school administration, and John and Karen Nickle, who have since retired from the Houston area and moved to Kansas.

In the audience were Bobette Doerrie, N5UDJ, a science teacher at the elementary school in Perryton, Texas, and two of her students. She drove five hours from her home in the panhandle to be there for the event because she hopes to make application for her school in the near future.

As Gary and Bobette know, the process is a bit lengthy, particularly in time. Gary's experience of waiting for a year is typical.

The application process is also thorough. For example, it goes through several review processes. Rosalie reviews it from an educational standpoint. AMSAT reviews it from the equipment standpoint, to make sure that the equipment on hand will be adequate for a successful contact. And NASA reviews it from an orbital viewpoint, to see if the proposed school will be in the orbital path long enough and at the right time of day (middle of the night contacts would not work out very well).

Other considerations are also examined, particularly to see if the school's objectives in making the contact have something in common with NASA's objectives. It is important to note that even if a school's application is not selected for one mission, it is not necessarily rejected. It is almost always recycled to see if it will qualify for a future mission.

Do you know of a school that has a program or a teacher interested in promoting amateur radio? If you are interested in helping create a lifetime of positive memories for a group of students, contact Tracy Bedlack, N1QDO, at the League for an application.

Yes, Dorothy, Kansas is still there. The astronauts on-board the Shuttle *Endeavor* flew over it in their space ship, and the principal of a small elementary school in a small town in Kansas was, for a short time, the "Wizard of Oz."

Ron Hammel, KC6WLC (pictured here at 12,000 feet on the California/Nevada line in DM08), and Joe Morris, N6RPM, are teaming up to again as a Big Gun Rover for the ARRL June VHF QSO Party. This team placed second in the Rover category last year and is making an all-out assault on first place, which would be a first for the west coast. Good luck, guys!
(Photo courtesy KC6WLC)

Current Contests

ARRL June VHF QSO Party: This year *only* the ARRL June VHF QSO Party has been moved forward one week. It starts at 1800 UTC 4 June and ends 0300 UTC 6 June. The exchange is your callsign and your grid locator.

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"America's Best"

Complete rules are found in May *QST*. This contest is the most popular VHF contest because of propagation (usually some sporadic-E and tropo enhancement) and the time of year (vacation time). Additionally, many operators who occasionally check out the VHF+ bands will participate in this contest just to see how propagation works on these bands.

SMIRK 6 Meter Contest: The 19th annual SMIRK contest will be held from 0000 UTC 18 June to 2400 UTC 19 June. The exchange is your callsign, grid locator, and SMIRK membership number. If you do not have a SMIRK number, you must first work 6 SMIRK members, then send your log information, which includes their SMIRK numbers, and $6.00 (a check made out to SMIRK is preferred over cash) to Pat Rose, W5OZI, P.O. Box 393, Junction, TX 76849. The scoring is as follows: for each contact, count two points for each SMIRK member and one point for each non-SMIRK member. The total score is the total of all the QSO points multiplied by the number of grid locators worked. Important note: All voice contacts within the 48 contiguous states must take place above 50.125 MHz. Only contacts outside the 48 contiguous states should take place below 50.125 MHz. Awards will be given to the high scores in each geographic location. Note: Only SMIRK members are eligible for awards. Logs and entry sheets can be obtained by sending an SASE to Pat. Additionally, completed logs and entry sheets are to be mailed back to Pat.

Field Day: This is the most popular contest in U.S. amateur radio, principally because of the "operating from portable locations" concept and the family atmosphere surrounding the contest. As with last year, incentives for operating on the VHF+ amateur bands have been built into the rules. You can earn additional bonus points for setting up a VHF+ station and making at least ten contacts with it. Note that this station does not go against your total transmitter count. For example, if you are entered in the "3A" category, you can have three stations on the air *plus* this VHF station and still be considered "3A." In that regard it is similar to the Novice/Technician station. It is also worth noting that because of the privileges associated with the Novice/Technician station, it is an additional source for VHF+ activities. Because propagation is decreasing on 10 meters, it might be worth emphasizing to your Field Day planning committee the importance of exploring the voice privileges on the VHF+ amateur bands for these additional point gathering sources. The exchange for this contest is your callsign, transmitter class, and ARRL section. Complete rules for this contest can also be found in the May issue of *QST*.

Calling Frequencies, DX Windows, and Grid Locators: As mentioned above, the June VHF QSO Party invites newcomers to the VHF+ amateur bands. Field Day also invites newcomers. It is important to make these new friends of ours aware of, in a positive way, the DX window and calling frequencies on the various bands. As with previous years, last year during the June VHF QSO Party, European stations were hearing U.S. stations in the DX window but could not break through the QRM curtain. We in the VHF+ community who know better cannot emphasize enough the importance of respecting these frequencies.

Because the exchange for Field Day does not include a grid locator, some of the operators may not even know what grid locator they are within. Please be patient with them and accept their exchange without making a big deal about the grid locator. After all, the VUCC rules say that you can figure out the grid locator later after you receive the QSL card. The only important aspect is to make a complete contact.

Current Conferences

ARRL National Convention: The ARRL National Convention will be held in conjunction with the annual Ham-Com convention in Arlington, Texas. As with previous years, the North Texas Microwave Society will be hosting a forum. The Saturday forum will be moderated by NTMS President Roger Dillon, N5PGH. The speakers are as follows. Kent Britain, WA5VJB, will speak on microwaves made easy. Greg McIntyre, AA5C, will speak on VHF+ contesting. Al Ward, WB5LUA, will speak on portable operating. Floyd Fuller, WQ5S, will talk on computer-controlled antenna rotation.

Although a regional hamfest, it is well attended. Upwards of 11,000 have participated in the past. There are indoor and outdoor fleamarkets and dealers from everywhere.

For more information, contact Ham-Com, Inc., 6208 Preston Road, Dallas, TX 75205-1655, or call 214-522-5003 (FAX 214-521-0016). A number of hotels, within easy driving distance, are priced between $30 (Motel 6) and $110.00 (Marriott) per night.

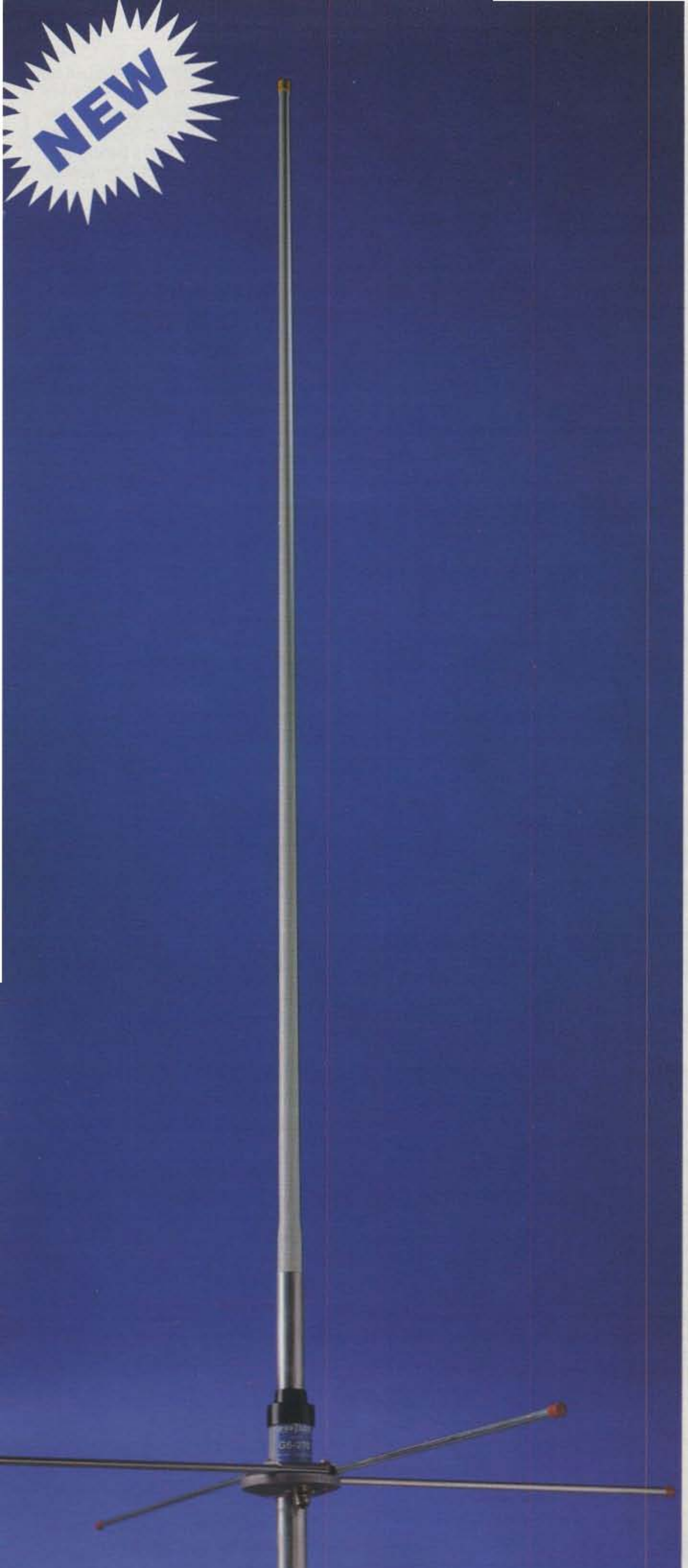
Current Meteor Showers

Between 29 May and 19 June the *Arietids* Meteor Shower will once again be evident. This is a daytime shower with the peak predicted to occur around 0413 UTC (±12 hours) on 7 June. Activity from this shower will be evident for around eight days, centered around the peak. You will note that these dates cover the dates of the ARRL June VHF QSO Party. Therefore, watch for possible enhanced meteor scatter activity as a way of making extra contacts. At its peak, you can expect around 60 meteors per hour traveling at a velocity of around 37 km/sec. (23 miles/sec.).

On 16 June the *June Lyrids* is expected to peak at around 1248 UTC (±3 hours). This shower was first discovered in 1966 by Stan Dvorak, an amateur astronomer from California. Maximal observed meteor activity is around 10 per hour, traveling at a velocity of 31 km/sec. (around 19 miles/sec.). Because this meteor level is not much above the background level of regular meteor activity, some feel that the shower is no longer around. However, if it is, the peak activity will occur over two days, centered around the peak time.

On 29 June the *Beta Taurids* is expected to peak around 1130 UTC. Because it is a daytime shower not much is known about the stream of activity. However, according to the book *Meteors* by Neil Bone, this and the *Arietids* are two of the more active *radio* showers of the year. Peak activity for this shower seems to favor a north-south path.

Around the same time, a minor shower has



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also been active in the past. The *June Bootids* has shown activity centered around 28 June. However, no evidence for this shower has existed for several decades.

Predicting Meteor Shower Peaks: For listing possible peaks of meteor showers for this column, I have begun using a program called "Compact Meteor Scatter Software." It is authored by Ilkka Yrjola, OH5IY, and is available on both the WB4YZA (704-284-4854) and WZ1V (203-768-4758) BBSs, both of which are configured for 14.4 kbaud and N-8-1 format. In addition to predicting peaks of fifteen major and many minor showers, this program is designed to be used to key your radio for European-type CW meteor skeds. If you download it and start using it, send Ilkka a message that you are doing so as a way of encouraging him to continue to update it.

Current Grid Expeditions

Ted Goldthorpe, WA4VCC, reports that he and two of his Carolina DX Association buddies and their respective wives will travel to Ft. Fisher, NC, which is on Pleasure Island (FM13), just south of Wilmington. They will be on 6 and 2 meters and 135 and 70 cm from 4 June to 10 June. They have rented a two-story townhouse, as Ted says, "right on the ocean." Operators for the trip will include Ted; his wife, Itice, KB4CSE; Bob Dixon, K4MQG; his wife, Carolyn, KA4WUR; Bill Parris, AA4R; and his wife, Joetta, N4NPT. Ted says that this trip is for the rare grid locator first and vacation second. Hum . . . I wonder what the wives will say about that!

The **FRC** reports that COØFRC will again be active from Bellomonte, Cuba (EL93) for the June VHF QSO Party. Possible operation may also include EME, satellite, and meteor scatter contacts on a couple of days before and after the contest weekend. Hopefully, activity will also take place on 135 and 23 cm, bands which are not currently active in Cuba.

Ron Hammel, KC6WLC, and **Joe Morris, N6RPM**, plan a trip in southern California for the contest. Also during the contest, **Henry Schelb, KD6YOB**, and **Mike Lee, KD6WZR**, plan a Rover trip through DM04, DM05, DM06, DM07, DM08, DM13, DM14, DM15, DM16, DM17, and DM18.

There will be plenty of other trips planned for the contest weekend. Listen to the Monday night VHF net (3843 kHz, 9 PM ET) for the latest information.

After the contest weekend **Bob Norton, N5EPA**, plans to take a "radio vacation." He expects to arrive in NW North Dakota sometime during the 13th. From there he will enter Canada and travel through Alberta and eastern British Columbia. His travels will include, in the order he expects to traverse, DN97, DM87, DN88, DN98, DN89, DN79, DN69, DN59, DO60, DO50, DO50, DO41, DO31, DO21, DO11, DO12, DO02, DO03, DO02, DO01, DO11, DO10, and DO20. He will also be on the air from the grids he travels through while going up and back to Canada.

Bob will operate on 50.130 MHz, or higher if the band is busy. He will be running an ICOM IC-551, and 80 watt brick amp when in motion, a vertical whip, and when stationary a five-element Yagi at 18 feet.

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K. Kantronics KPC-3

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The KPC-3 is a small-sized, low power, full featured packet TNC designed with the new user in mind while providing all the power required by experienced packet radio operators. The KPC-3 incorporates the Kantronics full-featured PBBS, including reverse forwarding to a BBS, mail waiting LED, and remote sysop access. It comes complete with version 5.0 firmware, DB-9 connector, 2.1mm power connector, and two manuals: one a quick-start manual, the other a complete reference manual. Measures 0.8" x 5.2" x 5.2" and requires 6-25 VDC at only 40 mA max.

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Within Your Reach.

L. Ballantine 9601M (Military USM413) *True RMS AC Meter* $89

This True RMS Analog AC Meter was manufactured for the U.S. Air Force in the 1980's for $2,250.00. 500 µV to 500 V ranges with 10 Hz to 1 MHz frequency response and 10 MΩ input impedance. Other features include AC amp output and Linear dB mirrored scale. Conforms to OSHA and UL requirements. Comes equipped with ruggedized case and probe. Can optionally be operated with an internal battery pack (11 C cells) for 8 hours, but will work standard on 110 VAC.

M. Bird 8135 *Coaxial Load Resistor* $110

The Bird Model 8135 TERMALINE Load Resistor is a portable, general purpose 50 Ω coaxial transmission line termination. Self-contained unit requiring no outside power source or additional equipment. Provides an accurate, dependable, and practically non-reflective termination for adjustment, standby, and testing of transmitters under non-radiating conditions from Dc to 4 GHz. VSWR is rated at 1.1:1 max (DC-1 GHz); 1.2:1 max (1 GHz-4 GHz). Rated for load power of 150 watts continuous. Female N type connector.

N. Fluke 8022B *Digital Multimeter* $99

The 8022B is a pocket-size digital multimeter that is ideally suited for applications in the field, lab, shop or home. Offers all standard VOM measurement functions including AC & DC Volts, AC and DC current and resistance. Features a high contrast 3 1/2-digit LCD display that can be easily read from across the room! Each range has full auto-polarity operation, overrange indication, and effective protection from overloads and transients. Long term calibration stability- 2 years. Easy calibration- few adjustments. DCV: 200 mV to 1000 V f.s.; ACV: 200 mV to 750 V f.s. (45 Hz to 450 Hz); AC & DC current: 2 mA to 2000 mA f.s.; Resistance: 200 Ω to 20 MΩ f.s.

P. Protek 223 *Handheld 7-Function Digital Multimeter* $79.95

FACTORY NEW ITEM

It's easy to see the physical difference between this 7 function meter and others you've seen...the difference doesn't stop there! It's distinct design was conceived to function as an integral part of its test and measuring capability. Once the rotary knob is positioned to the desired function and the probes connected to the test point, the bold LCD indicates the test circuits value quickly and accurately. Measures DCV to 1000 V, ACV to 750 V, DC & AC Current to 10 A, Resistance to 40 MΩ, Frequency from 100 Hz to 500 kHz, and Capacitance from 4 nF to 40 µF full scale. This handheld is loaded with features including Auto Ranging, Bar Graph, Data Hold, Ampere Warning Beep, Relative Set, 4,000 Count Display, Auto Power Off, Continuity, and Diode Test. A fantastic meter at an unheard of price!

R. HP 3200B *VHF Oscillator* $695

Provides 10 to 500 MHz in six bands. Frequency accuracy is within ±2% after half-hour warm-up. Power level across a 50 Ω external load is greater than 200 mW (10 to 130 MHz); greater than 150 mW (130 to 260 MHz); greater than 25 mW (260 to 500 MHz).

S. Wavetek 2001 *Sweep/Signal Generator - Wavetek Price $ 5,695.00* $1795

Sweep/Signal Generator offering programming, versatility and an exceptionally wide frequency range of 1 to 1400 MHz in three bands, can be used in three modes of operation; Start-Stop, ΔF or CW. Swept from end to end or up or down at any rate from 50 sweeps/Sec or 1 sweep every 100 Sec. Manual, triggered or recurring sweeps and the sweep frequency, width and output attenuation may be controlled by external voltages. RF output amplitude from +10 to -80 dBm in 10 dB steps and a 20 dB variable. Marker type is a birdy by-pass with provisions for six plug-in marker modules plus an external marker input (optional).

T. Goldstar OS-9020A *Oscilloscope* $379

FACTORY NEW ITEM

The Goldstar OS-9020A oscilloscope provides both high quality and performance with lower cost to fill the requirements of schools, industry, service shops and hobbyists. This 20 MHz oscilloscope is loaded with features such as automatic focus, variable hold-off, TV sync circuit, X-Y operation, and a 6-inch rectangular CRT with internal graticule. Basic specifications include a vertical deflection bandwidth of DC to 20 MHz, (7 MHz magnified), modes of operation are CH1, CH2, add, dual/chop. Deflection factor of 5 mV/div to 5 V/div in 10 calibrated steps. Accuracy in normal operation is ±3%. Time base of 0.2 µS/div to 0.2 S/div in 19 calibrated steps. Trigger system modes of auto, norm, TV-V, TV-H with source of CH1, CH2, line and external. The OS-9020A meets IEC- 348 safety requirements. The OS-9020A is sold factory new and includes a 2 year warranty. For an economic choice with high quality the Goldstar OS-9020A can't be beat.

All Test Instruments Come With Manuals, Are Pre-Owned & Completely Operational Unless Otherwise Stated.

W. Wavetek 188-S-1257 *4 MHz Function Generator* $595

Special edition of the Model 188. Includes rugged portable case with protective front cover along with 600 Ω and 50 Ω front-panel outputs. Covers a wide 4 mHz to 4 MHz frequency span in seven overlapping ranges. Each multiplier setting gives a full 1000:1 frequency band, it also has a 10,000:1 logarithmic frequency range. Sine, Triangle, Square, TTL pulse, and DC outputs are available for true versatility. Operational modes include Continuous, Triggered, Gated, Sweep, Sweep Stop. 50 Ω output is variable to 20 V peak-to-peak HI output, and to 2 V p-p LO output.

X. HP 8555A *RF Section* $949

Top-end tuning section for Hewlett-Packard's high performance modular Spectrum Analyzer family. When added to a system package, it will offer absolute amplitude calibration capabilities from -125 dBm to +10 dBm over a frequency range of 10 MHz to 18 GHz with fundamental and harmonic mixing. Optional mixers can extend its frequency coverage to 40 GHz. Sensitivities to -125 dBm (125 nV) and resolution to 100 Hz with bandwidth ranges from 100 Hz to 300 kHz in 1-3-10 sequence. These high resolution measurements are made possible in part by the 8555A's automatic tuning stabilization (phase-lock) feature, which allows for narrow frequency range scanning with a minimum of display jitter.

Y. HP 141A/1415A *Storage Mainframe With TDR Plug-In* $350

Broadband system for testing cables, transmission lines, strip lines, connectors, and other types of high frequency devices. HP 141A supplies power and display capabilities for versatile 1400 series plug-ins, wide range of writing speeds and storage capabilities. HP 1415A TDR is quick and easy to operate, determines location, magnitude and nature of each discontinuity. Risetime: <150 pS (reflectometer); ~110 pS (signal channel); ~50 pS (step generator). Other features include: 50 Ω input & output impedances; 20 to 200 nS/cm time scale; x1 to x200 (1, 2, 5 sequence) magnification.

Z. HP 331A *Distortion Analyzer - HP Price $1650* $549

The 331A covers the 5 Hz to 600 kHz frequency range and measures total distortion from 0.1% to 100% full scale in seven ranges. Harmonics are indicated up to 3 MHz. Measures noise as low as 25 µV, and voltages over a wide range, 300 µV to 300 V rms full scale. Frequency calibration accuracy is better than ±5% (5 Hz to 300 kHz), better than ±10% (300 to 600 kHz). Basic voltmeter accuracy is ±2%.

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CIRCLE 149 ON READER SERVICE CARD

Bob says that because of the hundreds of QSL cards he gets, he regrets that he cannot any longer afford to answer requests without an SASE.

VHFer Seen On Menacing Posters

Walt Schivo, KB6BKN, has found a new way of having Eyeball QSOs, at least one way Eyeball QSOs that is. Walt is an "extra" actor who has appeared in films such as *Class Action*. Recently he appeared on a poster as a menacing, shirtless, tattooed biker with whom you would not want your child to be a r oommate at the local jail. This picture has been used as part of a campaign by the Youth Law Center of California to promote child welfare awareness.

Walt reports that he is active on 6 meters and ATV (with a 10 watt transmitter that accesses the Mt. Diablo ATV repeater) from his QTH in Novato (CM88). In addition, Walt maintains a 6 meter beacon on 50.0628 MHz daily from 4:00 AM to 9:30 AM PT. He is also active from his DX Ranch QTH in Michigan Bluff (CM99) at a 4000 ft. elevation, where he has worked all states except Iowa and Mississippi, twice, along with a bit of DX, using only 10 watts. Finally, Walt reports that his son, Darren, recently became licensed as KD6GCG.

So watch for Walt on the air or on a poster at your supermarket (if you live in California). If you work him, you will receive a QSL card showing Walt as a mad scientist ready to fire up the California Kilowatt. Your pictures kind of put my tuxedo QSL card to shame, Walt, although I'm not sure which one does it.

Eight Minutes With The Shuttle Ten Years Earlier

It was a fall evening over ten years ago. Word had spread like wildfire on the air and off of the impending fly-over of the Shuttle and of the possibility of communicating with Owen Garriott, W5LFL, the astronaut/amateur radio operator on board.

It was a first. Amateurs had been working each other for over a dozen years through the satellites, but this was the first time that amateur radio operators on earth were able to communicate with an amateur in space.

I was no different from anyone else in sharing that enthusiasm. After getting off work I went to my sister Pat's house for supper. I settled down with them to share supper and my excitement. I told her and her family that after supper I was hoping to hear the astronaut on the amateur radio set that I had in my car. With looks of skepticism, they wished me well in my endeavor.

After the meal I reached into my pocket for my car keys. I couldn't find them. Thinking that I had dropped them, I looked all around their house and still could not find them, all the while suspecting the worst. Finally, I could look nowhere else and went outside to look through the window of my car.

My suspicions were confirmed. I discovered that they were indeed in the ignition. Thoughts of missing the golden opportunity of hearing the astronaut raced through my mind as I raced around the car checking all the locks. I finally determined that I was indeed locked out and the keys were locked in.

About this time Larry, my brother-in-law, came out to see if I had found my keys. Seeing me leaning against the car, he instantly knew that I had found them in the wrong place. He immediately did an about-face and went back into the house. In my momentary grief, I figured that he thought I wanted to be alone and didn't want to share my potential disappointment with the rest of my family. However, almost as soon as he had gone back into the house, he reappeared with two coat hangers in hand, one for him and one for me. My grief turned to relief as I realized the potential solution of the problem was in his hands.

Upon arrival at my side, he handed me one of the coat hangers and proceeded to disassemble the other. Following his lead, I twisted mine into a new shape that included a loop on one end to snag the lock button on the door. And following his instructions (he was now on the passenger side of the car trying to get his coat hanger inside that window), I worked the coat hanger inside the top of the window between the glass and the rubber seal. Then I slid it down along-side the glass until its loop was just over the top of the lock button. After the third try, I hooked the loop around the button and pulled up.

"Pop" went the lock button as it raised up with my jerk of the coat hanger. Immediately grabbing the door handle, I opened the car door, jumped inside, grabbed my keys from the ignition switch, slid across the seat, and opened the passenger door.

Larry's pleasantly surprised and relieved look at seeing the door open in front of him reflected my feelings. After congratulating me on "breaking into" my car, he asked me if I had my keys. I showed them to him and then seeing that I had an hour's wait before the fly-over, we both went back inside the house, where I accepted some good-natured teasing from the rest of my family.

About a half hour later I went back out to the car. I turned on the 2 meter radio to the appointed frequency. I could hear some of the locals chatting about the impending event. I checked the antenna about three more times and then drove off to a clear spot on a small hill to be alone with my radio. I had asked members of my family if they wanted to go with me, but they declined. I suspected that they thought it was near impossible for me to hear someone from space and they didn't want to be present when I was disappointed, not hearing the astronaut.

So, by myself I waited. Checking my watch, I waited. At about the appointed time I started to hear the rumbling of what sounded like a growing pile-up. And all of a sudden, clear as day, was Owen's voice coming back to one of the locals, and then another and another. I was hearing him on my little old radio in my car!

Almost as soon as it had begun, it was over. Owen's voice faded from the speaker and so did the din of the sound of the guys calling him. I reflected on the excitement of the moments just passed and the wonder of my hobby. Then I drove back home, replaying the events of the past few minutes in my mind. I thought that I may have called Owen once, but I was so awestruck on hearing his voice that I remembered I had just put the mic down and listened.

Upon returning to my sister's house, I went inside. Pat knew the instant she saw me that I

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R7

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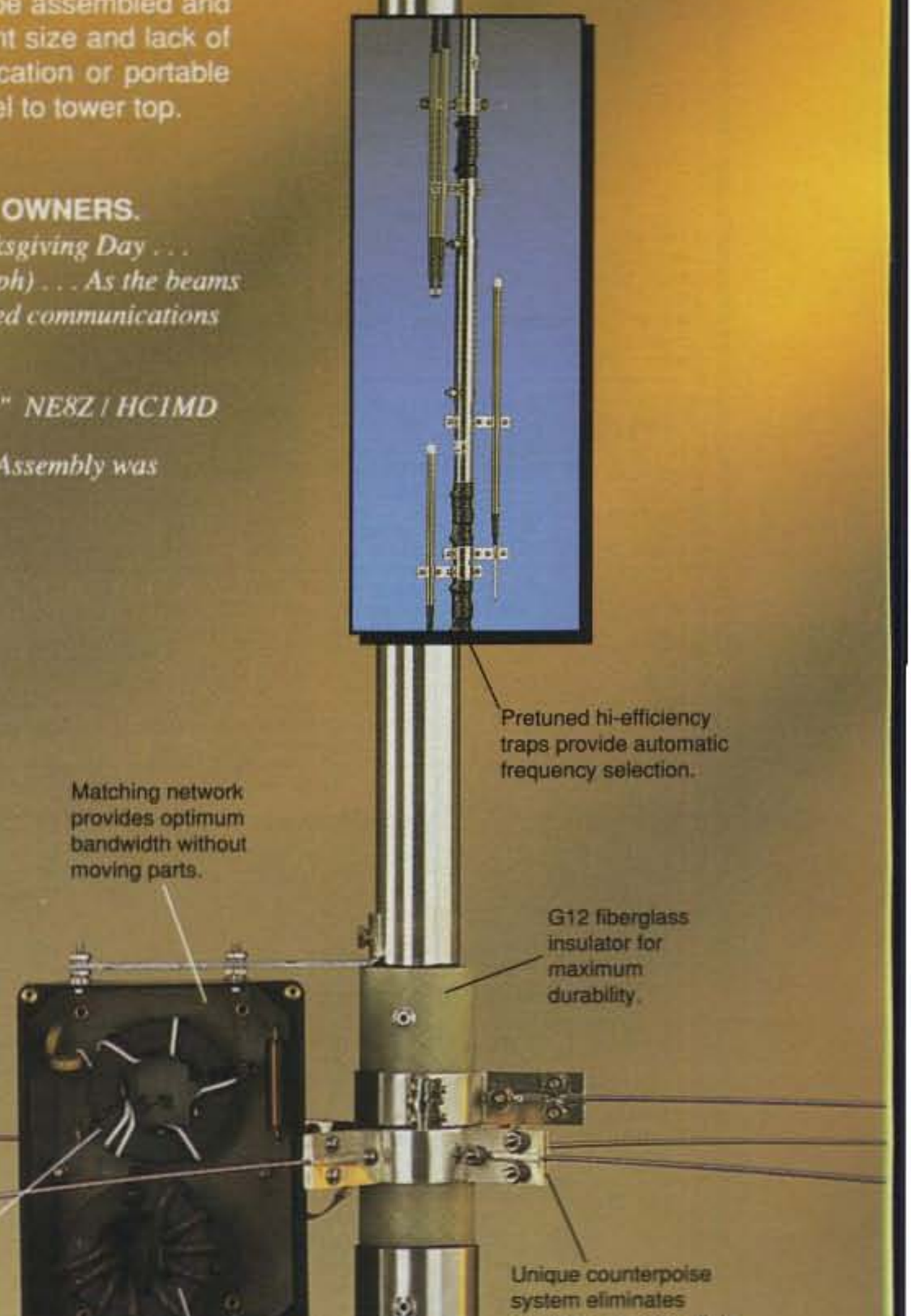
"My first QSO was ZA1A in Albania with my R7." NE8Z / HC1MD

"Metalwork, machining and traps well made . . . Assembly was straight forward and easy." WX6W

SPECIFICATIONS

Frequency, MHz	28, 24, 21, 18, 14, 10, 7
Gain, dBI	3
Electrical Wavelength	Half-wave
SWR 2:1 Bandwidth	10m-2 MHz / 12m-100 KHz 15m-450 KHz / 17m-100 KHz 20m-250 KHz / 30m-25 KHz 40m-75 KHz
Power Rating, Watts PEP	1800
Radiation Angle, degrees	16
Frequency Selection	Automatic
Horizontal Radiation Pattern, degrees	360
Height, ft (m)	22.5 (6.9)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft² (m²)	2.25 (.21)
Weight, lb (kg)	12.3 (5.6)
Counterpoise Radials Supplied	7
Wind Survival, mph (kph)	80 (128)



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had heard the astronaut. Then she told me what I had earlier suspected: she had not wanted to go because she really didn't think that I would hear him. She finally shared her regrets with me for not having been a part of that moment in my amateur radio life.

It was that Sunday afternoon ten years later that I described in the lead topic in this column. Upon arriving at the Mooreland, Oklahoma Hamfest I was greeted at the door by Jerome Doerrie, K5IS, Bobette's husband. I asked him where Bobette was and he told me that she was with Gary at his school in Anthony awaiting the 3 PM fly-over of the Shuttle. He explained to me that Gary's school had been picked out of the hundreds of applicants and Gary was going to have a group of youngsters ready to communicate with the astronaut at the appointed time.

As the Oklahoma section manager, I felt a sense of responsibility to stay at the hamfest to do my job representing the League. However, realizing that I had approximately an hour's time before I had to leave and still make it to Anthony, I knew that I could see everyone and still leave in plenty of time. I also knew that my hosts would certainly understand if I told them I was leaving and passing up the home cooked meal to go to Anthony for the event.

Nevertheless, I started thinking about the extra time it would add to my trip back to Oklahoma City and the fact that I had never been to Anthony and I had no idea at which school Gary worked and that I didn't think that I could get directions and be there in time. Before I knew it, I had talked myself out of going up to Anthony.

About an hour later Jerome bid me farewell and I knew where he was going. I also knew that I had made my decision to stay.

After returning home Sunday evening, I called Gary and interviewed him for this column. From my experience that night in San Diego, I knew what he was feeling. Oddly enough, I also knew what my sister felt not having gone with me that night so many years ago.

After completing the phone call to Gary, I vowed never to pass up another opportunity to share the excitement and wonder of our amazing hobby.

And Finally

Speaking of family and amateur radio, as I was working on this column, I was awaiting arrival of a somewhat surprise visit from my brother, Bill, and sister-in-law, Jackie. They told me that they were going to be driving to Oklahoma City by way of El Paso. When they told me that they would be in El Paso for a couple of days, knowing that they never had been there, I told them that if they needed help finding their way around, they could call my friendand fellow section manager, Milly Wise, W5OVH.

I later called Milly and told her to use her motherly ways to watch out for my brother and sister-in-law should they give her a call. In spite of her pseudo reputation of being an "Old Vicious Hen" (phonetics she long ago made up from her callsign), she readily agreed.

As it turned out, they decided to come to Oklahoma City via Amarillo, which put them here a day earlier. So much for anymore time to work on the column. However, family comes first!

Thinking about the many friends I have in the hobby, I reflected upon another facet of the wonder of the hobby. You, the readers of this column, are also among my friends. Your reports of your amazing feats and your joys in the hobby are what makes this column a success. Thank you again for your help.

If you have an amazing feat that has yet to be published, please contact me. The address is at the beginning. The numbers are 405-528-6625 phone voice and 405-528-0746 FAX. My CompuServe account number is 72124,2734. For Internet, send me messages by addressing it to: 72124.2734@compuserve.com.

Until next month . . .

73, Joe, N6CL

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KP2A	13,673,125
EA8AH	12,052,110
9Y4H	10,793,916
6V6U	10,608,539
EA8BR	8,606,620
8R1K	7,175,904
9M8R	7,034,598
K1AR	6,702,480
FR5DX	6,386,730
ZD8VJ	6,018,734
S59UN	5,915,024
CE3FIP	5,603,808
K5ZD/1	5,419,575
ZB2X	5,380,124
WR6R/KH6	5,057,280
OHØDX	4,972,572
FY5FY	4,957,992
EA3NY	4,886,561
N6BV/1	4,849,481
GW4BLE	4,531,396
VK9NS	4,448,664
4O7AV	4,405,420
4N1T	4,252,110
DJ4PT	4,135,698
V47KP	4,075,897
K3ZO	3,917,442
K1RU	3,589,955
W3BGN	3,559,314
V47NS	3,520,672
W2SC	3,504,816

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LU6ETB	1,560,132
CX5BW	1,447,855
PY3OC	1,121,672
LU5FEW	1,038,864
LU9MBY	785,368
L2Q	730,020
IR8A	534,924
VP2VF	529,000
PWØW	523,200
CT1AOZ	500,664
4L/AHØM	483,936
KG6DX	476,190
S51AY	448,656

21 MHz

ZW5B	2,932,797
9Y4VU	2,217,680
V26N	2,213,028
ZWØJR	1,585,688
OK1RI	1,349,196
S57EK	1,273,712
ZS6WB	1,078,036
VE7SZ	1,036,464
SP7GIQ	1,019,940
HK3JJH	971,964
DJ7AA	937,408
VY2Ø	928,560
LT5H	878,436
K1UO	876,095
K2Ø/1	810,704

14 MHz

ZXØF	2,227,220
PJ9M	2,174,656
IT9A	1,328,150
CH7SV	1,316,658
YW1A	1,253,020
LZ5W	1,181,817
S52AA	1,177,536
IB9S	1,136,836
JAØJHA	1,106,418
CT1ESV	915,904
UN4L	892,080
OK5A	857,736
GM3WOJ	818,380
9A7A	803,880
S57DX	797,308
RU1A	793,873
4X6FR	788,015
GW8GT	756,000

7 MHz

PJ9U	1,267,280
FG5BG	1,001,526
CN2JR	630,126
S59AB	607,539
G3NLY	573,271
YV5MRR	567,468
YT7AA	516,334
DL8OH	401,140
ZS6EZ	400,440
W7XR	363,113
KC7EM	335,298
UB4HO	333,135
CT7D	331,848
XQ8ABF	315,900

3.7 MHz

4M5B	194,586
DL3LAB	191,760
IV3TAN	188,400
GMØECO	183,162
WE3C	177,228
S51OJ	175,560
ON9CJM	170,367
W6RJ	154,548
DL2ARD/P	151,008

1.8 MHz

IV3PRK	44,676
S57AV	40,365
4X4NJ	33,592
UT5DK	31,735
S51HB	28,224
VE3BW	23,436
VE3ABG	22,724
EA3CCN	18,960
OK1JDX	18,232
4L/3W3RR	15,609
WB9Z	14,094
KH6CC	12,308
K5UR	10,528

LOW POWER ALL BAND

7Q7XX	5,524,800
TO5MM	5,240,120
VP2EJ	4,528,482
HC1OT	4,194,840
EL2PP	3,491,256
HKØHEU	3,137,076
ED8CQ	2,175,618
9J2FR	1,902,810
P29KH	1,853,280
K2SG	1,768,240
N8II	1,761,762
CE2EZE	1,657,416
S59DX	1,627,248
S53EA	1,562,586
TM6GG	1,518,594
XE3RKK	1,396,494
YB6INU	1,336,500
VF1L	1,322,750
LX1NW	1,210,971
LX1KC	1,049,152
WS1A	1,046,662
AP5N	1,041,600
K6GØ/KH6	1,027,978
5Z4FO	1,010,464
PW2N	1,000,176

28 MHz

LU3HIP	560,875
EA6VQ	505,120
T93M	424,999
PY2PD	424,154
LU1VK	381,669
TI2KSR	322,920
EA8IN	309,246
ZS6YA	303,347
OA4ZV	243,511
OM3CFA	205,590
ZL1AXB	171,648

21 MHz

5Z4BI	1,250,088
CN2JF	779,085
IK2DZN	656,494
EA8IY	601,156
EA3FQV	510,051
4X6ZK	453,476
YO4NF	417,339
DU1EIU	338,744
JI2UNR	335,400
VK2AYD	334,696
DU3RCM	325,692
SP5IVC	323,550
IT9JWV	311,640
4M5X	307,536

14 MHz

IR1T	714,096
IB4M	661,788
LU2NI	442,680
GIØSAP	355,540
IR3S	352,444
LU1ICX	313,065
K1VUT	255,600
UV3HD	204,624
N4MO	196,482
CT3BD	172,422
K2QMF	157,290
JE2UFF	151,168
JA7DOT	150,125

7 MHz

YV6BTF	299,328
TA2BD	104,960
RB5QRW	102,258
LZ1ZX	100,528
YO4FYQ	56,335
JG6CVO	40,704
JH6EJG	37,107
UB5ZBF	34,278
JA1LZR	29,667
VE2DSX	25,192

3.7 MHz

S51AW	68,000
IT9HBT	62,178
S59CAB	57,749
HA4XN	35,046
EA5GRC	34,681
CL3ZD	31,777
EA2ABM	31,108
OK1FPS	29,700
F6BVB	25,559

1.8 MHz

OZ3SK	23,769
LA6WEA	13,395
OH1KF	9,568
YL2GUO	8,200
SP2FOV	7,644
UB5TFB	7,290
S58MM	6,815

QRP ALL BAND

7Z2AB	2,612,088
F5BEG	576,750
N1AFC	375,237
EA3RQ	325,376
IK1GKE	309,276
UA9CUA	303,525
N4JF	297,920
JA2IVK	268,822
UB4FXX	268,488
LY1DR	260,832
P4ØC	253,120
KA1CZF	250,868
RV9C	225,959
HA7YS	198,360
4O1K	197,325
LA1XDA	163,014
EA1GT	162,259

ASSISTED ALL BAND

CH3EJ	8,607,000
DLØWW	4,936,152
K1ZM	4,778,400
TM2V	4,730,103
K2WK	3,879,334
AA2DU/1	3,551,899
N3AD	3,430,142
KC1F	3,031,056
DJ2YA	2,977,752
K3WW	2,967,228
KE2NL	2,621,805
K1TO	2,572,968
K1KP	2,486,495
KF2O	2,091,912
KS9Z/1	2,044,900

MULTI-OPERATOR SINGLE TRANSMITTER

PJ1B	22,809,375
P4ØL	22,692,488
P49T	17,684,346
OT3T	12,360,345
IQ4A	12,180,672
VP2VFP	10,637,473
L4ØF	10,236,352
V31DX	9,920,556
TM7C	9,138,483
N6VI/KH6	9,111,626
OK5W	8,916,480
LZ9A	8,573,400
PT7CB	8,569,200
YS1X	8,289,027
HZ1AB	8,287,504
CR3M	7,957,080
KC1XX	7,730,460
OH2X	7,519,029
TM2Y	7,506,331
AHØK	7,319,565
9K2ZZ	7,261,380

MULTI-OPERATOR MULTI-TRANSMITTER

EA9UK	37,783,578
VP2EC	29,803,383
VP5L	21,746,430
GØKPW	20,031,284
HG73DX	19,493,110
UW2F	16,696,880
N2RM	16,291,740
OT3A	16,162,158
HCØE	15,452,712
W3LPL	15,092,776
CH9DH	14,649,546
LU4FM	13,078,884
K2TR	12,414,492
V26B	11,846,252
VS6WO	10,793,254
K3LR	10,689,888

USA ALL BAND

K1AR	6,702,480
K5ZD	5,419,575
N6BV/1	4,849,481
K3ZO	3,917,442
K1RU	3,589,955
W3BGN	3,559,314
W2SC	3,504,816
N2LT	3,459,600
K2DM	2,857,435
W1WEF	2,822,820
N2NU	2,777,719
N7AVK	2,749,236
W2HPF	2,661,088
K2ZJ	2,625,978
KX3Q	2,422,536
KE9A/4	2,386,892
K4VX/Ø	2,092,662
N7TT	2,085,946
NN7L	2,076,940

28 MHz

W6AXX/3	172,752
W9XT/4	115,411
NZ8O	112,875
K4YT	95,125
N5NMY	89,316
KA2DFO	87,901
K7RLS/4	74,241
K5LZO	69,708
W2KZE	37,260
K2EEK	35,343
WØACT	33,825

21 MHz

K1UO	876,095
K2Ø/1	810,704
KS1L	679,680
NG2X	675,990
K3ZJ/8	614,859
WZ3Q/4	516,426
WB9YXY	489,552
N4CT	443,455
N1CC	400,960
KØKR	376,275
W4CVX	308,728
WS1M	254,185

14 MHz

KK9A	733,698
K7RI	715,407
K9ES/4	503,982
W7IL	497,007
N8JEC	377,019
W1XE/Ø	312,000
K9BGL	257,796
K2MGA	210,094
K9CAN	200,850

7 MHz

W7XR	363,113
KC7EM	335,298
KVØQ	246,048
W1RR	174,330
WF5E	125,020
KA5W	106,878
WB8VPA	94,829
WA4CTA	87,360
WØKEA	82,280
KD9ST	79,851
W1YY	79,209

3.7 MHz

WE3C	177,228
W6RJ	154,548
AD1G	64,117
W9LT/8	33,441
KB1H	23,370
WB7EWC	22,464
WA2AOG	14,396
KR9G	11,742
W5CWQ	7,900
KE9U	6,348

1.8 MHz

WB9Z	14,094
K5UR	10,528
W2FCR	4,429
KK4SI	4,320
AA4MM	3,648
WØCM	2,944
W8XD	2,106
W2VO	2,016
W8UVZ	1,104

LOW POWER ALL BAND

K2SG	1,768,240
N8II	1,761,762
WS1A	1,046,662
WA2UUK	940,352
AI6E/1	833,784
W2CRS/Ø	758,016
AA4EL	749,580
KE2ZU	691,548
KØRNZ	675,966
WA7BNM/6	608,304

28 MHz

KD4HXT	133,584
KE5FI	127,124
WB5CRG	125,857
KC3PZ	104,400
KA1YIY	92,476
WB2BZR/3	89,625

21 MHz

WØLSD	216,812
WJ7S	191,250
NI5M	185,080
WZ8T	180,780
N1KWF	168,885
NY5B	159,880

14 MHz

K1VUT	255,600
N4MO	196,482
K2QMF	157,290
KF8UM	138,112
KD5IA	47,712
W4WJJ	45,080

7 MHz

N9JF	18,018
N5AHS/3	7,738
WA6WPG	7,128
NI6G	5,735
W3CPB	5,461

3.7 MHz

WR3I/4	15,795

1.8 MHz

KØCS	3,135
WT3W	930

MULTI-OPERATOR SINGLE TRANSMITTER

KC1XX	7,730,460
N3RS	5,847,530
K1DG	5,785,215
KY3N	5,322,430
K1NG	5,297,752
K1RX	5,185,848
KS9K	5,000,528
K4ISV	3,864,644
W9KDX	3,394,622
K2WI	3,359,961
N2BA	3,122,208
K8LX	3,067,208
W5KFT	2,932,248
NN3Q	2,921,184
AB5K/5	2,570,164
AA4G	2,556,036

