73 Amateur Radio Today

DECEMBER 1993
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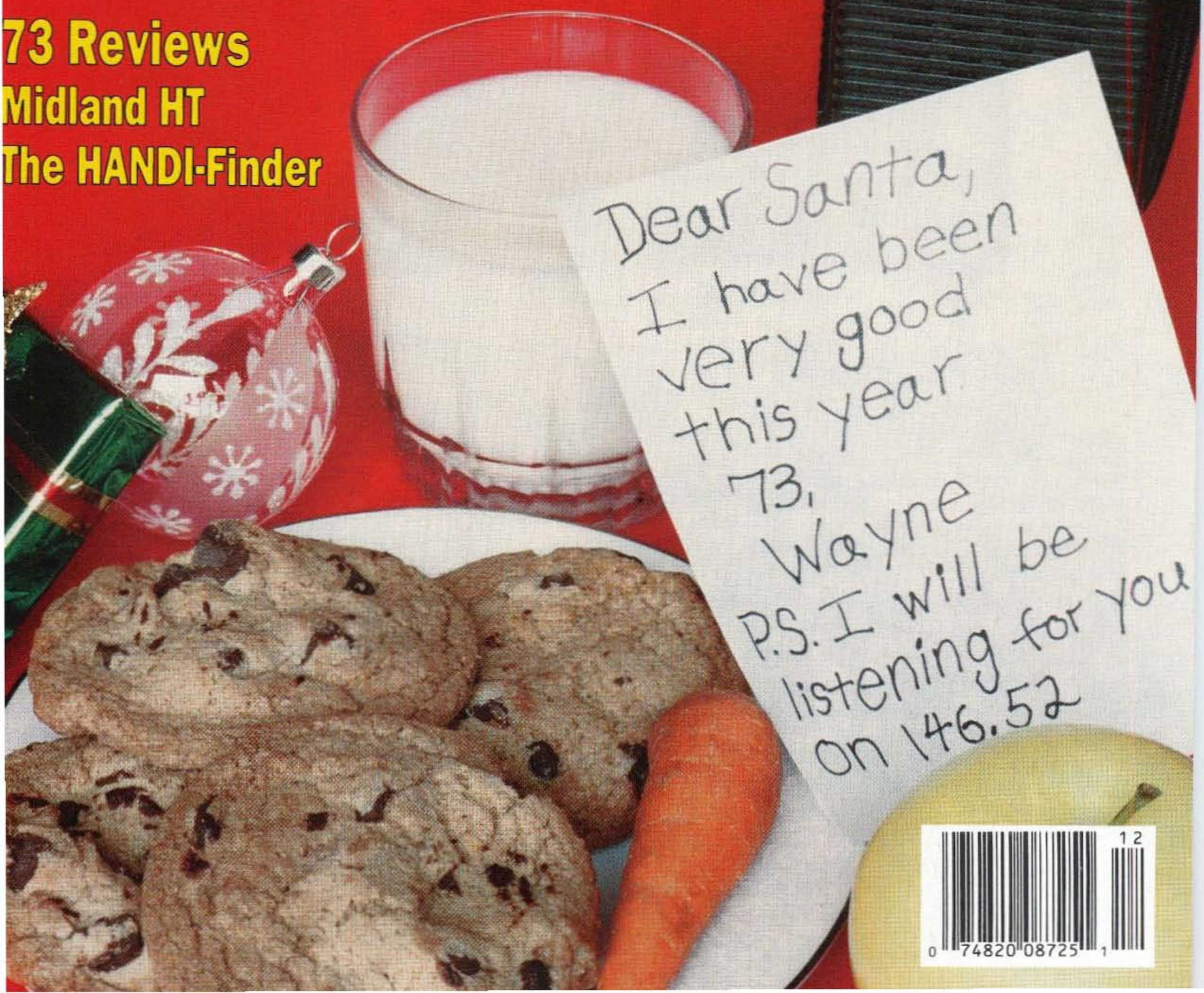
International Edition