MULTI-OPERATOR MULTI-TRANSMITTER

N2RM	16,291,740
W3LPL	15,092,776
K2TR	12,414,492
K3LR	10,689,888
W7RM	6,830,332
KY1H	6,192,720
W4MYA	6,149,800
K3ANS	5,164,558
NQ4I	5,146,602
NF2L	4,849,335

EUROPE ALL BAND

S59UN	5,915,024
ZB2X	5,380,124
OHØDX	4,972,572
EA3NY	4,886,561
GW4BLE	4,531,396
DJ4PT	4,135,698
DL2NBU	3,411,670
G3NAS	3,208,600
GIØKOW	3,008,643
GJØSLY	2,709,760
LY3BX	2,473,044
IR1A	2,237,256
F6HLC	2,134,809
DL8PC	2,132,094
UB7Q/DJ5BV	1,810,470
LY2IJ	1,781,200
EA7BA	1,607,200
HBØ/DF3GY	1,591,288
DF3QG	1,503,885

28 MHz

IR8A	534,924
S51AY	448,656
S51SO	316,684
DJ1ZU	250,178
PBØAFZ	164,220
F5HNQ	121,365
GØAEV	113,563

21 MHz

OK1RI	1,349,196
S57EK	1,273,712
SP7GIQ	1,019,940
DJ7AA	937,408
YL1WW	797,580
LZ6R	715,135
TM1K	714,455
II4A	697,125
YT9C	666,672
S52KD	662,796
EA5BY	615,519
OHØNJ	609,928
OH1AA	601,392
G4LJF	521,520
EA4EOV	492,755
IK4AUY	479,196
ON5GQ	401,232
SMØKV	253,872

14 MHz

IT9A	1,328,150
LZ5W	1,181,817
S52AA	1,177,536
IB9S	1,136,836
CT1ESV	915,904
OK5A	857,736
GM3WOJ	818,380
9A7A	803,880
S57DX	797,308
RU1A	793,873
GW8GT	756,000

7 MHz

S59AB	607,539
G3NLY	573,271
YT7AA	516,334
DL8OH	401,140
UB4HO	333,135
CT7D	331,848
OM3CQR	250,902
TF3CW	219,559
ISØQDV	172,508
EA5BM	171,414
IK4ALM	151,528
RB4GA	144,875
IQ5Q	128,588

3.7 MHz

DL3LAB	191,760
IV3TAN	188,400
GMØECO	183,162
S51OJ	175,560
ON9CJM	170,367
DL2ARD/P	151,008
S52CD	141,700
OH7UE	128,029
DL3OI	117,312
ES5MC	104,247

1.8 MHz

IV3PRK	44,676
S57AV	40,365
UT5DK	31,735
S51HB	28,224
EA3CCN	18,960
OK1JDX	18,232

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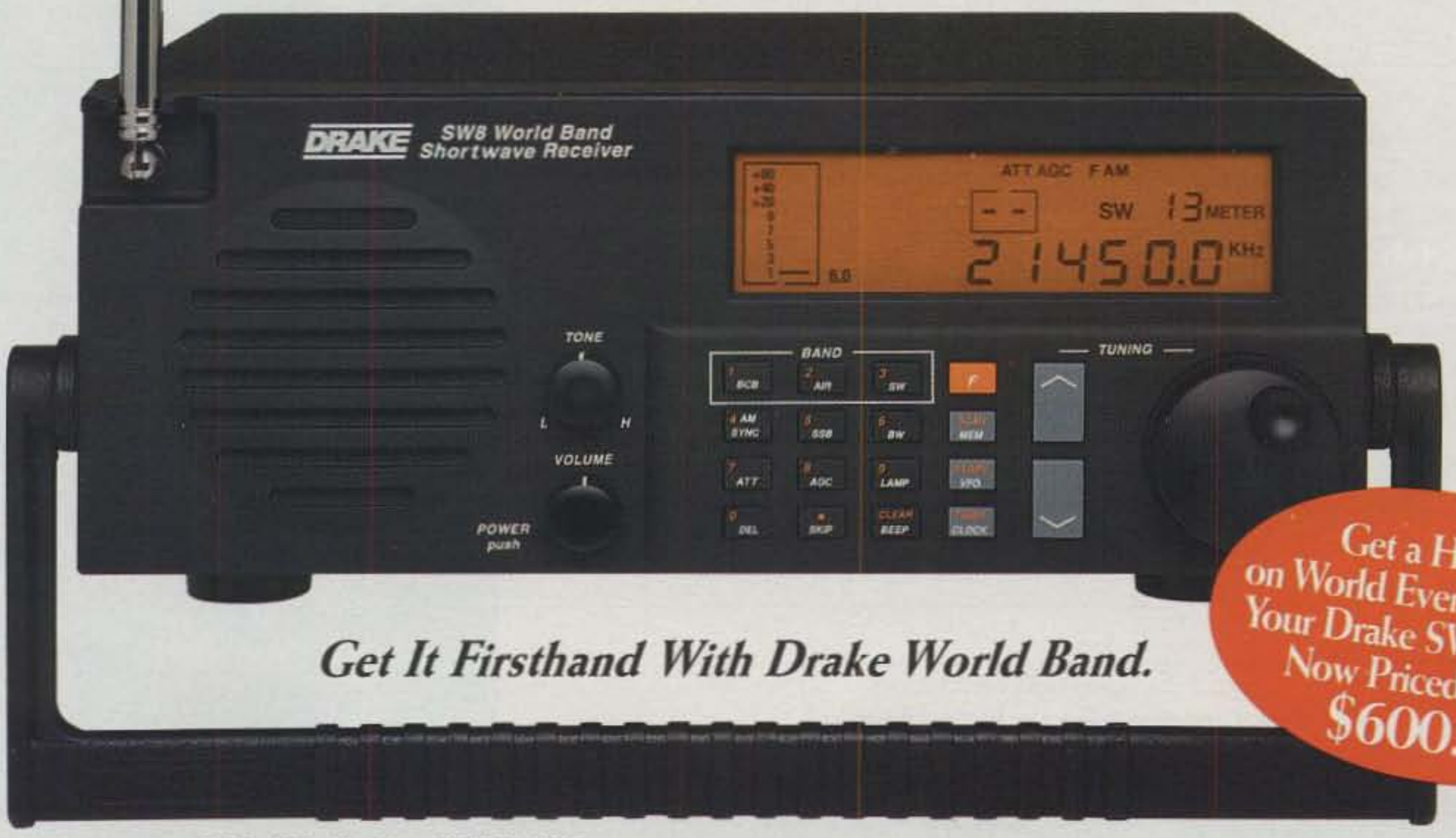

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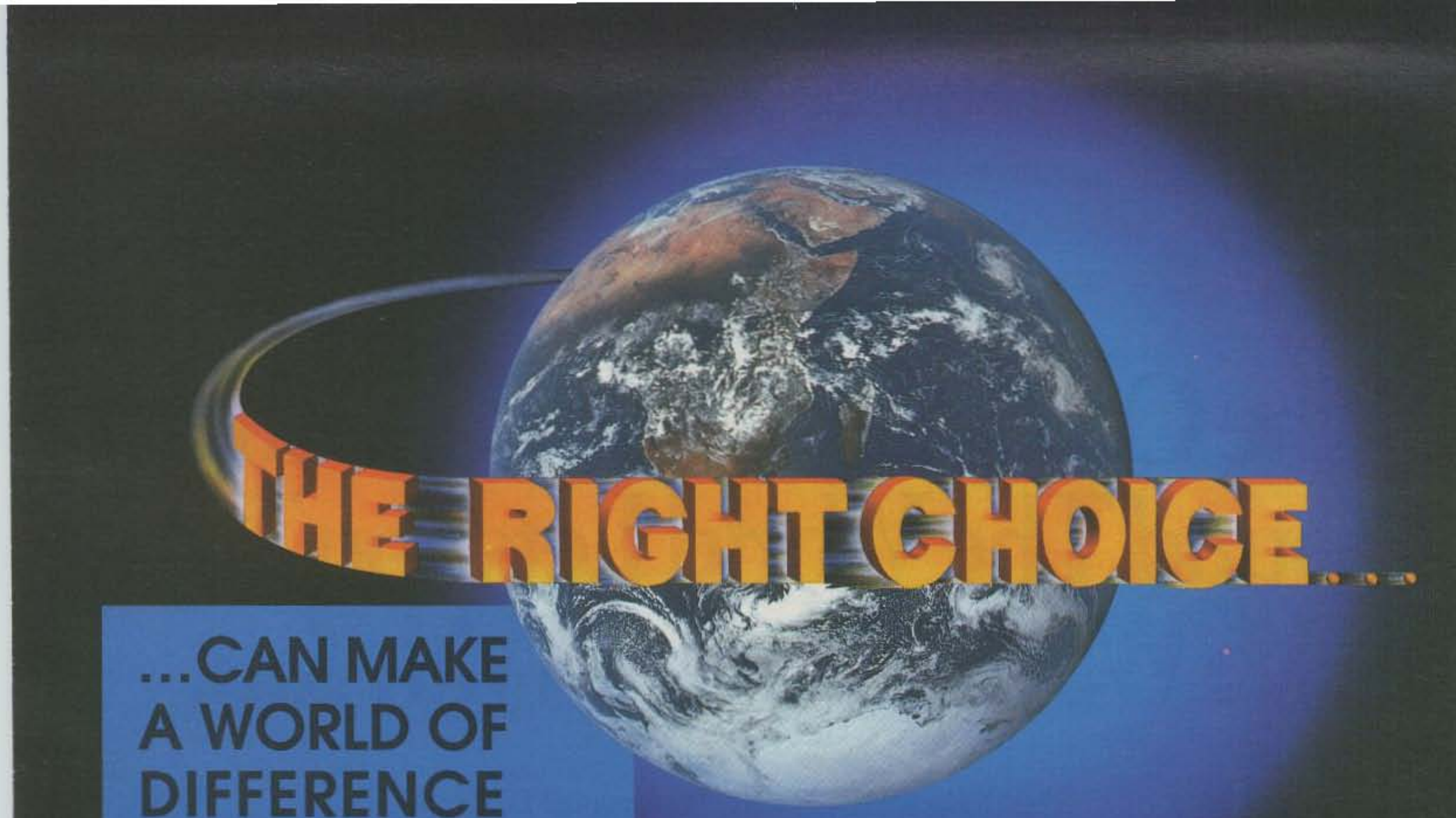

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S59DX	1,627,248
S53EA	1,562,586
TM6GG	1,518,594
LX1NW	1,210,971
LX1KC	1,049,152
EA3BKI	870,406
S51FA	834,558
S59DJK	834,309
DK1QH	769,472
EA3ELZ	760,806
EA2CLU	737,262
EA3CWT	687,530
UA4AGF	643,536
EA5PX	633,609

28 MHz

EA6VQ	505,120
OM3CFA	205,590
HA1FF	153,897
CT1ERK	153,232
IK4LZH	139,896
S57JZ	127,488
GI4SNA	111,807
HG8FH	106,370
CT1ETE	105,900

21 MHz

IK2DZN	656,494
EA3FQV	510,051
YO4NF	417,339
IT9JWV	311,640
DL1IAO	293,888
EA1KN	251,868
S59ZZ	241,760
IT9RYJ	216,376
PAØMIR	161,424

14 MHz

IR1T	714,096
IB4M	661,788
GIØSAP	355,540
IR3S	352,444
UV3HD	204,624
SP5LKM	132,182
ED5ABE	128,270
9A1EZA	111,071
UA1TAN	100,455

7 MHz

RB5QRW	102,258
LZ1ZX	100,528
YO4FYQ	56,335
UB5ZBF	34,278
YO3JF	18,522
LZ2ZY	14,100
OK2BQZ	10,088

3.7 MHz

S51AW	68,000
IT9HBT	62,178
S59CAB	57,749
HA4XN	35,046
EA5GRC	34,681
EA2ABM	31,108
OK1FPS	29,700
F6BVB	25,559
OM3YCL	20,176

1.8 MHz

OZ3SK	23,769
LA6WEA	13,395
OH1KF	9,568
YL2GUO	8,200
SP2FOV	7,644
UB5TFB	7,290
S58MM	6,815

MULTI-OPERATOR SINGLE TRANSMITTER

OT3T	12,360,345
IQ4A	12,180,672
TM7C	9,138,483
OK5W	8,916,480
LZ9A	8,573,400
OH2X	7,519,029
TM2Y	7,506,331
HB9H	6,277,804
OE2XEL	6,219,402
OM3KAG	6,127,764
OE6CLD	6,120,576
ON7UN	5,615,104
CU2T	5,497,275
ED3DU	5,431,511
TM5B	5,299,236

MULTI-OPERATOR MULTI-TRANSMITTER

GØKPW	20,031,284
HG73DX	19,493,110
UW2F	16,696,880
OT3A	16,162,158
DFØDX	8,560,097
IQ3A	8,338,512
SN6O	3,504,498

CIRCLE 97 ON READER SERVICE CARD

WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Lighthearted Hamming

Ready for a fun break from serious high-power DXing, all-out contesting, and usual desk-confined hamming? Need an interesting mini-pursuit to keep life exciting? This month's column is just for you! It contains a cross section of lighthearted ideas and "weekender" projects guaranteed to boost everyone's interest.

This "potpourri column" is the result of your input and our friendly conversations in several areas including mobiling, portable operating, building unusual QRP rigs, using classic gear, and more. Rather than hold this fascinating collection of ideas and views until each could be inserted into a subject-related column, I elected to combine all of them here in a fun-for-all mixture.

Although strictly a personal opinion, I think we occasionally lose sight of amateur radio's simply fun side. We invest in massive antenna systems that are nearly impossible to maintain without a tower crew, overfill a complete room with exotic equipment, and pump out a bundle for repair assistance when something goes wrong. Like many of you, however, I'm finding new magic in installing and using antennas light enough to handle alone, and lower budget gear that can be enjoyed (or replaced!) in a less costly manner. And the good news is I still work my fair share of big-time DX. Economy cars can travel the same long distance as the higher priced vehicles, but the ride may not be as luxurious. However, classic amateur radio beauty is, as it has always been, in the eyes of the beholder.

That's enough talk. Let's now look at how some creative-minded amateurs are setting their own special pace in 1994!

Station In A Bag

Many amateurs (including me!) have dreamed of a medium-power and fully portable HF station but never found the right items to make such a package a reality. Avoiding use of large batteries for necessary high-current requirements typically diverted the project into a QRP pursuit. That in turn meant raising a full-size dipole (or larger antenna!) to radiate a good signal. Since going that far, we might as well spread out the gear on a table and operate Field Day style—a "back to square one" situation.

4941 Scenic View Drive, Birmingham, AL 35210

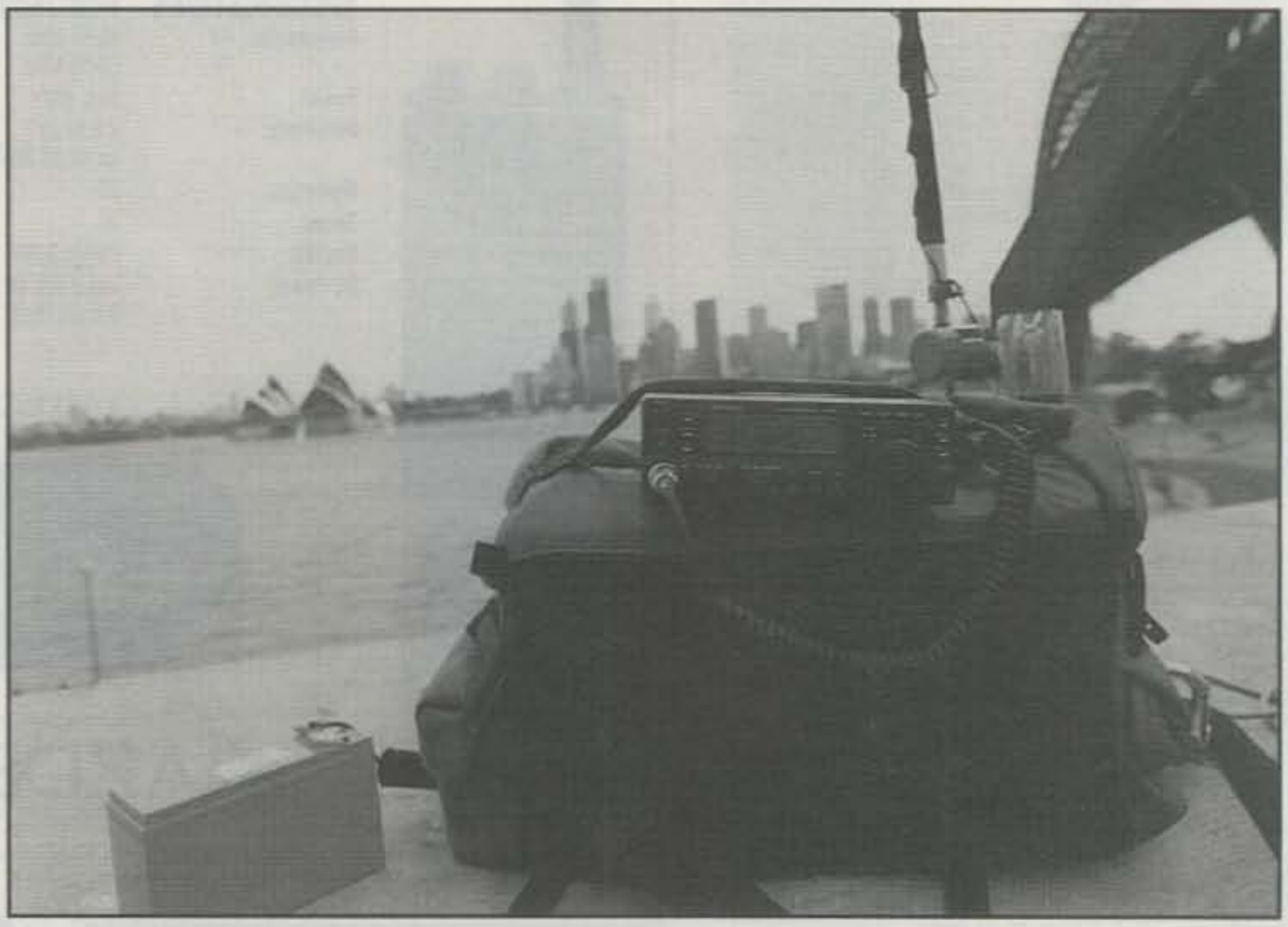

Photo 1– WD4FSY's self-contained, fully portable "station in a bag." One of the two side-carried gel-cell batteries has been placed beside the bag for illustration. Setup involves only propping up the antenna, laying out two ground straps, and "firing up" the rig. (Photo by WD4FSY/ VK2IBB, Sydney Harbor, Australia)

Faced with that situation and needing a go-anywhere HF rig during his recent visit to Australia, outbacking Don Arnold, WD4FSY, devised a clever solution to fit his globetrotting lifestyle. He wired a pair of 12 volt 6 amp sealed gel cells in parallel, connected them to his Kenwood TS-50, added another 5 foot long cable with cigarette-lighter plug for recharging while mobiling, and then mounted everything in a camera bag. Coax cable for the antenna (an all-band Outbacker mobile whip which separates into three 2 foot sections for storage) and a roll of copper foil (to make an instant ground plane) were also packed in the bag.

The resultant setup, shown during operation from Sydney Harbor in photo 1, is a complete 50 watt "bag station." The setup can even be operated at the full 100 watt level for a brief time, provided the batteries are fully charged and the transceiver is moved atop the bag for ventilation. Set-up or tear-down time for this rig is less than 5 minutes, and radiated signals are significantly greater than those from any QRP rig.

007 Setup

Our friend Erskine Jackson, W4CEC, took a slightly different approach to the portable rig concept, mainly because his operations away fron the shack were in areas with AC power. He simply modified a standard-size briefcase to carry everything in a professional-looking manner (photo 2). A large piece of foam cushioning was fitted into the briefcase, and cutouts were made to hold his TS-50, MFJ tuner, homebrewed keyer, and paddle solidly in place. A Yaesu FP-757GX (a terrific little 1 inch tall, 12 volt, 20 amp switching-type power supply) and power cables pack comfortably below the foam layer, and various lengths of wire and RG-174 coax store in the briefcase top section. Setting up for weekend cottage or motel-room operation takes only minutes. In fact, the transceiver can be propped on the briefcase front for impromptu operations. Even James Bond would be im-

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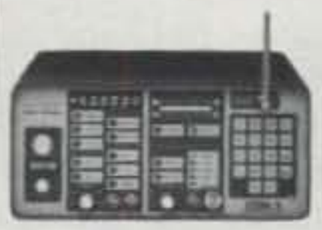
For a slick little QRP boost, use one of the 20 Watt amplifiers. Needs only 1/2-2 watts of drive for full output, linear for SSB, AM or CW operation, power MOSFETs for high effieciency and multistage low pass filter for a clean signal. Built-in T/R relay for automatic switching, runs on 12-15 VDC at 2-4 amps. Add our matching case set for a complete station look.

Your choice of bands **$49.95**
Specify band: (QAMP-20, 30, 40, 80)
CQAMP Matching case set **$14.95**

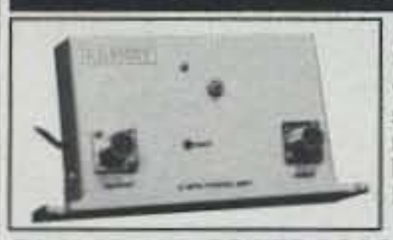
2WAY RADIO SERVICE MONITOR



COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantastic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10.000 µV output levels • High receive sensitivity, less than 5 µV • 100 kHz to 999.9995 MHz • Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder • 1 KHz and external modulation.

COM-3 2 Way Radio Service Monitor **$2995.00**

2 MTR & 220 BOOSTER AMPS



Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz units. Both have all the features of the high-priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested **$99.95**
PA-20 220 MHz POWER BOOSTER (8 X power gain) Fully wired & tested **$99.95**

QRP TRANSMITTERS/HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.

Your choice of bands
(Specify band: QRP-20, 30, 40, or 80) **$29.95**
Matching case knob set.CQRP **$14.95**

20, 30, 40, 80M All Mode RECEIVERS

Build your own mini ham station Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602, IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.

(Specify band: HR-20, HR-30, HR-40, HR-80) **$29.95**
CHR, Matching case **$14.95**

FOXHUNT HEADQUARTERS

Locate hidden or unknown transmitters fast. The Foxhound direction finder connects to the antenna and speaker jack on any radio receiver, AM or FM from 1 MHz to 1 GHz. The antenna (a pair of dipole telescopic whips) is rotated until the Null meter shows a minimum. A pair of LEDs indicate to turn Left or Right. The Foxhound is ideal to use with a walkie-talkie. if you wish to transmit, go ahead, a built-in T/R switch senses any transmitted RF and switches itself out of circuit while you talk. It doesn't get any easier than this! We provide all parts except for a few feet of 1/2 inch PVC pipe avialable at any hardwar e store for a dollar or two. Add our matching case set for a complete finished unit. Be the one with the answers, win those transmitter hunts and track down those jammers, you'll do it all with your Foxhound.

Add some fun to your club events by having a transmitter hunt! Foxhunting is a craze sweeping the nation, but many clubs are missing out on the action because they lack the expertise or time to develop their own foxhunt transmitter. We set one of our most devious and sneaky engineers to the task of designing an easy to build and use, yet highly capable Foxhunt transmitter. A snazzy microprocessor controller has both preset and programmable transmission characteristics allowing you to easily set the difficulty level from "beginner" to "know-it-all"! The SlyFox, FHT-1, is crystal controlled in the 2 meter band (crystal for 146.52 included) with a power output of 5 watts that is adjustable by the controller.The transmitter is programmed to ID in CW or add our voice option if you really want to aggravate the troops - "Ha ha, you can't find me!" Join the fun, get rid of those stuffy old meetings and picnics, have a foxhunt!

DF-1 Foxhound direction finder kit **$59.95**
FHT-1 SlyFox Foxhunt transmitter kit **$129.95**
CFHT Heavy duty metal matching case set for FH T-1 ..... **$29.95**
CDF Matching case set for DF-1 ..... **$14.95**
FHID-1 Voice ID option **$29.95**

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly NO TUNING". Includes FREE disk software. PC Board and Full Documentation. Kit form.

P-64A ..... **$59.95** P-IBM ..... **$59.95** CASE CPK **$12.95**

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna

FM-10A Stereo transmitter kit .. **$34.95**
CFM Case,whip ant set **$14.95**

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler /descramblerkit **$39.95**
CSSD matching case set **$14.95**
SS-70WT Assembled
SS-70 and case set **$79.95**

Miniature SPEAKER-MIKE

Fits Icom, Yaesu, Alinco, Ramsey and Radio Shack rigs! Looking for a handy little speaker-mike to compliment your FX transceiver or other ICOM style handie-talkie? The Ramsey SM-1 speaker-mike is a beauty. It's only 1 1/2" wide by 2 1/2 inches high and has a handy clip on the back so you can easily clip it to your lapel or shirt. Its small internal speaker isn't going to break any eardrums but is very clear and has plenty of pop to be heard when worn. There's even a jack on the mike so when you plug it in, you still have the use of the speaker jack from your radio. Fits all Radio Shack, ICOM, Yaesu, Alinco and Ramsey rigs.

SM-1 Mini-Speaker mike, Fully assembled **$24.95**

CW KEYER

Send perfect CW. Microprocessor keyer features 4 programmable memories of up to 26 words each, Iambic keying, dot-dash memory, variable speed from 3-60 WPM, adjustable sidetone, keying to any rig and fully RFI proof. EAROM memory keeps messages up to 100 years - you'll go silent before the key! Includes built-in touch paddles or use your own. Easy assembly and matching case set available for a nice station look.

CW-700 Micro keyer kit ..... **$69.95** MK Matching case set **$14.95**
CW-700WT Assembled CW-700and case **$119.95**

ACTIVE ANTENNA

Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!

AA-7Kit ..... **$28.95** Matching case & knobset, CAA .. **$14.95**

AIRCRAFT RECEIVER

Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110-136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit **$29.95**
Matching case set, CAR **$14.95**

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugar cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too!

FM-5 Micro mike kit **$19.95**

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit **$19.95**

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning. AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!

Shortwave receiver kit, SR1 ..... **$29.95**
Shortwave converter kit, SC1 ..... **$27.95**
Matching case set for SR1, CSR .. **$14.95**
Matching case set for SCI, CSC ... **$14.95**

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.

PA-1, 40W pwr amp kit **$34.95**
TR-1, RF sensed T-R relay kit **$14.95**

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Ramsey carries a complete line of low cost, easy to build, easy to use functional kits that can be used alone or as building blocks in larger more complex designs. Mini-kits include audio amps, tone decoders, VOX switches, timers, audio alarms, noise-makers and even shocking kits! Call for our free catalogue!

MORE KITS NEXT MONTH'S ISSUE

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Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour-just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge-batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit **$49.95**
CDN Matching case set **$14.95**
DN-1WT Fully assembled Dr. Ni-Cad with case **$89.95**

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TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. Add $4.95 for shipping, handling and insurance. For foreign orders add 20% for surface mail. COD (U.S. only) add $5.00. Orders under $20 add $3.00 NY residents add 7% sales tax. 90-day parts warranty on kit parts. 1-year parts & labor warranty on wired units.

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CIRCLE 150 ON READER SERVICE CARD

pressed by this clever package.

Technically astute readers are probably asking if ultra-small and 250 watt rated RG-174 coax is really a good choice for portable use, especially with today's emphasis on low-loss cables. Both Erskine and I have used 50 and 70 foot lengths of RG-174 for quick-stint hamming, and we cannot tell the difference between it and RG-8X. I would not expect comparable results when used on 10 meters or in lengths over 100 feet, though.

Magazine-Rack Shack

Say you have been looking for a quick and easy way to set up a small HF rig in the family room, den, or even by the bed? Check out W4CEC's creative and quite attractive solution shown in photos 3 and 4. This arrangement is XYL approved and it truly represents casual operating at its best!

A conventional wooden magazine rack is used to hold the transceiver (Kenwood TS-50) and power supply (Yaesu FP-757), and there is extra room for a tuner or a larger power supply plus some magazines. A 2 meter/70 cm rig can even be added on the rack's "open side," and the middle handle section is still accessible for lift-and-go carrying. Photos cannot capture the full beauty of this rig cart, so I will point out some of its finer details.

The transceiver's rear lip "catches" and holds perfectly on the rack's side, leaving plenty of ventilation room for the heat sink. The rig is also angled perfectly for armchair use. Bungee cords hooked to ornamental side knobs hold the TS-50 securely. Small hangers were added to each side of the rack to hold earphones and mike, the keyer and paddle sit on the chair arm when used, and power-supply to TS-50 cabling is inside the rack for neatness. Erskine moved his rack shack beside an extra chair for better lighting/photography, or you would see the coax he routed from his main shack to the den emerging from the air-conditioning vent by the chair. Erskine says this setup is proving so enjoyable that he has almost forgotten what his main (big rig) looks like. Might this indicate a future trend?

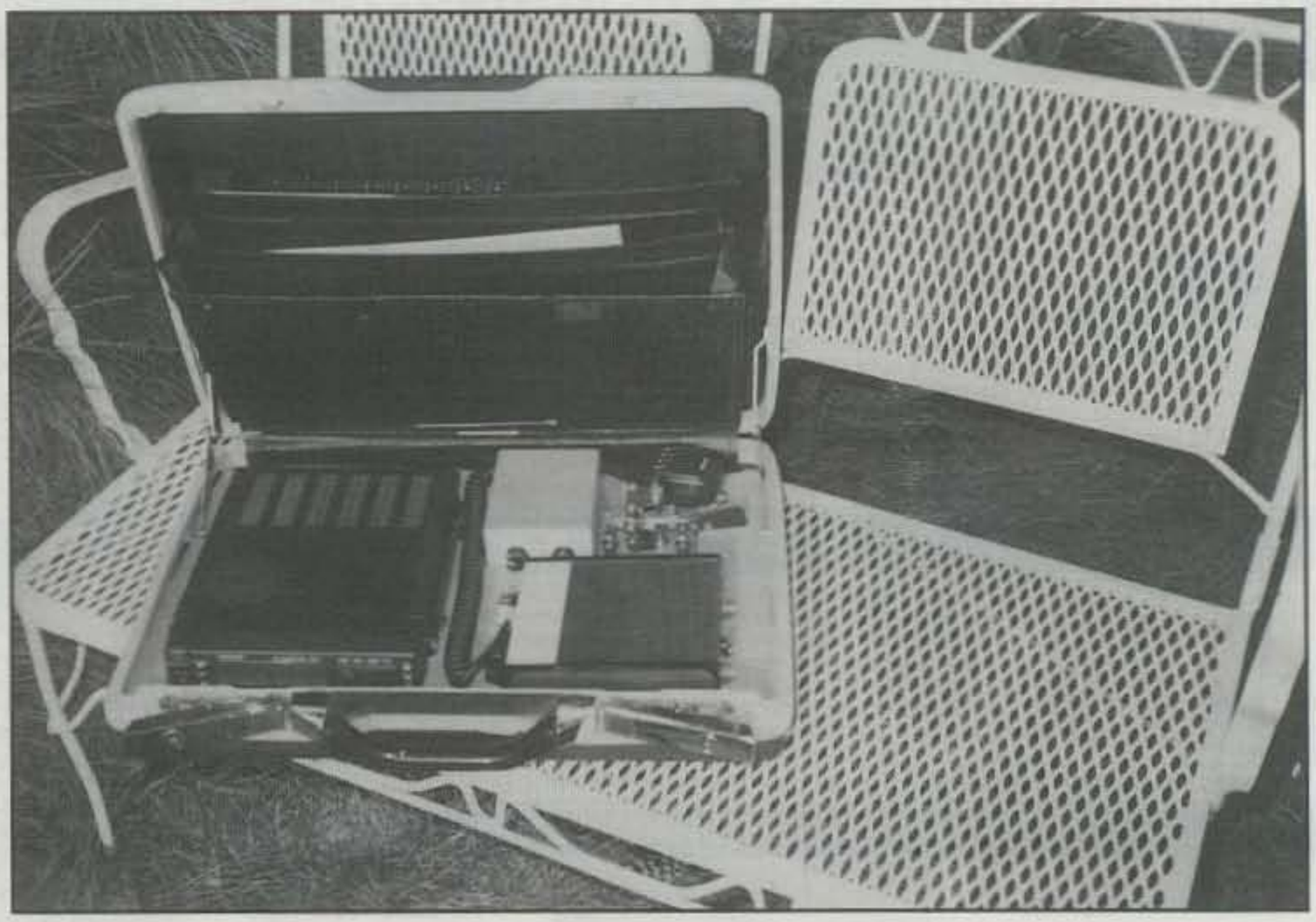

Photo 2– Seeking a rugged yet inconspicuous way to carry his HF gear on vacation or into motels, W4CEC added foam cutouts to a regular briefcase. The result is a quick-pack carrier that keeps everything in one trim package.

QRP In A Can

Remember our last QRP column's open invitation to share views of your homebrew rigs/projects mounted in unusual enclosures? Joe Esposito, K2YJL, responded pronto with the photo of his Tuna

Photo 3– W4CEC shows how he adapted a regular magazine rack and made it into a full rig cabinet. Existing sections support transceiver, power supply, and magazines. (See text.)

Photo 4– Opposite side view of W4CEC's "lift and go" magazine-rack shack. Power supply to transceiver cable is inside the rack. Earphones and mic hook on the side. Bungee cords hold the gear securely.

Tin Two Transmitter built in a Dixie beer can (a collector's item) shown in photo 5. Two classics in one!

The Tuna Tin Two, as seasoned QRP-ers may recall, uses a pair of 2N2222 transistors and a handful of Radio Shack chokes, resistors, and capacitors to produce a 300 mw transmitter for 40 meters. Joe built his copy of this vintage rig with components mounted "downward" rather than flat on the can's top, and then added a battery in the lower section and sockets for the key and antenna on the side. Joe "finished off" the handheld delight with an equally rare J-51 "scissors key," an item we will discuss further in the next "Keys" column.

Now how about sharing a photo or two of your own special-enclosed project with *CQ* readers? We will include it in a future column and give you full credit.

Those Memorable Command Sets

Occasionally we've mentioned Army surplus "BC" receivers and "ARC-5" transmitters used for low-cost home and mobile operations during the mid 1950s. Well, we finally struck a familiar note with one of our readers.

Bernie Ginsberg, KC6P, stepped forward recently to say he uses one of these almost 40-year-old combos on the air today, and it still pumps out a respectable CW signal (see photo 6). Ah . . . the memories of dear old Novice days these awkward-looking units inspire is incredible—like blindly digging in a maze of wires to convert their filaments to 12 volts, adding a BFO switch and volume control, and dinking with B+ dropping resistors. And is there a 1950s-licensed amateur today who does not recall getting his first tooth-jangling high-voltage shock or genuine RF burn while trying to get one of these "ether pumpers" going? Those were indeed educational times!

Bernie's "Command set station" consists of a 195 to 550 kHz BC458 "Q5er" and an external converter for receiving 40 meters (the fancy way to go), and a 7.0 to 9.1 MHz transmitter modified to use a Pi-Net output. The setup (which for photographing purposes was moved onto a white sheet) is connected to a dipole antenna and has been Bernie's key to working quite a bit of 40 meter DX. Is the time right for a Command set comeback?

Classic Antennas For Classic Rigs

In answer to your requests, we wrap up this month's column by highlighting two popular HF antennas from the fabulous '50s. Both of these antennas can be assembled for only a few dollars, they will work with newer and older rigs alike, and

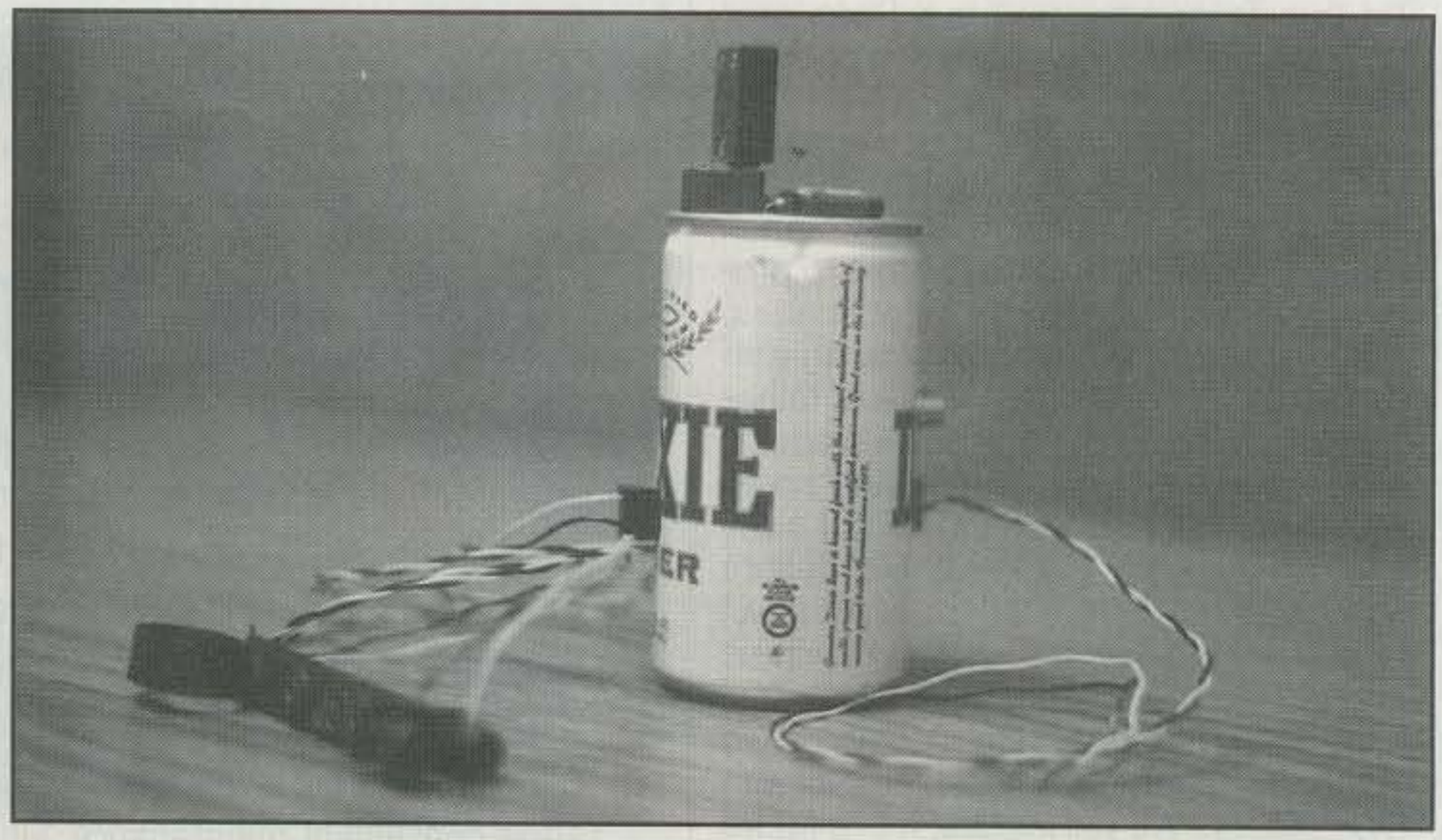

Photo 5– In answer to our request for rigs built into unusual enclosures, K2YJL sent this photo of his Tuna Tin Two in a Dixie beer can—twin classics! The T.T.T. transmitter pumps out 200 mw on 40 meters and has turned many good QSOs.

they are real conversation starters when used on the air today. Here is the perfect way to add that extra touch of nostalgia to your favorite setup!

Our first antenna is a replica of the famous Gotham "Work The World" vertical for 160 through 10 meters. This gem, illustrated in fig. 1, consists of a 22 foot tall radiator with an open-air base coil that can be tapped anywhere along its length for loading and impedance matching.

The original base loading coil was a 10 inch long section of now-extinct B&W coil stock measuring approximately 3 inches in diameter with 6 turns per inch. Approximately 56 turns were tapped/used for 160 meter operation, 26 turns for 80 meters, 14 turns for 40, 7 turns for 20, and experimentally found coax clip points between 2 and 8 turns for 15 and 10 meter operation. Those specs are strictly academic, however; a creditable amount of "hunting for lowest SWR tap points" was (and still is!) necessary. Basically, this means any coil (homebrew or commercially made) between 2.0 and 3.5 inches in diameter and between 30 and 60 total turns can be used. Just move the tap point until you "hit resonance." Even WARC coverage is possible when using a replacement coil for a Texas Bugcatcher!

The vertical radiator can be a single

Photo 6– Roaring back from the mid 1950s is this famous "Command Set Combo" that Bernie, KC6P, occasionally uses on 40 meters today. Forty years ago these rigs were available at Army surplus stores nationwide. Today, however, they are quite scarce.

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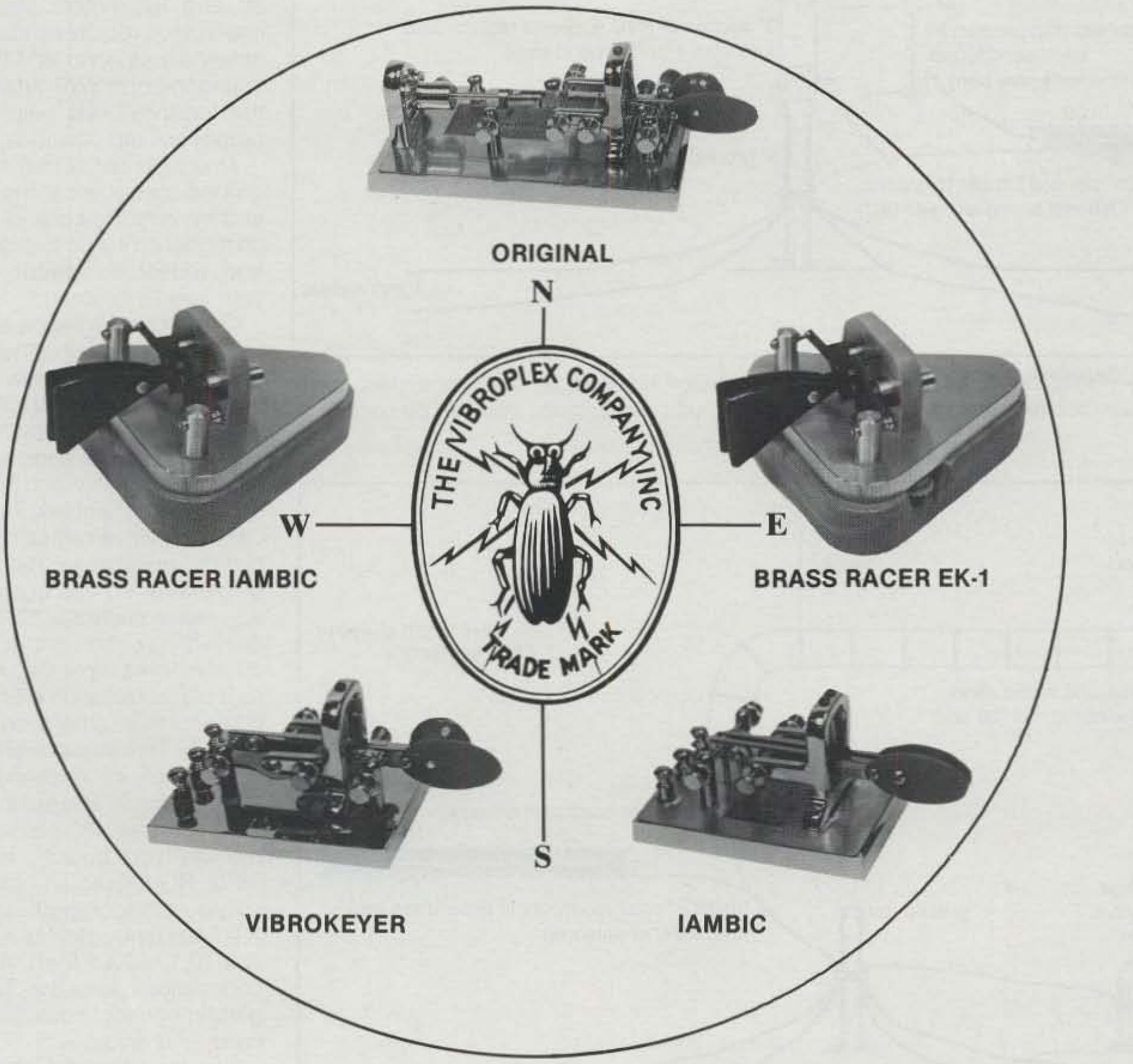

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CIRCLE 160 ON READER SERVICE CARD

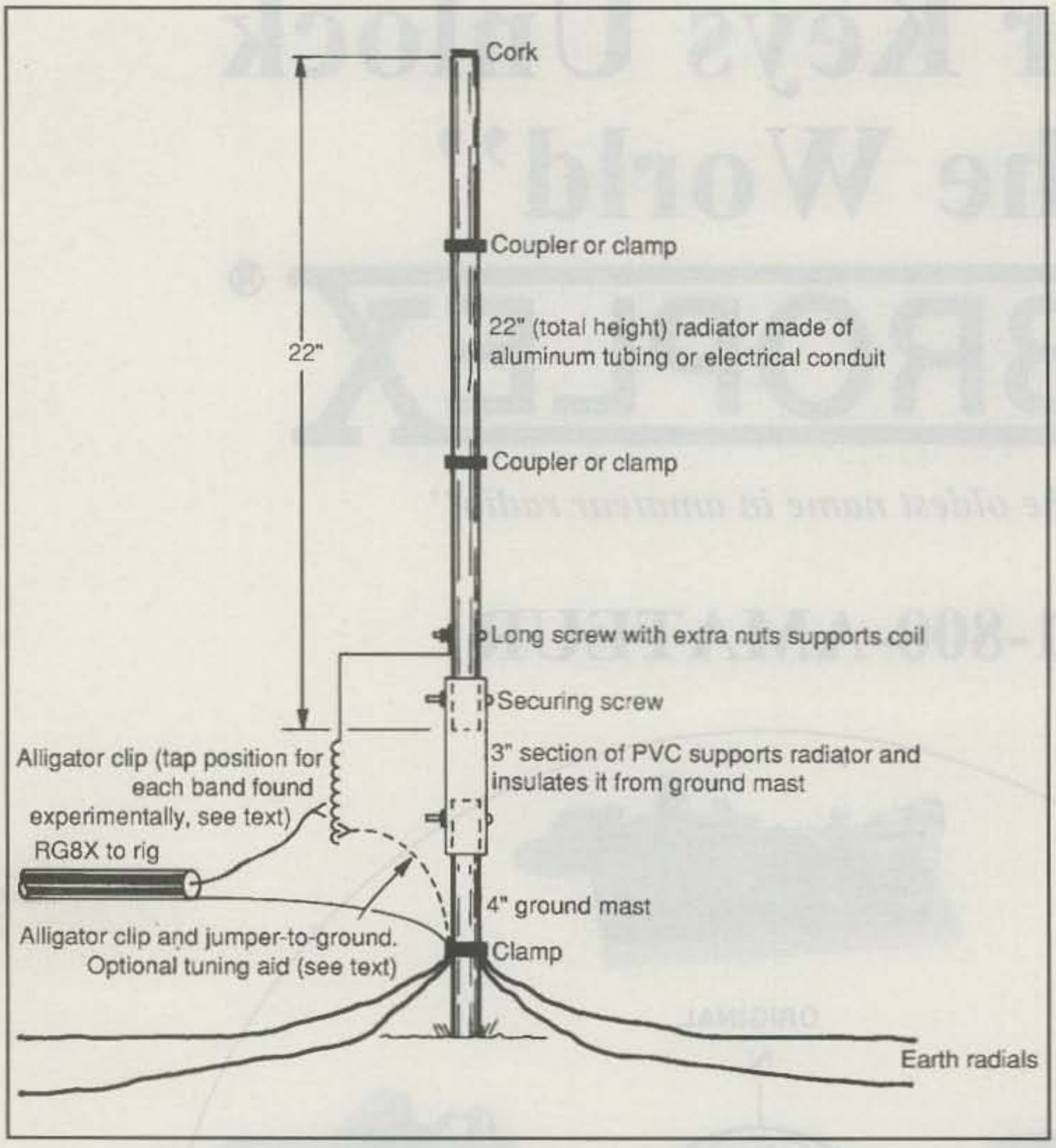

Fig. 1– Assembly outline of classic all-band Gotham vertical. It works similar to an oversize mobile antenna, so any large self-wound and tapped coil can be used.

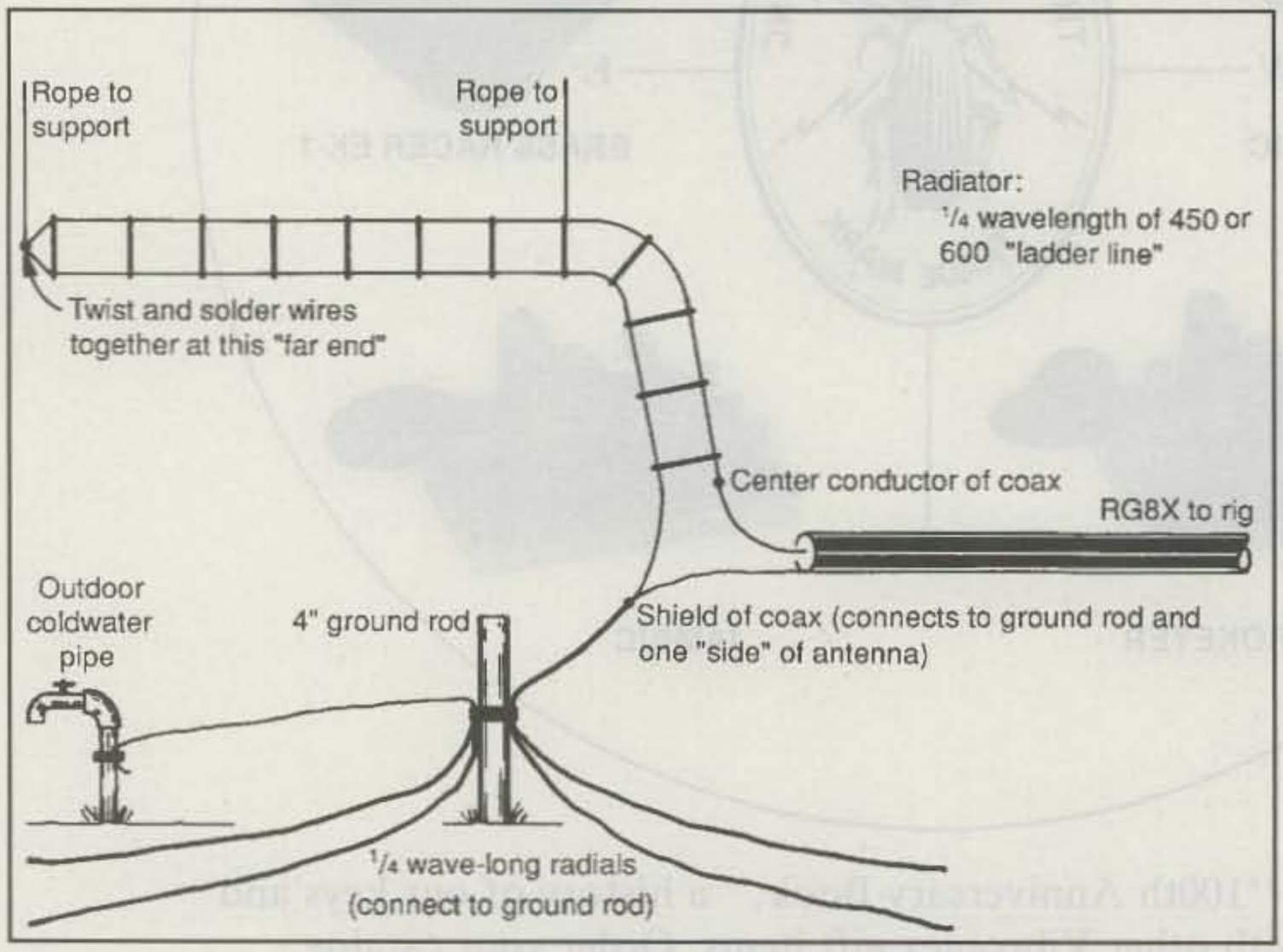

Fig. 2– Assembly outline of the El Toro antenna. Radiator can be installed vertically, sloping, or bent to fit available space.

length of aluminum tubing, concentric pieces of tubing, or even electrical conduit cut with a hacksaw and joined with hardware couplers. A thick-wall 3 to 4 foot mast makes a good base support and ground rod. Add at least two 1/4-wavelength radials for each band for best results. Mast and radiator sections can be separated by a short piece of PVC tubing or a wood frame with "U" clamps, as desired. Drill a hole through the PVC and tubing sections, insert a heavy bolt to hold each secure, then use extra nuts to connect/mount the coil and ground cables as shown in fig. 2. Weatherproof bolt connections with Coax Seal®, cap the vertical's top with a cork, and you are ready for tune-up.

The Gotham replica operates as an end-fed "halfwave or longer" radiator on 10, 12, and 15 meters; a base-loaded halfwave vertical on 17 and 20 meters; and an oversize/high-efficiency mobile whip on 30, 40, 80, and 160 meters. Matching feedpoint impedance requires patience and a good antenna bridge. An MFJ-204B, 207, or 247 impedance or SWR analyzer inserted at the feedpoint will help you quick-spot proper coil tap positions.

One final tip: Sometimes tapping the ground connection to the coil's lower area and moving the coax center connection up higher on the coil yields the best match and widest bandwidth. Experiment to your heart's content!

Our second antenna is a reproduction of the "El Toro" open-wire antenna that was popular during the mid-1950s. The original version used difficult to handle traps for multiband coverage, so I simplified it to a single-band antenna you can assemble quickly and use on a favorite band without fumbles. The El Toro is basically a 1/4-wave radiator with a "high efficiency" advantage. Rather than using a single wire "worked against ground" (like a 1/4-wave vertical), it is made of ladder line with ground connected to one conductor. This simple step raises the antenna's signal radiation efficiency from 20 to 60 percent. In other words, performance of the El Toro is surprisingly good!

Assembly information for the El Toro is shown in fig. 2. The main radiator is made from open-air 450 ohm or 600 ohm ladder line (your choice). It is fed with RG-58 or RG-8X (again, your choice). Calculate radiator length using the formula 234/frequency (MHz) = feet (example: 234/10.1 = 23.1 feet). Add 2 inches for connections, twist the "far end" wires together, connect coax, solder all connections, and enjoy.

We are again out of space and must QRP pronto. Stay tuned, however. Our best "Keys" column yet (plus more special topics) is coming in the near future. See you on 30 CW!

73, Dave, K4TWJ

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Signal intelligence experts, public safety agencies and people with inquiring minds that want to know, have asked us for a world class *handheld* scanner that can intercept just about any radio transmission. The new Bearcat 2500XLT has what you want. You can program frequencies such as police, fire, emergency, race cars, marine, military aircraft, weather, and other broadcasts into 20 banks of 20 channels each. The new rotary tuner feature enables rapid and easy selection of channels and frequencies. With the AUTO STORE feature, you can automatically program any channel. You can also scan all 400 channels at 100 channels-per-second speed because the Bearcat 2500XLT has TURBO SCAN built-in. To make this scanner even better, the BC2500XLT has AUTO SORT - an automatic frequency sorting feature for faster scanning within each bank. Order your scanner from CEI.

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Bearcat 200XLT-J handheld	$199.95
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Size: 2.45" Wide x 1.38" Deep x 6.4" High
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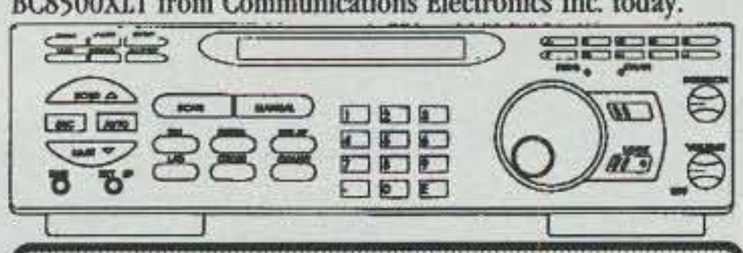
Turbo Scan · VFO Control · Priority channels
Auto Store · Auto Recording · Reception counter
Frequency step resolution 5, 12.5, 25 & 50 KHz.
Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High
Frequency Coverage:
25.000 - 28.995 MHz. (AM), 29.000 - 54.000 MHz. (NFM), 54.000 - 71.995 MHz. (WFM), 72.000 - 75.995 MHz. (NFM), 76.000 - 107.995 MHz. (WFM), 108.000 - 136.995 MHz. (AM) 137.000 - 173.995 MHz. (NFM), 174.000 - 215.995 MHz. (WFM), 216.000 - 224.995 MHz. (NFM), 225.000 - 399.995 MHz. (AM) 400.000 - 511.995 MHz. (NFM), 512.000 - 549.995 MHz. (WFM) 760.000 - 823.9875 MHz (NFM), 849.0125 - 868.9875 MHz (NFM) 894.0125 - 1,300.000 MHz. (NFM).

The new Bearcat 8500XLT gives you pure scanning satisfaction with amazing features like Turbo Scan. This lightning-fast technology featuring a triple conversion RF system, enables Uniden's best scanner to scan and search up to 100 channels per second. Because the frequency coverage is so large, a very fast scanning system is essential to keep up with the action. Other features include ***VFO Control*** - (Variable Frequency Oscillator) which allows you to adjust the large rotary tuner to select the desired frequency or channel. ***Counter Display*** - Lets you count and record each channel while scanning. ***Auto Store*** - Automatically stores all active frequencies within the specified bank(s). ***Auto Recording*** - This feature lets you record channel activity from the scanner onto a tape recorder. You can even get an optional ***CTCSS Tone Board*** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. ***20 banks*** - Each bank contains 25 channels, useful for storing similar frequencies in order to maintain faster scanning cycles. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **BC005** CTCSS Tone Board $54.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC8500XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited warranty from Uniden. Order your BC8500XLT from Communications Electronics Inc. today.



CB/GMRS Radios

The Uniden GMR100 is a handheld GMRS UHF 2-way radio transceiver that has these eight frequencies installed: 462.550, 462.725, 462.5875, 462.6125, 462.6375, 462.675, 462.6625 and 462.6875 MHz. This one watt radio comes with flexible rubber antenna, rechargeable ni-cad battery, AC adapter/charger, belt clip, F.C.C. license application and more.

Cobra 2000GTL-J SSB Deluxe CB Base	$389.95
Uniden GMR100-J GMRS Handheld	$159.95
Uniden WASHINGTON-J SSB CB Base	$189.95
Uniden GRANTXL-J SSB CB Mobile	$139.95
Uniden PRO538W-J CB & Weather	$59.95

Shortwave

ICOM R1-J ultra compact handheld wideband receiver	$469.95
ICOM AH7000-J super wideband discone type antenna	$99.95
Grundig Satellit 700-J portable with 512 memory &AC adapt.	$389.95
Grundig Yacht Boy 400-J digital portable shortwave	$199.95
Grundig Yacht Boy 230-J portable shortwave	$139.95
Sangean ATS202-J ultra compact 20 memory shortwave	$79.95
Sangean ATS606-J ultra compact 45 memory shortwave	$149.95
Sangean ATS606P-J shortwave with antenna & AC adapter	$169.95
Sangean ATS800-J portable 20 memory shortwave	$69.95
Sangean ATS803A-J portable with SSB reception & AC adapter	$159.95
Sangean ATS808-J portable 45 memory shortwave	$159.95
Sangean ATS818-J portable without cassette recorder	$189.95
Sangean ATS818CS-J with cassette recorder	$209.95
Sangean ANT60-J portable shortwave antenna	$9.95

Weather Stations

Public safety agencies responding to hazardous materials incidents must have accurate, up-to-date weather information. The Davis Weather Monitor II is our top-of-the-line weather station which combines essential weather monitoring functions into one incredible package. Glance at the display, and see wind direction and wind speed on the compass rose. Check the barometric trend arrow to see if the pressure is rising or falling. Our package deal includes the new high resolution 1/100 inch rain collector part **#7852-J**, and the external temperature/humidity sensor, part **#7859-J**. The package deal is order **#DAV1-J** for $524.95 plus $15.00 shipping. If you have a personal computer, when you order the optional Weatherlink computer software for $149.95, you'll have a powerful computerized weather station at an incredible price. For the IBM PC or equivalent order part **#7862-J**. For Apple Mac Plus or higher including Quadra or PowerBook, order part **#7866-J**.

Other neat stuff

Uniden EXP9200-J 900 MHz. 2 line cordless phone	$289.95
Uniden EXP9100-J 900 MHz. 1 line cordless phone	$269.95
Cobra CP910-J 900 MHz. spread spectrum cordless phone	$249.95
ICOM GP22-J handheld global positioning system	$699.95
WR200-J weather radio with storm alert	$39.95
RELM WHS150-J VHF handheld 5 watt, 16 ch. transceiver	$339.95
RELM RH256NB-J VHF 25 watt synthesized transceiver	$289.95
Ranger RCI2950-J 25 watt 10 meter ham radio	$244.95
Ranger RCI2970-J 100 watt 10 meter ham radio	$369.95
Uniden LRD9000W1-J Super Wideband Laser/Radar Detector	$169.95
PWB-J Passport to Worldband Radio by IBS	$10.95
POL1-J Police Call for CT, ME, MA, NH, NY, RI, VT	$5.95
POL2-J Police Call for DE, MD, NJ, PA	$5.95
POL3-J Police Call for Michigan & Ohio	$5.95
POL4-J Police Call for IL, IN, KY, WI	$5.95
POL5-J Police Call for IA, KS, MN, MO, NE, ND, SD	$5.95
POL6-J Police Call for DC, FL, GA, NC, PR, SC, VA, WV	$5.95
POL7-J Police Call for AL, AR, LA, MS, OK, TN, TX	$5.95
POL8-J Police Call for AZ, CO, ID, MT, NM, NV, UT, WY	$5.95
POL9-J Police Call for California, Oregon & Washington	$5.95
USAMMMOT-J magnet mount scan antenna w/Motorola plug	$29.95
USAMMPL-J magnet mount scan antenna with PL259 connector	$29.95
USAMMBNC-J magnet mount scanner antenna w/ BNC connector	$29.95
USAK-J VHF scanner/VHF transmitting antenna PL259 connector	$29.95
USASGMBNC-J glass mount scanner antenna with BNC connector	$29.95
USASGMM-J glass mount scanner antenna with Motorola jack	$29.95

Buy with confidence

It's easy to order from CEI. **Mail orders to:** Communications Electronics Inc., Emergency Operations Center, P.O. Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add $15.00 per radio for U.P.S. ground shipping and handling in the continental U.S.A unless otherwise stated. Add $8.00 shipping for all accessories and publications. Add $8.00 shipping per antenna. For Canada, Puerto Rico, Hawaii, Alaska, P.O. Box, or APO/FPO delivery, shipping charges are two times continental U.S. rates. Michigan residents add state sales tax. No COD's. 10% surcharge for net 10 billing to qualified accounts. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. We welcome your Discover, Visa, American Express or MasterCard. Call 1-800-USA-SCAN to order toll-free. Call 313-996-8888 if outside the U.S.A. FAX anytime, dial 313-663-8888. **For technical assistance to solve your communications problem, call the Communications Electronics technical support hotline for $2.00 per minute at 1-900-555-SCAN.** Order your new electronic equipment from Communications Electronics Inc. today.

For credit card orders call

1-800-USA-SCAN

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Emergency Operations Center
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For information call 313-996-8888 or FAX 313-663-8888

CIRCLE 135 ON READER SERVICE CARD

AWARDS

BY NORM VAN RAAY, WA3RTY

NEWS OF CERTIFICATE AND AWARD COLLECTING

This month we feature the story of

John (Jack) McLernon, NV6I
USA-CA #793, 1-8-93

"My life started in Lake County, Illinois in 1928. Our family moved to northern Wisconsin a few years later, where I completed grammar school.

"In 1942 we moved to Chula Vista, California, where I finished high school in the class of 1946. My introduction to amateur radio was while I was in high school. The father of one of my pals was an amateur. However, all I could do was look at the equipment. I attended San Diego Junior College and became an aircraft mechanic.

"In 1948 I enlisted in the Air Force and served four years working on airplanes. A few months after being discharged in 1952, I joined the Marine Corps.

"After spending a couple of years as a math instructor at the com-electronic school battalion in San Diego, I was able to attend Officer Candidate School at Quantico, Virginia and was commissioned a second lieutenant in 1955. I was sent to Hawaii, where I served as a Platoon Leader and then as a Company Commander and participated on the track team throwing the javelin. The various pieces of communication gear that I became acquainted with intrigued me, especially when phone patches were run from far and distance places.

"During this time I was fortunate in that I became 'involved' with a lady Marine officer (now NV6L). We were married in 1957. Jan and I left active service in 1958 and settled in southern California.

"After working in construction for a few years, I pulled out my old tool box and returned to aircraft mechanics, retiring after 26-plus years as an inspector/mechanic.

"In 1975 Santa delivered a CB radio to me. This did not suffice, so in 1978 I became KA6CWJ and later upgraded to KD6CN. On our 25th wedding anniversary Jan and I both passed the Extra class tests and were issued our present calls of NV6I and NV6L. Jan started county hunting in 1990, and I served as duty driver/station mechanic until 1991, when I upgraded to county hunter.

"My USA-CA #793 was awarded on 8 January 1993. What a thrill! My thanks go to Jan's sharp ears and all the fine mobile stations and net controls.

"Other than amateur radio, my interests are golfing, hunting, and traveling. I also enjoy building our antenna systems for both the home and mobile stations. The mobile antennas tend to be destroyed when struck by seagulls, tree limbs, etc. The mast problem is almost solved. However, the resonators, even though of the beefed-up variety, will not survive a hit by a seagull. The seagulls do not survive either.

"The home station has a homebrew three-element quad as well as wire antennas on the roof for 10 through 160 meters. When Jan hears a 'new one' and I am lost, she goes to the backyard and calls up to the roof, 'Are you up there? We have a new one on.' Then it's down the ladder, rush to the radio shack, and work the station. By this time I need a break. Keeps me trim, though.

"I would say that the best part of county hunting is actually meeting the folks involved at conventions and during our travels. My navigator (NVGL) takes me on some of the darndest roads. Good thing the fifth wheel is short. Sometimes I park the fifth wheel and venture out with only the Dakota, because it doesn't mind those 'darndest roads.' If you hear a very weak CW signal at 28.696, it could be Jan and me exchanging reports from a homebrew hand-held to a truck or car for a new county.

"As of this writing I need to work and confirm three more counties to have completed working all counties for the second time. I am still somewhat in awe of accomplishing this once, much less twice.

My thanks to all the county hunters for their friendship and help in obtaining USA-CA #793. 73, 88, and Good Hunting!—Jack, NV6I.

Box 76, Pleasant Mount, PA 18453-0076

HONOR ROLL
500

YV5MRR 2752 CT1BWW 2753

Awards Issued

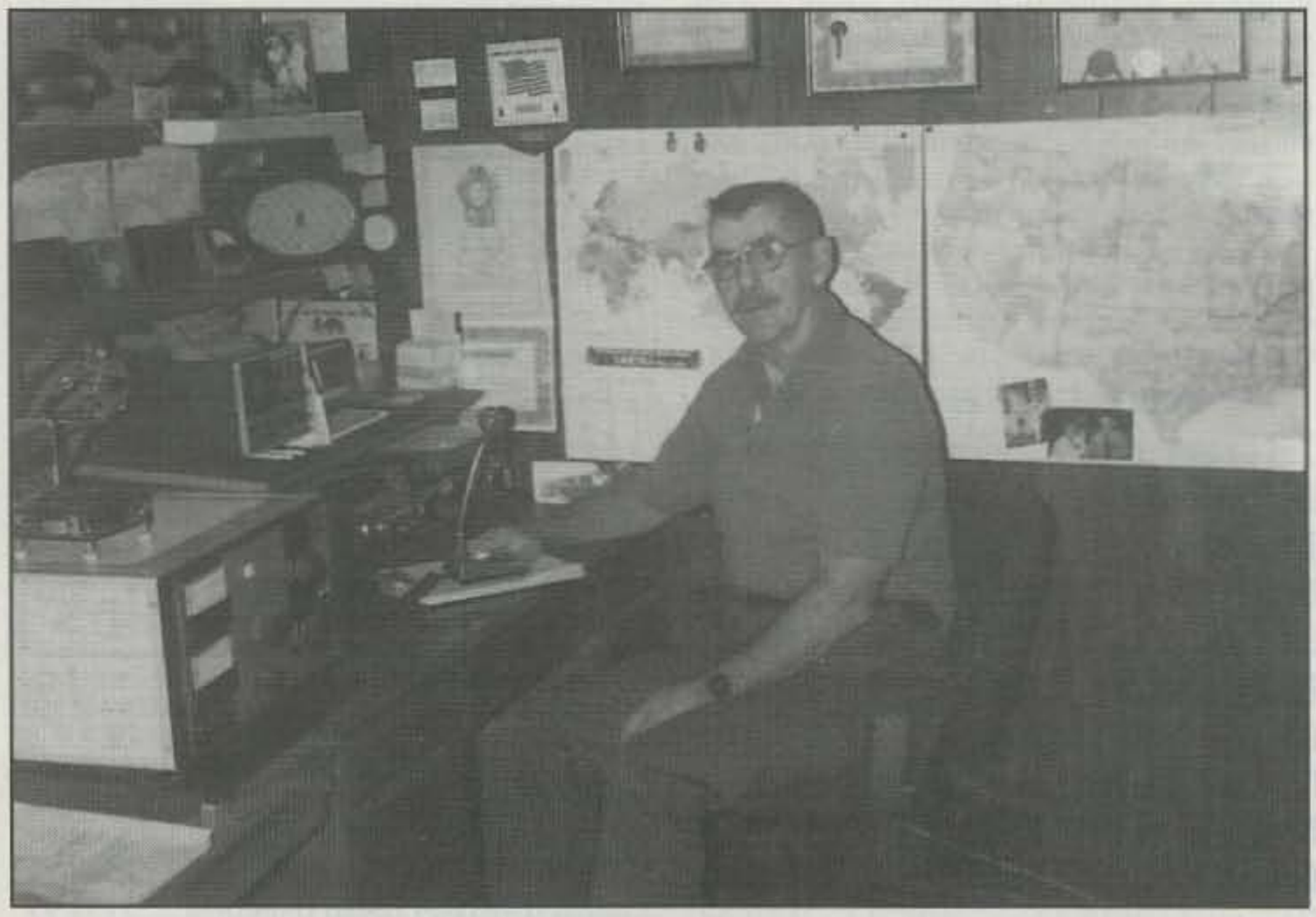
There were only two awards issued this month.

Victor M. Martin, YV5MRR, submitted his basic book and received USA-CA 500 #2752 Mixed Band/SSB on 3 March 1994.

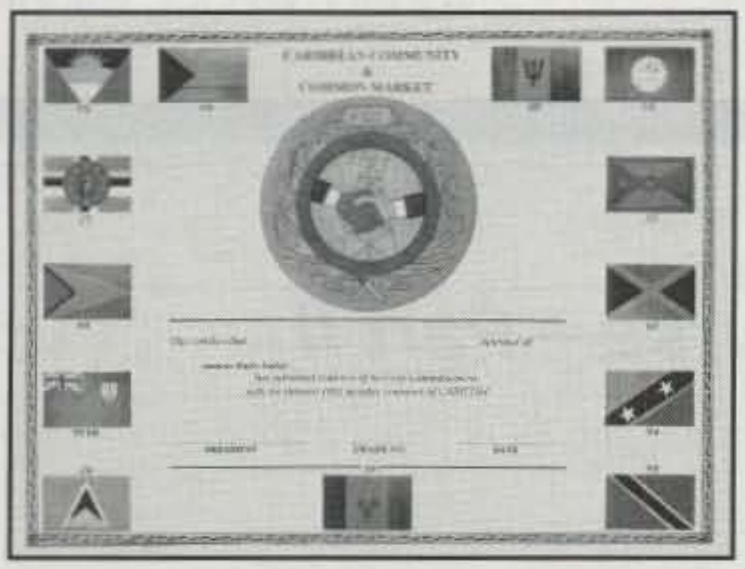
CT1BWW, Manuel L. Alberto C. Marques, also received his first USA-CA Award #2753 Mixed Band/SSB on 3 March 1994.

Awards Available

Work the thirteen 1993 member countries of CARICOM. This award is sponsored by The Friendly CARIBUS Connection, a Caribbean/United States Regional Amateur Radio Communication Network



Jack McLernon, NV6I, USA-CA #793.



The Caribbean Community and Common Market Award.

established in January 1978 to fill a need for maintaining contacts between Caribbean rooted amateurs and their counterparts and families.

Since its inception, the net has operated daily and has encouraged the friendliness, warmth, and helpfulness that characterize the West Indian identity.

A formal net operates on 14.283 MHz every morning between 1030–1200 ETC on weekdays and 1100–1400 on Sundays. Each afternoon at about 2130 they also get together for rag-chewing.

Since 1982 a convention has been held every two years. The first was in St. Vincent and the Grenadines (J8); the second in Barbados (8P); the third in Trinidad & Tobago (9Y); the fourth in Dominica (J6), where a constitution was ratified; the fifth in St. Lucia (J6); and the sixth is to be held in Grenada August 8–13, 1994.

Requirements are as follows:

1. One contact with each of the member countries on any band or mode, or any combination of bands and modes after January 1994.

2. The member countries are: Antiqua (V2); Belize (V3); Guyana (8R); St. Kitts/Nevis (V4); St. Vincent & the Grenadines (J8); Trinidad & Tobago (9Y); Bahamas (C6); Dominica (J7); Jamaica (6Y); Barbados (8P); Grenada (J3); Monserrat (VP2M).

3. Send a copy of your log (no QSL cards) showing date, time, stations worked, mode, band or frequency, report received and report given, certified by another amateur. Enclose $5.00 US to cover postage and handling. Mail to Vincent Bacchus, KA2CPA, 130-72 227 Street, Laurelton, NY 11413.

Award News

We received a note from James Jarvis, W9KCM, a member of the Blackhawk DX and Contest Club at Rockford, that they will be on the air from Boone County, Illinois for 24 hours 28–29 May 1994.

Another note from KA3DCQ, Public Relations Officer of the YL System, reminds us that the YL Net is on 14.332 from 1300Z until the band closes. All amateurs are invited to check in to make contacts. To become a member and be eligible to participate in the YL Awards Program, check into the net and ask for a membership package, or send a #10 SASE to WA1GAG, Thomas Wuelfing, 210 Morrill St., Gilford, NH 03246

On a Personal Note

Spring has finally come to northeastern Pennsylvania. We had a record snowfall this year of 90+ inches at the Wilkes Barre/Scranton Airport. However, here in Pleasant Mount I'm sure we had another 12+ inches.

About the time you receive this issue of CQ I'll be on my dream trip to my father's home in Arnhem, The Netherlands. It's really hard to believe. Again, thanks to the Dutch QSL Bureau for helping me contact my cousin.

Another trip will be to the MARAC Convention in Springfield, Missouri on 21–25 June 1994. I'm looking forward to face-to-face QSOs with all my County Hunting friends. Perhaps some lucky folks will have qualified for one of our awards and receive it in person.

73, Norm, WA3RTY

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Novice-Technician Licensing Course—Part II

This month we take up our amateur radio licensing course with the topic of circuit components.

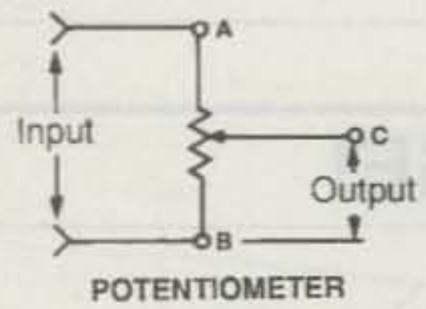
Circuit Components

RESISTANCE

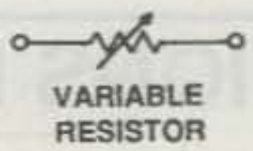
Basic unit of resistance is the ohm.
Formula letter symbol of resistance is **R**.
Resistors are rated in:
- Ohms
- Power dissipation capability (watts)
- Tolerance (not for wirewound resistors)

Resistor types
- Carbon composition
- Carbon film
- Metal film
- Wirewound (not for AF/RF)

Symbols
- Fixed resistor
- Variable resistor—potentiometer, etc.

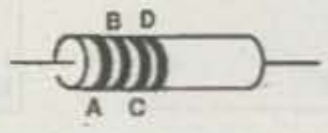


POTENTIOMETER



VARIABLE RESISTOR

Input applied to A and B
Output taken from C and B
C represents the movable arm/slide contact.
Used to provide a variable output voltage from zero to the full value of the input voltage.



Resistor color code

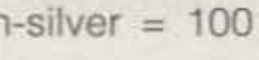
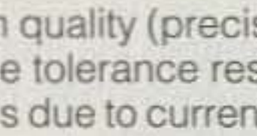
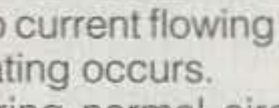
0 = Black	5 = Green
1 = Brown	6 = Blue
2 = Red	7 = Violet
3 = Orange	8 = Grey
4 = Yellow	9 = White

Colored bands are read left-to-right.
First band shows first significant number.
Second band shows second significant number.
Third band shows the number of zeroes to add after the first two numbers.
Fourth band shows tolerance.
- Gold is ± 5%
- Silver is ± 10%
- Brown (or none) is ± 20%

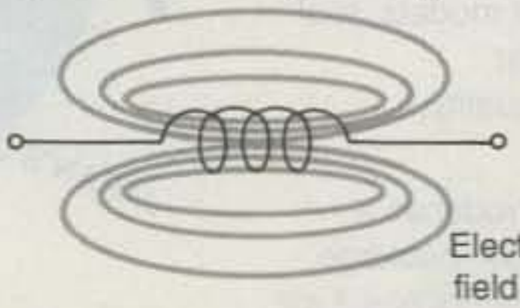
Examples
A band red (2)
B band violet (7)
C band orange (3 zeroes)
D band silver (± 10%)
Resistance value 27,000 ohms ±10%, which is 24,300 to 29,700 ohms.
Brown-black-brown-silver = 100 ±10%, which is 90–110 ohms.
The tolerance of a high quality (precision) resistor is ± 0.1%.
The tolerance of a wide tolerance resistor is ± 20%.
Resistor heating occurs due to current flowing through it. The higher the current, the more heating occurs.
If a resistor gets too hot during normal circuit operation, replace it with a resistor that has a higher power dissipation rating and the same resistance value.

INDUCTANCE

Formula letter symbol is **L**.
Basic unit is the henry. Henry, milliHenry, and microHenry values are used.

Symbols
Fixed inductor 
Variable inductor 
Metal core fixed inductor 

Inductance value determined by number of turns, coil length, coil diameter, and wire material.
The core is positioned inside the coil of wire, where the magnetic lines of force are concentrated. Inserting an iron core inside a coil increase sits inductance by a factor of about 1000. As an example, 2.5 microHenry inductance would become a 2.5 milliHenry value.
Air cores are used in radio frequency coils.
Iron cores are used in house power (60 Hertz) choke coils, such as in power supply circuits.
Thinner iron core laminations are used in audio frequency coils. Nickel laminations are often used in top-quality audio frequency coils.
Do not use a metal tool to adjust the core in a coil, because the metal in the tool will change the inductance value, resulting in an incorrect adjustment when the tool is removed.
An inductor stores energy in the electromagnetic field that is generated by current flowing through it.



Electromagnetic field

An inductor opposes any increase or decrease in the rate of the current flowing through it.
Toroidal core symbol is the same as the iron core symbol.

45527 Third Street East, Lancaster, CA 93535-1802

CAPACITANCE

Basic unit is the Farad.

Formula letter symbol is **C**.

Capacitor stores energy electrostatically on facing (adjacent) plate surfaces.

Capacitor opposes voltage changes. It charges when higher voltage is applied to it, and it discharges when applied voltage is lowered.

Typical values are in the microFarad and picoFarad ranges, which is millionths of a Farad to millionths of millionths of a Farad.

Typical ratings state capacitance and voltage rating,such as 80 mFd at 30 VDC.

Capacitance value is determined by plate area/size, number of plates, spacing between plates, and dielectric material between plates. Larger plates, closer spacing, more plates, and better dielectric increase capacitance value.

Symbols

= fixed, unpolarized (bypass, coupling, etc.)

= fixed, polarized (power supply, etc.)

= air variable (RF tuning)

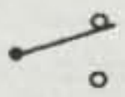
Air, electrolytic, paper, mica, oil-filled, etc.

SWITCHES

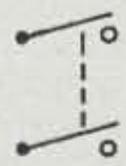
Think of each "pole" as an input, and think of each "throw" as an output (left-to-right displays)

Symbols

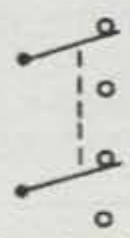
single-pole single-throw (SPST)



single-pole double-throw (SPDT)



double-pole single-throw (DPST)*



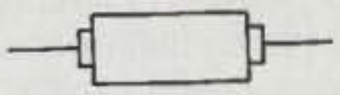
double-pole double-throw (DPDT)*

*(*The dashed line indicates that the switch arms are mechanically connected.)*

Miscellaneous schematic symbols and related data

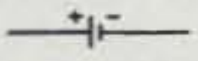
Antenna

Antennas are used to transmit and receive signals.

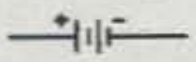
Fuse 

Fuses protect circuit components from being damaged by high currents.

Batteries



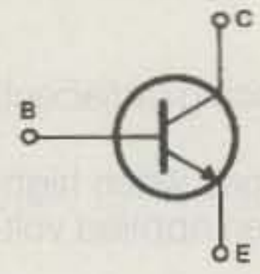
single-cell



multiple-cell

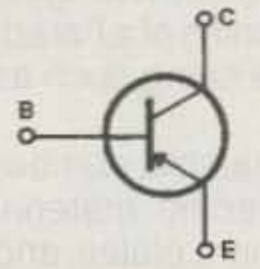
Each battery has a positive pole and a negative pole.

Transistors and Tubes



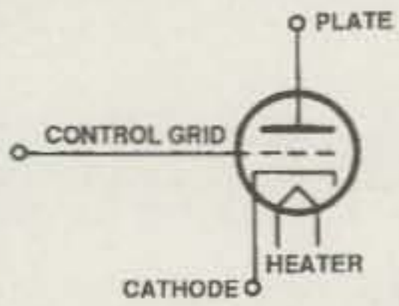
NPN transistor

Bipolar transistors

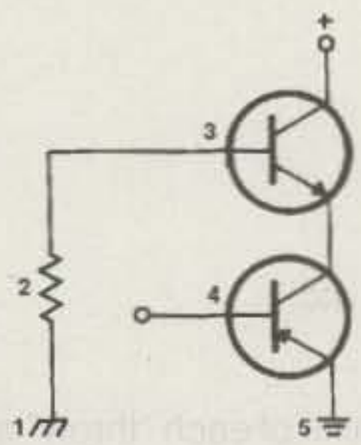


PNP transistor

B = base; E = emitter; C = collector



Triode Vacuum Tube



1 chassis ground
2 fixed resistor
3 NPN transistor (arrow Not Pointing iN)
4 PNP transistor
5 earth ground

Transistors use low voltages to amplify signals.

Tubes use high voltages to amplify signals.

Tubes can handle higher power than transistors.

(to be continued)

WARC 500 Award

This award is available to all amateurs. You must complete two-way contacts with other amateurs on the 12, 17, and 30 meter bands. Each country counts on each band. The basic award requries a 500 total, with endorsements available at additional 100 levels. No QSL card confirmations are needed to obtain this award. The award is an etched plaque that makes a handsome addition to a shack. The endorsement plates attach to the plaque. The cost of the basic award is $50. An award application and a check list are available for $2.00, or 4 IRCs. The address is James E. Mackey, P.O.Box 270569, West Hartford, CT 06127-0569.

Bighorn Radio Club Museum

Robert Ryan, K6YVG, urges readers to support the Bighorn Radio Club Museum in Colorado. This group is trying to acquire many older pieces of amateur radio equipment. If you are interested in this museum, you could contact the curator, Don Zielinski, KØPVI. The address is P.O. Box 229, Byers, CO 80103 (telephone 303-822-9868). Bob Ryan serves as their contact person in the southern California area. He picks up items and ships them to Colorado. He is authorized to negotiate prices in purchases of equipment. His address is 26409 Dovewood Way, Santa Clarita, CA 91350 (telephone 805-259-6177).

Greek 10 Meter Beacon

SV3AQR/B is on the air continuously from Amalias, Peloponese, Greece. This beacon station transmits A1A code on 28,182.5 kHz using 4 watts to a 5/8 wavelength vertical antenna. Signal reports are greatly appreciated. The address is SV3AQR, Box 30, Amalias, 27200 Greece.

73, Bill, W6DDB

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277 • FAX (714) 458-0826

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

- LOW PROFILE POWER SUPPLY

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES

MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	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) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

Swing Into Summer

Summer means that the "antenna season" is upon us. Are you ready? Appropriately for the season, we'll begin our column this month with a variety of antenna subjects.

Antenna Topix

Sommer HF SKYDISK Antenna. In the April 1992 column we discussed the Sommer trapless multiband beams offered by Walfried Sommer, W4/DJ2UT. The no-trap driven arrays were designed to overcome trap losses to make multiband beams perform as well as monobanders, despite the problems involved in coping with the narrow bandwidth and low resistance of closely spaced designs. The Sommer multibanders used a complex system of active and inactive driven elements. In the same column we also noted the new Tele-Command-System TCS80, a flexible vertical antenna for all high-frequency (HF) amateur bands from 75 through 10 meters.

Sommer now has something new—the HF SKYDISK, a cousin of the broadband discone. The discone generally has been limited to the very-high-frequency (VHF) and ultra-high-frequency (UHF) bands, since an HF discone to cover 7 to 30 MHz would have a height of about 35 feet and a top disk diameter of 30 to 45 feet—a little impractical, to say the least.

The HF SKYDISK effectively does the work of a broadband HF discone, without its awkward size, by providing only an element of the cone for each HF amateur band. Each wire element of the "cone" forms a small angle from the disk to its lower end. The disk is provided by a simple, spoked wheel.

The new 15 ft. 30 lb. antenna covers all bands from 10 to 40 meters. It has a single 50 ohm coax feed, low SWR (under 1.4:1) on all bands, and no traps. It comfortably handles over 1.5 KW RF power. Its wind load is approximately 4.5 sq. ft., and its angle of radiation is generally low (zero to 15 degrees), depending on installed height above ground. Antenna performance (gain) on 10–20 meters reportedly is equivalent to that of a half-wave vertical dipole, while on 30 and 40 meters performance is 0.5–3.5 dB lower than a vertical half-wave dipole. Price is $380 ($320 for the kit version), UPS postpaid.

289 Poplar Drive, Millbrook, AL 36054

Spec sheets are available from Sommer Antennas, 395 W. Osceola Road, P.O. Box 710, Geneva, FL 32732 (407-349-9114).

Max-Gain Systems Fiberglass Products. In the March 1991 column we discussed the snazzy "Black Max" 2 meter, 5-element, N6NB-based fiberglass-boom Quagi, the MAXI-5. Priced at $69.95, it was offered by R. Allen Bond, WB4GNT, at Max-Gain Systems.

In a recent letter Allen noted that his three-year-old company has added to its fiberglass products. He says that his firm is a major source of small quantities of a wide range of reasonably priced fiberglass products suitable for antenna construction. Max-Gain also brokers and sells large quantities of fiberglass to commercial firms and industrial users.

Max-Gain stocks a complete line of solid-rod, round-tube, and square-tube fiberglass suitable for antenna construction and other hobby purposes. It also sells two types of two-piece telescoping fiberglass quad spreaders with usable lengths to 15 ft.; since they telescope to 8 ft., they are UPS shippable. Their "type 1" spreaders can be extended by another 7 ft., if desired, by using a section of 1½ inch tube, for a total of 22 ft.

Specifications on fiberglass quad spreaders, a sleeving and reinforcement guide, tips on working with fiberglass, and a price list are available from Max-Gain Systems, Inc., 221 Greencrest Court, Marietta, GA 30068-3825 (404-973-6251).

Stormwise Lightning Alert. Do you cringe in fear of your antennas and amateur gear when electrical storms threaten? McCallie Manufacturing Corp. offers STORMWISE™ Lightning Alert™ advance storm warning and lightning sensors. These devices warn that thunderstorms, with the possibility of dangerous lightning, are approaching. The warning they provide gives you time to shut down and/or disconnect equipment.

A popular Stormwise product is the LSU-222A Lightning Storm Detector. It has a sensor that alerts you to approaching cloud-to-ground lightning. The device alerts you if the lightning is far or near by automatically changing the volume of the alarm warning tone. A three-way alarm feature lets you choose a loud alarm, hear each lightning return stroke "signature pattern," or have the alarm beep when a "lightning burst" is detected.