Curing Cable TV Interference

Building Better Breadboards

Remote Tuned Antenna

73 Reviews
Midland HT
The HANDI-Finder



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TUVALU

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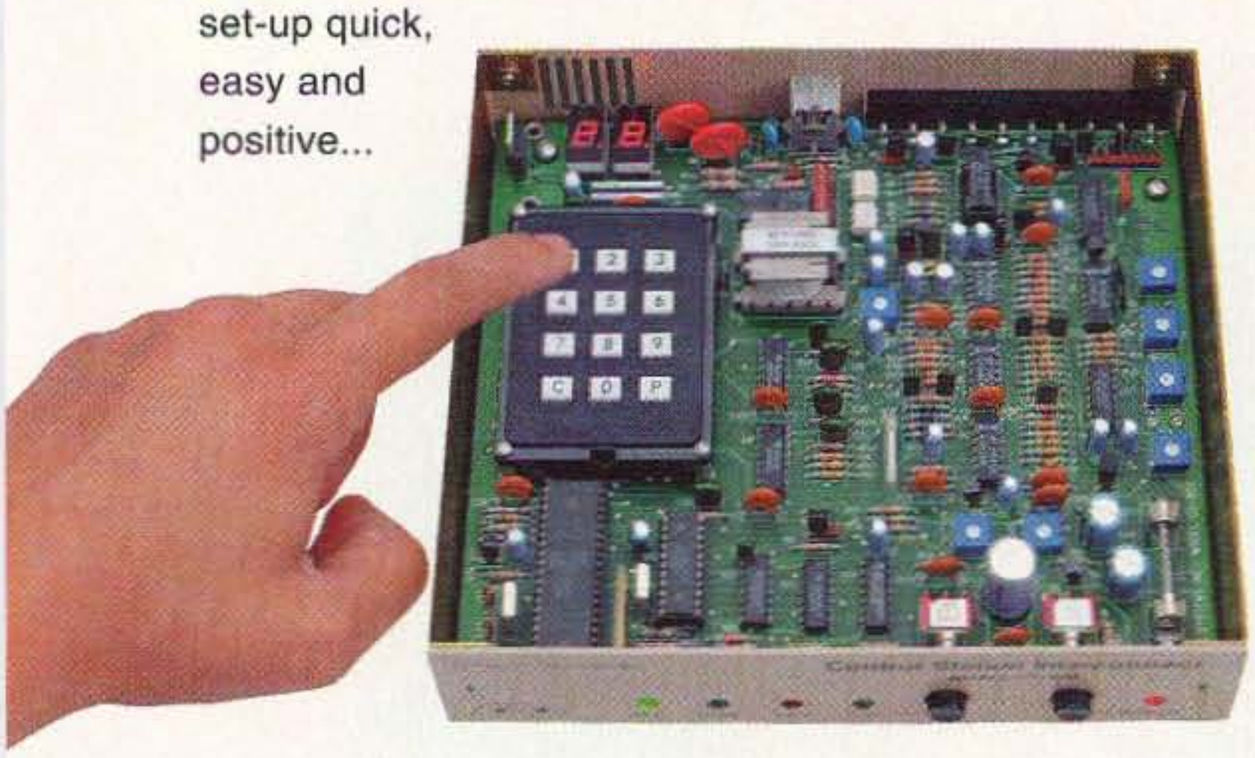

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CIRCLE 12 ON READER SERVICE CARD

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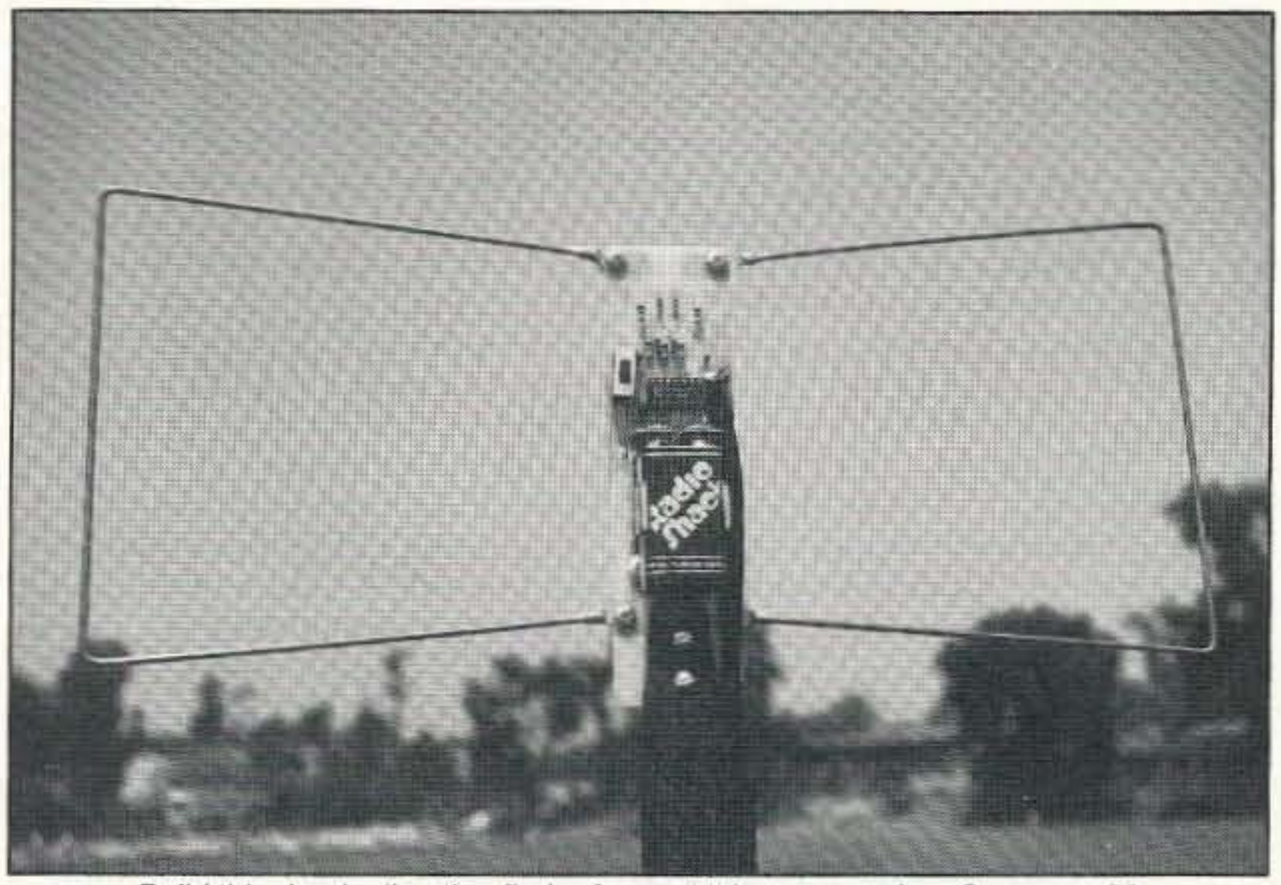

Build this dandy direction finder from a kit in one evening. See page 26.

DEPARTMENTS

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FEEDBACK!**

It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 17. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.

On the cover: A recently-discovered photo from the Green family archives.

FB

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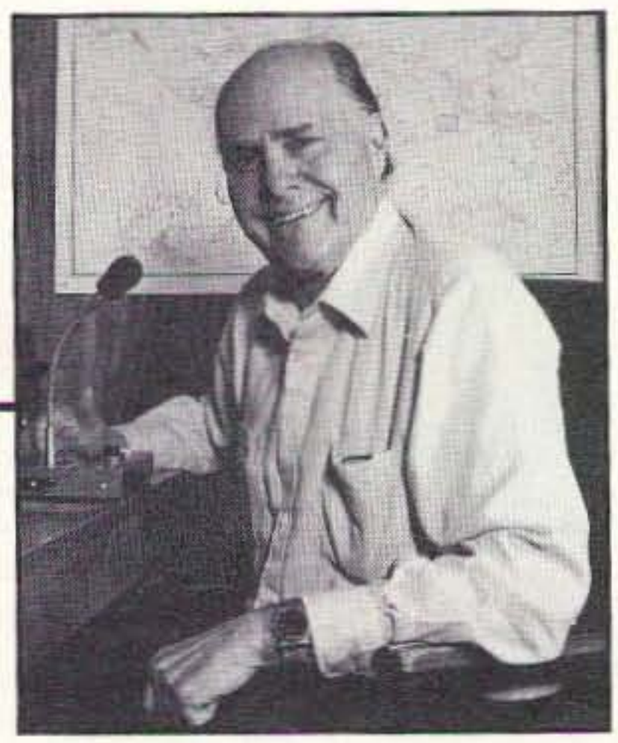
Contract: You have stumbled into the pages of *73* magazine. You are now in our evil clutches! Now get to work on a home-brew project! We don't mean chugging frosty beers in the living room; we mean slinging solder. So, find a project you would like and get going.

Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Spending Money is a Lot More Fun . . .

. . . than making it. That's the hard part . . . at least for most of us. So wouldn't you like all the guidance you can get to help you spend your money wisely? I really hate it when I get suckered, don't you? Well, you can help me and the rest of us who might blunder into some sucker bets by giving us the benefit of your experience . . . happy or sorry.

Here's the drill. Whenever you buy any ham product . . . a transceiver, HT, antenna, book, gadget, and so on, check it out carefully and then let me know how much you'd recommend it, on a scale of one to 10, as something you think the rest of us ought to buy. Give me your call, your recommendation, your age, and how long you've been a ham. You might send it on a QSL card, a page torn from your old spiral notebook, via the *73* BBS, CompuServe, MCI, fax, or whatever. No, never mind the whatever.