The weatherproof $29.95 (plus $3 s/h) device uses a patented, mast-mounted Extremely Low Frequency/Very Low Frequency (ELF/VLF) impulse detection sensor. It draws no power from its battery unless lightning activity is sensed. When it detects lightning, the sensor drops from an infinite resistance to a level where current flows through it, activating the alarm.

You also can use the LSU-222A with a computer for recording and plotting real-time lightning data. An optional $39.95 computer program records, counts, and graphs lightning detections. The optional package includes an electrically isolated serial port interface for the LSU-222A detector.

For specifications, contact McCallie Manufacturing Corp., P.O. Box 77, Brownsboro, AL 35741-0077 (205-776-2633).

Alpha Delta Update. Don Tyrrell, W8AD, proprietor of Alpha Delta Communications, is known for his line of surge protectors, which take several forms. These include the popular Transi-Trap™ Surge Protectors that use gas-tube Arc-Plug™ cartridges to protect sensitive electronic equipment from transients coming

The main requirement for most satellites is for multimode 145 MHz and 435 MHz transceivers and a suitable RF power amplifier. These photos show a typical satellite-capable hamshack, this one belonging to Keith Baker, KB1SF. Primary equipment for satellite communications are Kenwood TS-711A (145 MHz) and TS-811A (450 MHz) transceivers, plus an RF Concepts RF power amp. The portable hamshack gear consists of a Ten-Tec "Mode B" (435 MHz uplink/145 MHz downlink) converter to a Kenwood TS-50S. (KB1SF photos)

through coaxial cable transmission lines. During the period of a transient the cartridges toggle to ground, shunting the spike. Several models protect to 500 MHz; these are priced from $22.95 up. Field-replaceable cartridges are $12.95 and up.

Another product is the Model CLP Lightning Surge Protected Control Line Protector, which we discussed in the December 1990 column. It protects control lines to rotors, switches, telephones, and other equipment. The $49.95 device protects up to eight control wires. Each wire is protected by a replaceable Arc-Plug cartridge.

Besides these protectors, Alpha Delta also offers several lightning surge protected two- and four-position RF coaxial switches ($49.95 to $89.95). Each of the Delta-series coax switches uses the field-replaceable Arc-Plug suppressors.

Although Alpha Delta is best known for its lightning surge suppressors, they also offer at least seven HF wire antennas featuring sloper and parallel dipole designs. These include two HF amateur band slopers, the DX-A Twin Sloper (with its separate 160/40 meter and 80 meter legs) and the 60 ft. DX-B Single Wire Sloper (for 160–30 meters). There also are three multiband parallel dipoles covering 80 through 10 meters in various band combinations. Also offered are two SWL antennas: the 60 ft. DX-SWL Sloper (mediumwave through 13 meters) and the 40 ft. DX-SWL/S Sloper for 90 through 13 meters. Antenna prices range from $59.95 to $99.95, depending on the design.

Contact Alpha Delta Communications, Inc., 1232 E. Broadway, Suite 210, Tempe, AZ 85282 (602-966-2200).

Software Topix

InstantTrack from AMSAT. Communication through amateur radio satellites has long been a "hot" area in amateur radio. Since 1961, when the first Orbiting Satellite Carrying Amateur Radio (OSCAR) was launched, amateurs have communicated over thousands of miles using VHF and UHF—wavelengths traditionally for short, line-of-sight distances. Of course, to successfully communicate over these distances you have to know just where the satellites are to know where to point your antennas.

The Radio Amateur Satellite Corporation (AMSAT) offers programs that allow simple and rapid antenna positioning. The AMSAT programs provide accurate schedule and tracking information on satellites in circular and elliptical orbits using "Keplerian" orbital information from AMSAT or NASA. Among other things, the programs determine the times when a satellite will be above the horizon and provide timed coordinates for zeroing-in a directional antenna on the satellite in azimuth and elevation.

For the IBM PC, Orbits II, Orbits III, QuikTrak, and InstantTrack are popular programs. AMSAT also offers both IBM PC and Mac software to access BBS capabilities of the Microsats and telemetry decoding programs that allow observation of telemetry frames from these satellites. AMSAT sells programs for the Commodore 64 and 128, Amiga, Apple, Atari, IBM PC, Mac, Radio Shack TRS-80 and CoCo, and the HP-41 programmable calculator.

Recently we had the opportunity to test drive InstantTrack, with which we were impressed.

Shown here is a typical base-station amateur satellite antenna installation. The antennas are a KLM 435-40CX linear antenna for 435 MHz and a KLM 2M-22C for 145 MHz. Both are mounted on a Create Design CR-30 "roof" tower that stands under 10 feet tall. Four concrete blocks up-ended at each foot and sunk in the ground keep the assembly from moving. (KB1SF photo)

Though not a new program, it stands at the top of the current AMSAT line. The program, designed by Franklin Antonio, N6NKF, assists amateurs who need to track a large number of earth-orbiting satellites, point antennas at them in real time, estimate when communications links will be possible with amateurs in other countries, and take care of various housekeeping chores associated with these tasks.

InstantTrack boasts several features that position it uniquely among satellite tracking programs. The program is speedy and easy to use, characteristics not shared by all satellite software. The program features automated orbital element entry, meaning that you can simply read in NASA or AMSAT format satellite element files to update the program's database. The program automatically sets the time on your computer, and it shows you the positions of your favorite satellites. It has a menu of some 200 satellites and a city database of 1754 cities.

Other features include color high-resolution graphics, grid-square recognition, satellite covisibility and path-loss calculations, real-time rotor control (via a suitable hardware interface), sun and moon tracking, the ability to track multiple stations, online help, and on-disk documentation. Program versions for both math coprocessor-equipped and non-coprocessor-equipped PCs are provided. Fig. 1 shows the InstantTrack Main Menu Screen; fig. 2 is the InstantTrack Map Screen Display.

InstantTrack, like other AMSAT software, isn't shareware, but rather is offered in exchange for a $50 donation for AMSAT members, $70 for nonmembers, or $200 for commercial users. Software sales are, of course, a significant source of revenue for AMSAT's worthwhile satellite projects. AMSAT also offers a small library of publications for the satellite enthusiast. Annual AMSAT domestic membership is $30.

For software and publication listings, as well as additional membership information, contact AMSAT, P.O. Box 27, Washington, DC 20044 (301-589-6062).

1994 AmSoft CD-ROM. In the March and December 1993 columns we mentioned the excellent "World of Ham Radio" shareware CD-ROM offered by Pete DeVolpi, KC3TL. If you have a CD-ROM drive installed on your PC, you already know that a very cost-effective and fast way to build up your software collection is

Here's a portable satellite communications setup that's just right for Field Day. It uses a 20-element KLM linear antenna for 435 MHz and a KLM 11-element array for 145 MHz. The assembly uses a wooden closet dowel for a cross-boom, a Radio Shack tripod, and two old TV rotators. (KB1SF photo)

```
12/28/93 13:57:38 UTC          InstantTrack V1.00b

                          Main Menu

                  1. Realtime Track 1 Satellite (Text Screen)
                  2. Realtime Track 1 Satellite (Map Screen)
                  3. Satellite Position Table (Ephemeris)
                  4. Satellite Visibility Schedule
                  5. Update Satellite Elements
                  6. Update Station Elements
                  7. Multiple Satellite Co-visibility
                  8. Update Time (NBS via modem)
                  9. TSR Status
                  ? Help
                  Q Quit

                  Select:

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        ao-10     ao-13     ao-16     do-17     lo-19     fo-20     ao-21
Azim    105.960°   19.051°  145.739°  300.576°  134.584°   49.623°  325.000°
Elev    -17.375°  -14.031°  -33.192°  -60.438°  -27.620°  -60.391°  -46.907°
```

Fig. 1– Shown here is the Main Menu Screen of AMSAT's DOS-based, top-of-the-line satellite tracking program, InstantTrack. The program sports several features that position it uniquely among satellite tracking programs. The program is speedy and easy to use, features not shared by all satellite tracking software.

through CD-ROM discs of shareware and public-domain programs.

Pete has released the 1994 edition of his shareware CD-ROM. New for 1994 is the FCC amateur radio license database. The included CALLSIGN search engine searches over 700,000 new and previous callsigns to find any licensed operator in seconds. You can view the search results on-ine or save them to disk.

Also new (and perhaps the best feature) is a front-end menu system called CDVIEW. Highly user-friendly, it operates the disc with simple screen commands, online help files, and instant information files from anywhere within the CD-ROM. In fact, many, if not most, of the programs can be operated directly from the CD-ROM without tying up any of your valuable hard-drive space.

Over 7000 program files cover many of the latest amateur radio software program releases. Subjects include antennas, scanning, Morse/CW, engineering, examinations, formulas, logging, propagation prediction, packet, RTTY, satellites, weather tracking, and more.

Fig. 2– One of InstantTrack's best features is its capability to display graphics. The program's Map Screen Display presents full-color, high-resolution (EGA/VGA) maps of the Earth, showing satellite and observer positions, satellite footprint, grayline, and more. A non-graphics text screen also is available.

Over 1000 radio equipment modification files are included. Thankfully, there are few, if any, "junk programs" on the CD-ROM. AmSoft even offers to provide technical support. All a customer need do is call for assistance.

For more information, contact AmSoft, P.O. Box 666, New Cumberland, PA 17070-0666 (717-938-8249).

More 10-10 Stuff de K4HAV. We have covered several specialized recordkeeping programs for 10 meter contesting offered by Jim Hardy, K4HAV, most recently in the February 1993 and January 1994 columns. Jim's programs are for those who chase "10X" certificates and awards sponsored by the 10-10 International organization and others that focus on 10 meters.

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. Last year he released the $50 1010SB for 1010 users who have a SoundBlaster or compatible sound board; this is the 1010 Contest Program modified to provide eight prerecorded contest messages.

Jim is at it again in response to the October 1993 announcement of the 10-10 Prefix Award. He has updated the 1010CH County Hunter Program to keep up with all the prefixes and prepare applications for the user. However, since 1010CH is already a very large program, he also has written a new 10WPX program for the award. If you are a 1010CH user, a $10 update fee gets you an updated 1010CH program and the new 10WPX program, plus the current version of the 1010 Contest Program. A $15 update brings you all this plus the latest address additions of new 1010 members. Jim also says his programs have been modified to accept 10-10 member numbers over 65,000.

If all this 10-10 stuff sounds confusing, ask Jim for a listing of his available awards programs. Contact Hardy Data Systems, P.O. Box 7304, Tifton, GA 31793 (912-387-7373).

Namlulu 1994 Update. In previous columns we profiled the inexpensive hamshack and other software programs for the IBM PC offered by William F. Baylor, Jr., NN8Z, and Adelaide ("Ad") Baylor, KE8ZM. A half-dozen or more hamshack programs are available for logging and records management, QSL tracking and address maintenance, participation in the CQ WW WPX Contest, telephone and address list maintenance, formula calculation, and QTH location and searching. Programs range from $7.95 to $19.95.

Bill promised more programs for 1994, and they're here. Recently, 1994 versions of CAL ($17.95), QSL ($19.95), and LOG ($16.95) were announced. The CAL (Calculate) program now includes new formulas, a DXCC list, a frequency allocation chart, and international Q-signals. The QSL and LOG programs have been expanded to handle all your records: prefix codes are assigned automatically, and DXCC tracking is also automated. Band assignments have been increased to cover additional bands, and "totals counters" and "prefix file counters" have been added.

For more information, contact Namlulu Communications, 1120 Meadowview Road, Willard, OH 44890 (419-935-0270).

EDOS. Are you a Windows user who would like to "soup up" Windows' handling of your DOS sessions? EDOS, Enhanced DOS for Windows, is a very impressive "DOS box" utility that replaces Windows DOS sessions with its own enhanced version.

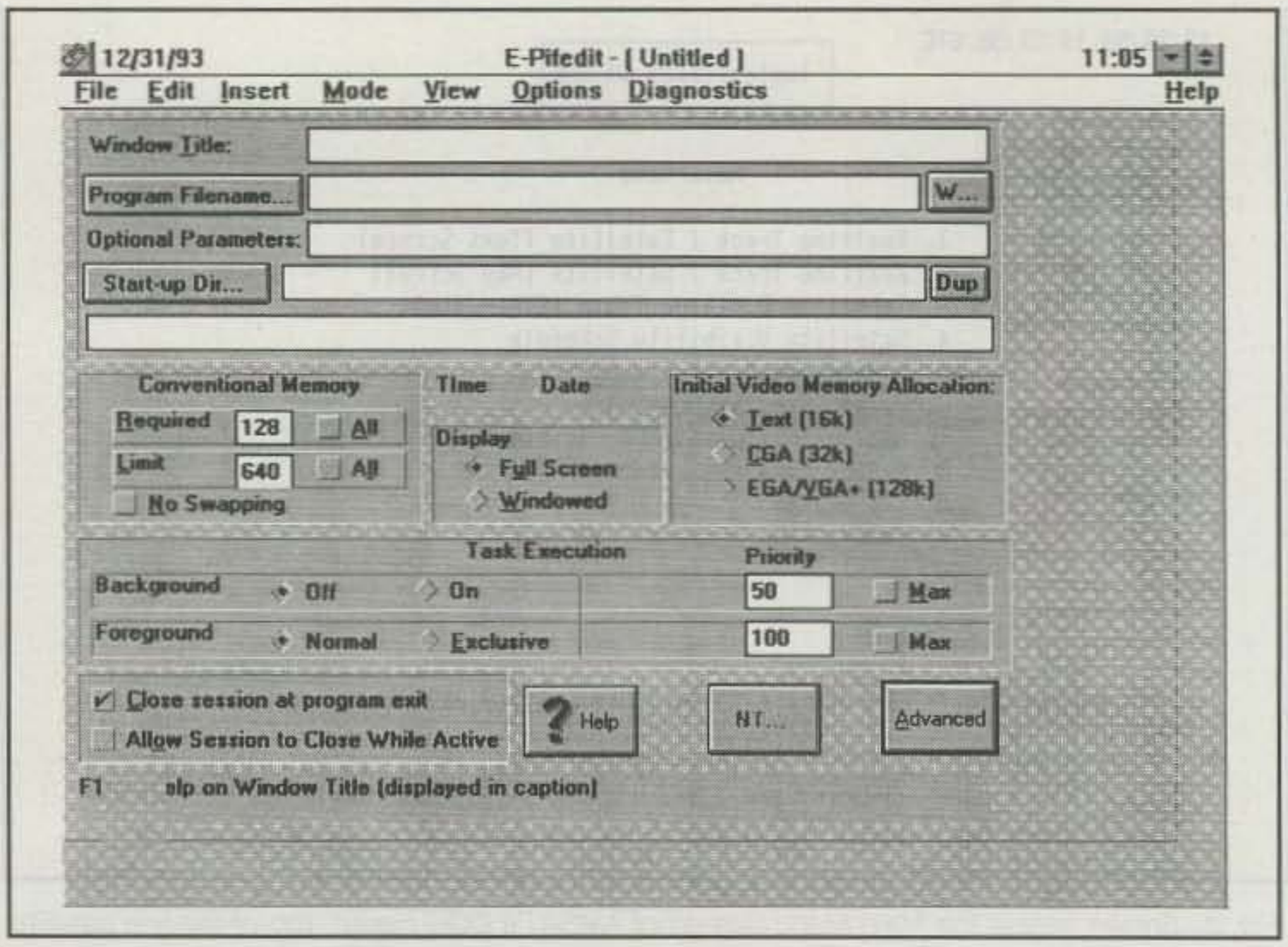

Fig. 3– EDOS, or Enhanced DOS for Windows, is a powerful device driver that adds many amazing features to your DOS sessions under Windows, making the DOS sessions "Windows-aware" whenever you run DOS in Windows' 386 enhanced mode. A freebie that's tossed in is an impressive replacement for Microsoft Windows PIF (Program Information File) Editor. Displayed here is the E-PIFEDIT screen. (See the text of this month's column for details.)

The utility is a powerful device driver that adds many features to DOS sessions under Windows, making DOS sessions "Windows-aware" whenever you run DOS in Windows' 386 enhanced mode. You can run DOS sessions above the usual 640K limit and run Windows applications from its command line. Windowed EDOS sessions even feature a toolbar and drag-and-drop capabilities.

EDOS adds several internal commands to DOS. These commands let you change your DOS session's settings on the fly, set alarms, add memory, start performance timers, disable dangerous DOS commands, view and print the Windows clipboard, and more. The utility provides five DOS session icons for sessions of 736K, 704K, 640K, 128K, and 50K of memory; there's also a full online Windows Hypertext Help system. The utility itself uses no conventional memory, loading itself entirely in extended memory.

While the program is oriented to technically-inclined users who don't mind experimenting to optimize results, the user's manual and distribution diskette provide a good deal of technical and troubleshooting information for the less-advanced user. Also tossed in are an Enhanced Program Information File Editor, E-PIFEDIT (fig. 3), and some improved Windows utility files you can transfer to your PC. The program is $69.95 and is available from Firefly Software, P.O. Box 5035, Oregon City, OR 97045 (1-800-248-0809).

From the Radio Bookshelf

Using Computer Bulletin Boards. In a recent column we noted the *Windows Shareware 500* book/disk set. In its preparation author John Hedtke, KD7WS, examined thousands of programs, selecting the most useful shareware, compiling it on three high-density diskettes, and including the disks in the 400+ page book-disk combo. The book provides information on IBM PC shareware, offers suggestions on obtaining shareware software, discusses viruses, and considers hardware and software compatibility. (The book is $39.95 from Ventana Press, P.O. Box 2468, Chapel Hill, NC 27515 [919-942-0220].)

John also has written another computer book, *Using Computer Bulletin Boards*, Second Edition. John's 1992 book introduces beginners to BBSes and shows intermediate users useful tips and tricks. It tells you practically everything you need to know to go online effectively. The book begins by discussing basic online communications concepts and shows you what equipment to use. The book then demonstrates using a BBS, and it introduces you to a variety of popular BBSes such as RBBS-PC, Fido, PCBoard, WILDCAT!, The Major BBS, TBBS, and TurboCit. BBSing via amateur radio is also covered.

The book introduces the popular online information services such as CompuServe, GEnie, BIX, and America Online, and it has information on offline mail readers and BBS networks. A 3.5 inch diskette containing a working copy of the popular Qmodem TestDrive communications program is included.

The 422-page, $29.95 book is available from MIS:Press, Henry Holt & Co., Inc., 115 West 18th Street, New York, NY 10011 (1-800-247-3912).

New Publisher for Resource Directory. It's no secret that we're a big fan and user of the *Amateur Radio Mail Order Catalog and Resource Directory*. As we have said before, it's a very comprehensive communications resource book that until recently was published by John Hart, NØOCF. The directory

originally was designed by John so newcomers to the hobby could have one sourcebook for everyone in the mail-order business.

The catalog has a new publisher, *CQ* colleague and 160 Meter Contest Director David Thompson, K4JRB, owner of Resource Solutions. The 1994 issue marks the fourth edition of the catalog, and now it's bigger than ever with over 250 pages, nearly 200 categories, and more than 1600 entries of mail-order products and services for amateurs.

The catalog is categorized and alphabetized into easy-to-find headings. Listings include the name, address, phone, and FAX number of the vendor, plus a description of products and services. Again, the catalog includes "A Library of Tips" from *CQ* columnist Bill Welsh, W6DDB, tailored for the newcomer. Other features include directories of catalogs, radio clubs, VECs, amateur radio services, foreign radio magazines, and BBSes.

While the catalog is published annually, Dave plans to maintain accurate listings by updating the catalog on an ongoing basis. Starting in July, the mid-year update will be a computer disk that allows quick look-up by either company name or category. The price for the 1994 catalog is $16 plus $3.00 postage via priority mail. It's also available through dealers.

Contact Resource Solutions, 6050 Peachtree Parkway, Suite 340-228, Norcross, GA 30092 (404-448-9836).

New Radio Works 1994 Catalog. According to Jim Thompson, W4THU, of The Radio Works, the 1994 General Catalog #941 is available. It's 64 pages and features a complete selection of baluns, line isolators, coaxial cable, connectors, antenna wire, and most anything else needed by the wire antenna enthusiast.

New for 1994 is the Dipole/2. It's a half-size dipole that uses no loading coils. Performance of the Dipole/2 is said to suffer little from the reduction in size, and it may be supported as a horizontal flattop, a sloper, or a vertical dipole. Also new are the no-compromise SuperBaluns; a redesigned, low-loss RemoteBalun; a Line Isolator for vertical antennas; and the Terminator-3, a Line Isolator interface for use between the transmitter and a transmatch. Also featured are several new low-loss coaxial cables, glass-mount VHF and UHF mobile antennas, and a new line of connectors. Jim also says he has brought back the MicroDipole and the InTreeVert antennas that were sold several years ago.

The Radio Works General Catalog costs $2. It covers most anything anyone could need to assemble his own wire antenna, including insulators, sealant, antenna tuners, surge protectors, mounts, guy rope, wire and cable, and connectors. The catalog features both Jim's own baluns and preassembled antennas (Windoms, loops, double Zepps, G5RVs, etc.) as well as selected systems and components from other manufacturers.

Radio Works also offers a separate Reference Catalog, a sourcebook that's more like a magazine than a catalog. While the 1994 General Catalog runs to 64 pages, the Reference Catalog is 128 pages; together, the two total nearly 200 pages of technical and cost information on wire antenna systems, baluns, components, articles, and specifications.

The cover price of the 1994 General Catalog is $3, but to CQ readers it's free (but add $2 if

you want it sent via first-class mail, or $5 to foreign addresses). Both catalogs are available as a set for $4 postpaid ($8 foreign) from The Radio Works, P.O. Box 6159, Portsmouth, VA 23703 (804-484-0140).

Short Bursts

Millennium Countdown. There are several problems associated with "the turn of the century," which isn't all that far away. One such problem, cited in *Parade* magazine of January 2, 1994, alludes to the fact that there isn't universal agreement as to exactly when the turn of the century occurs. Is it January 1, 2000, or January 1, 2001? In that the first century included the years 1 through 100 A.D., the 20th century consists of the years 1901 through 2000, ending December 31, 2000. Does that mean the next century and millennium begin on January 1, 2001, or not?

Such confusion exists every hundred years, raising questions as to whether you might be better off ducking the question and simply celebrating the event twice. A new British film, Century, tries to deal with the problem in staging a party celebrating the turn to the 19th century on December 31, 1899—or should the party have been celebrated on December 31, 1900?

In 1899 and 1900 the argument was mainly an academic one. But with computers into almost every facet of our business and personal existence today, there's more to the millennium than an academic argument. It's a real and thorny issue.

Larry W. Martin pointed this out in an article in last July's *Software Magazine*. In it he notes the many problems that can arise when you perform arithmetic on dates. If, for example, you subtract a year 1999 date (say, 99-01-12) from a year 2000 date (say, 00-04-01), you would, in this otherwise simple instance, get a negative number and possibly crash your computer.

The problem is that the way to state the date hasn't been properly or consistently defined. Therefore, there will be lots of strange results involving both mainframe and microcomputer programs dealing not just with the dates themselves, but with the resultant financial and personnel calculations, once we turn the century. Merely changing programs' date routines doesn't necessarily solve the problem. Each computer program, screen, and report—as well as the logic—must be examined. People are looking at this problem, and it's been widely discussed and documented, but so far it hasn't been comprehensively solved.

Natural Radio Update. Parts of the Extremely Low Frequency (ELF) and Very Low Frequency (VLF) spectra—from about 100 to 10,000 Hz (0.1 to 10 kHz)—are replete with "natural radio emissions." Most such emissions are created by the interaction of lightning storms with the planet's ionosphere and magnetic field. The lightning discharges disturb the Earth's magnetic field and result in some rather unusual electromagnetic signals.

What are these strange sounds? "Whistlers" sound like falling musical notes and result when lightning-bolt electromagnetic impulses travel within ducts along the Earth's magnetic field lines. There also is the "dawn chorus" that resembles a flock of birds chirping or frogs croaking. This chorus reportedly derives from lightning stroke impulses interacting with the Earth's magnetic field.

There also are hissing, rushing, and blowing sounds that have their origins in electrical emissions from the Earth's magnetosphere. Too, there are the crackling sounds produced by electrical storms. And then there are the "tweeks" having a ringing sound effect that's noticeable at night, made by lightning impulses that travel and disperse in a resonant "pipeline" formed by the Earth's surface and the ionosphere.

Does all this QRN sound interesting enough to actually listen to? S.P. McGreevy Productions distributes a small portable receiver, the WR-3 VLF Receiver, for the purpose. It's a handheld, battery-operated set that contains a proprietary circuit to receive the emissions using a 33 inch telescoping whip. The price is $65, which includes a seven-page listening and operating guide. A 30 minute audiocassette of natural sounds is $8.

Contact S.P. McGreevy Productions, 45 Elda Drive, San Rafael, CA 94903. (We first mentioned the WR-3 in the May 1992 column, but at that time the receiver was offered by another firm, Conversion Research, Descanco, CA.)

Wrapping It Up

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

Overheard: Wouldn't you know? The more something costs, and the bulkier it is, the farther you have to ship it for repairs.

73, Karl, W8FX

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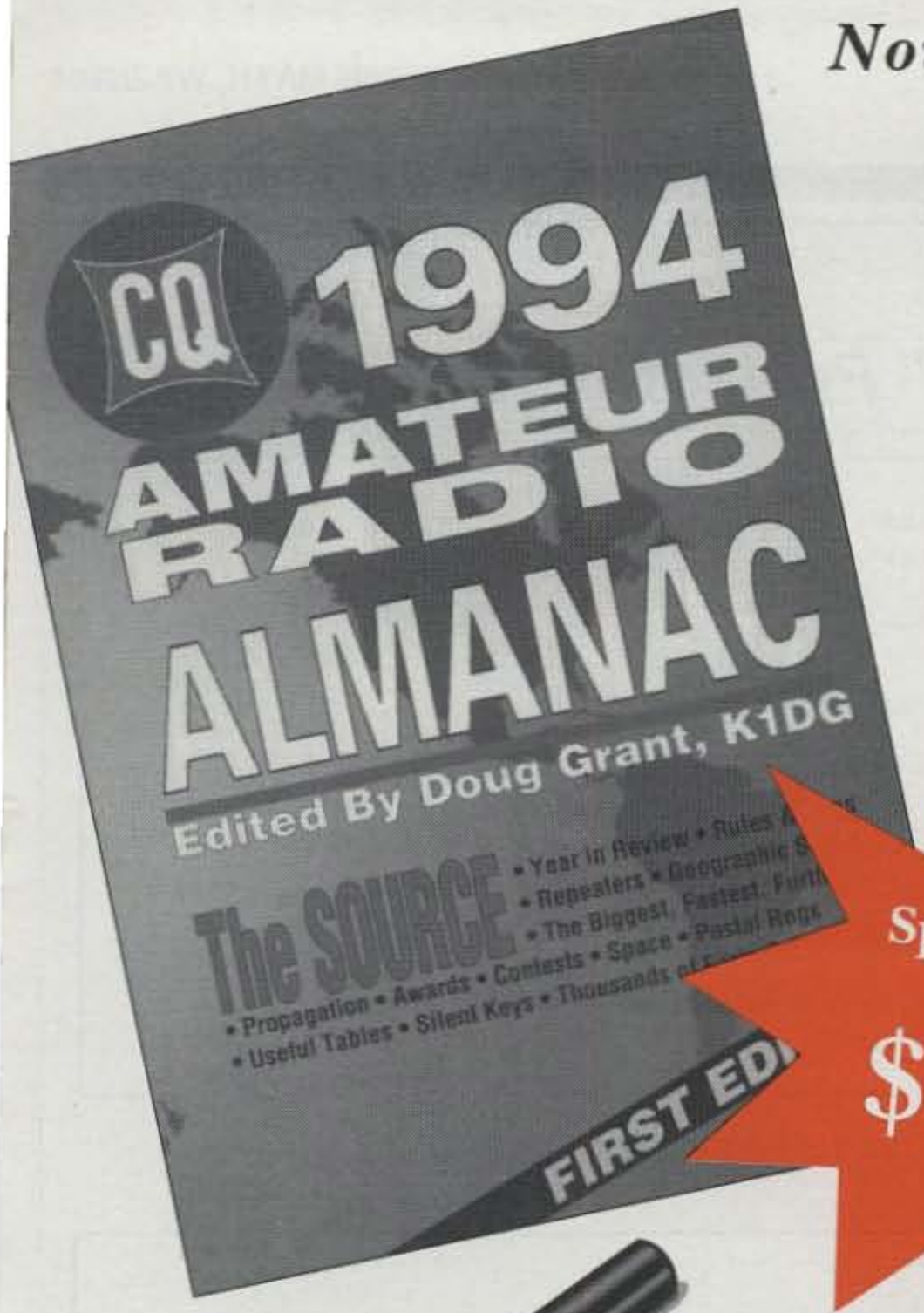

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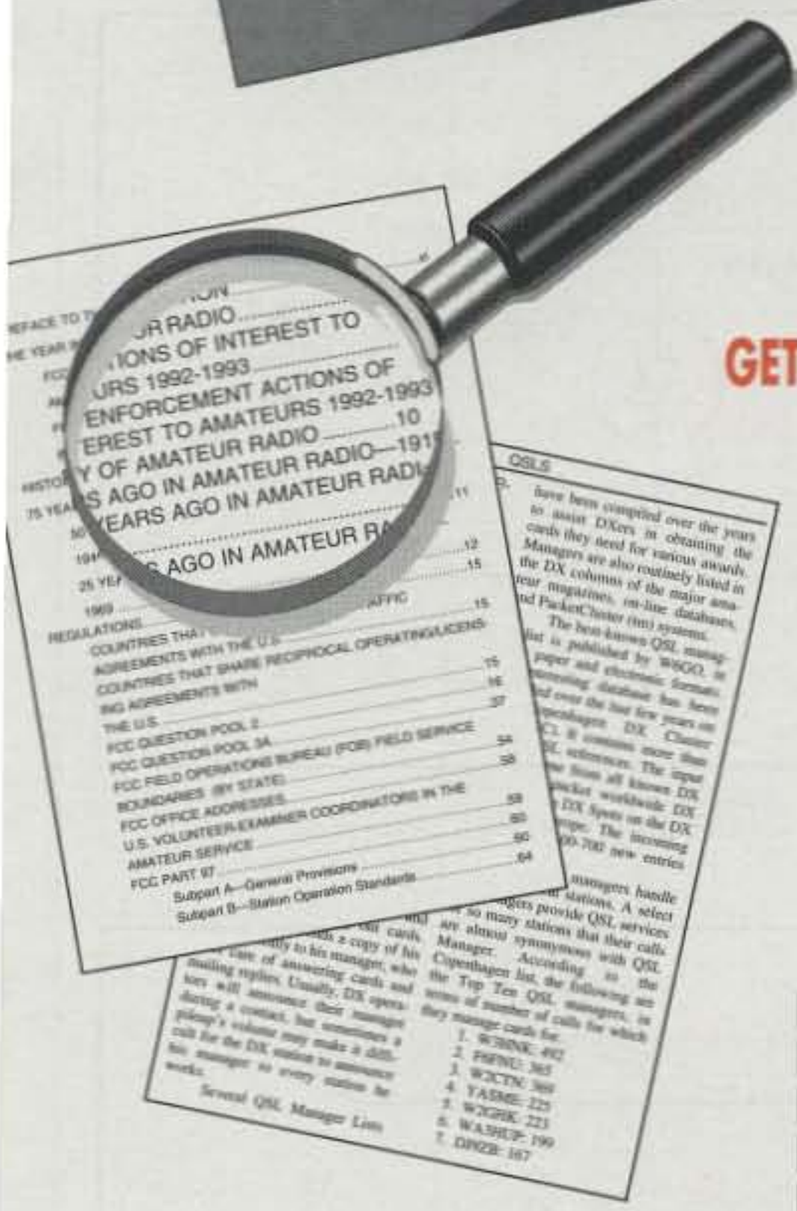

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MATH'S NOTES

BY IRWIN MATH, WA2NDM

WHAT'S NEW AND HOW TO USE IT

A Power Supply "Crowbar" Protection Circuit

One of the most common circuits built by experimenters is the power supply. Virtually every project requires power of some sort, and many derive this operating power from the AC line or some other similar uncontrolled source. If the dropping element or regulator of such a supply fails by shorting, the effect to the rest of the circuit can often be disastrous. The fuse that everyone includes (you do, don't you?) may not blow quickly enough to protect delicate op-amps or similar devices, and in some cases such failure can be quite expensive. There is a circuit that commercial power supplies use, however, that is fast enough to react to an over-voltage condition (in a microsecond or so), and that is the topic for this month.

The circuit I am describing is shown in fig. 1. It functions by immediately shorting the output of a power supply when the input exceeds a particular value. It then either causes a safety fuse to blow or trips a circuit breaker, effectively disconnecting anything that is connected to the supply. Such a circuit is commonly called a "crowbar" circuit because (as the inventors obviously felt) it is the electronic equivalent of throwing a crowbar across the line!

In the circuit shown, Q1 is a sensitive gate SCR with a maximum current rating that is at least five to ten times the maximum short current of the power supply. The fuse, or circuit breaker, is chosen so that its trip current is about twice the maximum current drawn from the power supply during normal operation. The zener, CR1, is a 400 milliwatt to 1/2 watt device with a voltage equal to the voltage at which you want the circuit to trip.

In normal operation the zener does not conduct, as it is biased below its conducting voltage. This results in zero volts at the gate of the SCR, which keeps it cut off and out of the circuit. The instant the output rises above the zener voltage, however, CR1 conducts, fires the SCR which immediately shorts the line (protecting the circuit), and then blows the fuse or trips the breaker. Although you might now need a new fuse, the $50 worth of components you were powering will live to see another day. As a practical example, fig. 2 is a circuit that will trigger at 6 volts, making it ideal for protecting TTL circuitry.

If zeners are not available for the exact voltage you need, the circuit can easily be modified as shown in fig. 3. Here the zener has been replaced by a voltage divider con-

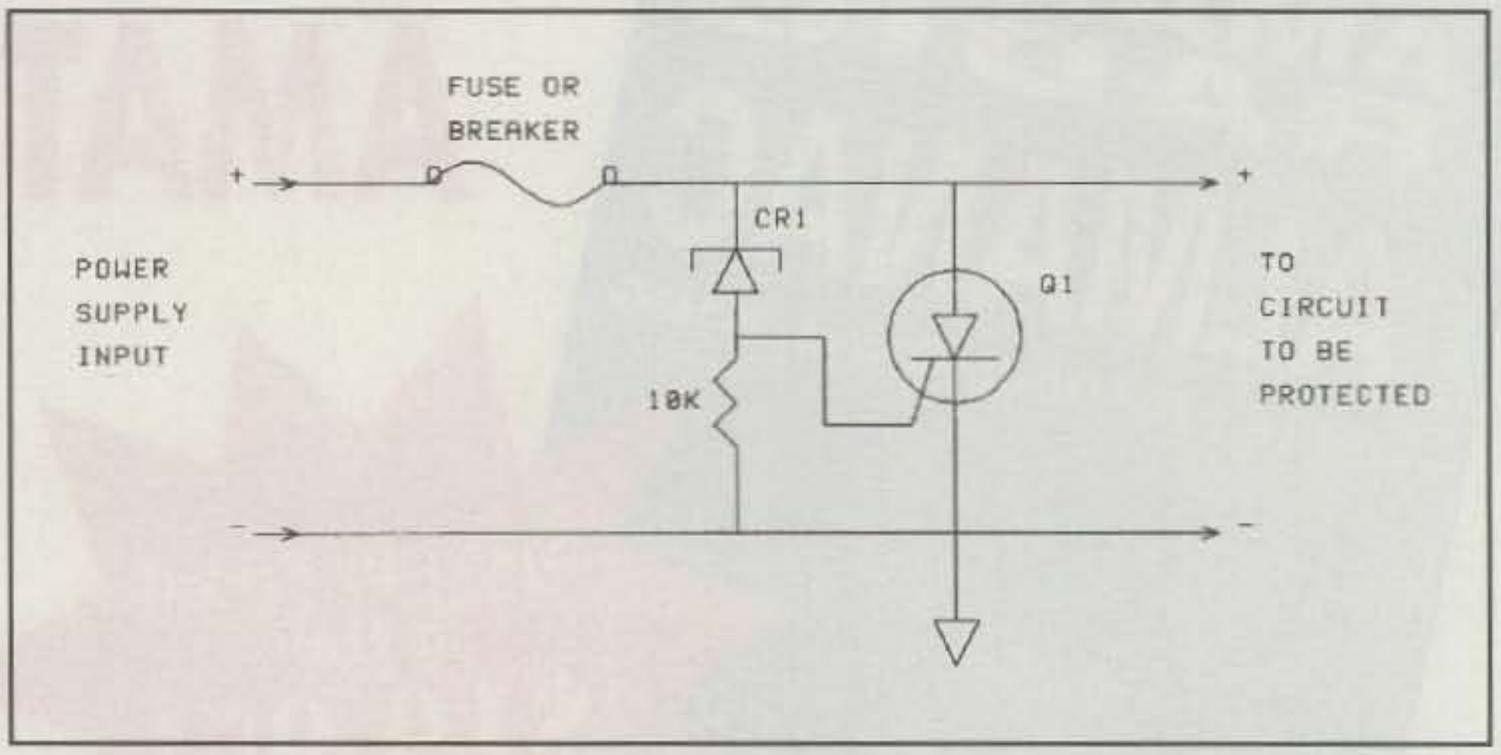


Fig. 1– Circuit of the electronic "crowbar."

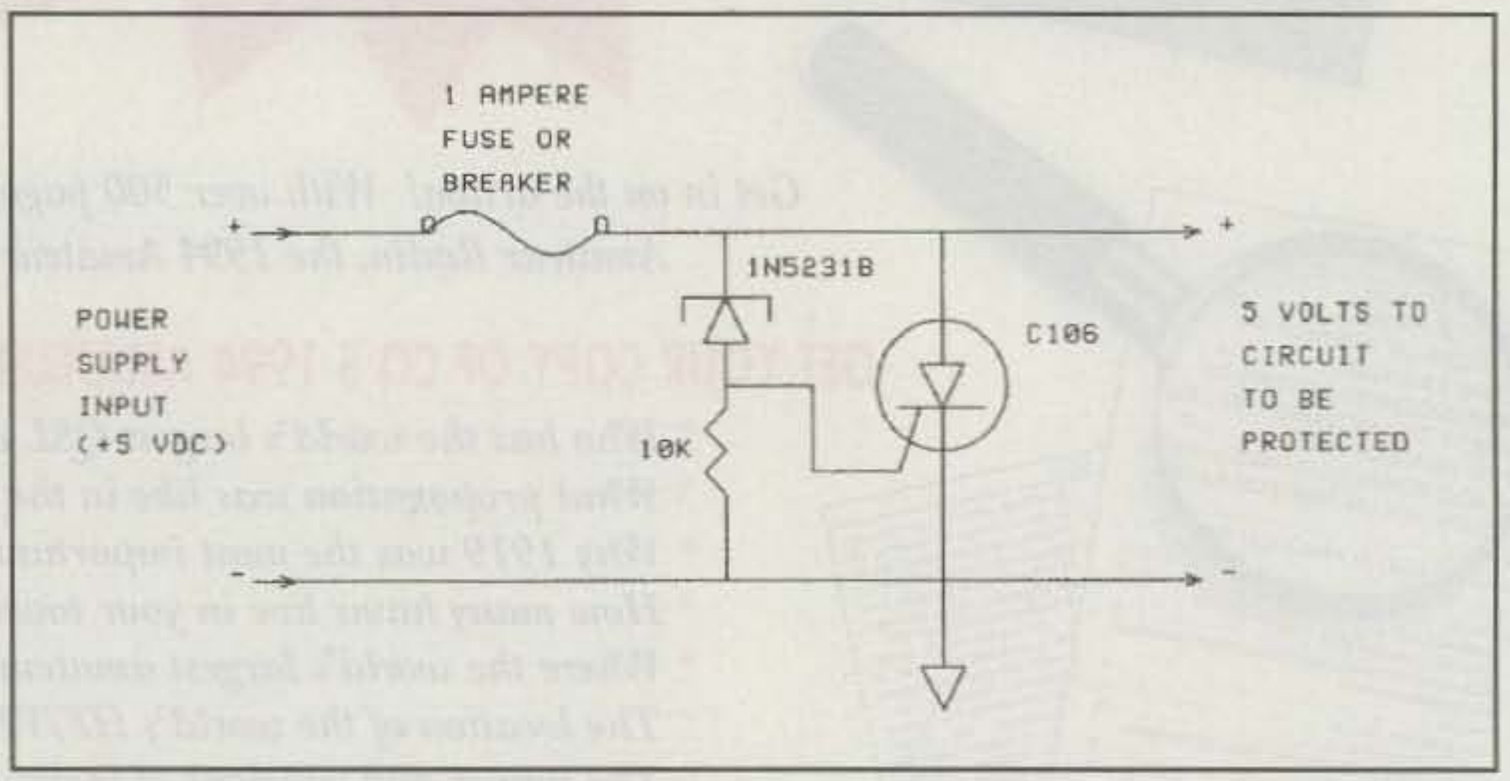


Fig. 2– TTL crowbar circuit (trips at 6 volts).

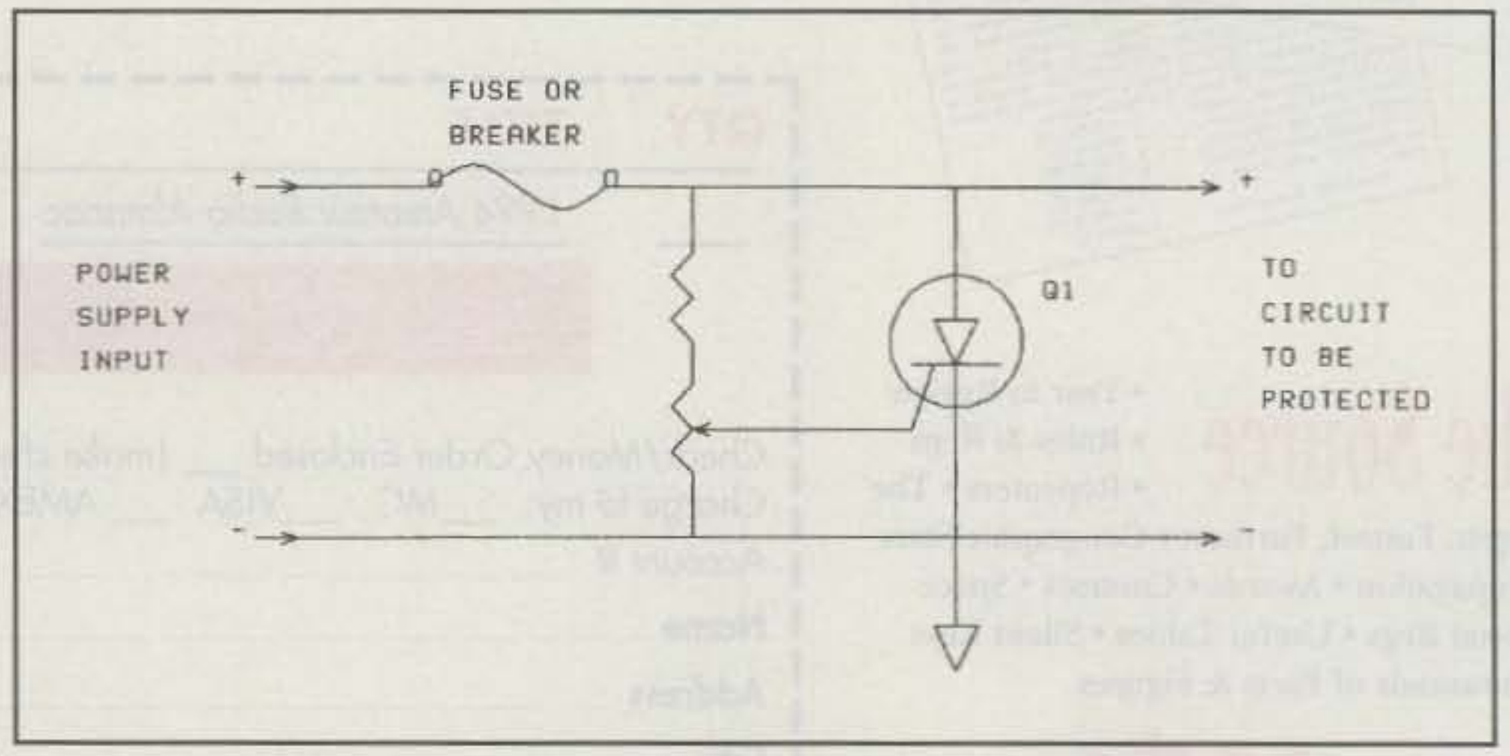


Fig. 3– Variable crowbar circuit.

c/o CQ magazine

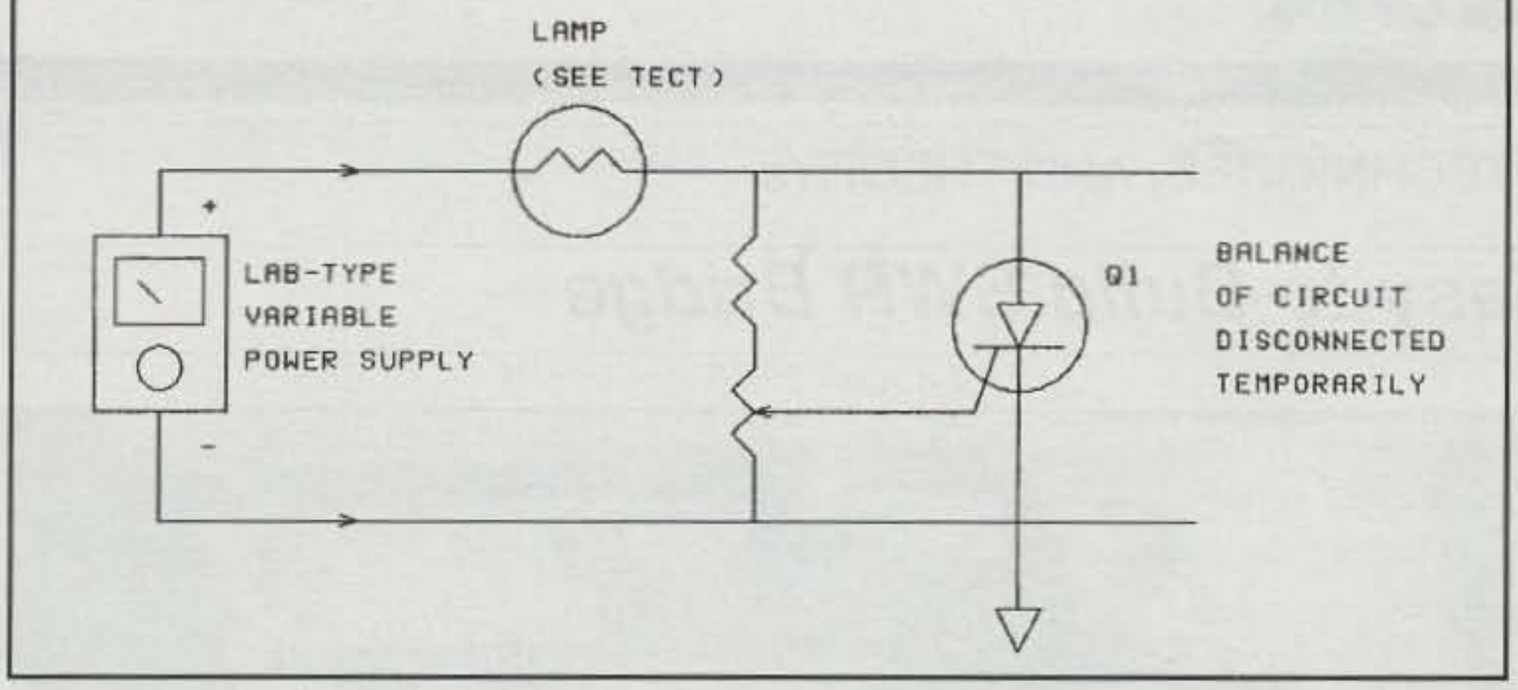


Fig. 4– Test setup for calibrating the crowbar circuit.

sisting of a potentiometer and fixed resistor. Operation, however, is still the same. When the voltage at the arm of the potentiometer reaches the triggering point of the SCR, it fires and protects the circuit in the same manner as the zener version. Varying the set point of the potentiometer varies the point at which the circuit will trigger.