If you've bought one of the ARRL books, how is it? How about the new *CQ* videotapes? I was surprised at how good they are. What do you think? I'm still trying to decide what rig to get for my new ham shack and so far you haven't been a lot of help. Look, I tell you when I find things I enjoy and think are a good deal, so what's wrong with you reciprocating? I might even pass your rating along to help other readers get the most from their money.

One to 10, with one being absolute garbage . . . like a certain KV4 I could name . . . and 10 being heavenly bliss . . . like my Scott Kirby CDs of Joplin's music. By the way, 99% of you have disappointed me far beyond my ability to express myself . . . and you have to admit I'm pretty good at that . . . by not yet buying one of Kirby's Joplin CDs. I've thought it over carefully and decided that Scott Joplin was the most creative composer America has ever produced. Yes, he was black. What are you, a bigot? This came to mind because Volume 4 of "The Complete Joplin" is now available. This is the last of the series.

Just as I try to get you to enjoy all the different things we can do in amateur radio . . . things that I've enjoyed . . . I've been trying to get the readers of my *Secret Guide To Music* to try the music that I love the most. And I've been succeeding pretty well. I've gotten thousands of my readers into Joplin's incredible music, and even converted thousands of rock fans to enjoying classical music, too. Do you have a CD player yet? There must be some music you enjoy listening to. So get a player and take a little time to sit back and luxuriate in music that will help rebuild your psyche. Then try one of my Joplin CDs and see what happens to you.

I'm sure I've told you the story, but you've probably forgotten it. What happened was that when I saw *The Sting* around 20 years ago I loved the music and started buying every Joplin LP I could find. But the more I listened to them, the more I knew something was missing. They all sounded too much like a player piano. I wished my father hadn't been so against my learning to play the piano when I was young. I wanted to let the beauty I could sense in the music come out.

When I got into the music business publishing *CD Review* I started bugging the record companies to look for a pianist who played Joplin right. I got nowhere. They just looked at me funny. So late one night I was walking along a street in New Orleans, coming back from a riverboat jazz concert, when I passed a grungy little bar with piano music coming out the door. Joplin! I grabbed Sherry and stopped. Hey! We went in, sat down and had a couple Cokes. There was this young kid with a ponytail playing Joplin the way I'd heard it in my heart. After a couple hours of ecstasy I knew I was in the record business. Yes, I knew that 95% of all records lose money. I didn't care. People just had to hear this. It was a mission.

So we brought Scott Kirby to New Hampshire and recorded a CD of Joplin's music. Sherry found a nice old Steinway piano in the Peterborough Unitarian church, and by luck I had an experienced recording engineer working for me. We got Knud Keller KV4GG, who had been my bookkeeper for years, to keep the old piano in tune. Knud used to be a concert pianist in Stuttgart before getting practical. I paid him off with a new ICOM rig.

Kirby, 24, was an Ohio State graduate, with a good solid classical music background. But he loved Joplin's music so much he moved to New Orleans from Columbus, bought a piano, put wheels on it, and played Joplin's music every day on the streets. As far as I know, Scott is the only person in the world making a steady living playing ragtime. There are one or two chaps playing ragtime in the Disney parks, but they're part-time. Kirby turned out to be one of the nicest guys. Despite his stupendous talent, he's unassuming.

The church was a difficult place to record. Every time a truck went past on Route 202 Scott had to stop and start over again. He and David Torrey, the engineer, got to recording after midnight to avoid these interruptions. So when we wanted to do a second CD we had Knud look for a better piano, one we could set up in the garage at my farm, using that as a studio. Knud found a wonderful 1898 Steinway upright. Great sound. Then he found an 1896 Bradbury upright concert grand, which was even better for some of the rags. The Steinway was great for the concert pieces. David set up sounding boards to liven up the garage and Scott did another CD. He liked the new pianos so well we decided to start this new CD as Volume 1 of a set of four CDs of the "Complete Joplin" rags, marches and waltzes.

About this time Phil Martus, from the circulation department, got to helping clean out my barn. He did a marvelous job. I looked at the huge space he'd cleared and thought we had room to build a recording studio. David designed it and Phil, with his brother Greg, built it. The end result was something you ought to see if you ever get up this way. It's state-of-the-art digital. Artists who've come here from all over the world to record tell me it's the finest studio in the country. Scott did Volumes 2, 3, and 4 in the new studio.