To calibrate the circuit of fig. 3, you must first set the potentiometer to zero (the point at which the arm connects to ground). Referring to fig. 4, temporarily disconnect the circuit to be protected and replace the fuse or circuit breaker with a lamp that is rated at about 1.5 times the voltage at which you wish the crowbar to trigger. Connect a variable lab-type power supply, set to the exact input voltage at which you want the crowbar to trigger, to the input of the circuit as also shown in fig. 4. Now slowly turn the potentiometer until the lamp just comes on. If you need to repeat this procedure, turn the power supply off (to reset the SCR), return the potentiometer to zero, and start again. When you are satisfied with the triggering point, reconnect the fuse or circuit breaker and the rest of the circuit, and you are in business.

The first time the crowbar protects a delicate, expensive experimental circuit from going up in smoke, you will truly appreciate the extra few minutes involved in building it.

73, Irwin, WA2NDM

DOUG'S DESK

BY DOUG DeMAW, W1FB

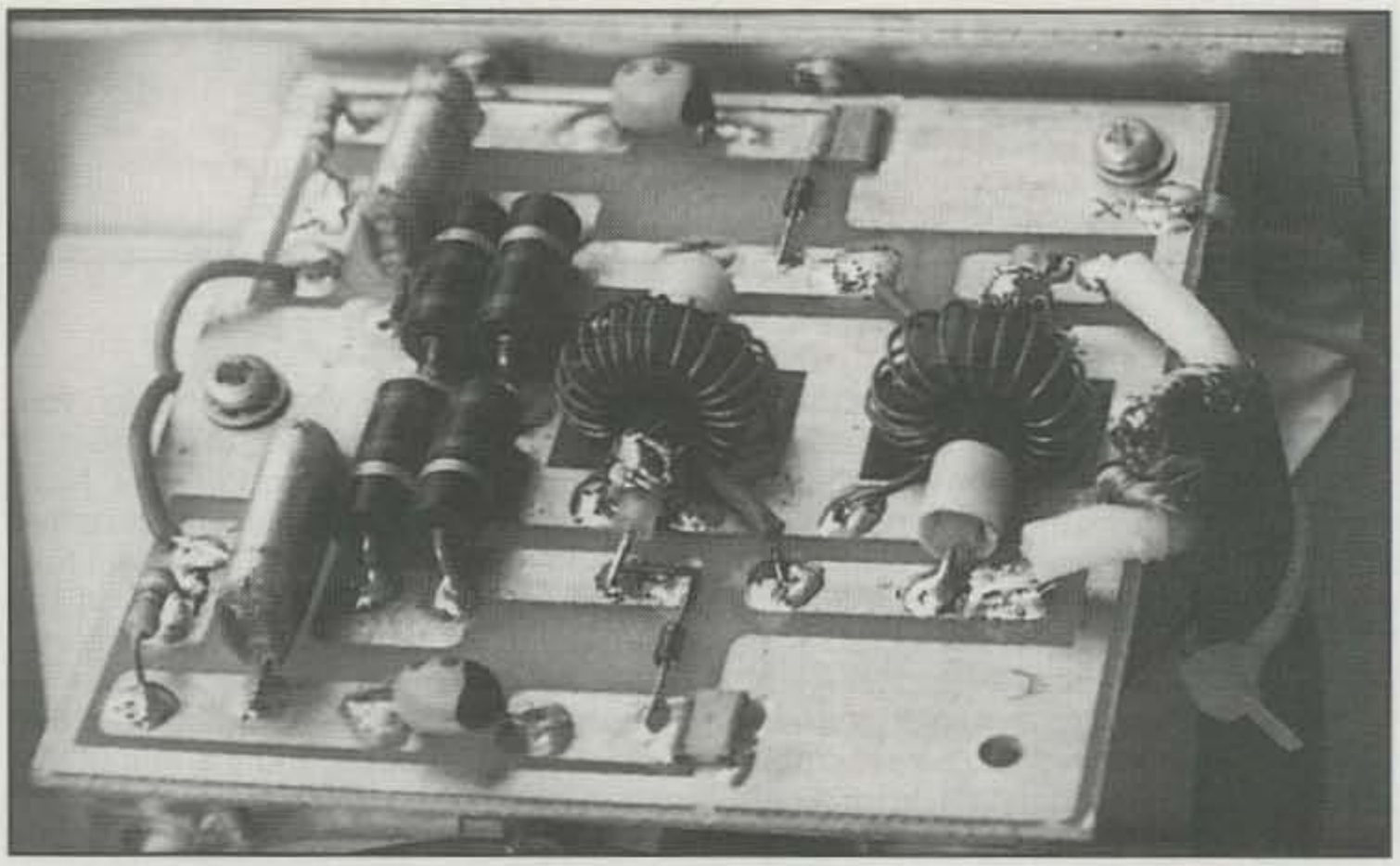
CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORYs

An Easy-to-Build SWR Bridge

It is not unusual to hear an amateur mention the troubles he had when trying to balance a homemade SWR bridge. Balancing requires the adjustment of small capacitors in the FWD and REF legs of the bridge in order to have equal currents flowing when testing the bridge by reversing the input and output loads. Some interaction occurs between the nulling or balancing adjustments, and this requires repeating the procedure at least twice. Some home-built bridges refuse to balance, much to the consternation of the constructor.

I have had numerous phone calls and letters on this very subject. Almost without exception, the problem turned out to be too great a minimum capacitance in the nulling trimmers. Amateurs tend to substitute components, and it's easy to end up with a trimmer that you cannot adjust to a low enough capacitance to achieve bridge balance. In an ideal situation your trimmer would have a range from 0 to, say, 10 pF for most bridges. However, many trimmers have ranges from 3 to 10 pF, and some have an even higher minimum C value. I have found that glass piston trimmers have a very low value of minimum C, as do many PC mount mini air variables. The worst capacitors one can choose for this application are plastic, ceramic, or mica trimmers.

Fig. 1 shows the circuit for a typical SWR bridge that uses nulling trimmers. C1 and C2 are the capacitors mentioned in the foregoing discussion.



The completed SWR bridge, which does not take up much room.

A Better Bridge Circuit

I came across an interesting SWR bridge circuit in the winter 1989/1990 edition of the British QRP journal *SPRAT* (published by the Rev. George Dobbs, G3RJV). The circuit was designed by D. Stockton, GM4ZNX. The circuit for this relatively fool-proof bridge is presented in fig. 2. I built several versions of Stockton's circuit and was delighted with the inherent balance. No balancing capacitors are required for this design. The primary criterion is that the layout be symmetrical, and that the leads are kept short and direct.

Technical Details

The fig. 2 circuit provides a sensitive instrument that has a very low insertion loss. As is the case with the classic Warren Bruene SWR bridge from which most modern-day similar circuits have been derived, the GM4ZNX design is not frequency sensitive. This means that the response remains essentially uniform across an operating range from 1.8 to 30 MHz. This is not true of the earlier Monimatch styles of bridge that become more sensitive as the operating frequency is increased.

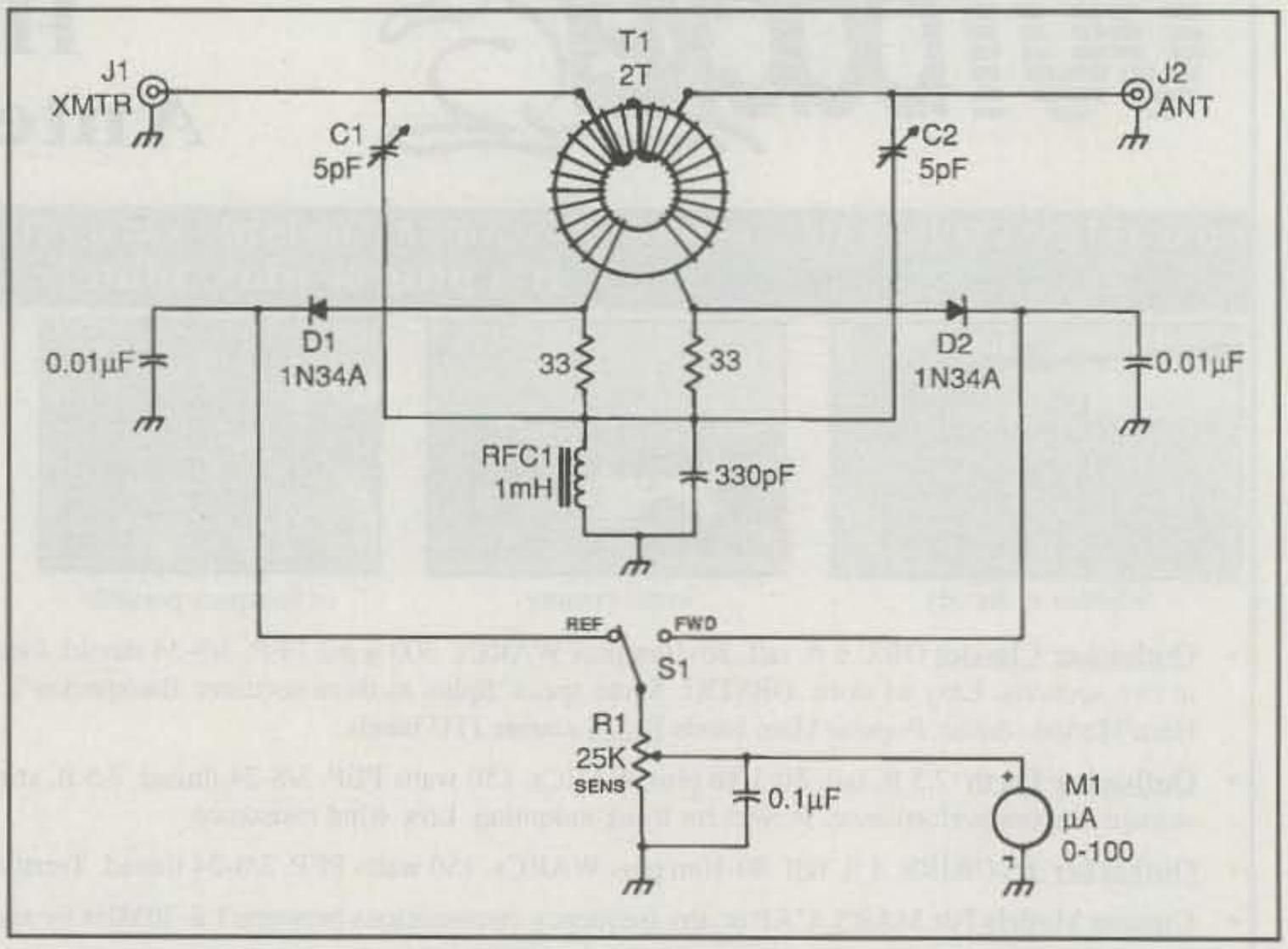


Fig. 1– Example of a spinoff of the Bruene SWR bridge. It relies on the settings of C1 and C2 for bridge balance. This circuit is designed for QRP operation, and hence the two-turn primary winding on T1. A complete circuit description for this bridge is given in the first edition of the W1FB QRP Notebook *by the ARRL.*

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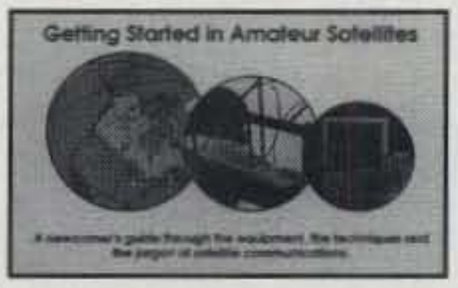

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The circuit in fig. 2 may be tailored easily for QRP or QRO use. The sensitivity is determined by the turns ratios of the two transformers. I reported incorrectly in *W1FB's Design Notebook* (ARRL publication) that the turns ratio of one transformer needed to be altered to change the sensitivity. GM4ZNX apprised me of the error shortly after the book was released. He also stated that Schottky diodes should be used at D1 and D2 (I had shown 1N34As for the QRP version), but I have had good luck with matched 1N914s at 100 watts or greater. For QRP use 1N34A diodes worked nicely.

R1 through R4 in fig. 2 should be 1 watt carbon composition resistors. Unfortunately, these noninductive resistors have become as rare as teeth in an earthworm these days. Modern so-called carbon resistors are now known as carbon film resistors. The resistive element is spiral wound over an insulating form and does exhibit a small amount of unwanted inductive reactance. However, I have observed no bad effects when using them in critical circuits up to 30 MHz. They can present problems at VHF and higher. Carbon film resistors are suitable for use in this circuit. I paralleled two 100 ohm units at each load point in order to minimize the internal inductance of the resistors, while providing the desired internal 50 Ω loads for the circuit.

The short lengths of 50 Ω RG-58A coax that pass through the toroidal transformers, T1 and T2, have the shield braid grounded at one end, as indicated in the diagram. This provides Faraday shielding for best bridge performance.

Separate meters may be used to allow monitoring the FWD and REF currents simultaneously. You may prefer to lower the cost of the project by using a single meter and a FWD/REF switch on the instrument. R5 and R6 are adjusted to provide full-scale meter deflection in the FWD mode for a specified RF power level. The bridge is terminated by a 50 Ω dummy antenna for this calibration procedure. The meter face can then be marked for various power levels by measuring the RMS voltage across the dummy antenna with a VTVM and an RF probe ($P_{WATTS} = E^2/R$) while varying the transmitter output power. The calibration may be carried out also by means of an accurate scope or by comparing the readings with those of a calibrated RF wattmeter.

If you are interested in using the bridge for only relative measurements of SWR, you can skip the calibration procedure. In this situation you can opt for using a single panel-mounted 25k Ω linear potentiometer to replace R5 and R6. An SPDT switch may then be used to switch the FWD and REF DC lines of the bridge to the switch and from the switch to the sensitivity potentiometer (see fig. 3).

M1 and M2 of fig. 2 are 100 µA DC meters. However, meters with movements up to 500 µA are suitable except for very low QRP levels (less than 1 watt), where you will fare better with a 50 or 100 µA instrument. I use an inexpensive surplus edgewise FM tuning meter that has a 200 µA movement.

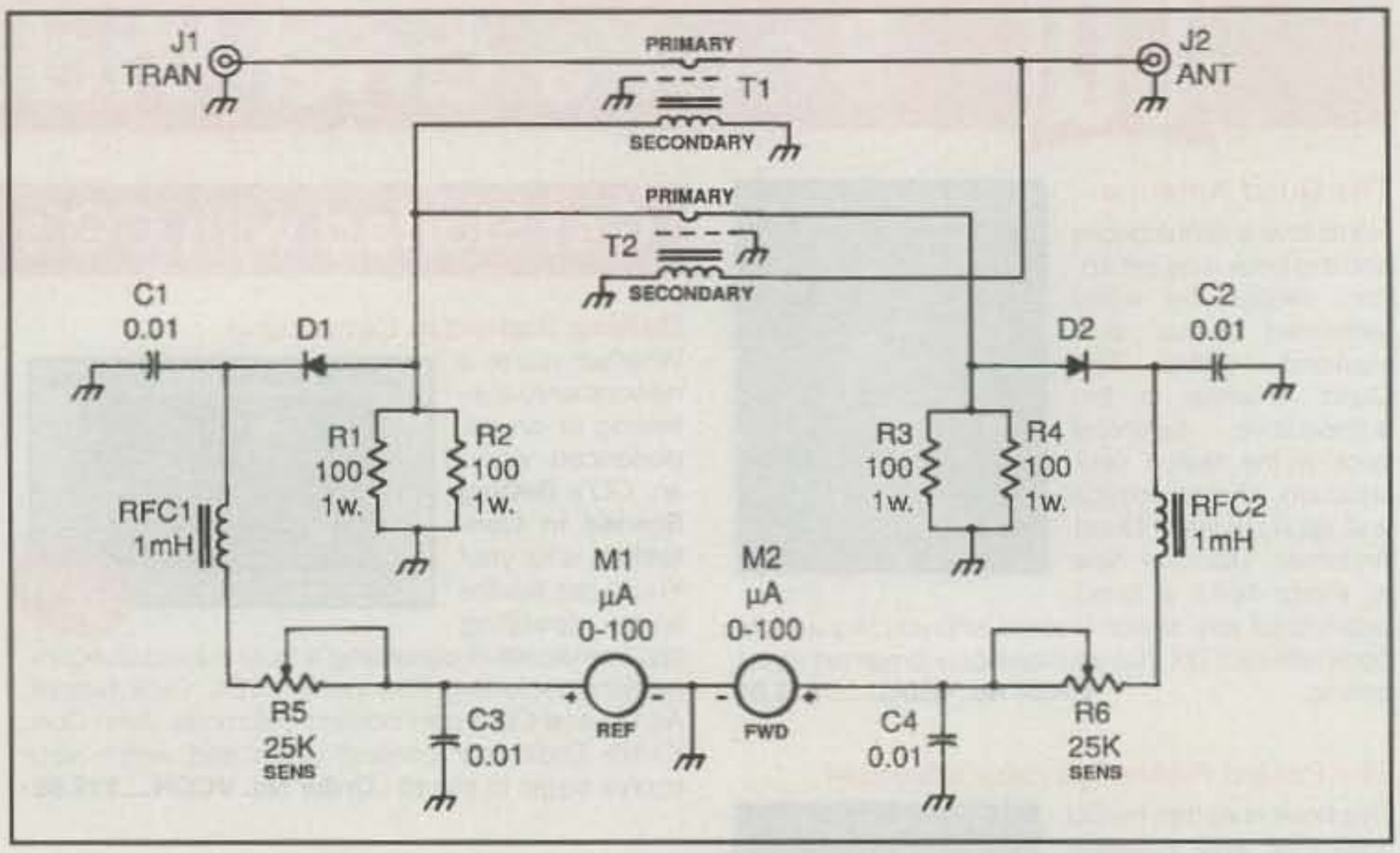


Fig. 2– Circuit diagram of the GM4ZNX bridge that uses no nulling trimmers. It differs from the fig. 1 circuit by having no trimmer capacitors and two transformers rather than one. Capacitors are disc ceramic and are in µF. Resistance is in ohms. R5 and R6 are PC-mount potentiometers. See text for D1 and D2 information. RFC1 and RFC2 are miniature molded RF chokes. T1 and T2 have 20 turns of no. 26 enameled wire for power levels to 1 kW. Use 12 turns of no. 24 enameled wire on each transformer for QRP operation. T1 and T2 are wound on Amidon Associates FT-50-61 ferrite toroids for operation from 3.5 to 30 MHz. Use FT-50-43 cores for 1.8 through 30 MHz. M1 and M2 are 100 µA DC meters (see text).

Construction Notes

A PC-board pattern for the GM4ZNX bridge is provided in fig. 4. If you are experienced at laying out PC boards, you may wish to make the circuit more compact than it is portrayed here. The ground conductors on the board need to have good electrical contact with the metal chassis or box to which the module is attached. A short metal standoff post can be used at each of the three PC board mounting holes to ensure a good connection. This will minimize the otherwise inductive effects of the ground foils. Un-

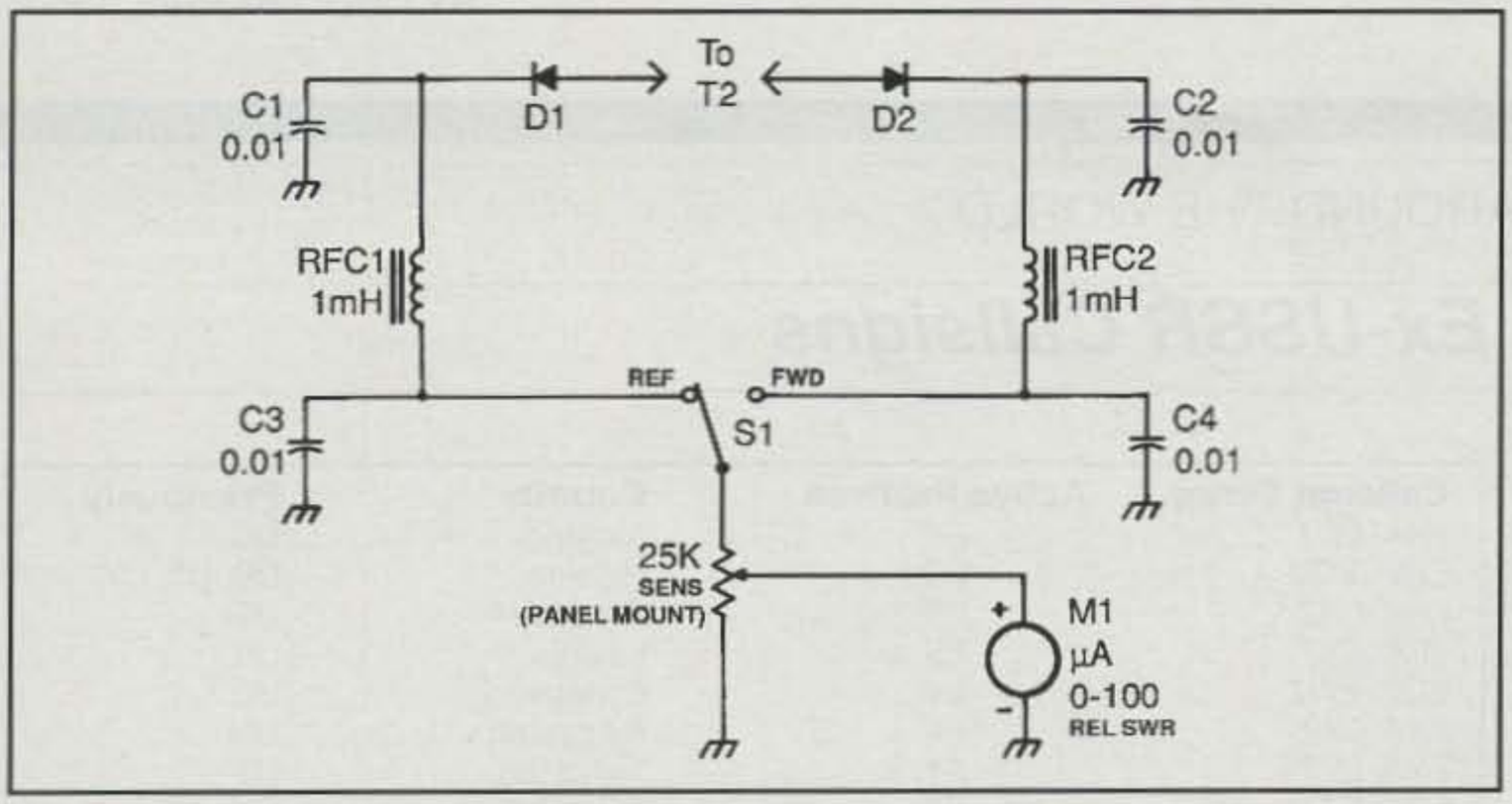


Fig. 3– Example of a method for using one meter, a FWD/REF switch, and a sensitivity control for relative SWR readings.

wanted inductance can spoil the circuit balance.

Checkout

Testing of the bridge is accomplished by attaching a 50 Ω noninductive load to J2. RF power is applied at J1. Adjust the transmitter output power to obtain a full-scale reading at M1 with the bridge set for the FWD mode. Now switch to read REF power. M1 should have a reading of zero. Reverse the connections at J1 and J2, select the REF mode, and apply RF power. M1 should have a full-scale reading, and it should indicate zero in the FWD position of the selector switch. These readings indicate correct bridge balance. If these results cannot be obtained, you will need to make certain that the wiring is correct, that D1 and D2 are closely matched, and that R1 through R4 each have a resistance of 100 Ω. Also, be sure that T1 and T2 are connected exactly as shown in fig. 2.

Tag Ends

You can match your diodes by checking the forward and reverse DC resistance with an ohmmeter. The forward resistance (low reading) is the most important one to consider. Generally, it will be on the order of 5 to 10 ohms for 1N914 diodes. The back resistance will be in excess of 100k Ω. A digital ohmmeter will provide the best accuracy for this test.

This is one of the best SWR bridges I have used in the past 30 years. It is not only easy to construct, but there is none of the tedium associated with balancing other styles of SWR bridges. The photograph shows a model of this circuit that I used to replace the bridge in a Murch MT-2000 Transmatch owned by N8TDR. The performance greatly surpasses that of the original built-in bridge that tended to yield incorrect SWR indications on some of the amateur bands. 73, Doug, W1FB

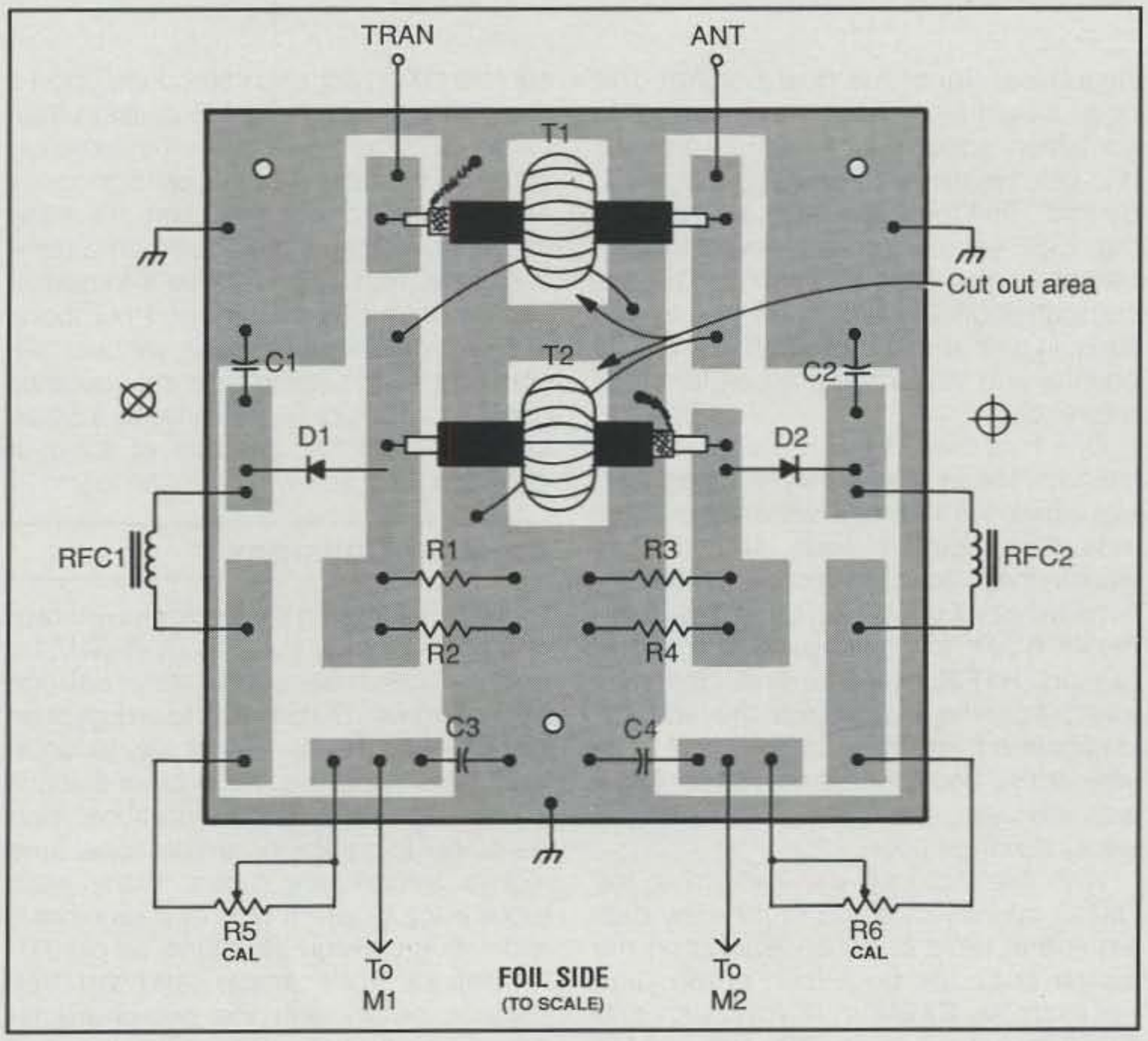


Fig. 4– Scale layout of the bridge PC board showing where the components are mounted. The parts are installed on the foil side of the board. PC boards for this project are available from FAR Circuits (18N640 Field Court, Dundee, IL 60118). Homemade boards can be created by using a motor tool and pointed abrasion bit to form the copper islands. Alternatively, the non-etched areas of the board may be protected by strips of masking tape while the etching process takes place.

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

Ex-USSR Callsigns

The callsign confusion produced by the break-up of the USSR more than two years ago is slowly dissipating. While there continues to be some hold-over callsign usage, and even some minor confusion within an allocated callsign block, DXers can begin to have confidence in their ability to identify an ex-USSR DXCC country on the basis of the prefix.

We can better understand the problems in this callsign reallocation if, before we get into the details of the new CIS callsigns, we briefly review the process of prefix allocation in general. Callsign series are allocated by the International Telecommunications Union (ITU) in Geneva to independent nations. (The allocations must be confirmed at a World Administrative Radio Conference, but are allocated provisionally between WARCs.)

Every nation gets at least one unique prefix block, and countries with lots of radio transmitters can get several prefix blocks. These blocks range from all possible prefixes beginning with a given letter, such as K for the USA, to half-series blocks, where the first two characters in the allocations are shared between two countries. (This is the case with Swaziland 3DA–3DM and Fiji 3DN–3DZ.)

Prior to the break-up of the USSR, that country enjoyed the exclusive use of prefixes beginning with U or R, as well as some other callsign blocks, including EM-EO, ER–ES, EU–EZ, LY, YL, and 4J–4L. For the most part, the Soviet amateurs with HF privileges used callsigns beginning with U, with the second letter usually indicating the individual Republic. Thus, UM stations were in Kyrgyzstan and UFs were in Georgia.

When the USSR ceased to be, the ITU requested that Russia pick some prefix blocks to keep, and return the others to the ITU for allocation to the newly independent countries of the CIS. For a time chaos reined. The Baltic republics unilaterally reclaimed their pre-WWII prefixes. Thus, Estonia stations started using ES calls, Latvia YL, and Lithuania LY.

The rest of the redistribution process took considerably longer. The new allocations were supposed to be effective Jan. 1, 1994, but in many cases amateur stations continued to use previously issued callsigns that now belonged to other countries. There was also some confusion about exactly which prefixes had been reallocated to which republics. By mid-1994 most amateurs in what was the USSR were using their new callsigns, based on the new allocations. The accompanying table shows the new allocations, in alphabetic order, with the DXCC country and the former prefixes for cross reference.

Callsign Series	Active Prefixes	Country	Previously
EKA–EKZ	EK	Armenia	UG
EMA–EOZ	EO	Ukraine	UB, UT, UY
ERA–ERZ	ER	Moldava	UO
ESA–ESZ	ES	Estonia	UR
EUA–EWZ	EV	Belarus	UC
EXA–EXZ	EX	Kyrgystan	UM
EYA–EYZ	EY	Tajikistan	UJ
EZA–EZZ	EZ	Turkmenistan	UH
LYA–LYZ	LY	Lithuania	UQ
RAA–RZZ	RA	Russia	UA
UAA–UIZ	UA	Russia	UA
UJA–UMA	UM	Uzbekistan	UI
UNA–UQZ	UN	Kazakhstan	UL
URA–UZZ	US, UT, UX, UY	Ukraine	UB, UT
YLA–YLZ	YL	Latvia	UP
4JA–4KZ	4J, 4K	Azerbajian	UD
4LA–4LZ	4L	Georgia	UF
R1F	R1FJL	Franz Josef Land	4K2

Table I– New allocations of the former USSR with the DXCC country and former prefixes for cross reference.

One hold-over is the Russian offshore islands. These stations were using callsigns from the 4K block, with the next digit indicating location. Thus, 4K1 stations were in the Antarctic region, and 4K2 stations were on Franz Josef Land. However, the 4K block now belongs to Azerbaijan. In April **R1FJL** was the first station to switch from the 4K2 block to the new R1F designation for Franz Josef Land. The very active South Shetland station **4K1F** was still using that callsign in April, but should change soon.

With this table we can determine the DXCC country of some of the new callsigns that have been appearing on the bands since the beginning of the year. For example, **EXØM** is in Kyrgyzstan, and **EVØA** is in Belarus. The **UX, US,** and **UY** stations are all in the Ukraine, while the **UI3** stations are in Russia.

In addition to determining the DXCC country of a given station, callsigns often indicate much more information of interest to a DXer. For example, once upon a time the number in the US callsign indicated geographic location. To some extent, the format of the US callsign gives an indication of license class. In many countries callsigns are issued on a rational basis, with considerable information packed into a few letters and numbers. Some understanding of the various callsign allocation rules in different countries can be of considerable value to a DXer. Let's examine the structure of amateur callsigns, and see what we can learn.

Amateur Callsigns

Most ITU-assigned prefix blocks are two-character blocks, such as SUA–SUZ for Egypt. This means that any callsign beginning with SU belongs to an Egyptian station. Note this is true not only for amateur stations, but also for all other stations whose signals cross international borders, including shipboard stations, land mobile, aircraft, and others. Within each block each different type of station has a distinctive callsign structure, as per ITU regulations. For example, land and fixed stations begin with the two-character country prefix, followed by a letter, and 0–3 numbers.

The ITU regulations limit amateur callsigns to the country prefix, followed by a single digit, followed by a group of not more than three letters. JY5Z is therefore

P.O. Box 50, Fulton, CA 95439

The WPX Program

SSB

2438	KBØADI	2441	NW6S
2439	IT9YRE	2442	JAØBOV
2440	S51NU	2443	TI7DBS

CW

2809	DL2RYL	2812	IK1PQT
2810	NW6S	2813	K8JJC
2811	HB9CSM	2814	JA9TSI

MIXED

1649	IK7NXM	1651	PS8YL
1650	NW6S	1652	DL6NDN

Mixed: 450 IK7NXM, NW6S, DL6NDN. 500 IK7NXM, NW6S, DL6NDN. 550 IK7NXM, NW6S, DL6NDN. 600 IK7NXM, NW6S. 650 IK7NXM, NW6S. 700 IK7NXM, NW6S. 750 IK7NXM, NW6S. 800 IK7NXM, NW6S. 850 IK7NXM, NW6S. 900 NW6S. 950 NW6S. 1000 NW6S. 1050 NW6S. 1100 NW6S. 1150 NW6S. 1200 NW6S. 1250 NW6S. 1350 W9IAL. 1550 WB3DNA. 1600 WB3DNA. 1700 WB2ABD. 1750 WB2ABD. 1800 WB2ABD. 1950 KS4S. 2450 HAØHW. 2950 I1EEW. 3250 W2FXA.

SSB: 350 NW6S, JAØBOV, HL5BUV, TI7DBS. 400 NW6S, JAØBOV, HL5BUV. 450 NW6S, JAØBOV, HL5BUV. 500 NW6S, JAØBOV, HL5BUV. 550 NW6S, WWØE, JAØBOV, HL5BUV. 600 NW6S, JAØBOV, HL5BUV. 650 NW6S, JAØBOV. 700 NW6S, JAØBOV. 750 NW6S. 800 NW6S. 850 NW6S. 900 KB1HC, NW6S. 950 KB1HC. 1000 KB1HC. 1050 KB1HC. 1150 NE8Q. 1250 I3ZSX. 1300 I3ZSX. 1850 W9IL. 2650 F2VX. 2700 F2VX.

CW: 350 KBØADI, NW6S, HB9CSM, PS8YL, K8JJC, JA9TSI. 400 KBØADI, NW6S, HB9CSM, PS8YL, K8JJC, JA9TSI. 450 KBØADI, NW6S, HB9CSM, PS8YL, K8JJC, JA9TSI. 500 KBØADI, NW6S, HB9CSM, PS8YL, K8JJC, JA9TSI. 550 KBØADI, NW6S, HB9CSM, PS8YL, JA9TSI. 600 NW6S, HB9CSM, PS8YL, JA9TSI. 650 NW6S, HB9CSM, PS8YL, JA9TSI. 700 NW6S, PS8YL, JA9TSI. 750 NW6S, PS8YL, JA9TSI. 800 NW6S, PS8YL. 850 NW6S, PS8YL. 900 PS8YL. 950 PS8YL. 1000 W9IAL, PS8YL. 1050 W4TYU, PS8YL. 1100 PS8YL. 1750 G4SSH.

10 Meters:	NW6S, PS8YL.
15 Meters:	NW6S, PS8YL.
20 Meters:	NW6S, PS8YL.
40 Meters:	NW6S.
80 Meters:	NW6S, W4TYU, PS8YL.
Asia:	DJ8WQ, NW6S, HB9CSM, PS8YL.
Africa:	NW6S, PS8YL.
No. Amer:	NW6S, PS8YL.
So. Amer.:	NW6S, PS8YL.
Europe:	DL2RWL, NW6S, NB9CSM, PS8YL, DJ8WQ.
Oceania:	NW6S, PS8YL.

Award of Excellence: WØULU.

Award of Excellence with 160 Meter Bar: none.

Award of Excellence Plaque Holders: I8YRK, W4CRW, SMØAJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, IØJX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, KØJN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KBØG, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, YBØTK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NXØI, W9NUF, N4NX, SMØDJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWB, KC8PG, NE4F, VE3MS, K9LJN, ZS6EZ, YU2AA, I1WXY, IK2ILH, DEØDAQ, LU1DOW, N1IR, IK4GME, WX3N, KC7X, N6IBP, W5ODD, IØRIZ, I2MQP.

Award of Excellence Plaque Holders with 160 Meter Endorsement: CT1YH, IV3PVE, KA5RNH, ZP5JCY, AB9O, FM5WD, SMØDJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SMØAJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, 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, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCV, I2MQP, IØRIZ, W5ODD, WX3N, IK4GME, HA8XX, YU1AB.

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.

a legal callsign, but HG275BCS and HR2FRACAP are not. While these are the official ITU rules, in reality there are many examples of technically illegal callsigns on the amateur bands. In theory, according to ITU regulation 2100, amateur callsigns may not begin with a digit if the second character is I or O. However, even as I write this column, both 9I2Z and 7O1AA are on the air. The use of multiple digits between the prefix and suffix is common, as the "200" US bicentennial calls demonstrated. However, the vast majority of amateur callsigns adhere to the ITU rules: country prefix, followed by a single digit, followed by one to three letters.

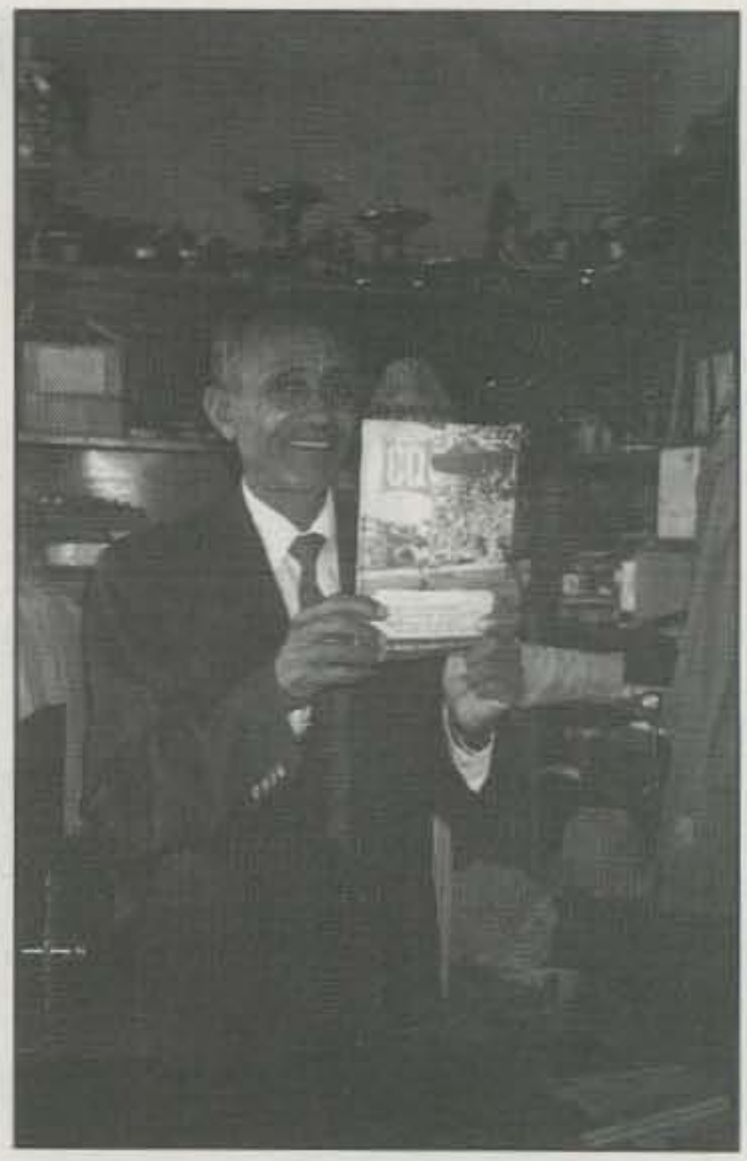
There is a lot of latitude within this range, from PJ8X to WB2CHO. In theory, the FCC could issue amateur callsigns such as K1A, W4Z, or N6R. Maybe the FCC should auction off these calls to the highest bidder!