Now that he's done all of Joplin's music he'll be coming up to record some good rags by other composers. But most of all I want you to hear the wonderful rags that Scott's written.

Since appearing on my Greener Pastures Records, Scott has been invited to play at the major ragtime festivals around the country. He's knocked 'em dead! When he finishes playing there's a silence and then the audience gives him a standing ovation. No one else gets that, and there are some famous ragtime performers at these shindigs. If I get you hooked on ragtime, which I hope I can, you may be getting together with me at festivals in Sedalia in June, Boulder in July, and Fresno in November.

I hope you'll excuse me for coming on like this, but since most of you have been reading my stuff for years, I think of you as friends I write to every month, not as subscribers. So I share my enthusiasms and frustrations with you. I haven't told you, but when you take the time to write back, I enjoy reading what you've got to say. I try to answer, when I can, but I can't answer everyone. In my music magazine I ask my readers to let me know if they find a CD which they think I'll enjoy . . . and I do the same for them.

So that's why I'm after you to try your hand at 10 GHz, where I had so much fun making contacts with Chuck Martin WA1KPS in seven different states. That was so exciting I didn't want you to miss out. Ditto if you can make it on a DXpedition somewhere. These are things you'll remember the rest of your life with pleasure.

That's one thing I like about music . . . once you get a record you'll always be able to enjoy it. Don't get me started! I feel the same way about books. Hey, you really ought to read this one! Well, I can't get you into my living room and play my favorite CDs for you or walk you through my library, pointing out the books that are the most fabulous. I can't even get out my slides and show you how exciting it was to visit and operate from Sabah or New Caledonia. But maybe I can get you to try your hand at some satellite contacts. And how about getting geared up for some 2m aurora contacts this fall? I guarantee you'll never forget one single contact! And if I can get you to subscribe to my music magazine, we can share our music tastes. I'll try to get you tuned into Delius, Glière, Ippolitov-Ivanov, and a few more. But my first try will be Joplin. Maybe I'll get you to buy the boxed set of four CDs for $60. Probably not. But you should.

I bought my first record when I was around 12. Strauss waltzes. RCA Red Seal. Cost a buck for 10 minutes of music. That's around $20 in today's dollarettes. Now you can buy a superb 60 minutes of music for around $15. I've been putting out samplers for $3.79, just to cover the postage and handling, each with an hour of wonderful music. I've over a hundred of 'em available. They're all listed in my *Secret Guide*. Each has about 15 of the best-rated tracks from recently released independent record company CDs. This is one of the best ways to shop for new CDs. There's nothing like hearing the music to know whether you're going to want to invest $15 in a CD.

Oh, I forgot. I got all wrapped up in

Continued on page 80

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LETTERS

Number 2 on your Feedback card

From the Hamshack

William W. McConnell KD4UUB, Clover SC I live in a region where thunderstorms are frequent, sudden, and severe. I'm concerned about providing adequate lightning protection for my ham shack; however, I find that the ham literature on the subject is superficial and not very helpful.

I sent for and received the catalog from Poly Phaser Corporation, a *73* advertiser, and was delighted to find it contains lots of good information about lightning protection/grounding systems and about their products. But their information is aimed primarily at large commercial installations which are, undoubtedly, the source of most of their business.

My suggestion is that *73* commission an expert in the protection/grounding field to prepare a comprehensive article (or series) on this vital subject. I envision that the article(s) would cover the current technology and would be written specifically to cover a typical ham station.

Perhaps *73* would publish this up-to-date information on protection/grounding systems that will be definitive for ham applications.

Bill—Coincidentally, the September issue of Radio Fun *features an article on the fundamentals of lightning, including dos and don'ts for the average ham and a book review for those seeking more information. This may not answer* all *of your questions, because lightning is still not* completely *understood, but I hope it helps you . . . Charlie WA1RZW*

Harvey A. Nelson N9FHO, Madison WI Wayne—OK, here's the check for my renewal.

I usually agree with most of what you have to say regarding our hobby. One instance where I disagree with you (and most of the amateur community) is on the 14.313 MHz issue. You tend to view things from the perspective of an entrepreneur (you're a good one!) . . . cost/benefit ratios, market analysis, perceived value, image, product development, etc. I work in a hospital (I'm not an MD) and tend to view issues in terms of treatable/non-treatable disease.

Suppose that your community was experiencing some sort of infectious epidemic. Suppose that doctors and public health officials tell you that there is no cure for the disease but that it can be localized and contained in a very limited area . . . say a little island in the middle of a river that runs through your town. Would you be willing to sacrifice that little island for the good of the greater community? Are you willing to accept a leper colony in your midst?

My answer, in this instance, is an emphatic YES! What we have on 14.313 MHz is a spot where a good portion of the "crazies" have decided to collect themselves. Without prodding from the rest of us, they have found their fellows and are busily feeding on one another. That leaves the rest of the band open for our more pleasurable activities. There should be one such frequency on every band. We can avoid being "infected" by using our receivers properly . . . a trick I learned in my old TV-watching days: The big knob changes the channel and one of the little knobs usually turns it off. (We might include this bit of knowledge in the Extra Class question pool!)

You and I, in laissez-faire fashion, need not concern ourselves with what others choose to listen to, but with making our own conversation interesting enough to attract our own following . . . hoping that our insightful questioning will add to our own stores of knowledge.

But what about the youngsters? The 12- and 14-year-olds we hope to attract? Don't we have some responsibility for them? We must protect their tender ears, if not their minds . . . right?

Baloney! Those 12- and 14-year-olds, each and every one, has at least a parent who has taken on that responsibility . . . if not willingly, then by force of law. Our *obligation* in their nurturing is to pay our taxes to provide for their schools and to avoid hitting them with our automobiles when their parents allow them to play in the streets! Nothing more.

The parent must play as much a part in the kid's newfound hobby as the kid. The parent has the responsibility for knowing what is happening on 14.313 and monitoring his/her child's activities . . . the same responsibility they have for monitoring what books and magazines the kid reads and what movies and TV programs the kid watches (hopefully not many!). When the kid blunders onto the frequency, the parent will have to explain what the "cancer" is all about and how to cope with it.

You might want to provide parents with the insights they will need (as a part of your business venture). How about sending a nice letter/pamphlet to the *parents* of the newly licensed young ham, explaining some of the more *unattractive* aspects of our hobby, along with complimentary copies of your rags? After all, mom and dad are most likely paying for the kid's magazine subscriptions.

For my own part, I will encourage youngsters to begin their ham careers in digital modes . . . there ain't no backspace key on a tongue or microphone.

The only problem with that, Harv, is to figure out how we can keep the FCC Commissioners from hearing the baloney on 313, and thinking that we're all like that . . . Wayne.

Fred Carmichael KD4ATW, Chattanooga TN Reading Wayne Green's "Never Say Die" columns in August and September, and David Cassidy's "Random Output," has encouraged me to voice my opinion of the No-Code Tech license and the license procedure.

I am 47 years old and ever since I was 12 years old I wanted to be an amateur radio operator. I took the test the first time when I was 12 years old, and have taken it four times since. Each time I failed because of not being able to receive the code. However, two-and-a-half years ago I passed the No-Code Tech. I have had a great time since, operating 2 meters, 70 cm, and packet. I enjoy packet the most because it involves three of my loves: amateur radio, computing, and bulletin board systems. If it weren't for the No-Code Tech, I would not be writing this letter. I am currently working towards my General, but once I pass I will only use the voice bands, not CW.

We need young people in our ranks of amateurs. Young people are not interested in learning code, but most are interested in computers and other digital modes.

I agree with both Wayne and David in that we need to change the license structure and testing requirements if amateur radio is to survive. I suggest that we have two classes of licenses. The first would be for 10 meters and below; the second for all above 10 meters. We could call the first class "Amateur" and the second "Amateur Extra." To take care of all the old folks who like relics (code), we could do like the present system: Tech and Tech Plus. Next we would need to change the test to cover the FCC rules: operating practices, and how to properly use your radio equipment. The code side of the test would be optional, with 5 wpm for Amateur Plus and 13 wpm for Amateur Extra Plus. This way, if you wanted to use the relic, you could take the optional code test to get you Plus. Code would not be a requirement.

I have read articles and heard everyone talking about amateurs needing to change, getting younger people involved, and moving into the 21st century and not clinging to the past. I also know that making the changes I have suggested would require some changes internationally, but why not make these changes?

Peter A. Bergman NØBLX, Brainerd MN Wayne—I agree completely that something is wrong with education in America. We have "Honor Students" who cannot find their town on a map and have trouble with arithmetic, forget trig or calculus.

Much of the problem comes from the fact that "fashion" sweeps through the educational establishment and, once in vogue, some of the ideas are almost impossible to dislodge. Currently, it is considered nasty to make kids memorize. This bit of nonsense has been around long enough that memory skills and the teaching of them is almost a lost art.

Another educational jewel is called "process not product." The followers of this one believe that if children are taught how to think—always an admirable goal—they will derive the facts for themselves. Rather like making bricks with straw, not clay. If you want a challenge, try teaching science out of a "P not P" textbook.