The amateur radio prefix is usually two characters, because most countries have unique two-character callsign allocations. There are a few single-letter prefixes, when an entire letter block is allocated to a given country: B for China; F for France; G and M for the UK; I for Italy; R for Russia; and K, N, and W for the USA. In two countries the prefix is three characters, as the block 3D is split between Swaziland and Fiji. Swaziland assigns callsigns correctly, using the 3DA prefix. Fiji should use a three-character prefix, such as 3DN, but uses 3D instead.

The ITU does not allocate callsign blocks that contain either Ø or 1; these are used informally in countries without ITU allocations, such as SMOM 1AØKM and the Spratly Islands 1S.

In some countries with multiple callsign blocks the different prefixes indicate either geographic location, as is the case in Brazil with PP, PR, PS, etc., or license class, as in Indonesia YB, YC, YD.

In amateur callsigns the prefix is followed by a single digit. Again, this digit can indicate geographic location as in Japan (and to some extent in the US), or license class, as in France. Those countries which have prefix blocks that end with a number are supposed to follow that prefix with another number, as in Zimbabwe Z21. Therefore, callsigns in Somalia T5 should have another digit



Admare, ex-ET3AZ, ET3AR, ET3MA, the oldest licensed amateur in Africa. He spent nine years in jail during the regime of Mengistu, and a US amateur kept his family financially afloat. (DJ9ZB photo)

after the 5. Whatever passes for a licensing authority in Somalia is apparently unaware of this ITU regulation.

In most countries the suffix of the callsign reveals either geographic location or license class, or sometimes both. Azerbajian issues its new 4J/4K callsigns according to license class, for example. Extra class amateurs rate a callsign with a single-letter suffix, such as 4K6A. These amateurs have privileges on all bands, with a 500 watt power limit. First and Second class amateurs use callsigns with two-letter suffixes, such as 4K3BN. First class amateurs have privileges on all bands, with a 200 watt power limit. Second class amateurs have a 100 watt limit, with some band restrictions. Third class amateurs have a 50 watt limit and limited band availability, and have callsigns with three-letter suffixes, such as 4K6RDS. Club stations are identified by a W, X, or Z as the middle letter of their three-letter suffix—4K7MWR. (Clubs may also have a single-letter suffix contest callsign.) Numbers Ø and 1 after the prefix will be limited to special-event and foreign operators, and 4J2/4K2 calls indicate the Nakhichevan Republic, ex-UD6N. Otherwise, the number in the callsign is not significant.

Each country has its own specific callsign structure. In Oman, for example, A41A– is issued to family members of the Sultans, while A43-- callsigns are reserved for special events. A45-- is for for-

eigners, and A47--is club callsigns. Probably the best way to keep track of the complexities of callsign assignment is through a recent edition of the *Call Sign Directory*, by Hans Schwarz, DK5JI, available through the German radio society, DARC. This 224-page paperbound book provides a wealth of details on the meaning of each callsign. A minor problem is that it is written in German, but English translations of the limited text and important key words allow anyone to understand the allocations.

With this book you can correct miscopied calls, pinpoint location in many cases, or in some cases even determine when a station was first licensed. As a DX editor I probably get more use out of the book than most amateurs, but it makes a handy reference for any unusual callsigns. The well-informed DXer is a successful DXer, and the *Call Sign Directory* is one of the tools that can improve your DXing prowess.

DXpeditioning Basics

Another very useful publication is "DXpeditioning Basics," by Wayne Mills, N7NG. This 30-page spiral-bound paperback is a collection of operating techniques for DXpeditioners, and is based on extensive study by Wayne Mills. The operating techniques cover the entire range of DXpeditioning, from the early planning about where to go, through the on-the-air operation and the QSLing.

Wayne uses some specific examples from his own DXpedition experiences to illustrate many of his suggestions for successful DXpeditioning. While many of his points would appear to be common sense, one need only listen to some poorly run DXpedition pileups to understand how much this slim publication is needed by the DX community. Other points may seem strange to someone who has never been on a serious DXpedition, such as the vital importance of maintaining rhythm in a pileup.

The individual chapters cover objections, organization, pileup management, QSL mechanics, frustration management, ethics, and more. Each short chapter discusses the main topics and then reiterates the main points is a summary. Wayne covers topics as diverse as how to handle portables to picking specific frequencies for different parts of the world.

My only criticism of the book is that I wanted more. This first edition is long on generalities and short on specifics, but it is nevertheless an excellent start on a difficult subject. No DXer who even considers going out on a DXpedition should fail to read this book and re-read it. Furthermore, the book has considerable value even for the stay-at-homes. DXers can gain insight into the problems of DXpeditioning and how the DXpedition operators are handling those problems through this booklet. "DXpeditioning Basics" is published jointly by the American Radio Relay League (ARRL) and the International DX Association (INDEXA). It is available postpaid in the US for $5 from INDEXA, P.O. Box 607, Rock Hill, SC 29731. For foreign airmail add another US$5.

DX Gatherings Update

There has been a major change in one of the DX gatherings mentioned in the April issue. The 1994 **W9DXCC Convention and Banquet** has moved to a superior location: the Rolling Meadows Holiday Inn Holidome, at 3405 Algonquin Road, Rolling Meadows, Illinois. The dates are Sept. 9–11. The program this year includes the 3YØPI Peter One Island DXpedition; Rod Newkirk, W9BRD; IOTA with W4BAA; Low-Band DXing by WB9Z; QSL checking for DXCC and *CQ* awards; and much more. Banquet speaker is Wayne Mills, N7NG (see above). Cost is $33.50 for full registration, including the banquet, or $23.50 for the banquet only, both prior to Aug. 15. (After Aug. 15 the prices increase to $38 and $26.50, respectively.) Send your check payable to W9DXCC with name, address, callsign, as well as dinner preference of either roast beef or chicken, to Gordon Bazsali,

The WAZ Program

Single Band WAZ

10 Meter SSB

474 ..... SM3MHD 475 ..... EA3CCN

15 Meter SSB

466 ..... K3ANS 467 ..... JH8CZB

20 Meter SSB

944 ..... T3ØJH

12 Meter Mixed

14 ..... LX2KQ

10 Meter CW

140 ..... AG9S

15 Meter CW

255 ..... AG9S

30 Meter CW

3 ..... W8UVZ

RTTY

89 ..... ON4ACG

Satellite

11 ..... PAØAND

All Band WAZ SSB

4152	4X4PG	4158	DL8UTC
4153	EA3CRI	4159	W7QHE
4154	WA6QDR	4160	YV1ERY
4155	EA3CCN	4161	IK1SLE
4156	DJØMBF	4162	KE6CF
4157	JA3MHA	4163	W4YCZ

CW/Phone

7439	S52FB	7445	DL6NDN
7440	JA3TBT (CW)	7446	JH4FBV
7441	JP1AEG	7447	OH6EW
7442	JF1PHY (CW)	7448	LA1TV
7443	KD1F	7449	JE1IZN
7444	KB8NTY		

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.

WB9EEE, 255 Hillcrest St., Hampshire, IL 60140. Hotel rooms at the Holidome are $65/night for 1–4 persons. Make your reservations directly with the hotel at 708-259-5000.

The **42nd Northwest DX Convention** will be held July 23–24 in Richmond, British Columbia. It is sponsored by the BC DX Club and the Fraser Valley DX Club. For further information, contact Earl Dery, VE7IN, 16969 20th Avenue, South Surrey BC, Canada V4B 5A8.

Ham-Com 94 in Fort Worth/Dallas June 10–12 will also host the **1994 ARRL National Convention**. The Lone Star DX Association will have a Saturday luncheon with presentations from 3YØPI, VK9MM, and ZD9SXW. Operators from each will be on hand. Other programs include VI9XN and "IOTA: A New Frenzy On The Air" with W4BAA, W9DC, WT2O, and K5MK attending. Contact W5BOS for additional LSDXA program information. Hotel and DX luncheon reservations should be made in advance. For registration information, write to Ham-Com 94, P.O. Box 861829, Plano, TX 75086.

And looking a bit farther away, we have the Radio Society of Great Britain's (RSGB) **1994 International HF and IOTA Convention**, Oct. 7–9, at the Beaumont Conference Centre, Old Windsor, Berkshire, UK. This year marks the 30th anniversary of the founding of the Islands On The Air programme, with a birthday party Friday night. The program includes VK9MM, ZD9SXW, and 3YØPI DXpeditions, and many other technical and

5 Band WAZ

As of February 28, 1994, 376 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

OH8KN
ZS4TX
KØCS
N7MC

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	IK8BQE, 199 (31)
K6YRA, 199 (34)	JA2IVK, 199 (34, 40m)
PY7ZZ, 199 (34)	W6TC, 199 (34)
AA4KT, 199 (26)	KA5W, 199 (26)
K7UR, 199 (34)	DF4DI, 199 (6)
NAØY, 199 (26)	SM3BIZ, 199 (32)
VE7DX, 199 (34)	K1ST, 199 (26)
WØPGI, 199 (26)	SM6AHS, 198 (12, 31)
W2YY, 199 (26)	4X6DK, 198 (4, 6)
W9WAQ, 199 (26)	ABØP, 198 (23, 34)
K6EID, 199 (34)	UA3AGW, 198 (1, 12)
W1JR, 199 (23)	KL7Y, 198 (34, 36)
N7RT, 199 (34)	VO1FB, 198 (19, 27)
VE7AHA, 199 (34)	EA5BCX, 198 (27, 39)
W1FZ, 199 (26)	KZ4V, 198 (22, 26)
IK2GNW, 199 (1)	K4PI, 198 (23, 26)
W9CH, 199 (26)	G3KDB, 198 (1, 12)
ACØM, 199 (34)	EA2KL, 198 (22, 26)
G3MXJ, 199 (12)	

The following have qualified for the basic 5 Band WAZ Award:

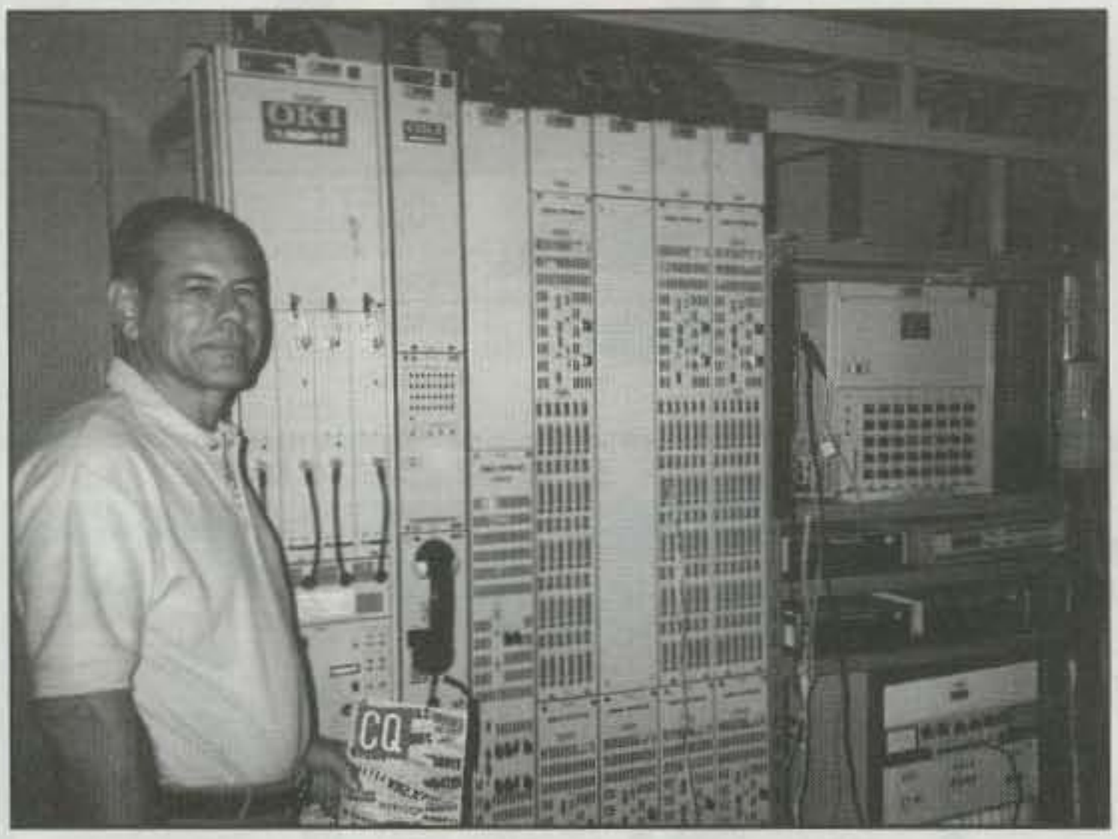
SV8JE, 175 Zones	SM3BIZ, 199 Zones
ZS4TX, 200 Zones	N6RO, 158 Zones

Endorsements:

K3ANS, 188 Zones	N7MC, 200 Zones
OH8KN, 200 Zones	EA2KL, 198 Zones
KØCS, 200 Zones	OH2DW, 190 Zones
G3KMQ, 193 Zones	

884 Stations have attained the 150 Zone level as of February 28, 1994.

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.



A photo of Oscar Daniel Funes, HR1DF, appeared in the Oct. 1951 issue of CQ, when he was 16 years old and running a 6L6-807 combination. (WK3Y photo)

Wayne Mills, N7NG, teaches 3D2ER how to tail-end. Wayne will be the banquet speaker at W9DXCC in September and is the author of "DXpeditioning Basics."

DXpedition programs. For more information, contact Neville Cheadle, G3NUG, Further Felden, Long Croft Lane, Felden, Hemel Hempstead, Herts HP3 0BN, UK.

Up-Coming DX Operations

Most of the DX news concerns Islands On The Air operations. Jaime Lira de Valle, PP5LL, will operate as **ZZ0LL** from Santa Catarina Island (SA-026) June 1–4. He'll be active on the traditional bands 80–10 meters, CW and SSB. Try 0700–1100Z, 1500–1900Z, and 2200–0200Z. QSL his home address: P.O. Box 08, 88010-970 Florianopolis, SC, Brazil.

There will be a bunch of special-event stations marking the 50th anniversary of the D-Day landing in France, around June 6, 1994. Look for **TM6JUN, TM4HOC,** and **TM4OO**. Several TM50-- callsigns will mark the 50th anniversary of the clandestine radio operations supporting the invasion, June 11–12. All will be on CW.

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with CQ Master Prefix List. Scores are based on the current prefix total regardless of an operator's all-time count. Honor Roll must be up-dated annually by addition to, or confirmation of, present total. If no up-date, file will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4557 9A2AA	2996 N4MM	2725 YU7SF	2332 K9QFR	2016 N6JM	1814 NV9S	1531 KA5TQF	1252 WØIZV	1072 EA3CWK
4198 K2VV	2973 ZP5JCY	2711 I1POR	2328 K2POF	1993 W8UMR	1784 W3KH	1505 LU8DY	1248 NE6I	1020 IT9JPK
3562 EA2IA	2972 KØBLT	2682 YU7BCD	2324 HAØIT	1961 S51NU	1782 SM6CST	1487 DK7NP	1228 ND3A	1010 CT1EEB
3553 IT9TQH	2964 W1BWS	2656 SM7TV	2303 I2EOW	1955 9A1BHI	1780 G4OBK	1484 K5IID	1224 K9BQL	956 JH1IED
3433 K6JG	2929 W9DWQ	2652 I6SF	2253 K8LJG	1954 W6OUL	1772 IK2ILH	1480 OE6CLD	1194 N6IBP	945 W4USW
3322 VE3XN	2922 WA8YTM	2626 K9BG	2221 S53EO	1951 K2OLG	1730 S58MU	1452 IØAOF	1194 JN3SAC	937 WB2PCF
3234 N4NO	2898 KA5W	2589 N2AC	2219 K5UR	1924 VE3MS	1714 K5DB	1365 I2EAY	1189 I1-50156	920 AA7TF
3229 N6JV	2862 I1EEW	2559 IT9QDS	2195 WB2YQH	1893 HA5NK	1681 VE9RJ	1364 HA9PP	1174 WØIJE	917 VE6BMX
3210 K6XP	2855 PY4OD	2416 K9AGB	2139 KL7AF	1869 KBØG	1605 CT1YH	1318 NJ1T	1125 WØULU	841 WU1F
3206 N9AF	2841 PAØSNG	2407 4N7ZZ	2118 3A2LF	1860 WB4RUA	1577 PY2DBU	1289 KØIFL	1119 NH6T	762 JR3TOE
3175 W2FXA	2840 IN3ANE	2402 SM6DHU	2118 W4UW	1854 WB2ABD	1567 WB3DNA	1287 KSØZ	1104 HP2CWB	753 OZ-2044
3133 I2PJA	2814 9A2NA	2381 I2MQP	2091 I2DMK	1851 KS4S	1560 CT1QF	1271 KC6X	1094 AB5C	671 WB9IHH
3084 SM3EVR	2747 N4UU	2377 HAØHW	2041 DK5AD	1832 W9IL	1546 EA1JO	1263 W9IAL	1074 WK3Z	640 KD1CJ
3003 W4BQY								

SSB

3898 IØZV	2583 F2VX	2152 W9DWQ	1811 CX6BZ	1539 K8LJG	1298 W6OUL	1148 F6FNA	944 EA3KB	775 EA1KN
3572 K2VV	2539 N4NO	2129 PY4OD	1806 CT1BY	1535 I6NOA	1279 K3IXD	1101 K9BQL	933 ND3A	762 EA5DCL
3534 IT9TQH	2533 NJØC	2110 LU8ESU	1787 SM6DHU	1534 YU7SF	1273 W5ILR	1096 HA5NK	919 N4CSF	744 JR3TOE
3424 VE1YX	2525 I2UIY	2087 YU7BCD	1779 IN3QCI	1510 CT1UE	1272 KBØC	1073 WB6SBK	917 NE6I	739 CE5FSB
3420 ZL3NS	2484 I1EEW	2049 I2EOW	1771 N4UU	1476 IK2DUU	1264 I3ZSX	1060 G4SDJ	916 WT3W	710 JA4DUD
3205 F6DZU	2439 I4CSP	2046 CT4UW	1770 IK5ACO	1470 OE6CLD	1254 KA5TQF	1046 KBØG	910 NH6T	687 SM6CST
3141 K6JG	2416 KA5W	1985 PY4OY	1742 WE2L	1442 I8LEL	1235 OE2EGL	1029 VE3MS	897 AA7TF	681 AA4UF
3130 I2PJA	2319 HA8XX	1937 W4UW	1711 KC8YM	1409 N2AC	1228 I1-21171	1021 EA2IF	897 KØIFL	674 KE4BM
3018 WD8MGQ	2300 WA8YTM	1933 KD9OT	1697 K2POF	1402 K2EEK	1199 IK2AEQ	1017 KC6X	879 SV3AQR	653 VE9RJ
2893 ZP5JCY	2296 W4BQY	1930 EA3FHT	1682 HAØIT	1395 KS4S	1193 G4OBK	1015 CT1EEB	871 EA1AX	644 EA8BGY
2859 CT4NH	2291 I2MQP	1925 K5RPC	1674 KL7AF	1389 WN5MBS	1180 EA9LZ	1010 KB4HU	851 CT1YH	620 UA1ZO
2833 K6XP	2286 I5ZJK	1902 CT1AHU	1659 I2TZK	1345 CT1BWW	1176 K8MDU	998 HP2CWB	849 KF7IO	611 EA8BWW
2690 N4MM	2179 I1POR	1880 K5UR	1650 KF7RU	1341 LU7HJM	1161 NG9L	991 YB3OSE	808 WU1F	600 JA2OCU
2630 EA2IA	2175 9A2NA	1850 EA2AOM	1616 N6FX	1339 W5AWT	1156 KB2DE	973 EA2CIN	806 I6KYL	600 IK6JYY
2606 OZ5EV	2171 I8KCI	1849 IK8GCS	1589 KAØZFX	1337 I2DMK	1153 K5IID	956 JH1IED	797 EA3EQT	
2593 EA8AKN	2156 EA3AQC	1841 4X6DK	1565 LU8DY	1331 DK5WQ				

CW

3568 K2VV	2577 PY4OD	2146 YU7BCD	1814 JA9CWJ	1709 N6FX	1559 I7PXV	1391 DJ1YH	1244 NJ1T	860 NE6I
3547 IT9TQH	2460 YU7SF	2132 KA5W	1808 TI4SU	1708 G4SSH	1555 W5AWT	1364 IK3GER	1229 LU2YA	852 KA5TQF
3486 WA2HZR	2410 N4UU	2060 G4UOL	1801 N4YB	1686 K8LJG	1547 KBØG	1363 G4OBK	1225 I2EAY	830 PY4WS
3365 W8RSW	2400 K6XP	2029 N4MM	1801 S51NU	1668 SM6CST	1539 HA5NK	1324 SM5DAC	1197 IK2ECP	821 KC6X
3211 N6JV	2365 N2AC	1951 S51NR	1787 SM6DHU	1658 W1WAI	1534 ZS6EZ	1317 G4MVA	1131 K9QFR	775 ND3A
3010 VE7CNE	2354 W4BQY	1922 W8IQ	1769 G3VQO	1658 OK1CZ	1503 S58MU	1297 3A2LF	1110 KA1CLV	751 AA6WJ
2787 N4NO	2348 W9DWQ	1890 EA7AZA	1769 K5UR	1650 KL7AF	1454 W6OUL	1287 EA6BD	1013 AC5K	669 NH6T
2613 K6JG	2284 JH3CXL	1861 9A2NA	1762 HAØIT	1602 VE9RJ	1443 VR2UW	1280 ZP5JCY	1009 W9IAL	659 HB9CSM
2608 EA2IA	2223 WA8YTM	1860 KA7T	1743 K2POF	1598 W9PWM	1410 I1EEW	1279 KS4S	945 W4UW	637 I2MQP
2605 YU7LS	2165 VE7DP	1856 IKØADY	1737 I2DMK	1562 OZ5UR	1408 VE3MS	1277 EA1JO	899 WØJIE	611 KI4UZ

Another special event in June is **BVØRI**, at the Rotary International Convention in Taipei, Taiwan. This station will be active June 12–15. QSL via the new BV QSL bureau, P.O. Box 73, Taipei, Taiwan, ROC.

Next month a group of northern DX-peditioners will travel to Herschel Island, in the Beaufort Sea. They will drive to Inuvik and charter a float plane for the trip to the island, which is a territorial park of Yukon. They will be on the island July 22–28 and operate under the call **VY1AU**. Look for them on the IOTA frequencies of 14260 and 21260 kHz, as well as 14130 and some 40/80 meter operation. Operators include Bill, VY1AU; Brian, VY1BE; Richard, N6IV/KL7; Larry, KF6XC; Carl, VE8CF; and John, NL7TB. QSL to NL7TB, direct only, please.

QSL Notes

Gene Shcumat, UA9AB, offers to help with QSL in Russia. He is QSL manager for **4K8F, EY4AA, UA9AN/UI, UAØUBG/UW8V, UW8V/UAØUBG, UD6DFF, UD8F, UG/UV3ZZ, UI8GM, UJ8RA, UL7VV, UZ9AXB**. He can give your QSLs to: RH8AY, UD6DV, UH8YP, UH9HWB, UI9ACQ, UI8DAT, UI8DT, UI8DX, UJ8XA, UI9AXI, UI9GWA, UM8NU, UM1N, UL7PP, UN7PP. Send your request direct only to Gene at P.O. Box 17, Troitsk 457100, Chelyabinskaya obl., Russia.

QSL **V31BW** to Bobby Webb, WB5B, 1001 W. Louisiana St., McKinney, TX 75069.

QSL **BZ4DHI, 3A/I1ZB, 3A/I1QOD, 3A/I1YRL** via Luc Glarey, I1YRL, Via San Martino 11, 10091 Alpignano (to) Italy.

QSL **8P9GG** to Michael Shaer, VE2XB, 5271 Connaught Street, Montreal, Quebec, Canada H4V 1X5.

VU2DK reports that Indian postal workers have discovered that QSL requests often contain valuables, such as IRCs and currency. This has led to considerable tampering and pilfering of amateur mail. He reminds DXers to use standard techniques to reduce such problems: no folded return envelope (use envelopes of different sizes), disguise return postage, no callsigns on envelopes, use security envelopes to ensure nothing can be seen of contents, and carefully seal with tape all envelope flaps.

QSL the April Aland Island operation of **OHØMYF** via Harry Mantila, OH6YF, P.O. Box 30, SF-64701 Teuva, Finland.

The Chinese Taipei Amateur Radio League now has a QSL bureau for **BV** amateurs: P.O. Box 73, Taipei, Taiwan ROC.

QSL the WPX SSB operation of **CQ1A** via WA1ECA.

QSL **1C1AK** via Idris, Box 1, Grozny, Chechenia, via Russia.

QSL **CO2MA/CO4, T42CW,** and **T43VR** via Ed, CO2MA, Box 21056, Alamar, Havana 12500, Cuba.

QSL Alex L. Rubtson, **EY8CQ,** (ex-UJ8JCQ) to Box 1102, Dushanbe 734032, Tajikistan Republic. Do **not** send cards via Moscow, and do **not** include any money; IRCs are okay.

QSL Lev N. Rubtson, **EY8AB** (ex-RJ8JAB), to Box 1047, Dushanbe 734036; other information as above.

QSL club station **EY1ZA** (ex-RJ7JYZ) to P.O. Box 126, Dushanbe 734025; other information as above.

QSL **EA8AH** to Pekka Kolehmainen, OH1RY, at his new address: Kisatie 10, 21530 Paimo, Finland.

QSL **6D2X, XE2XA,** and **XEØDX** via Ken Quin, K5TSQ, Box 734, Edinburg TX 78540.

QSL **J52AG** via Erik Sjolund, SMØAGD, Vestagatan 27, S-195 56 Märsta, Sweden. Most of Erik's 4000 QSOs were from the mainland; only 28 were from AF-020.

QSL **4X/VE2UJ** via 9A2AJ. Gil says he has answered all QSLs for **VE2LID**, his CQ Zone 2 operation in CQ WW CW 1992. Anyone still needing a VE2LID card

should send it to Gil Ouellet c/o UNTSO, P.O. Box 5854, New York, NY 10017.

QSL **PY5CHO** via Lions Clubs de Curitiba Marumbi, P.O. Box 6058, CEP 80011-970, Curitiba PR Brasil.

QSL the contest call **PT5W** direct to Ulysses J. Santos Neto, PY5LY, P.O. Box 6058, 80011-970 Curitiba PR Brasil.

QSL contest call **ZY5WKS** direct to Alessandro C. Siva PU5WKS, P.O. Box 1455, 80001-970 Curitiba PR Brasil.

QSL the contest call **ZY5RY** direct to Germano Lema, PY5RY, P.O. Box 6058, 80011-970 Curitiba PR Brasil.

QSL **ZF2VW, ZF2PV, FP8DK,** and **6Y5/W7WY** via W7WY.

QSL **BV9P** via the CTARL bureau with SASE: P.O. Box 93, Taipei ROC, or via BV2TA, Box 112/16, Taipei, ROC.

QSL Jim Bennett, **TU4EI**, via manager W3HCW. Don't use the TU bureau; Jim reports not receiving any cards via that route.

QSL **VP2E/N4CD** and **VP2E/N2TPH** via Bob Voss, N4CD, 3133 Charring Cross, Plano, TX 75025.

QSL Information

3B8/F5PXQ to F5KDZ
3ZØMTP to SP3SLA
4K1F to KF2KT
4K2BY to KF2KT
4K2MAL to UA4RC
4K4POL to UAØKCL
4L1FL to 4X6UF
4M1I to I2CBM
4M5I to I2CBM
4N7DW to YU7BJ
4S7DA to W3HNK
4T6AA to OA4FW
5H3JB to NK2T
5NØ/DL9GMM to DL9GMM
5NØBHF to OE6LAG
5N8LRG to WA4JTK
5R8DG to F6FNU
5R8KH to WB8LFO
5TØREF to F6FNU
5T5JC to F6FNU
5U7K to JA3XCU
5U7Y to JG3UPM
5X1F to WB1DQC
6Y5JA to 6Y6RA
7X4AN to DJ2BW
8Q7AA to JG2XYV
9A2AJ to K9JJR
9G1PW to WB2YQH
9G1SD to NØNLP
9I2M to DL7VRO
9I2Z to DL7VRO
9J2BO to W6ORD
9K2USA to K8EFS
9K2ZZ to W8CNL
9L1JN to K4ZLE
9X5DX to F2VX
A22MN to WA8JOC
A35SQ to W7TSQ
AH8F to G4ZVJ
AP2JZB to K2EWN
BV2A to K2CM
C21/MI to JR2KDN
C21/YI to JR2KDN
C4YY to 5B4YY
C53HG to W3HCW
CE9AA to CE3AA
CS1CRA to CT1BBR
CU1AC to W2FXA
CU2DX to KB5RA
D2EGH to CT1EGH
D2SA to F6FNU
D3C to F6FNU
EA9AI to EC9KU
EK7ZH to RA4CDE
EL2PP to N2CYL
ER3MM to I8YGZ
EU7SA to RC2SA
EVØA to F6AML
EW1WZ to DL1OY
EXØA to DF8WS
EXØM to DF3WS
EX8MF to UM8MFO
EY8MM to DL8WN
FG5FZ to F6FNU
FH/DJ2BW to DJ2BW
FH/DJ7HH to DJ7HH
FOØHAD to VE7GDX
FT5YF to F3CJ
FY5GJ to F2YT
FY5YE to W5JLU
HC8JG to WA6ZEF
HG275BCS to HA8PO
HL3IWD to HL1IWD
HT1T to SMØKCR
HV4NAC to IKØFVC
J28BM to K1SE
J52AG to SMØAGD
J87BZ to DL7FT
J88AQ to W2MIG
KC6CC to JA3IG
KC6KT to JR1IQI
KG4CI to XE1CI
KG4DX to KØIEA
KG4WP to WQ5Y
OC4EI to OA4ANR
P4ØMR to VE3MR
P4ØV to AI6V
PJ5/K3UOC to W1AF
PR1M to PY1AJK
PYØA to PT2GTI
PYØB to PP1CZ
PYØFM to PY5CC
RAØAL to W3HCW
RU6LC/Ø to UA6LU
S5ØX to S51OT
SVØHS to DJ8MT
T2ØCC to JR2KDN
T24JJ to JR2KDN
T3ØJJ to JR2KDN
T32AB to N7YL
T33CS to G4WFZ
T5YOU to WA6YOU
T93M to DL8OBC
T97M to DL8OBC
T97T to SM5AQD
TA/OK1FCJ to OK1FCJ
TA2DS to WA3HUP
TI4/AA7JM to WA5TUD
TI4CF to TI2CF
TI9CF to TI2CF
TI9JJP to TI2AOC
TL8GR to F5XX
TL8NG to WA1ECA
TU2QW to F6EXQ
TU2XR to KEØLS
TZ6WO to WB6EQX
UA1ZO to LA8PF
UK8AA to G3SRH
UK8FF to W3HNK
UXØUN to K8YSE
UX2HO to I2PJA
V27T to YU1RL
V29NR to YU1NR
V31BW to WB5B
V31IK to KD6ECB
V31ML to N5FTR
V31RM to DL7UUO
V31UO to DL7UUO
V47WK to AB4JI
V51C to ZS1IS
V51E to K8EFS
V59PI to DJ6SI
VP2EEE to KK3K
VP2EJA to JA1VPO
VP2MH to KC4DWI
VP5/AB5MF to AB5MF
VP8CBE to W6MKB
VP8GAV to GMØLVI
VP8PTG to G4RFV
VP9HE to KD8IW
VP9HK to K1EFI
VP9ID to K1EFI
VP9KG to K1EFI
VP9KK to K1EFI
VP9KR to K1EFI
VQ9FM to N4BPO
VQ9LV to KY3V
VQ9WL to VQ9IO
VR2IH to G4RGK
VR6YL to WD6GUD
XF4C to XE1BEF
Z31VP to DJØLZ
Z32JA to YU5XTC
ZA1J to I2MQP
ZA1W to HB9BGN
ZD7BJ to W4FRU
ZD8M to G3UOF
ZD9BV to W4FRU
ZF1CQ to W8BLA
ZK1AT to WB6EQX
ZK1AVY to AA7V
ZK1MTF to N7WTU
ZK1NC to VK4CRR
ZK1WTU to N7WTU
ZSØX to DJ6SI
ZS9Z to ZS6EZ
ZXØF to PY5EG
ZYØFT to PY5TM
7X5GZ to Ziane, BP 34, Elalia, Biskra, Algeria
HH2JFO to Joe, P.O. Box 1095, Port au Prince, Haiti
HH2MED to David, P.O. Box 1095, Port au Prince, Haiti
KH8/NØPHF to P.O. Box 4952, Pango Pango, American Samoa
TA3D to Yasar, P.O. Box 963, Izmir, Turkey
TG9AQ to P.O. Box 439, Guatemala City, Guatemala
Z21HS to P.O. Box 4110, Harare, Zimbabwe

CQ DX Awards Program

SSB

2073	LZ1HA	2078	N2JNZ
2074	KBØADI	2079	KB5OHT
2075	N2PKX	2080	WW1N
2076	ZS6DI	2081	KE6CF
2077	KD4HXT		

SSB Endorsements

320	KSØZ/329	320	N5FG/322
320	SM6CST/329	320	WØULU/322
320	OE3WWB/329	320	WB4DBB/321
320	KZ2P/329	320	OE7SEL/320
320	W6EUF/329	310	K8YVI/319
320	K6YRA/329	310	W8AXI/311
320	WB6OKK/328	300	XE1DU/302
320	AG9S/328	300	WB4UHN/300
320	SV1ADG/328	275	K2EEK/283
320	N4JF/328	275	KE6CF/283
320	N4KG/328	200	ZS6DI/222
320	VE2PJ/327	150	N2JNZ/191
320	WW1N/325	28 MHz	KBØADI
320	LZ1HA/324	28 MHz	N2PKX

CW Endorsements

320	SM6CST/329	310	IK2ILH/311
320	N4JF/329	300	G3KMQ/308
320	N4KG/328	300	G2FFO/304
320	IT9QDS/327	300	N5FG/301
320	WA8DXA/326	275	WB6OKK/298
320	AG9S/325	275	HB9DDZ/292
320	G4BWP/325	275	WB4DBB/283
320	W7CNL/324	250	NN7A/257
320	W8XD/321	150	KB5OHT/158
310	W4OEL/319	3.5/7 MHz	WB4DBB
310	N4AH/317		
310	AA2X/314		

Total number of active countries is 329. 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 Good Guys and Bad Guys

KA3TGY reports that **FH5CB** returned one of two IRCs with the QSL request.

Likewise, W9RXJ reports that **YV5AAX** returned one of two US$ sent, saying US$1 is enough for postage.

N6ZAE says he must have been one of the lucky ones who got his **TI9JJP** cards via TI2AOC without difficulty. Many other DXers report problems with this route.

And another reader reports that his **CR3W** card, sent to DF5UL with US$1, an IRC, and a self-addressed, stamped envelope, was mailed in California for $.29. "A pretty good profit on one QSL!"

Not Manager

N6ZJM reports that she is **not** a manager for the 1994 operation of **VP5E**. (VP5-calls are contest callsigns, and reissued frequently.) No word on the correct QSL route for VP5E.

73, Chod, VP2ML

CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Why Do We Contest?

June's Contest Tip

We often think about receiving antennas in terms of the 80 and 160 meter bands. Have you ever tried using a beverage (or similar antenna) on 40 meters? There have been countless times when a separate receiving antenna on 40 meters has dramatically improved my signal-to-noise ratio, more than compensating for reduced signal strength levels. The bottom line is *improved copying ability*. I've even heard of limited success on the higher bands. Give it a try!

As I passed through my 25th year of contest operating recently, I asked myself a somewhat reflective question: Why do I operate contests? I know this is a popular question among those who see little value in contesting. After all, what's the point of getting on the radio and passing one number after another to station after station? According to some, it all sounds like a useless accumulation of unneeded QRM, right?

I'd be kidding you if I didn't admit that the primary motivator for my interest in contesting is the competitive thrill of winning. Anyone who knows me personally would describe the core of my very nature to be someone who loves to compete. However, competing and winning are just a small part of the total equation.

My passion for contesting goes way beyond operating. It is actually based on people. As an active contest operator, I've had the opportunity to meet some of the most fascinating people one could ever imagine. They range from university students living in the Russian Urals to divisional General Managers of major US corporations. The friends I've made over the years through contesting are unlike most others I've made in "real life." We're not friends who simply exchange numbers, but friends who I count as some of the most engaging people you would ever want to meet.

I've enjoyed contesting over the years because contesters have always been a group that stretched the accepted envelope of normalcy in our hobby. In the early 1980s I participated in two ARRL Field Day operations where 15 separate transmitters (each running a KW) were set up and made operational in a 24 hour period. Our 20 meter antenna farm, as an example, consisted of an 80 foot tower with 4-element over 4-element 20 meter stacked Yagis (not bad by most fixed station standards!). After making 11,000+ QSOs both times, we simply took it all down and drove away. It may not have been a climb to the summit of Mount Everest, but it was an experience in amateur radio that I'll always remember.

And how could I fail to relate the experiences from meeting my long-time friend Victor, LY2BIG, during his first visit to the United States in 1991? Yes, we had spent years saying "you're 5905 . . . QSL, you're 5915" to each other. But there were tears in our eyes at that first eyeball that made all of our 2+ hour ragchews seem so meaningful. Victor enjoyed his stay in the US. And as you might expect from the contest community, he was treated to experiences that even you or I haven't had the chance to enjoy. Imagine the look on Victor's face as he drove a red Corvette down a lonely Texas super-highway. After two months of visiting—with my QTH being his last stop—Victor still took over 30 minutes to review the telephone section of our area's local electronic store. Victor asked, "Why do you Americans have so many telephones to choose from?" For me, friends like Victor are just another reason why I enjoy contesting so much.

As a contest operator, I had the honor to participate in the 1990 World Radio Team Championship in Seattle. It wasn't just an event where gold, silver, and bronze metals were awarded to worthy winners. Rather, the WRTC was a solid week of getting to know friends "face to face" from all over the world in a truly unique way. The WRTC event will always be one of my most pleasant memories in amateur radio as I began to really understand the struggles and joys of so many people from around the world on a firsthand basis—all contesters who had become my idols from decades of operating together on the bands. The more I talked to the likes of UW9AR, HAØMM, PY5EG, JE1JKL, and others, the more I learned how alike we really are in almost every respect.

The experiences I've gained from contesting could never be completely captured in a medium such as a contest column. Could I ever explain the thrill, fun, excitement, and camaraderie that came from operating with amateur radio legends such as W2PV, W3AU, or W4KFC? Could I ever adequately convey the roaring laughter that came from frequently raising and lowering a neighbor's garage door via his garage door opener while operating on 20 meter SSB or mistakenly screwing a Big Bertha array into the ground three times over at W2PV (neither of which were particularly funny at the time!)?

When I stop to think about my contest experiences, they are filled with fun and laughter that is so much more significant than the seeming uselessness of passing numbers back and forth that you may hear on the air. On one side of the coin, contesting has been more fun than you can imagine. On the other hand, the honor of participating in the presentation of Jim Lawson's (W2PV) final CQWW trophy only a few days before he died is something you can't convey easily in words. I'll never forget the tears in Jim's eyes as he witnessed real friendship by those who saw fit to honor a man's technical and operating achievements in the hobby—not by the number of 59s he passed out in the last contest.

If you've been an active contester over any period of time, I encourage you to think the way I have this month. If you're new at it, take heart that in future years you'll have your own stories to share. Perhaps even more important, if you dislike contest operating, consider the anecdotes I've shared with you this month. Like any aspect of our hobby, there's so much more than what you hear on the air!

c/o CQ magazine

Calendar of Events

May	21	NorthWest QRP Club CW Sprint
May	21-22	MFJ 90's RC QRP Contest
May	21-23	Michigan QSO Party
May	**28-29**	**CQ WW WPX CW Contest**
June	4-6	ARRL June VHF QSO Party
June	11-12	ANARTS WW RTTY Contest
June	18-19	All Asian CW DX Contest
June	25-26	ARRL Field Day
July	1	RAC Canada Day Contest
July	**9-10**	**CQ WPX VHF Contest**
July	9-10	IARU HF World Championship
July	16-17	Colombian Indepen. Day Contest
July	23-24	Venezuela CW DX Contest
July	23-24	SEANET CW Contest
July	30-31	Connecficut QSO Party
Aug.	6-7	YO DX Contest
Aug.	20-21	SEANET SSB Contest
Aug.	20-22	New Jersey QSO Party
Sept.	3-4	Bulgarian DX Contest
Sept.	3-4	All Asian SSB DX Contest
Sept.	5	Michigan QRP Club Sprint

Katashi Nose, KH6IJ Silent Key

As my deadline approached this month, I was deeply saddened to learn of the recent passing of another contesting great—Katashi Nose, KH6IJ. If you've been an active contester for the past few decades, I'm sure you can relate a personal story of the profound impact Katashi had on amateur radio in general and contesting in particular.

Katashi passed away on April 7, 1994 after suffering a severe stroke the week before. Born in Honolulu in 1915, he was the second son of parents who emigrated from Japan.

KH6IJ was first licensed as K6CGK in 1932 and became the first amateur radio operator in Hawaii to earn the ARRL's Worked All States award, in 1937—the first ever outside the continental U.S.

For 56 years Katashi wrote a newspaper column on amateur radio for the local newspaper, the *Honolulu Star-Bulletin*. He also authored numerous articles for amateur radio publications.

In my early years of contesting KH6IJ quickly earn legend status in my mind and that of most others. His smooth and steady operating style was something to admire. Katashi never missed picking me out of the QRM, even when I was using mediocre antennas. By the time I

hit the contest scene in the 1970s, Katashi had been a long-time contest champion. In fact, K6CGK (a.k.a. KH6IJ) was the very first winner of the CQ World-Wide in 1939, sponsored then by *CQ*'s predecessor, *Radio* magazine.

One of the biggest thrills of my amateur career was meeting Katashi face to face in Seattle during the 1990 World Radio Team Championship. Although frail from his first stroke, Katashi's humor and smile were something to treasure as I grasped the hand of one of contesting's great operators. There have been few others who ever equalled that eyeball experience.

As we all get older, we will continue to lose more of our friends. That's the way life has been designed. It doesn't mean, however, that we should ever forget each other's accomplishments. Katashi Nose was known to more contesters than practically any other active operator. Goodbye, my friend. You will never be forgotten!

Final Comments

That's it for this month. By now the Dayton Hamvention is history. I have a few stories that I'd like to share, but that will have to wait until the next column. Also, look out for a full report on the latest additions to *CQ*'s Contest Hall of Fame.

As always, please remember that the deadline for the September issue is July 1st.

73, John, K1AR

ARRL VHF Contest

1800-0300Z Sat.–Mon., June 4–6

Action will be found on the 50, 144, 220, and 420 MHz bands, and even higher up in the spectrum.

The scoring varies with the different bands used and there are certain requirements and restrictions in the rules. Complete rules can be found in the May issue of *QST*.

I recommend that you write to ARRL Headquarters for official forms. Include an SASE with your request to: ARRL VHF Contest, 225 Main Street, Newington, CT 06111.

ANARTS WW RTTY Contest

0000Z Sat., to 2400Z Sun., June 11–12

Sponsored by the Australian National Amateur Radio Teleprinter Society, this is the world working each other on all digital modes, 80–10 meters.

Classes: Single Operator, Multi-Single, SWL.

Exchange: RST, Time (UTC), and *CQ* Zone.

Scoring: This contest uses a complicated scoring method. A chart is available that calculates QSO points based on the zone location of the station you work. For space reasons we cannot publish the table. Perhaps you can obtain one via FAX or a local RTTY enthusiast. Multipliers are DXCC countries, continents. In addition, bonus points may be credited for working VK stations; 100 points—14 MHz, 200 points—21 MHz, 300 points—28 MHz, 400 points—7 MHz, 500 points—3.5 MHz. Final score is total QSO points times multiplier.

Awards: Awards will be issued for the first three places, on both a worldwide and country basis.

All logs must be **received** by September 1, 1994 and sent to: Contest Manager, ANARTS, P.O. Box 860, Crows Nest, NSW 2065, Australia.

All Asian DX Contest

CW: June 18–19 Phone: Sept. 3–4
0000Z Sat., to 2400Z Sun.

This is the 35th year of this activity sponsored by the JARL. The exchange is between Asian countries and the rest of the world.

Classes: Single operator, both single- and multi-band. Multi-operator, both single- and multi-transmitter, all band only (one signal per band only).

Club stations are classified as multi-operator, and each operator will give his age in the exchange.

Exchange: For OMs—RS(T) plus age of operator. For YLs—RS(T) and 00.

Scoring: Three points for contacts on 160; 2 points for contacts on 80; 1 point on all other bands.

Multiplier: Asians credit one multiplier for each different DXCC country worked per band. Non-Asians use the number of Asian prefixes worked on each band (*CQ* WPX list).