I enjoyed your thoughts on getting something for our foreign aid. Why not use the idea a little closer to home? Let's buy Haiti—if we can figure out who the government is. It would give us a place for an open market enclave close to the US, also perhaps a location for a large HIV sanitarium and save the Haitians wishing to live in the US a dangerous boat trip.

By the way, I have a college degree in education. I'm also dyslexic and have ADD. Sr. Mary Margaret didn't know about them so she just made me work harder instead of giving me an excuse for failure.

I don't teach anymore; I drive a cab for the handicapped. It's less frustrating.

Lavee Israel 5NØSVL/4X1UF, Lagos Nigeria Wayne—It's a pleasure to read your magazine after a pause of several years. I especially love to read your editorials, and I like them very much. In most cases I agree with you 100%. It is a pity, however, that people are so narrow-minded and stubborn, especially when they have to dictate to others what to do.

For the past two years, the recession in Israel has pushed me to do business in Nigeria, where I deal with commercial two-way radio, combining it with my hobby, operating as 5NØSVL. We are trying very hard to help as many youngsters as possible to join the hobby and I would like especially to mention Kunle 5NØOBA, Peete 5NØCEP and Musa 5NØSAI. If we need contributions of used radio gear, Peete tries to help us. If it's for VHF repeaters, we keep trying, sometimes in a hostile environment . . . but usually we are able to accomplish the goal. Your editorial from August is encouraging because it points out that we need to bring in as many young people as possible because this is the future, and not only in Nigeria. It applies to Jordan as well as to Israel, too, since that government is making the same mistakes. Maybe the only one doing it the right way is Japan, as you mentioned.

There are many club stations in Nigeria, and we have a weekly net every Sunday morning at 0800 on 7065 kHz. What we are trying to do is find as many surplus SSB radios as possible so those clubs can operate on this frequency.

It is very good to read your excellen magazine again. Keep up the good work and keep saying the right things. 73

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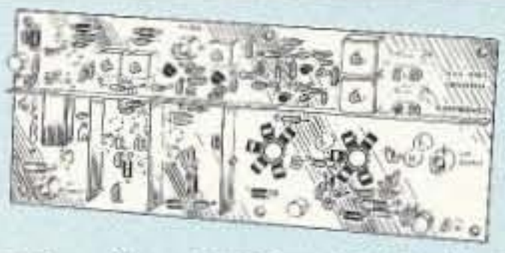
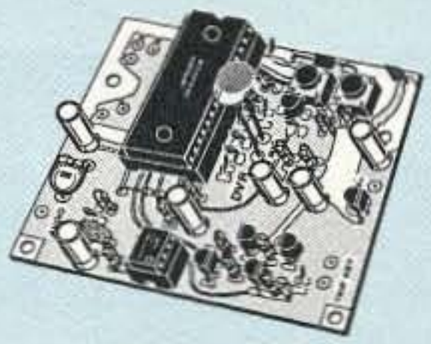


XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

ACCESSORIES



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- *FCC type accepted for commercial service (hi-band and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 20W 50-54MHz; 15W (25W option avail.) 143-174MHz; 15W 213-233 MHz; 10W uhf; 10W 902-928MHz.
- Available add-on PA's **up to 100W**.
- **Six courtesy beep types**, including two pleasant multi-tone bursts.
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- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters**.
- Many **built-in diagnostic** and testing functions using microprocessor.
- Color coded **LED's indicate status** of all major functions.
- **Welded rf-tight partitions** for exciter, pa, receiver, and controller.
- 3½ inch aluminum rack panel, finished in eggshell white and black.

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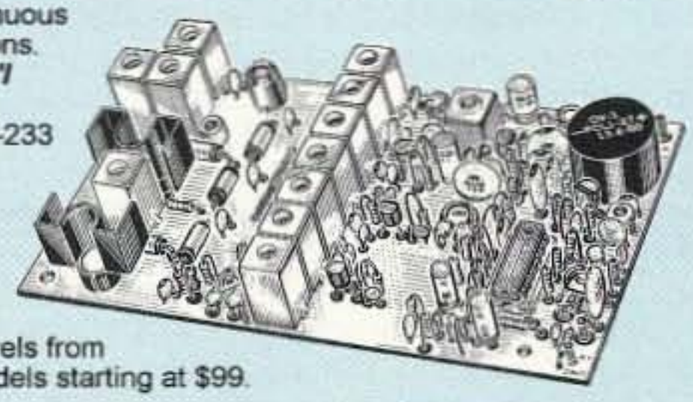
Also available in rf-tight enclosures, and with data modems.