Final Score: Total QSO points from all bands times the total number of multipliers worked.

Note: JD1 stations on Ogasawara are in Asia, and JD1 stations on Minamitori Shima are in Oceania.

Awards: Certificates to the top scorers, both phone and CW in each country and U.S. call area. In each class, both single band and all band, up to the fifth rank, depending on the number of log returns. Medals will be awarded to the all-band continental leaders both single and multi-operator.

Logs: Keep all times in GMT. Use a separate column for the country or prefix multiplier, and fill in only the first time it is worked. Use a separate log for each band. Include a summary sheet showing the scoring and other information, and a signed declaration that all rules and regulations have been observed.

There is a strict disqualification clause for taking credit for duplicate contacts in excess of 2% of the total on each band, as well as other infractions.

Logs must be received no later than Sept. 30th for the Phone section, and July 30th for CW. They go to: JARL, Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Asian Country List: A4, A5, A6, A7, A9, AP, BV, BY, CR9, EP, HL/HM, HS, HZ/7Z, JA-JS, JD1, JT, JY, OD, S2, TA, all C.I.S. DXCC countries, VS6/VR2, VU, VU4, VU7, XU, XV/3W, XW, XZ, YA, YI, YK, ZC4/5B4, 1S, 4S, 4X/4Z, 70, 8Q, 9K, 9M2, 9N, 9V.

ARRL Field Day

1800–2100 Sat.–Sun., June 25–26

Without a doubt this activity generates more stateside participation in manpower than any other amateur radio activity. It is mostly a club-organized event, and requires that the coordinator be knowledgeable about all the various operating/technical requirements.

Entries are separated into many classes. Rules and requirements are quite extensive and will be found in the May issue of *QST*. It is advisable that you read them thoroughly. **Note: Starting this year, WARC band Field Day QSOs are not permitted.**

Official log forms are a must. Direct your request with a large SASE to the ARRL, ARRL Field Day, 225 Main Street, Newington, CT 06111.

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

BY FREDERICK O. MAIA, W5YI

GMDSS To Replace Morse Code At Sea

The Global Maritime Distress and Safety System, known primarily by the acronym GMDSS, represents the biggest improvement in marine safety since the first maritime regulations were enacted following the sinking of the *Titanic* in 1912. It is an automated ship-to-shore distress alerting system that relies on satellite and advanced land-based communications. By incorporating these innovative techniques into the safety system and using ship-to-shore communications links, the GMDSS will significantly improve safety of life and property at sea throughout the world.

The current distress and safety plan at sea is primarily a manual, ship-to-ship system that relies on Morse code radiotelegraphy on 500 kHz and voice telephony on 2182 kHz and 156.8 MHz (VHF Channel 16). Its effectiveness depends on the location of the nearest vessel, the current radio-wave propagation conditions, and the technical proficiency of the radio officer.

Under the GMDSS, licensed radio operators on board GMDSS-equipped ships will use modern equipment to send distress alerts over long distances with assurance that they will be received on shore.

The GMDSS represents more than a decade of work by the London-based International Maritime Organization (the IMO) and the International Telecommunication Union (ITU) headquartered in Geneva. Both the IMO and ITU are specialized agencies of the United Nations.

The IMO is the international governing body for the maritime service. Among its duties is the specification of equipment to be carried aboard certain classes of ships. The IMO is made up of representatives from 66 nations that account for more than 97 percent of the world's ocean shipping.

Nearly 200 nations strong, the ITU meets regularly to agree on radio operating procedures and on the allocation of radio frequencies. At the 1987 World Administrative Radio Conference for Mobile Services (MOB-87), the ITU adopted GMDSS associated revisions to the Radio Regulations.

A year later world shipping leaders gave the go-ahead for the introduction of

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

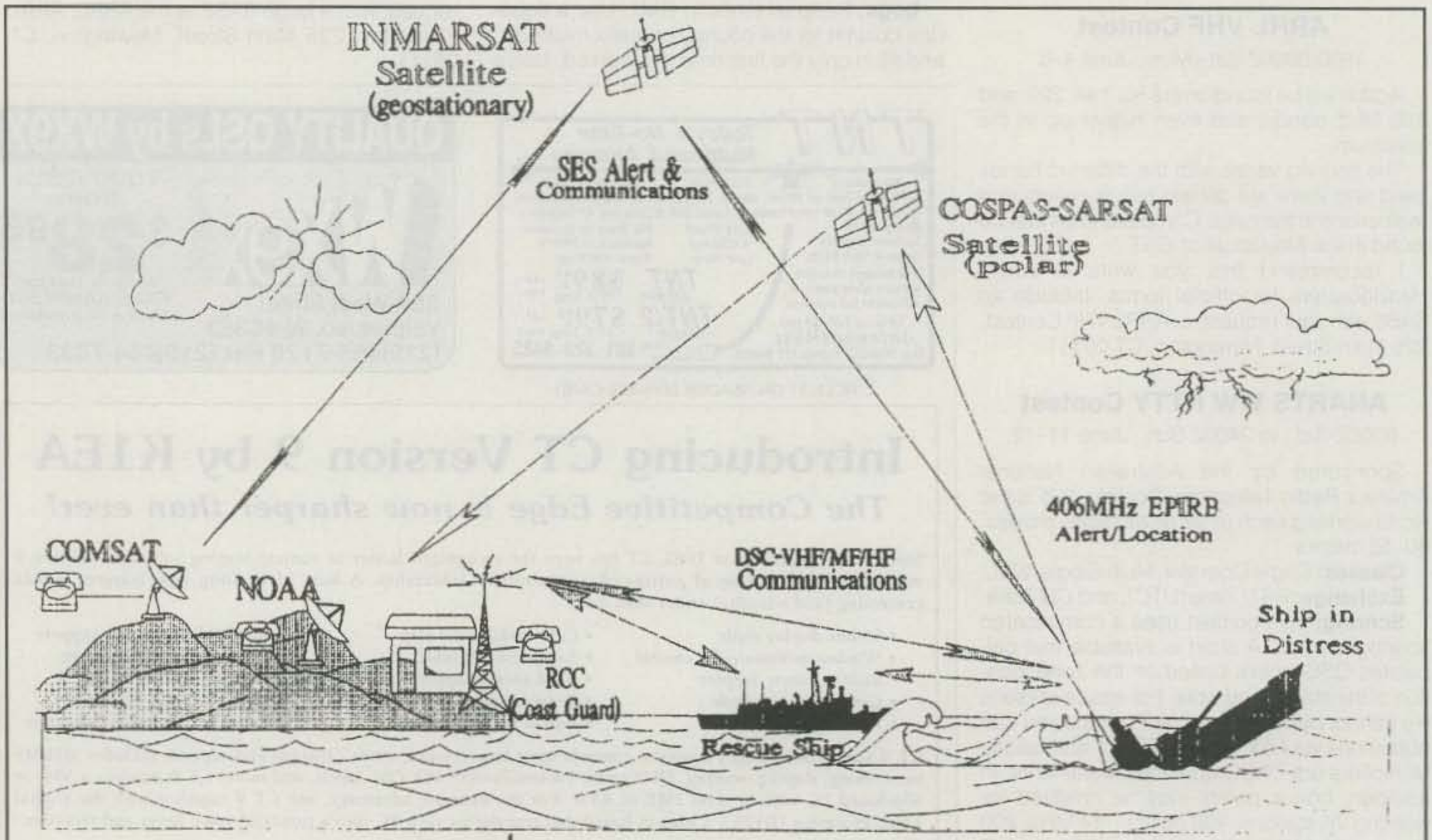


Fig. 1– An example of GMDSS communications. (Diagram courtesy the Federal Communications Commission)

Sea Area A1: is the area within VHF radiotelephone coverage of at least one coast station at which continuous DSC (digital selective calling) is available (approximately 20-30 miles).

Sea Area A2: is the area within MF radiotelephone coverage of at least one coast station at which continuous DSC is available (approximately 75 to 150 miles), excluding Sea Area A1.

Sea Area A3: is the area within the coverage of an INMARSAT geostationary satellite in which continuous alerting is available (approximately 70° North to 70° South), excluding Sea Areas A1 and A2.

Sea Area A4: is the remainder of the seas of the world (essentially the polar regions) and relies primarily on HF communications.

Table I– Ocean communication areas.

new automatic communications that would mean the end of Morse code for ships at sea. The IMO amended the 1974 SOLAS (Safety of Life at Sea) Convention to implement the Global Maritime Distress and Safety System internationally. They called it the decision " . . . one of the biggest advances in maritime communications since the introduction of radio."

In an October 1990 proceeding the Federal Communications Commission said they would adopt the international GMDSS provisions for U.S. "compulsory" vessels. A compulsory ship is defined as a large cargo ship of 300 tons gross tonnage and over, and all passenger vessels that carry more than 12 passengers regardless of the ship's size. Compulsory ships are required by law to carry certain radio equipment and personnel for safety purposes.

The FCC telecommunications regulations are contained in Title 47 of the Communications Act. Part 13 of Title 47 covers commercial radio operator qualifications, licenses, and examinations. The Part 80 Maritime Service rules specify the radio operator, the procedures, and the equipment carriage requirements aboard U.S. vessels. These regulations are based on the international and the domestic requirements of the 1974 SOLAS Convention and the U.S. Communications Act.

Just What Is The GMDSS?

Basically, it is a sophisticated ship-to-shore alerting system with ship-to-ship capability. Actually, it is made up of several communications systems, some of which have been in operation for many years. The COSPAS-SARSAT satellite system, which has been in operation since 1982, provides distress alerting using a 406 MHz emergency position-indicating radio beacon (commonly referred to as an EPIRB). This radio beacon automatically gives the ship's position and must be able to float free if the ship sinks.

COSPAS-SARSAT is a joint international satellite-based search and rescue (SAR) system established in Canada, France, the former USSR, and the United States to locate emergency radiobeacons transmitting on 121.5 and 406 MHz. The U.S. satellites in this system also receive on 243 MHz.

The International Maritime Satellite Organization's (INMARSAT) maritime mobile satellite system has also been in operation since 1982 and forms a major component for distress alerting and communications. In addition to the satellites, new automated terrestrial data systems and existing systems are combined into one overall communications system which makes up the Global Maritime Distress and Safety System.

The GMDSS will provide for new digital selective calling (DSC) services on the high frequency (HF), the medium frequency (MF), or the very high frequency (VHF) bands, depending upon the ship in

CURRENT	GMDSS
System:	
ship-to-ship	ship-to-shore
Equipment Determined:	
by ship size	by area of operation
Communications Range:	
nominal (150 to 200 miles)	worldwide using HF or satellites
Communications Quality:	
depends on propagation	improved by satellites and multiple frequency digital data transmissions
Watch Requirements:	
manual watch	automatic watch
Radio Operator:	
Morse code skilled radio tons	licensed radio operator officer on ships >1600 on all ships
Communications Requirements:	
different requirements	same requirements for all ships of different sizes, ships >300 gross-tons, and passenger ships

Table II– Distress and safety systems at sea.

EQUIPMENT	FUNCTION
406 MHz EPIRB	Ship-to-shore alerts via COSPAS-SARSAT satellite
VHF radio (DSC aand voice)	SAR Communications (Search and Rescue)
MF radio (DSC and voice)	Ship-to-shore alerts and communications
HF radio (required for sea area A4)	Ship-to-shore alerts and communications
INMARSAT ship earth station plus EGC capability	Ship-to-shore alerts, communications, and MSI (Safety Net)
NAVTEX receiver	MSI (Safety Net) 518 kHz
9 GHz SART	SAR locating beacon
Two-way VHF portable radios	SAR communications
2182 kHz watch receiver/ auto alarm	Receipt of 2182 kHz alerts until Feb. 1, 1999

Table III– GMDSS shipboard radio equipment. EGC = Enhanced group calling, MSI = Marine safety information, SAR = Search and rescue, SART = Search and rescue transponder. All GMDSS equipment must be type-accepted or approved by the FCC. INMARSAT is the primary satellite system used for GMDSS communications.

distress. These new DSC services will be used for ship-to-ship, ship-to-shore, and shore-to-ship automatic alerting, while existing terrestrial HF, MF, and VHF radiotelephony equipment provides distress, urgent, and safety related communications.

The GMDSS will enhance search and rescue operations at sea through the use of the new 9 GHz search and rescue transponder (SART). Finally, it will create a global network for the dissemination of maritime safety information (MSI) using three systems: NAVTEX, INMARSAT enhanced group calling (EGC), and HF narrow-band direct-printing (NBDP) radiotelegraphy. Manual Morse code—which the FCC refers to as "outmoded"—is not part of GMDSS at all.

The two most notable features of the system are that it is based on sea areas of operation and it offers multiple communications options. The first of these features, sea area basing, divides the seas into four communications areas (see Table I).

The sea areas are established by individual countries, which equip their shore stations with appropriate VHF, MF, HF, or satellite facilities to "cover" particular segments of ocean.

Multiple Options

The second significant feature of the GMDSS, multiple communications options, ensures that each ship using the GMDSS will have at least two options of distress alerting appropriate to its sea area. This redundancy will minimize the chance that a ship in distress will be unable to communicate because of weather, radio propagation difficulties, equipment failure, or other circumstances. This feature represents a significant improvement over the current distress system. A comparison of the primary features of the current distress and safety system and the GMDSS is given in Table II.

The basic concept of the GMDSS is that SAR authorities on shore, as well as shipping in the immediate vicinity of the ship in distress, can be rapidly alerted to a distress incident. The shore-based authorities designated as a Rescue Coordination Center (RCC) can then assist in coordinating rescue operations with minimal delay.

In the United States, the Coast Guard is the designated maritime SAR organi-

DATE	COMPLIANCE SCHEDULE
Feb. 1, 1992	Voluntary compliance, any ship may be GMDSS-equipped.
Aug. 1, 1993	All compulsory ships must have 406 MHz EPIRB and carry a NAVTEX receiver.
Feb. 1, 1995	Newly constructed compulsory ships must be GMDSS-equipped.
Feb. 1, 1999	All compulsory ships must be GMDSS equipped. Manual telegraphy, and watchkeeping on 2182 kHz and 156.8 MHz discontinued.

Table IV– GMDSS implementation schedule.

zation and will operate the necessary RCCs. The particular GMDSS equipment used to communicate varies by sea area and may have several alternatives. Table III is a simplified chart of GMDSS equipment and its primary functions, assuming a mid-ocean distress situation.

The IMO Conference prescribed two levels of GMDSS operators.

GMDSS Radio Operators

GMDSS ships must carry two GMDSS qualified radio operators for distress and safety radiocommunications purposes. They should be holders of the GMDSS Radio Operator's License (GMDSS/O). One shall be designated to have primary responsibility for radiocommunications during distress incidents. Each ship must carry a second GMDSS radio operator for backup purposes.

The GMDSS/O license is obtained by passing commercial radio Element 1 (Basic marine radio law) and Element 7 (GMDSS radio operating practices). Element 1 contains 24 questions (pass rate 18 answered correctly) and Element 7 contains 76 questions (57 must be answered correctly). Holders of the Marine Radio Operator Permit receive examination credit for Element 1. License term is 5 years, renewable.

GMDSS Radio Maintainers

The availability of the functional requirements of the radio equipment must be ensured by using methods such as duplication of equipment, shore-based maintenance, or at-sea maintenance, or a combination of these methods. (Two of these three methods are required in sea areas A3 and A4.) For ships using either duplication or shore-based maintenance options, licensed GMDSS radio operators are sufficient for safety communications requirements.

Ships electing at-sea maintenance, and only those choosing at-sea maintenance, will be required to carry a licensed GMDSS Radio Maintainer. Until the Communications Act is changed and license examinations are made available, the FCC is permitting T-1, T-2 (First and Second Class Radiotelegraph Operators), and holders of the GROL (General Radiotelephone Operator License) to act as a GMDSS Radio Maintainer "... because their examinations currently include knowledge of technical matters applicable to adjustments and repair of radio equipment."

The Radio Maintainer (GMDSS/M) may be one of the GMDSS Radio Operators or a different person. Actually, any member of the crew may be a GMDSS Radio Maintainer as long as he/she holds the license. The maintainer need not hold any other commercial radio operator license or be a radio officer.

The GMDSS/M license is obtained by passing commercial radio license Element 1 (Basic marine radio law), Element 3 (General radiotelephone electronics), and Element 9 (GMDSS radio maintenance practice and procedures). Element 1 contains 24 questions; Element 3 contains 76 questions; and Element 9 contains 50 questions. (Pass rate is 75% correct on each examination.) License term is 5 years, renewable. Holders of the Marine Radio Operator Permit receive examination credit for Element 1; the General Radiotelephone Operator License (GROL) holder receives credit for Element 1 and 3.

What About The Commercial Radiotelegraph?

At present only the question pools for Elements 1, 3, and 9 have been released to the public. These word-for-word questions—complete with their multiple choices, schematic diagrams, and the answer identified—are available from National Radio Examiners, Div. W5YI Group, Inc., P.O. Box 565206, Dallas, TX 75356 (VISA/MasterCard call toll free 1-800-669-9594).

Elements 5 and 6 are the question pools needed for the 1st/2nd/3rd Class Radiotelegraph, but they have not yet been released by the FCC. By the way, Extra Class amateur radio operators receive credit for the 2nd Class commercial telegraphy exam without testing.

73, Fred, W5YI

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Cycle Update

The present solar cycle, the 22nd observed since accurate records have been kept, continues to decline slowly towards a minimum, which is now expected to occur sometime between mid-1996 and early 1997.

The progress of sunspot cycle 22 from its beginning in September 1986 is charted in figs. 1 and 2. Fig. 1 shows smoothed sunspot numbers, while fig. 2 maps smoothed values of 10.7 cm solar flux levels. The graphs were prepared by the Space Environmental Services Center (SESC), U.S. Dept. of Commerce, Boulder, Colorado. Both graphs include SESC predictions for the remainder of Cycle 22, and for the next cycle, Cycle 23.

Table I lists in tabular form the smoothed sunspot numbers observed to date for cycle 22. Predicted numbers are shown for 1994. These predictions are based upon analyses made by the National Geophysical Data Center (NGDC), Solar-Terrestrial Physics Division, Boulder, Colorado. Note that the NGDC predicted values are somewhat higher than those predicted by the SESC. This is due to the different sunspot prediction models developed by both organizations.

The Solar-Terrestrial Physics Division of the NGDC has copied its master digital sun, sunspots, and geomagnetism data bases onto flopy disks for use on PCs. The "Zurich, Brussels, and International Sunspot Numbers (Wolf)" file is available. This file includes daily means (1818 to present), monthly, and smoothed monthly (1749 to present), and yearly means (1700 to present). Price is $50 for floppy disk, or $15 in report form. Floppy disk files are also available for 10.7 MHz solar flux (1947 to present), geomagnetic indices (1947 to present), sunspot region history, and coronal indices. Additional information can be obtained directly from the National Geophysical Data Center, Code E/GC2, Dept. 925, 325 Broadway, Boulder, CO 80303-3328 (phone 303-497-6761; FAX 303-497-6513).

The Royal Observatory of Belgium reports a mean sunspot number of 36 for February 1994. Daily values ranged between a high of 46 recorded on February 7, 13, and 28 to a low of 19 on the 21st.

February's mean value results in a 12-month running smoothed sunspot number of 52 centered on August 1993. This is a drop in three numbers from the previous month's level. A smoothed sunspot number in the mid-30s is forecast for June 1994.

The Dominion Radio Astrophysical Observatory at Penticton, British Columbia reports an adjusted mean value of 97 for the February 1994 10.7 cm solar flux level. This results in a smoothed value of 108 centered on August 1993. A level in the low 100s is expected during June 1994.

In last month's column the unusually high number of radio storms that ocurred during this past February was reported. The unusual storminess continued through March, with 13 days reported in this category. The most severe storm took place between March 7 and 9, when the worldwide A_p value soared above 50. The A_p value is a measure of geomagnetic instability, and values above 50 indicate severe geomagnetic storms. Other periods of radio storminess were reported on March 3, 10–15, 17–18, and 21.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for June 1994

	Expected Signal Quality			
Propagation Index.....	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 14, 18, 23-24	**A**	**A**	**B**	**C**
High Normal: 8, 11, 16-17, 19-21	**A**	**B**	**C**	**C-D**
Low Normal: 4-5, 7, 9-10, 13, 15, 22, 25, 29-30	**B**	**C**	**D**	**D-E**
Below Normal: 1, 3, 6, 12, 26 28	**C**	**C-D**	**D-E**	**E**
Disturbed: 2, 27	**C-D**	**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-to-poor (C-D) on June 1st, poor (D) on the 2nd, fair-to-poor on the 3rd, fair (C) on the 4th and 5th, fair-to-poor (C-D) on the 6th, etc.**

June Propagation

Summertime propagation conditions are expected on the HF amateur bands during June. These should be typified by somewhat *lower* optimum DX frequencies during most of the daylight hours, and somewhat *higher* usable frequencies

SESC Regression Model Prediction of Smoothed Sunspot Number

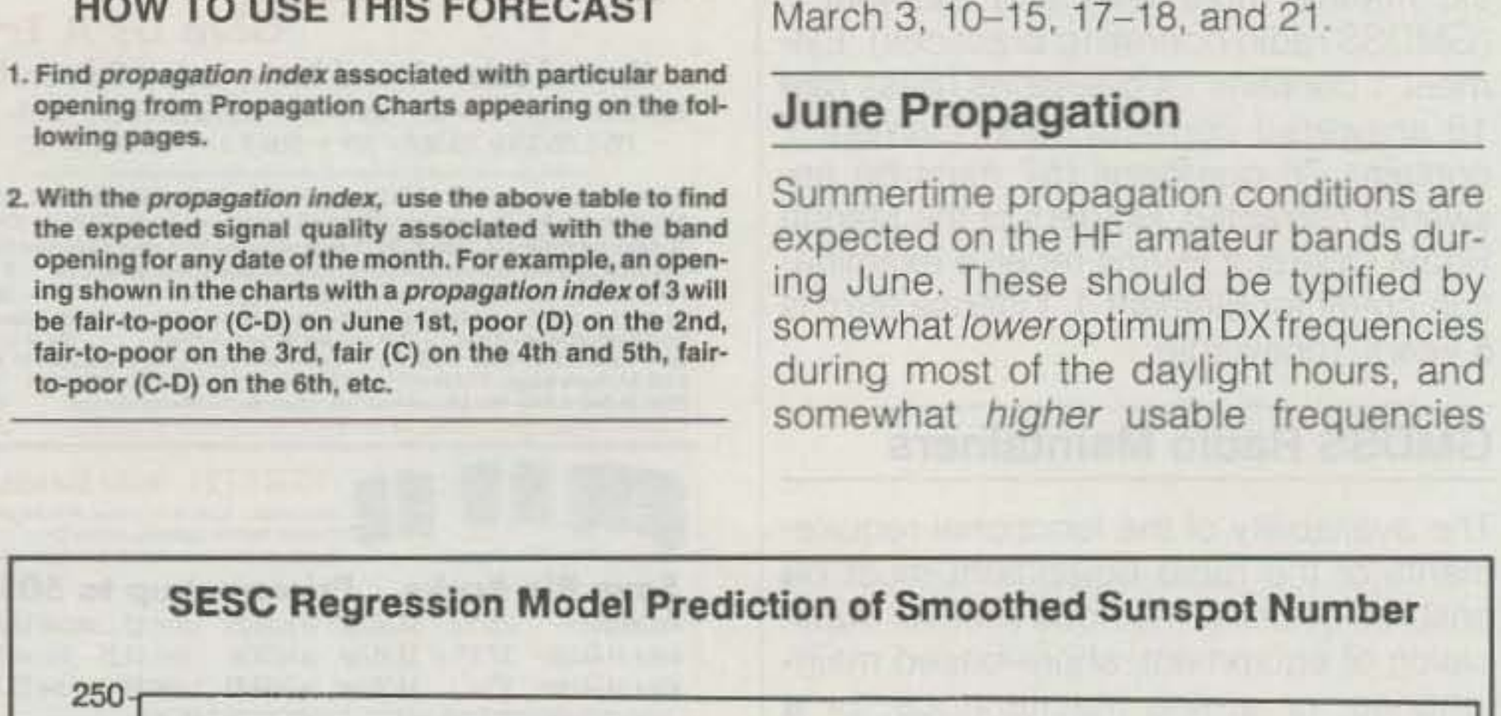


Fig. 1– Growth ofsunspot Cycle 22 from 1986 through August 1993, and a prediction for the remainder of the cycle and for Cycle 23, based on smoothed sunspot numbers.

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MARINE RADIOS
ICOM M7, M11, M56, M700TY, M800
AVIATION PORTABLE ICOM A-21
MOTOROLA MARINE KING KX 99

SCANNERS
AOR: 900, 1000, 1500, 2500, 2800, 3000A
ICOM: R-1, R100, R71A, R72A, R7000, R7100, R9000
Bearcat

Budwig ANT. Products
FLUKE 77, 83, 85, 87 Multimeters

Linear Amplifier
Ameritron, Icom, Kenwood, Yaesu

YAESU	ICOM
FT-23R/26/76	IC2/3/4SAT
FT411E-811-911	IC02AT/2SRA
FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

ICW2A
W2IAT
P2AT/4AT

IC-H16/U16
IC2IA

MOTOROLA RADIUS
COMMERCIAL RADIOS

Landmobile HT's
ICOM: U16, H16, V100, U400
MAXON, MOTOROLA,
YAESU: FTH 2008/7008
UNIDEN, REGENCY, KING,
MARINE ICOM: M7, M56, M700
AVIATION ICOM: A21 A200 H.T., TAD

TH-78A

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Month	1986	1987	1988	1989	1990	1991	1992	1993	1994
January	—	18	58	142	151	148	124	71	*45*
February	—	20	65	145	153	148	115	69	*43*
March	—	22	71	150	152	147	108	67	*42*
April	—	24	78	154	149	146	103	63	*41*
May	—	26	84	157	147	146	100	60	*40*
June	—	28	94	158	144	145	97	56	*39*
July	—	31	104	159*	141	146	91	55	*37*
August	—	35	114	158	141	147	84	52	*35*
September	12	39	121	157	142	145	80	*51*	*34*
October	13	44	125	157	142	142	76	*49*	*33*
November	15	47	130	158	144	138	74	*48*	*32*
December	16	51	138	153	144	132	73	*46*	*30*

*Table I– Progress of Sunspot Cycle 22 and predictions for the remainder of 1994. Predicted values are shown underlined. The peak value for Cycle 22 is shown with an *. (Based upon data supplied by the National Geophysical Data Center, Boulder, Colorado.)*

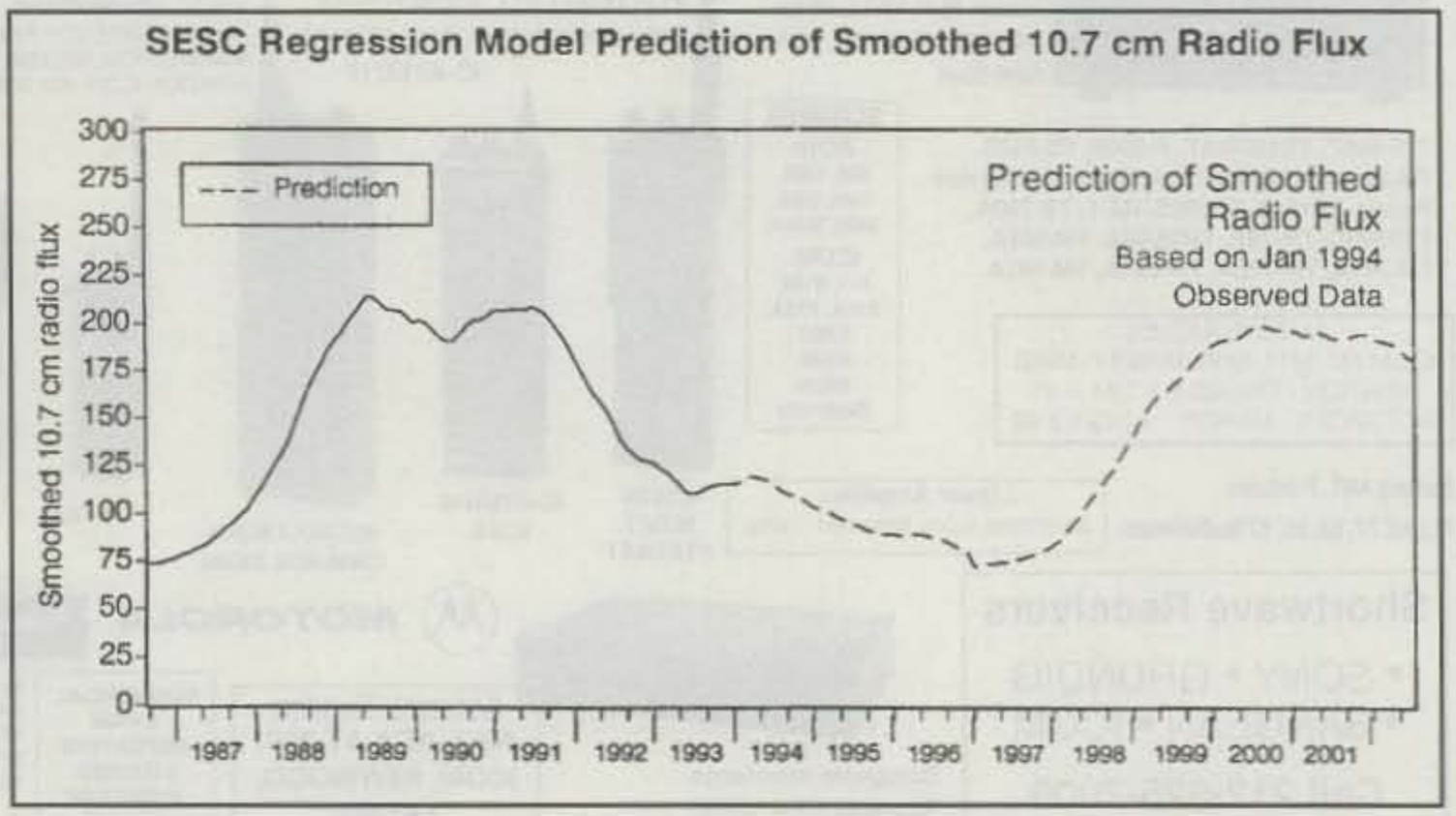

Fig. 2– Growth of sunspot Cycle 22 from 1986 through August 1993, and a prediction for the remainder of the cycle and for Cycle 23, based on smoothed 10.7 cm radio (solar) flux.

during the late afternoon, early evening, and nighttime hours, compared to conditions experienced earlier this spring.

Daytime signal absorption is expected to increase considerably during June and the summer months, resulting in generally weaker DX openings. Static levels generated by a seasonal increase in thunderstorm activity are expected to make DX reception difficult during the summer months, particularly on the 160, 80, and 40 meter bands.

Sporadic-E ionization is expected to increase considerably during June and is likely to reach a seasonal peak. This should result in improved short-skip conditions for distances up to at least 1300 miles.

This month's *CQ* Propagation Charts contain DXpredictions for the period June 15 through August 15, 1994. Short-Skip Charts for June for openings between 50 and 2300 miles, and from Hawaii and Alaska to the mainland, appeared in last month's column. Instructions for the use of this month's DX Charts appear elsewhere in this column.

In response to reader comments, the DX Propagation Charts beginning with this month's column have an area name change in order to keep abreast of recent political history. The geographic area previously called "European USSR" will be replaced by the term "Eastern Europe." This will continue to include, for propagation purposes, the newly independent states that formally were in the European area of the USSR.

The following is a brief band-by-band description of propagation conditions expected during June 1994. For specific times of DX openings, refer to the Propagation Charts on the following pages. See the Last Minute Forecast at the beginning of this column for a forecast of general day-to-day propagation conditions expected during June.

Twenty meters looks like it will be the best band for DX during June. It should

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

June 15 – August 15, 1994
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	11-16 (1) 16-18 (2) 18-19 (1)	06-09 (2) 09-13 (1) 13-15 (2) 15-17 (3) 17-22 (4) 22-00 (3) 00-03 (2) 03-06 (1)	20-22 (1) 22-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 22-00 (1)* 00-01 (2)* 01-02 (1)*
Northern & Eastern Europe	*Nl*	14-18 (1)	09-15 (1) 15-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-02 (2) 02-07 (1) 07-09 (2)	21-22 (1) 22-00 (2) 00-02 (1) 21-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	11-16 (1) 16-18 (2) 18-19 (1)	12-14 (1) 14-17 (2) 17-19 (3) 19-23 (4) 23-01 (3) 01-03 (2) 03-06 (1) 06-08 (2) 08-09 (1)	20-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	16-18 (1)	10-12 (1) 12-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-22 (1)	03-07 (1) 07-09 (2) 09-15 (1) 15-16 (2) 16-17 (3) 17-23 (4) 23-01 (3) 01-03 (2)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
Eastern & Central Africa	16-17 (1)	11-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-21 (4) 21-23 (3) 23-02 (2) 02-06 (1)	21-00 (1)
Southern Africa	10-13 (1)	09-11 (1) 11-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	00-01 (1) 01-05 (2) 05-07 (1) 15-16 (1) 16-18 (2) 18-19 (1)	21-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	*Nil*	10-12 (1) 19-22 (1)	17-20 (1) 20-23 (2) 23-03 (1) 06-09 (1)	19-21 (1)
Southeast Asia	*Nil*	10-12 (1) 19-21 (1)	19-21 (2) 21-23 (1) 23-01 (2) 01-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	*Nil*
Far East	*Nil*	10-12 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-12 (1) 19-20 (1) 20-23 (2) 23-00 (1)	*Nil*
South Pacific & New Zealand	18-21 (1)	15-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	18-21 (1) 21-23 (2) 23-01 (3) 01-03 (4) 03-04 (3) 04-07 (2) 07-09 (3) 09-10 (2) 10-12 (1)	01-03 (1) 03-06 (2) 06-08 (1) 04-06 (1)*
Australasia	18-20 (1)	10-12 (1) 18-19 (1) 19-20 (2) 20-21 (3) 21-22 (2) 22-23 (1)	23-01 (1) 01-02 (2) 02-04 (3) 04-05 (2) 05-07 (1) 07-09 (2) 09-10 (1) 16-18 (1)	03-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
Caribbean, Central America & Northern Countries of South America	09-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	08-09 (1) 09-11 (2) 11-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	07-10 (4) 10-16 (3) 16-00 (4) 00-03 (3) 03-06 (2) 06-07 (3)	19-21 (1) 21-23 (2) 23-03 (3) 03-05 (2) 05-06 (1) 22-23 (1)* 23-04 (2)* 04-05 (1)*

Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	12-14 (1) 14-16 (2) 16-18 (3) 18-19 (1)	08-09 (1) 09-11 (2) 11-15 (1) 15-16 (2) 16-17 (3) 17-20 (4) 20-22 (3) 22-23 (2)	11-16 (1) 16-17 (2) 17-18 (3) 18-02 (4) 02-04 (3) 04-07 (2) 07-09 (3) 09-11 (2)	20-21 (1) 21-22 (2) 22-02 (3) 02-04 (2) 04-05 (1) 22-03 (1)*
McMurdo Sound, Antarctica	*Nil*	16-20 (1)	17-19 (1) 19-23 (2) 23-01 (3) 01-03 (2) 03-05 (1) 07-09 (1)	02-05 (1)

Time Zones: CDT & MDT (24-Hour Time) CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*Nil*	15-18 (1)	05-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-00 (2) 00-02 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-00 (1)*
Northern, Central, & Eastern Europe	*Nil*	13-17 (1)	05-06 (1) 06-09 (2) 09-15 15-18 (2) 18-21 (3) 21-00 (2) 00-01	20-00 (1)
Eastern Mediterranean & Middle East	*Nil*	15-18 (1)	13-16 (1) 16-18 (2) 18-22 (3) 22-00 (2) 00-01 (1) 07-09 (1)	21-23 (1)
Western Africa	16-18 (1)	10-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	14-15 (1) 15-16 (2) 16-18 (3) 18-21 (4) 21-23 (3) 23-01 (2) 01-03 (1)	20-00 (1) 22-00 (1)*
Eastern & Central Africa	16-18 (1)	13-15 (1) 15-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	15-17 (1) 17-18 (2) 18-21 (3) 21-23 (2) 23-01 (1)	20-23 (1)
Southern Africa	10-12 (1)	09-10 (1) 10-12 (2) 12-13 (1)	22-00 (1) 00-03 (2) 03-07 (1) 13-15 (1) 15-17 (2) 17-19 (1)	21-22 (1) 22-00 (2) 00-01 (1) 22-00 (1)*
Central & South Asia	*Nil*	10-12 (1) 18-21 (1)	17-19 (1) 19-22 (2) 22-03 (1) 05-07 (1) 07-09 (2) 09-10 (1)	*Nil*
Southeast Asia	*Nil*	10-12 (1) 19-22 (1)	04-07 (1) 07-09 (2) 09-10 (1) 22-23 (1) 23-01 (2) 01-02 (1)	03-05 (1)
Far East	*Nil*	10-15 (1) 18-20 (1) 20-22 (2) 22-23 (1)	05-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-05 (1)	04-05 (1) 05-06 (2) 06-07 (1) 04-06 (1)*
South Pacific & New Zealand	18-20 (1)	13-16 (1) 16-18 (2) 18-20 (3) 20-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	17-19 (1) 19-23 (2) 23-01 (4) 01-05 (3) 05-07 (2) 07-09 (4) 09-11 (2) 11-13 (1)	23-01 (1) 01-03 (2) 03-05 (3) 05-07 (2) 07-08 (1) 01-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	17-20 (1)	14-15 (1) 15-17 (2) 17-19 (1) 19-20 (2) 20-21 (3) 21-22 (2) 22-23 (1)	22-00 (1) 00-01 (2) 01-05 (3) 05-07 (2) 07-09 (4) 09-11 (2) 11-12 (1)	01-03 (1) 03-07 (2) 07-08 (1) 03-06 (1)*

Caribbean, Central America & Northern Countries of South America	10-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-09 (1) 09-10 (2) 10-11 (3) 11-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	02-05 (2) 05-07 (3) 07-10 (4) 10-11 (3) 11-13 (2) 13-16 (3) 16-22 (4) 22-02 (3)	19-20 (1) 20-23 (4) 23-00 (3) 00-03 (2) 03-05 (3) 05-06 (1) 20-21 (1)* 21-23 (2)* 23-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-19 (4) 19-20 (3) 20-22 (2) 22-23 (1)	14-16 (1) 16-17 (2) 17-18 (3) 18-23 (4) 23-02 (3) 02-05 (1) 05-07 (2) 07-10 (1)	20-21 (1) 21-22 (2) 22-02 (3) 02-03 (2) 03-05 (1) 20-03 (1)*
McMurdo Sound, Antarctica	*Nil*	15-16 (1) 16-19 (2) 19-21 (1)	17-19 (1) 19-23 (2) 23-01 (3) 01-03 (2) 03-05 (1) 07-09 (1)	03-06 (1)

Time Zone: PDT (24-Hour Time) WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*Nil*	09-11 (1) 15-17 (1)	05-06 (1) 06-08 (2) 08-15 (1) 15-21 (3) 21-23 (2) 23-03 (1)	20-23 (1)
Central, Northern, & Eastern Europe	*Nil*	14-16 (1)	00-06 (1) 06-08 (2) 08-10 (1) 13-16 (1) 16-20 (2) 20-22 (3) 22-00 (2)	20-22 (1)
Eastern Mediterranean & Middle East	*Nil*	13-15 (1)	14-16 (1) 16-20 (2) 20-22 (3) 22-23 (2) 23-00 (1) 06-08 (1)	20-21 (1)
Western & Central Africa	14-16 (1)	07-09 (1) 11-13 (1) 13-17 (2) 17-18 (1)	14-16 (1) 16-18 (2) 18-20 (3) 20-21 (4) 21-23 (3) 23-03 (2) 03-04 (1) 07-09	20-22 (1)
Eastern Africa	*Nil*	13-16 (1)	16-19 (1) 19-22 (2) 22-00 (1)	*Nil*
Southern Africa	09-11 (1)	09-10 (1) 10-12 (2) 12-13 (1)	15-17 (1) 22-23 (1) 23-01 (2) 01-03 (1) 06-08 (1)	20-23 (1)
Central & South Asia	*Nil*	10-12 (1) 19-21 (1)	05-07 (1) 07-09 (2) 09-11 (1) 16-19 (1) 21-23 (1) 23-01 (2) 01-02 (1)	05-07 (1) 19-20 (1)
Southeast Asia	*Nil*	10-12 (1) 19-21 (1)	23-01 (1) 01-03 (2) 03-06 (3) 06-07 (2) 07-10 (1) 16-19 (1)	02-06 (1)
Far East	*Nil*	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	19-21 (1) 21-23 (2) 23-02 (3) 02-04 (4) 04-07 (2) 07-09 (3) 09-11 (2) 11-13 (1)	01-02 (1) 02-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 03-05 (1)*
South Pacific & New Zealand	13-15 (1) 15-18 (2) 18-20 (1)	10-12 (1) 12-15 (2) 15-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	17-19 (1) 19-21 (2) 21-02 (4) 02-06 (2) 06-08 (4) 08-10 (3) 10-11 (2) 11-12 (1)	22-23 (1) 23-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 23-02 (1)* 02-05 (2)* 05-06 (1)*
Australasia	15-17 (1) 17-20 (2)	13-15 (1) 15-18 (2)	20-22 (1) 22-23 (2)	22-00 (1) 00-01 (2)

	20-21 (1)	18-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	23-00 (3) 00-03 (4) 03-05 (3) 05-06 (2) 06-08 (3) 08-09 (2) 09-13 (1) 13-15 (2) 15-17 (1)	01-05 (3) 05-06 (2) 06-08 (1) 01-04 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (1) 15-17 (2) 17-18 (1)	09-11 (1) 11-14 (2) 14-16 (3) 16-19 (4) 19-20 (2) 20-21 (1)	18-01 (4) 01-03 (3) 03-05 (2) 05-08 (3) 08-11 (2) 11-14 (1) 14-16 (2) 16-18 (3)	19-21 (1) 21-23 (3) 23-04 (2) 04-05 (1) 20-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	08-11 (1) 11-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-21 (1)	14-16 (1) 16-18 (2) 18-19 (3) 19-23 (4) 23-01 (3) 01-02 (2) 02-05 (1) 05-07 (2) 07-10 (1)	20-21 (1) 21-00 (2) 00-02 (1) 02-03 (3) 03-04 (2) 04-05 (1) 02-04 (1)*
McMurdo Sound, Antarctica	*Nil*	17-21 (1)	16-18 (1) 18-19 (2) 19-24 (3) 24-03 (2) 03-07 (1)	00-06 (1)

*Indicates best times 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.
**Indicates best times to listen for F-2 layer openings on 6 meters.
For 12 meter openings inetrpolate 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.

open shortly after sunrise and remain open for several hours in almost all directions. When propagation conditions are normal or better, chances are good for openings to Europe, Central and South America, the South Pacific, Australasia, and the Far East, before noon-time absorption sets in. A second, and stronger, peak is expected during the afternoon and early evening hours. During this time good openings should be possible towards Europe and Africa, Central and South America, and towards the Middle East. Later in the evening, and until midnight, openings should peak towards South America, Antarctica, the South Pacific and Australasia, and the Far East. When conditions are somewhat better than normal, look for 20 meter openings towards the south and to the Pacific and Oceania well past midnight.

Few, if any, DX openings are expected on 10 or 12 meters, except to those areas of the Caribbean and Central America within the 1300 mile range of short-skip sporadic-E openings from the USA. An occasional longer opening into South America may be possible during the late afternoon hours. Except for sporadic-E openings within a 1300 mile radius, not much DX is expected on 15 or 17 meters until after noon. During the afternoon hours the bands should open towards Central and South America, with signals building up to very strong levels by the later afternoon. Occasional openings towards Africa and Europe may also be possible during the late afternoon.

With fewer hours of darkness and a sharp seasonal increase expected in the

level of static, DX conditions on 30 and 40 meters are not expected to be as good during June as they were earlier this year. Nevertheless, the bands should open to many parts of the world from shortly before sunset and remain open to just after sunrise, often with exceptionally strong signals.These should be good DX back-up bands to 20 meters during most of the period of darkness.

The shorter hours of darkness and seasonally high static levels are expected to adversely affect DX propagation on both the 80 and 160 meters bands during June and the summer months. DX openings to some areas of the world are forecast for 80 meters during the hours of darkness, but signals will often be weak andnoisy. Not much DX is expected on 160 meters until the fall, but an occasional opening may be possible during the hours of darkness.

Plenty of good short-skip openings are expected on the HF bands during the month. For distances less than 250 miles, try 80 meters during the day and 160 meters at night. For openings between 250 and 750 miles, 40 meters should be best during the day and 80 meters at night. Twenty meters should be optimum for openings during the day between 750 and 1300 miles, with 30 and 40 meters best from sundown to midnight and 80 meters from midnight to sunrise. Between distances of 1300 and 2300 miles use 20 meters during the day and 30 and 40 meters at night. Frequent short-skip openings, resulting from sporadic-E propagation, are also expected on 10, 12, 15,and 17 meters over distances between approximately 600 and 1300 miles. Fifteen and 17 meters should open over longer distances, up to 2300 miles, during the afternoon hours.

VHF Ionospheric Openings

Sporadic-E propagation increases considerably during June and the summer months, and this is expected to result in fairly frequent 6 meter short-skip openings over a range of 1000 to 1400 miles. During periods of wide-spread and intense sporadic-E ionization, two-hop 6 meter openings may occasionally be possible up to distances of approximately 2500 miles.

An occasional sporadic-E opening on 2 meters can occur, particularly when ioniztion is very intense, over distances between approximately 1200 and 1400 miles.

While sporadic-E propagation can occur at any time, hence its name, it is most likely to take place between 10 AM and 2 PM and again between 6 and 10 PM, local daylight time.

Meteors from the *Herculids* and *Scorpiids* showers are likely to enter the earth's atmosphere during the first half of June. Although classified as minor showers, some meteor-type propagation should be possible on the VHF bands between June 3 and 5, when both showers are expected to peak in intensity.

Trans-equatorial (TE) scatter openings are expected to fall off considerably during June, but a rare opening on 6 meters may be possible between 8 and 11 PM, local daylight time, on long north-south paths which cross the geomagnetic equator at an approximate right angle. TE openings, if they are to occur at all, will favor locations in the southern tier states.

While very little auroral activity is expected during June, some may occur during periods of radio storminess. Check the Last Minute Forecast at the beginning of this column for those days in June which are expected to be Below Normal or Disturbed. These are the most likely days on which auroral activity may occur.

73, George, W3ASK

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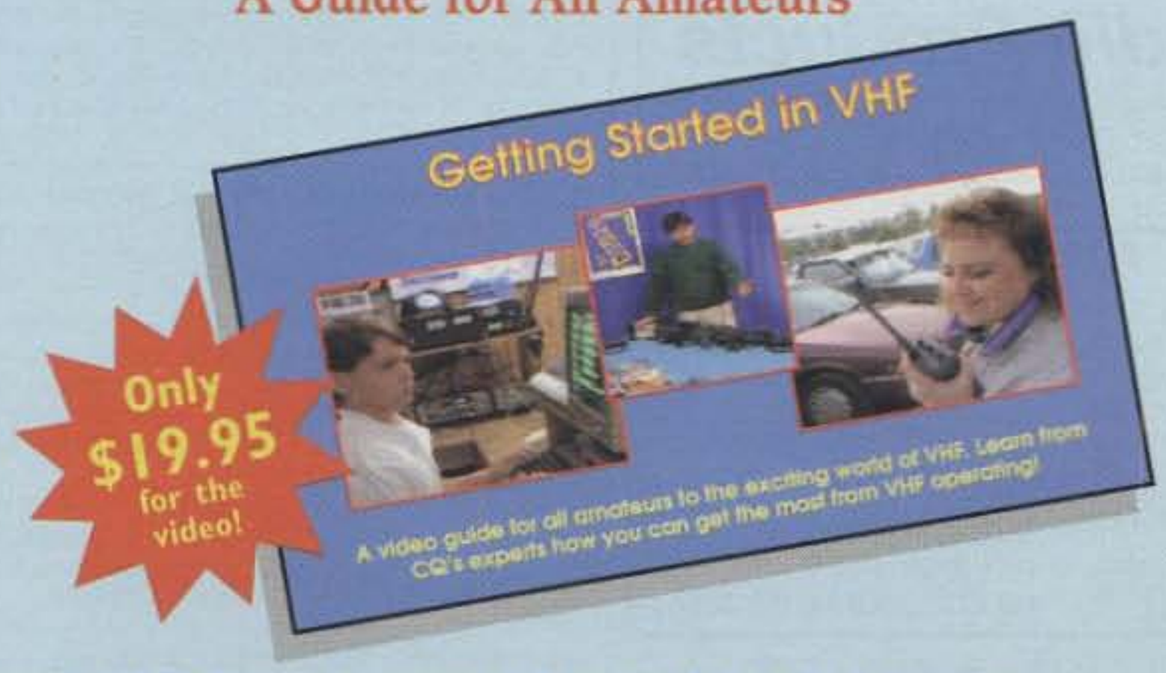

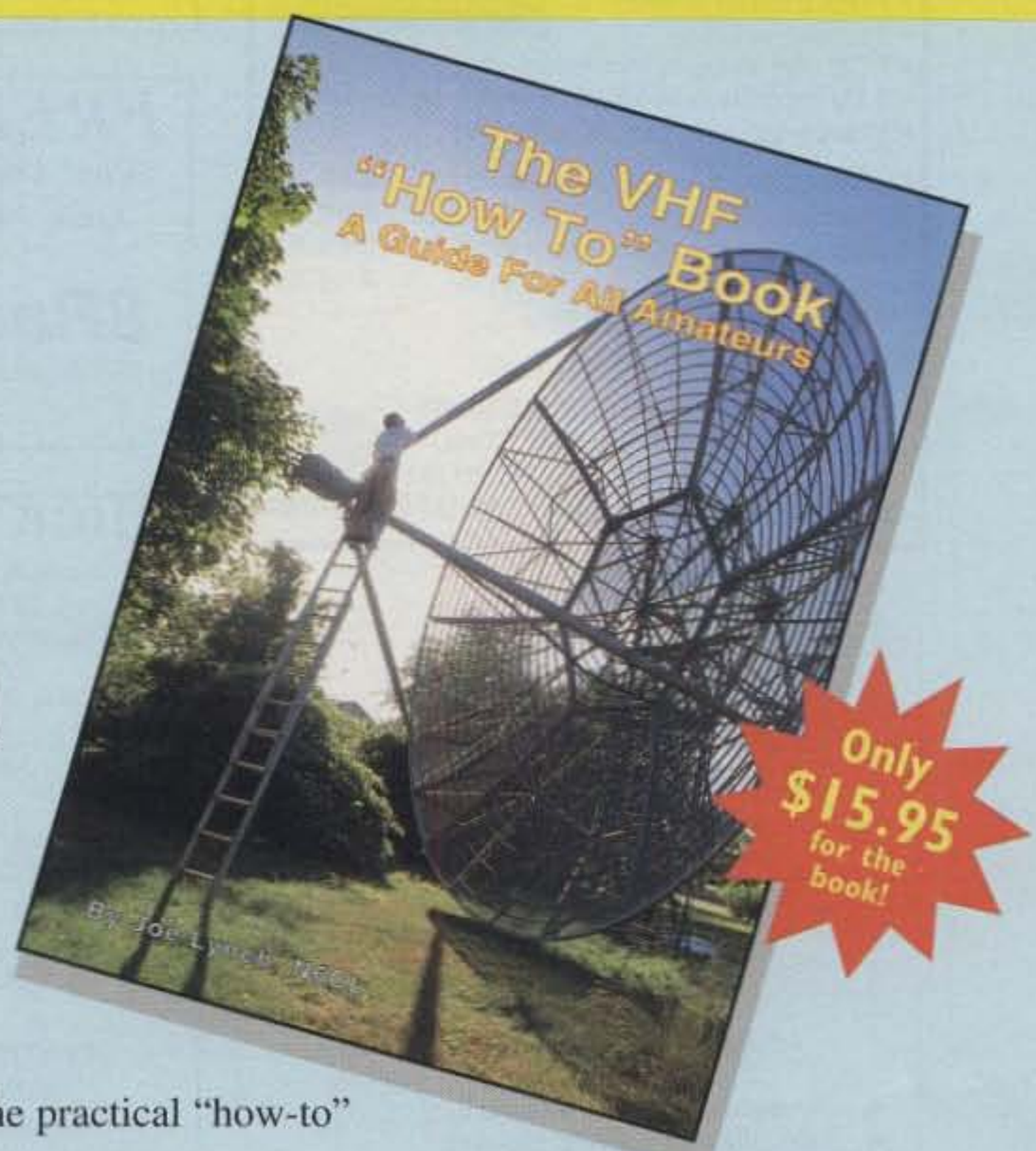

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SGC, a world leader in HF SSS equipment, is seeking experienced RF engineers. Experience in transmitter and receiver design, A/D converters, digital voice processing, and low noise oscillators is required. Preference to licensed amateurs. SGC, Inc., P.O. Box 3526, Bellevue, WA 98009. Principals only.

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S BAND MICROWAVE ANTENNA SYSTEM. For free information package and pricing, write R.C. Distributing, Box 552, South Bend, IN 46624 (219-236-5776).

AMATEUR RADIO CALLING CARDS. Your amateur call sign, name, address, and telephone number (if desired). Give out to your friends at your next meeting or hamfest. 100 cards for only $13.95. For free samples send SASE to CREATIVE IMPRINTING COMPANY, WB4FIH, 6522 Chesterfield Ave., McLean, Virginia 22101.

WANTED: National HRO-500 solid-state receiver. Must be in operating condition and with instruction manual, if possible. LOVETT, Box 550, Cape Charles, VA 23310.

WANTED: TEST EQUIPMENT CATALOGS. Hewlett Packard, Fluke, Tektronix, Tracor, etc., from the 1970s, 80s, and 90s. Call Bill at 800-526-0388. Bill Scolnik, P.O. Box 603, Hawthorne, NJ 07506.

WANTED: COLLINS KW-1. Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170 (1-313-453-8303).

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NEED SCHEMATICS for Bearcats BC-150, BC-200, BC-210. Will pay. Sam's OK. KI5HS, 15326 Tonya Dr., Houston, TX 77060.

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ROSS' $$$$ NEW June (ONLY) SPECIALS: Save time and money, have model number and manufacturer ready when you call or write. Kenwood TS-950SD $2950.00, HMC-1 $53.50. AEA PK-232MBX $310.00, HL-60 $215.00. ALINCO Call. YAESU FT-415/25B $255.00, FT-470 $355.00. ICOM 3230 $635.99, BP-23 $30.00, BP-70 $63.00, 707 $815.00, O4AT $250.00, 471H $1150.00. MFJ 815B $53.50. BENCHER Call. BUTTERNUT Call.CUSHCRAFT A3WS $250.00, AR-270 $55.50. TELEX HY-GAIN HAM-IV $310.00, T2X $360.00, CD-45II $225.00. RF CONCEPTS Call. MIRAGE Call. LARSEN Call. LIMITED TIME OFFERS. LOOKING FOR SOMETHING NOT LISTED OR HARD TO FIND? CALL OR WRITE. Over 9000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. Hours Tuesday-Friday 9:00 to 6:00, 9:00 to 2:00 P.M. Mondays. Closed Saturday & Sunday. ROSS DISTRIBUTING COMPANY, 78 South State, Preston, Idaho 83263 (208-852-0830).

TRANSCEIVERS. Kenwood TS830S $600, TS530S $500, TS520S $375, TS820S $475. Yaesu FT101E $375. TS430S AM Filter $50. K1BW, 508-537-7195.

WANTED: Johnson Ranger II in good working order and excellent exterior. Don, KA4ETR, 613 Greenbriar Rd. #21, Warner Robins,GA 31093 (912-929-5871).

HEATHKIT AMATEUR RADIO EQUIPMENT for sale. HW-101, SB-100, SB-101, SB-102, SB-104A, SB-200, SB-230, DX-60,HD-15, SB-614, SB-644. Also ICOM IC-22A, KDK FM 2025 MK 11. 30-day warranty. RTO Electronics, 9046-3 US 31, Ber rien Springs, MI 49103 (616-473-3201).

FOR SALE: UNIDEN 2600 President 10 meter transceiver, excellent, will ship, $135. D. Murano, 5829 Gulfport Blvd., Gulfport, FL 33707 (813-345-0507; FAX days 813-464-4060).

FOR SALE: KENWOOD, TS-820 transceiver, 300 watts, 10–80 meters, WWV, digital, LSB, USB, CW, FSK, with microphone, manual, good condition, will ship, $300. D. Murano, 5829 Gulfport Blvd., Gulfport, FL 33707 (813-345-0507; FAX days 813-464-4060).

FOX TANGO NEWSLETTER: Collector's editions. Call for years available. Entire library $30.00. Great for Yaesu enthusiast. International Radio & Computer, Inc., 407-489-5609.

QSLS—ELEGANT, AFFORDABLE. Samples $1 (refundable with order). AACO, Dept. C46, 1639 Fordham Way, Mountain View, CA 94040.

HF AMPLIFIER KITS, 14 VDC, 2SC2879, 600W $215, 1200W $420. SASE to KD4YBC, 7824 Tiburon Dr., Largo, FL 34643.

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WANTED: Accessories for Atlas 210X, 220-CS AC Console, MT1 Mobile Antenna Matcher, DD6-C Digital Dial. Write or call Jack, VE4AE, #148-144 Portsmouth Blvd., Winnipeg, MB R3P 1B6 Canada (204-895-2039).

DISCOUNT PRICES AT RT ELECTRONICS: 10/11 meter radios, antennas, scanners, power supplies, and more. Free flyer. P.O. Box 2123, Warren, Ohio 44484 (phone 216-369-1789).

DON'T WAIT IN LINE! Advance tickets save you time and money! Suncoast Amateur Radio and computer convention, November 19 & 20, 1994, Florida State Fairgrounds. $5 Advance Tickets. Write: FGCARC, P.O. Box 2423, Clearwater, Florida 34617-2423.

ANGUILLA—VP2E! Ham apartment for 1 or 2 persons. Multiband Yagi, 40M Yagi, R7 Vertical, tuner, power supply. Call Dave, VP2EHF, or Dorothea, VP2EE, 809-497-2150.

LET ME SHOW YOU the tips and techniques of amateur astronomy. Clear Skies quarterly newsletter $19.00. MC/VISA/AMEX. 1-800-501-3003.

HOMEBREWERS: Build 20 original CW projects with hamfest parts. $4.00 US; $5.00 Canada/Mexico; $6.00 elsewhere. Robert D. Null, N4QR, 501 North First Avenue, Maiden, NC 28650-1105.

MORSE CODE COMPUTER INTERFACES for IBM $49.95. Free IBM Shareware and Ham Catalog. Dynamic Electronics, Box 896, Hartselle, AL 35640 (205-773-2758, FAX 773-7295).

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WANT: Bencher paddles, BY-1 or BY-2. Also need spare parts for these. KB5AYO, Glenn Torres, 584 Central Ave., Reserve, LA 70084.

I'D LIKE TO BUY OR BORROW information (books, reprints, etc.) on DIVERSITY reception and/or transmission. Also want non-ARRL Antenna Books, technical or engineering level. W. Clem Small, 764 Coal Pit Rd., Corvallis, MT 59828 (406-961-5262).

WANTED: Defective Beckman HD-100 multimeter for parts. Handheld type with a yellow case. Call 606-236-6510. George Griebe, WQ4Z, 650 Chestnut, Parksville, KY 40464-9624.

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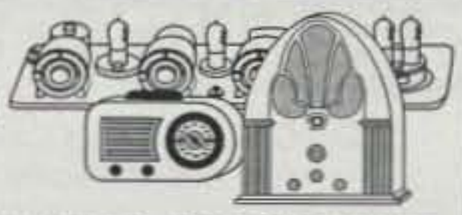

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QST 1930–1993 $500, textbooks, ARRL, physics, ham parts, ham items. SASE to Bill Tucker, W4FXE, 1965 S. Ocean Dr. 15-G, Hallandale, FL 33009 (305-456-1349).

WANTED: Kenwood AT-250, SP-430, copy of Service Manual for TS-130S. Yaesu FBA-2 Battery Pack Adapter, new, $4.00. D. Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065 (619-789-3674).

NEW PROP PITCH MOTOR in original container, Hy-Gain Rotor-Brake 400 Rotator, one 50 amp 120V Variac, 3600V 120/220 oil-filled transformer. Hal Thomas, K6GWN, 310-944-2325.

VHF/UHF STUFF: SHF 903 MHz XVTR $150, MMT 144/28 XVTR $195, 6 mtr. T.E. 400WT Amp 0550G $300, H.B. 220 MHz 250WT Amp $185. Clem, W8VO, 810-795-4670.

WANTED: Unassembled Heathkit HF Linear Amplifier. Adam Boettiger, N7VEW, P.O. Box 10942, Yakima, WA 98909.

NEED SCHEMATICS for Bearcats BC-150, BC-200, BC-210. Will pay. Sam's OK. KI5HS, 15326 Tonya Dr., Houston, TX 77060.

CRYSTALS: SASE for list. K8LJQ, 2023 Lannen Rd., Howell, MI 48843-9255.

WANTED: KDK FM-240 transceiver for 2 meters. State condition. Call 606-236-6510. George Griebe, WQ4Z, 650 Chestnut, Parksville, KY 40464-9624.

FOR SALE: Drake TR-3 10–80 meters tube transceiver, comes with mike, manual, external PS. $250, U pay shipping. More info send SASE to P.O. Box 518, White House, FL 32220.

FOR SALE: IC-781. B/O $4500. Poss deliv. MA, VT, NH. Bill Welch 508-653-2347 (eves).

WANTED: Collins 30S1, Drake TR-6/AC-4, Cushcraft 17B2, Diamond SG-2000, Icom CP-13. KØMK—218-865-6541.

WANTED: Heathkit HD-8999, CW keyboard, disco-era 12" 45 RPM records. T.N. Colbert, General Delivery, Burton, OH 44021.

WANTED: 2 new 6146B tubes. Q.R. Galbraith, K5TVC, 4303 Kingsway Drive, Farmington, NM 87402.

FOR SALE: NYE VIKING 020-001 2 KW Low-pass filter, $30 plus $5 UPS shipping. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

HY-GAIN ANTENNAS. 205BA 5 element 20 meter mono-bander, used very little, $300. 105BA 5 element 10 meter mono-bander, like new, $100. BOTH $375. You ship. K7ABV, 406-727-7032.

FOR SALE—HEATHKIT HW-101 with P.S. SB200 amp. Never used. All very mint. $600 FOR ALL. Local only. W6PZX, P.O. Box 183, Cool, CA 95614.

FOR SALE: HEATHKIT MODEL SA-2500 Auto-Tune Antenna Tuner, 160 thru 10 meters (2000w SSB, 1000w CW input) with manual, original box, excellent condition, $260 plus shipping. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

WANTED: C-1024/ARC-27, C-1025/ARC-27, C-404A/ARC-3 control units. Charles T. Huth, 229 Melmore Street, Tiffin, OH 44883.

RADIO WORKS Y1-4K, High Power, Current-Type, Beam Balun $10.00. Walt Grosch, KZ9F, 1735 Stoneway Court, Richfield, WI 53076 (414-628-1558).

WANTED: FP707 AC supply for FT707 xcvr with connecting cable. Please advise price FOB. Harry J. Raye, W1SMQ. Shore Road, Box 28, Perry, ME 04667 (207-853-6630).

DX-SCUBA PEDITION "ZF"—Grand Cayman Island home for rental. Enjoy the beautiful waters of the Caribbean by day, and work the big pile-ups at night! For info please contact: Kirk Fabrizio, ZF2RH, AH6ML, 218 E. Pedregosa, Santa Barbara, CA 93101 (805-687-4312).

CRYSTALS FOR HEATH, Drake, etc., HF, VHF, UHF, all sizes. $10 each. Send your needs and SASE. For my equipment list: $1 & SASE. Joe Bedlovies, P.O. Box 139, Stratford, CT 06497.

OPERATE AM? Advanced Modulation extends positive peaks to 1500 watts. $2 for circuits. W4CJL, 202 Baker Drive, Florence, AL 35630.

WANTED: Dentron 75 meter MLX-20 Xcvr, with manual and working. L. Smith, Route 1, Box 368D, Poland, IN 47868.

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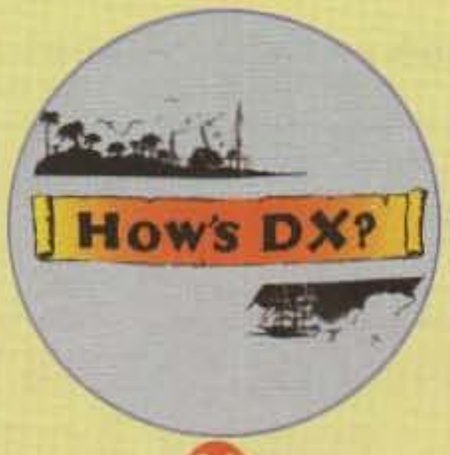

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SPAM's Advanced Modulation's Positive Peaks allows 1500W. PEP. $2 brings circuits. W4CJL, 202 Baker Drive, Florence, AL 35630.

FOR SALE: CQ/HR/73/QST Magazines. SASE for list. Ernie Guimares, KA1VY, 401 Bedford Street, Lakeville, MA 02347.

QST 1930–1949, $250. Ham items and parts, textbooks, physics, radio, ARRL, lists. SASE to Bill Tucker, W4FXE, 1965 S. Ocean Drive, Apt. 15-G, Hallandale, FL 33009 (305-456-1349).

FOR SALE: D-104 microphone, $25. GE desk microphone with electret element, $20. Ken Lowrey, KF8BC (513) 779-4148.

WANTED: Ameco TX-86 transmitter. KD2HW, 101-23 Lefferts Blvd., Jamaica, NY 11419.

WANTED: HEATH HP-24, AC power supply for HA-14 amplifier. Will consider both units if necessary. Ray, N5DIJ, P.O. Box 195, Sargent, GA 30275 (404-253-7572).

SELL brass telegraph key, R.A. Kent model KT-1, new condition, $120 (including shipping). Bill, W6PRI (408) 996-7624.

WANTED: MFJ-9040, Ten-Tec Scout 555, paddle and 8086 type laptop computer. AA8NT, ex KC8HF, 5354 Fox Ridge Drive, W. Bloomfield, MI 48322.

ASSEMBLY MANUAL for Heathkit IM-13 VTVM, $4.00. D. Heise, AA6EE, 16832 Whirlwind, Ramona, CA 92065 (619-789-3674).

CRYSTALS: SASE for my list. K8LJQ, 2023 Lannen Road, Howell, MI 48843.

WANTED: E.F. Johnson Navigator, Ranger, Pacemaker or Valiant transmitter. 250-39 T/R switch, 1 kW antenna tuner. Price/condition to AB6YW, P.O. Box 1441, Vallejo, CA 94590 (707-642-9842).

WANTED: Service manual/schematic for JFD model 7200 field strength meter. Marvin Moss, Box 28601, Atlanta, GA 30358.

WANTED: For Hallicrafters S-120 receiver the following tubes: 50CS, 2AV6, 12BH6, and a 12Be6. Reasonable price. Also face plate for the same receiver. David Wood, P.O. Box 174, Scarborough, ME 04074-0174.

TRYING TO REVIVE badly made, very sick Allied Knight Kit R55A rcvr. Need manual/schematic. Any help appreciated. Jack, WA4CSM, 8109 N.W. 58 Ct., Tamarac, FL 33321 (305-721-2337).

LOOKING FOR MANUALS, SCHEMATICS on the Pawnee Heathkit model HW-20 transceiver. David Wood, P.O. Box 174, Scarborough, ME 04070-0174.

DRAKE: Rare SC-2/SC-6 converters with CPS-1 P/S in CC-1 converter console with manuals. LIKE NEW. Best offer. Joe, 3700 Cliffwood Drive, Bedford, TX 76021 (817-281-1128).

HELP WANTED: To get copies of articles describing the "Swiss Quad," its formula to build it,and/or measures to experiment with it on 2 meters and 435 MHz. I will pay expenses for copies and mail. Please contact XQ3DPD, Michel, P.O. Box 9, STGO 10, Santiago Chile, or FAX (562) 232.81.97.

Cushcraft AR-6, Six Meter Ringo 1/2 Wave Vertical Antenna, $30.00. Walt Grosch, KZ9F, 1735 Stoneway Ct., Richfield, WI 53076 (414-628-1558).

FOR SALE: Collins CP-1 Xtal Pack. No extractors. Good cond. $100. Very good $115. Gary Gleicher, Box 427, Little Neck, NY 11363 (718-423-1911 eves).

WANT: Track diagram books for CNW, BN, KCS, CR, CSX, NS or others. E. of Mississipi. T.N. Colbert, WA8MLV, Burton, Ohio 44021.

HEATH SB-200 with an extra pair (new) 572B's. Low time on air. Original builder. $495.00. WA2RHA, 609-298-2871.

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Advertiser's Index

(continued on page 155)

HARD TO FIND Heath, Drake, etc., parts and manual copies. SASE/quotes. UT2000B $215. MS-4 $60. 100W QRP Amp $195. List $1 & SASE. Joe Bedlovies, POB 139, Stratford, CT 06497.

HALLICRAFTERS SX-100 WANTED. Joe Falcone, 800-436-7026. Leave message.

WANTED: Collins 30S1, 312B5, CC-2; Diamond SG-2000; MFJ-249; ICOM CP-13, HM-65/70. SELL: 2 new Eimac 3-400Z's. Forrest, 218-865-6541.

WANTED: TH-25 or FT-411E. NØLLR, 612-257-2519.

TELEGRAPH KEY, RA Kent Model KT-1, like new. Cellular Phone, Panasonic 3 watt transportable. Bill, W6PRI, 408-996-7624.

FOR SALE: Moving sale, 20 years of collection, all types of tubes, transformers, chokes, crystals, 40 years of *QST*, *CQ*, 20 years of *73* magazine, relays, panel meters, knobs, sockets, coils, high-wattage resistors, capacitors, switches, volume controls, air variables, fixed vacuums, BC 221, Cardwell TS173UR freq meter, 500+ feet of new RG58 by Teledyne, plus more. Some freebees to big buyers. Prefer single buyer or volume buyers, but will deal with serious buyers. All worth $3000. Will take $1500. Call 209-255-8967, Varo, N6DBH, 750 N. Garden, Fresno, CA 93727.

FOR SALE: Heath Oscilloscope, Panasonic Word Processor, Canon Copier, Camera, mint, one year, half price. Carl, 412-475-4769, eves. 9–10PM EDT.

WANTED: RYCOM R-2174A/URR Voltmeter, NAVSHIPS 93210 and 91275 manuals. Charles T. Huth, 229 Melmore St., Tiffin, OH 44883 (419-448-0007).

FOR SALE: QST/HR/73 and misc. publications. SASE. KA1VY, Ernie Guimares, P.O. Box 1262, Lakeville, MA 02347-7262.

FOR SALE: Back issues CQ, QST, Ham Radio, 73, Communications Quarterly, and other radio publications. Send SASE for list. Nate Williams, W9GXR, 6915 Prairie Drive, Middleton, WI 53562.

WORK DX IN LASER BAND!!! The most sensitive receiver components for sale: PHOTOMULTIPLIER TUBES with matching preamplifiers. For info call Zoran, VE3WGA, at 416-469-2166.

TEXTBOOKS, RADIO, physics, ARRL, ham items, parts, test equipment, art books. SASE lists. Bill Tucker, W4FXE, 1965 S. Ocean Dr. Apt 15-G, Hallandale, FL 33009 (305-456-1349).

WOULD LIKE TO TRADE my SONY video editor controller/titler model #RM-E700—paid $1085 in Dec. 93 (never used)—for any 2000 watt Henry or Drake linear amplifier. Call 408-241-9090, ask for Wilson.

WANTED: National HRO-5 H&J coils dog house power supply. Also coils and power supply for SW-3. Jim Leathem, Box 50355, Parks, AZ 86018, 1-602-635-2117).

HEAVY DUTY THRUST BEARINGS. $50.00 ea. plus $5.00 s/h. WA9BOW, Terry Pfeiffer, 4604 Strong Rd., Crystal Lake, IL 60014 (815-455-1151).

FOR SALE: Drake TR-3 10–80 meter HF transceiver. Comes with manual and mike. For more info., send SASE to P.O. Box 518, Whitehouse, FL 32220.

FOR SALE: Heathkit Model SB 220–221 Linear Amp, 10 through 80 mtrs., mint condx, manual, $600. Cushcraft AV-5 Vert, 10 through 80 mtrs, $45. Dick Petrilli, KA5KHI/4, 878 Hwy 544-4A, Conway, SC (803-347-2361).

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TH-22AT
Slim, Compact, Lightweight 2 Meter Handheld Plenty Of Power, Multiple Scan Functions

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FT-736R
Multi-Mode VHF/UHF Full Duplex Base, Optional Modules For Extra Bands

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FT-990
100 Watt HF Transceiver With General Coverage Receiver

ICOM

SALE

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2 Meter Handheld With Up To 7 Watts Output

FT-690
6 Meter Portable For Mountain Or Remote Campsite, USB, LSB, CW, FM

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FT-5100
Compact 2M/70cm Mobile. Built-In Antenna Duplexer

FT-11R
2 Meter, FM Handheld. World's Smallest Size HT With Full Sized Keyboard

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FT-890AT
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IC-737
New, Affordable HF Transceiver With Plenty Of Features

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FT-5200
Dual Band Mobile With Snap-Off Front Panel

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2M/440MHz Handheld With Multiple Power Levels, 82 Memories And Aircraft Receive

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FT-840
New, Compact HF Transceiver With 100kHz-30MHz Receive

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The Quality Leader For UHF, VHF Amps, Repeater Amps, Preamps and Watt/SWR Meters

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NEW LOW PRICES

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On Glass Dual Band Antenna
1/2 Price Special
2 Meter/70cm
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124WB	$ 49.95
ARX2B	$ 49.95
AR270	$ 59.95
AR270B	$ 84.95
ARX270	$184.95
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A449-11	$ 59.95
A50-5	$124.95

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1796	$169
1798	$229
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284, 5, 6, 7	$ 22
249	$169
259	$189
949E	$129
986	$239
989C	$288

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1-800-345-5686 West

FT-2500M/FT-7400H 2m/70cm Mobiles

NEW

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Largest Display Available
- Power Output:
  FT-2500M 50/25/5 Watts
  FT-7400H 35/20/5 Watts
- Flip Up Front Control Panel Hides Seldom Used Buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FTS-17A	CTCSS Decode Unit
FRC-6	DTMF Paging Unit
SP-4	External Speaker
FP-800	Power Supply

*FT-2500M

"No other mobile has a Military spec rating. This radio can really take it!"

"New Omni-Glow display and backlit DTMF Mic, too. Both Yaesu 'firsts'!"

"3-stage advanced track tuning really reduces intermod. Its great!"

"Yaesu did it again."

US MILITARY APPROVED MIL-SPEC 810

Performance beyond the call of duty.

Just when you thought you had the most formidable mobile built, we made the FT-2500M – the next evolution of powerful, rugged mobile radios.

The FT-2500M takes the durable quality, features, and performance of the popular FT-2400H and goes one better! A new easy-to-operate front panel design with rubber coated knobs, new, large state of the art Omni-Glow display to provide enhanced viewing at all angles and light levels, and Yaesu's exclusive 3-Stage Advance Track Tuning feature that reduces intermodulation and front-end overload puts the FT-2500M as close as you can get to commercial grade performance in amateur frequencies.

The FT-2500M is the only mobile with a Military spec rating and the most often used controls on the front and those you "set and forget" neatly hidden. It's the first mobile radio with a backlit DTMF mic, too. With its extra large heat sink and one-piece die-cast chassis, the tough FT-2500M is unlike any other mobile in its class.

Test the mettle of your mobile. If it doesn't measure up to the endurance standards of the U.S. Military, get the FT-2500M. For flawless performance in rough and rugged situations, the FT-2500M is really formidable – just what you'd expect from Yaesu. See it at your dealer today!

YAESU

Performance without compromise.℠

FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz. FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/25/5 Watts (FT-7200 35 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.

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.

Hear signals you've never heard before.

FT-1000
All Mode HF Transceiver

- RF Power Output: Up to 200 Watts
- True Cross-band Dual Receive: Two Large Tuning Knobs
- Front Panel RX Antenna Switch: For Beverage or Loop
- Direct Digital Synthesis (DDS)
- Automatic Antenna Tuner: Built-in, 30 Memories
- Frequency Range: 100kHz-30MHz (RX), 160-10 meters (TX)
- 100 Memories: Independent ATU and Mode/IF Filter Memory
- CW Spot and Two CW Key Jacks for Maximum Convenience
- Dynamic Range: 108 dB
- Optional Digital Voice Recorder (DVS-2): 16 Seconds Each RX/TX
- **Accessories:**

SP-5 External Desk-top Speaker
LL-5 Phone Patch Unit
MD-1C8 Desktop Microphone
YH-77ST Stereo Headphones
FL-7000 500W Linear Amplifier
DVS-2 Digital Voice Recorder

You're a competitor. You want optimum receiver performance and you want "muscle" on transmit. First with 200 watts – more power than any competing transceiver – and "hand warm" at maximum RF. It's easy to see why the FT-1000 has been judged "best overall" by top DX'ers worldwide.

For elite-class contesting and DX operation, exclusive features maximize your score. Dual Receive – Watch a multiplier or new country on one frequency, run QSOs on another. Diversity Reception – Use two antennas at different heights or opposite polarization. Extensive Cascaded IF Filtering – For "low end" battles. Dramatic front panel design features two flywheel-weighted tuning knobs, RX antenna selector and two large displays.

A perfect blend of electronics and human engineering, the FT-1000 is the Best of our Best!

To hear signals you've never heard before and get the competitive edge, see your Yaesu dealer today.

YAESU

Performance without compromise.℠

FT-11R/41R
2m/70cm Handhelds

- **Frequency Coverage:**
  Wide Receiver Coverage:
  FT-11: 110-180 MHz RX,
  144-148 MHz TX
  FT-41: 430-450 MHz RX/TX
- Selectable Alpha Numeric Display
- New Compact Battery Design
  4.8V produces 1.5 Watts
  9.6V produces Full 5 Watts*
- 150 Memory Channels
  (75 when Alpha Numeric)
- AM "Aircraft" Receive
  (110-136 MHz)
- Small Compact Size w/ Easy Operation (measures only:
  4"H x 2¼"W x 1"D)
- Rx/Tx Battery Savers
- High-efficiency MOS FET Power Module
- Large Back-Lit Keypad and Display
- Up/Down Volume/Squelch Controls
- Built-in DTMF Paging/Coded Squelch
- Automatic Power Off (APO)
- **Accessories:**
  FNB-31 4.8V, 600 mAh Battery
  FNB-33 4.8V, 1200 mAh Battery
  FNB-38 9.6V, 600 mAh Battery
  FBA-14 6 AA Size Battery Case
  FTS-26 CTCSS Decode Unit
  NC-50 Dual Slot 1-Hour Desk Charger
  CA-10 Charge Adapter (required w/ NC-50)

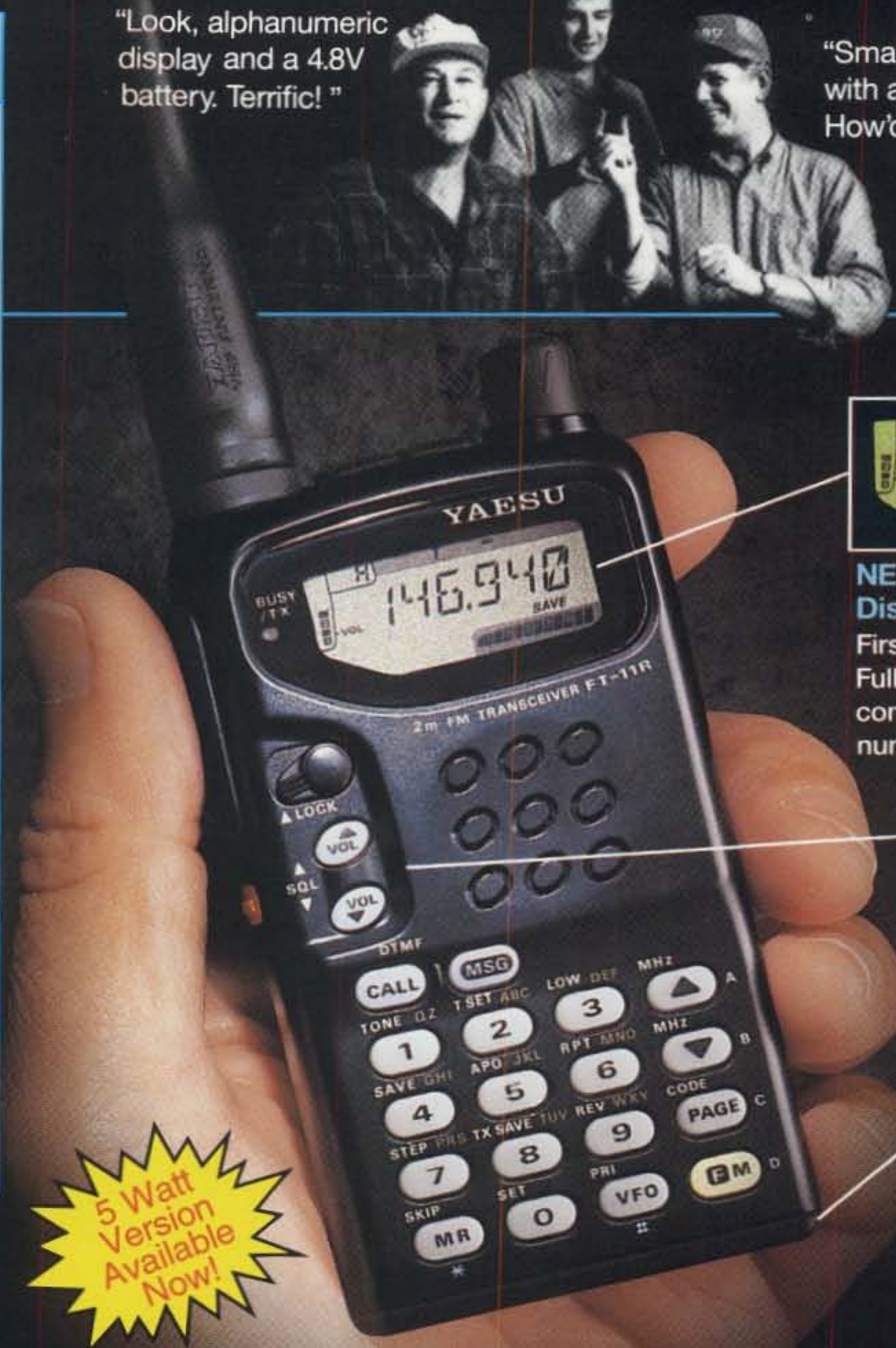
*FT-11 Only.
FT-41, 3.5 Watts

"Look, alphanumeric display and a 4.8V battery. Terrific!"

"Small and thin – with a full sized keypad! How'd they do that?"

"Yaesu did it again!"

NEW!



NEW Alphanumeric Display
First time for Yaesu HT Full function LCD combines letters and numbers.

NEW Up/Down Thumb Control
with Volume and Squelch Bar Graph. No other radio has this. Back lit, too!

NEW Compact Battery Design
4.8V gets you 1.5 Watts. A first for amateur radio.

5 Watt Version Available Now!

Get a grip on this!

World's smallest size HT with a full sized keypad
Measures only: 4"H x 2¼"W x 1"D

"Small" is relative, isn't it? It could mean size – which in this case it does. And, it could mean "reduced", which it doesn't! Nothing missing from the hot new FT-11R HT from Yaesu except bulk! You're going to wonder just how all the features of this full-function radio fit in. Until you remember Yaesu pioneered 2-way radio micro technology.

To see what this really means to you, check out all the new features. Like the alphanumeric display. This Yaesu HT first, lets you tag your favorite frequency by name, call sign or number. Or, the new "voltage stingy" battery. It's an industry first for amateur radio. Smaller and compact, the 4.8V battery gives you 1.5 watts on TX. And, if that's not enough, there's an optional drop in, dash mount battery charger.

You see it's not a small time performer. Just small sized. The FT-11R. Another small example of Yaesu superiority. See your dealer today!

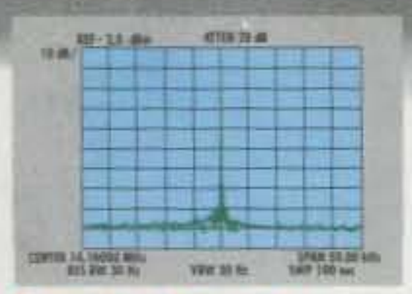
YAESU
Performance without compromise.℠

Expand Your Horizons to 6 Meters!

NEW from ICOM

IC-736: 6 Meters and HF!

- ☐ HF and 6 Meters!
- ☐ 100 W Output for Both HF and 50 MHz
- ☐ Internal AC Power Supply
- ☐ Automatic Antenna Tuner (Covers 6 M to 160 M)
- ☐ Dual Antenna System
- ☐ 100% Full Duty Cycle
- ☐ Newly Developed DDS Circuit for 1 Hz Fine Tuning Resolution
- ☐ Quick Split Function (with pre-programmable offset)
- ☐ MOS-FET "Class A" Audio
- ☐ Multi-Function Meter (4-in-1)
- ☐ Double Cooling Fan
- ☐ Selectable Filters
- ☐ 10 dB Pre-amp, 20 dB Attenuator
- ☐ Built-in Electronic Keyer
- ☐ RIT, ΔTx, ΔRx
- ☐ 10 Key Pad
- ☐ VOX
- ☐ RF Gain
- ☐ 101 Memory Channels
- ☐ Passband Tuning
- ☐ AF-type Speech Compressor
- ☐ CW Full Break-In
- ☐ Notch Filter
- ☐ Noise Blanker
- ☐ Large Display



Transmitter C/N Ratio

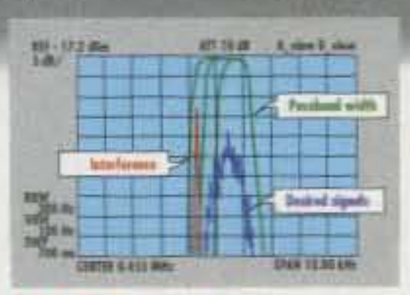
Now you can work all of the HF bands AND have access to one of the most exciting amateur bands – 6 M! The IC-736 is an all band, all mode transceiver with a general coverage receiver. Only an antenna, coaxial cable and AC outlet are necessary to get up-and-running with this rig. Cutting edge features and "plug 'n play" operation make the IC-736 a "complete station in a box!"

The IC-736's compact and cleverly designed **Automatic Antenna Tuner** has preset memories for each 100 kHz step, thereby providing very high speed tuning. Tunes all ham bands plus 6 M!

Equipped with **2 Antenna Connectors,** the IC-736 includes an **Automatic Antenna Selector.** In each band, the band memory memorizes the selected antenna so you don't need to change an antenna manually each time you change the operating band.

The IC-736 employs power **MOS-FET's** in the driver and final amplifier stages, providing a clean, 100 W of output power over all of the ham bands as well as the 50 MHz band.

An **Aluminum Die-Cast Frame** and **2 Large Cooling Fans** help stabilize the



PBT Characteristics

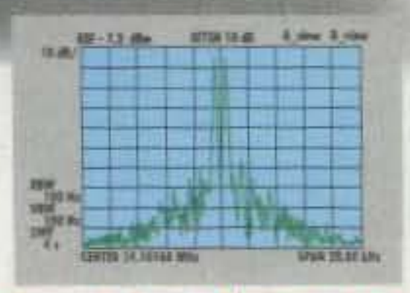
IC-736's PA circuit to obtain 100% full duty cycle operation. Performance you can count on under the most demanding of conditions.

CW fans will love the IC-736. The **Full Break-In Function** (QSK) allows you to receive signals between transmitted keying pulses (semi break-in is also available). **Separately Designed CW Key Jacks** allow you to connect both a memory keyer and a paddle – great for contest operation!

The **Double Band Stacking Register** memorizes 2 frequencies along with modes in each band so it can be used like 2 VFO's in one band.

Up to 10 **Electronic "Memo Pads"** are available. This is especially useful during contests or while DX hunting. When catching a station you would like to temporarily store, simply push the memo pad-write button. The frequency and mode is automatically stored in a memo pad so you can continue band searching.

For interference rejection, the IC-736 has **Passband Tuning** and a **Notch Filter.** During crowded band conditions, these two functions can be used in combination, providing an extremely effective method of reducing most types of interference.



Dynamic Range Characteristics

The **RIT** and **ΔTX** functions independently change the receive or transmit frequencies, respectively. Great for split frequency operation or for compensating for the frequency drift of another station.

The IC-736's offset frequency for **Quick Split** Function can be pre-programmed. A **Split Lock** function prevents you from mistakenly changing the receive frequency while changing the transmit frequency.

A newly designed **DDS** (Direct Digital Synthesizer) provides frequency resolution to an exacting 1 Hz. Rotate the main dial and experience the comfortable analog feeling of fine tuning. One complete dial rotation is equal to 200 Hz.

Call (206) 450-6088 for FREE Product Literature!

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