FM EXCITERS: 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l high band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
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- **VHF & UHF AMPLIFIERS.**
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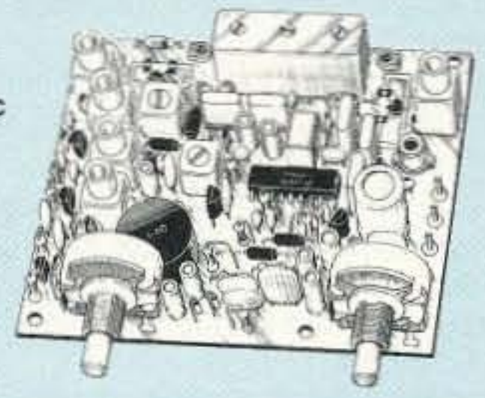

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- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w&t $219.
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Government Launches PCS Era

The Federal Communications Commission has allocated 160 MHz for the new PCS (Personal Communications Service) in the 2 GHz band. The decision is expected to spark intense competition to deliver wireless services.

The FCC plans to use auctions to award PCS licenses. Local telephone companies are seen as the big losers in the decision. The new PCS service will compete with the cellular telephone industry and will carry data, video, and voice transmissions.

What this will mean to the future of ham radio is anyone's guess. Some are already speculating that PCS will be to the 1990s what the cellphone was to the 1980s. One lightweight portable communicator could soon serve you at home, at work, and in your car. Your phone number would follow you wherever you go. The system can deliver reliable communications to portable phones, FAX machines, and pocket computers.

The Clinton Administration hopes to generate as much as $10 billion for the treasury from frequency auctions. By the year 2010, 60 million subscribers could generate up to $40 billion in revenue. *TNX Electronic Engineering Times, Issue 765, Sept. 27, 1993, and W5YI Report, Issue 19, October 1, 1993.*

ICOM Is Dealing

ICOM America is for the first time offering discount coupons for a variety of products that complement ICOM radios. Anyone purchasing a new ICOM radio between now and December 31, 1993, will receive a book of 32 coupons from 21 leading manufacturers who sell products and accessories.

ICOM's Chris Lougee says, "Virtually every time someone buys a new radio, they need additional components to go with that radio. ICOM is taking a leadership position in identifying complementary products and making arrangements to sell those products to consumers at a significant discount. We believe it will broaden the appeal of amateur radio."

High-Tech Highway

The Clinton Administration's Information Superhighway Plan is starting to take shape. The NTIA (National Telecommunications and Information Administration) will be given the lead role in its formation. The government's strategy calls for competing multiple cable, telephone, and computer networks.

Commerce Secretary Ron Brown will steer an industrial advisory council. You can expect major modifications to existing cable legislation and telephone restrictions. *TNX W5YI Report, Issue 19, October 1, 1993.*

Confirmation Likely

Communications attorney Reed Hundt is expected to be confirmed as the new FCC Chairman. Hundt was well received in his initial confirmation hearing before the Senate Commerce, Science and Transportation Committee.

The 45-year-old Hundt is a partner in the Washington law firm of Latham & Watkins, and he enjoys the friendship of Vice President Al Gore. Hundt has supported increased competition in the telcom industry and universal access to new information technologies overseen by the FCC. *TNX Electronic Engineering Times, September 27, 1993.*

Canada Loves Its Hams

A seven-page full-color spread titled "Loud and Clear" graced the pages of *Canadian Geographic* magazine's September/October issue. The feature article paints a sparkling picture of amateur radio operation in the Dominion.

The story was written by Janice Hamilton VE2JHJ and photographed by husband Harold Rosenberg VE2HRP. Rosenberg says, "I feel that spreading the good word about ham radio is very important, especially in the mainstream press." *TNX ES FB VE2HRP, VE2JHJ, and The Royal Canadian Geographical Society.*

Technical Opportunities Knock

There will soon be far fewer opportunities for blue-collar workers, and a lot more for those who posess technical expertise, according to an expert quoted in *Electronic Engineering Times.* Dennis A. Swyt, a technical manager at the Institute of Standards Technology, painted a picture of an America where engineers and skilled technicians will gain influence and power.

Swyt delivered his remarks to the Engineering Workforce Commission. He added, "The most important occupation group in the U.S. today, and continuing in your lifetime and your children's lifetime, is that of the technical professionals." *TNX Electronic Engineering Times, Issue 767, October 11, 1993.*

RF Standards Could Impact Hams

New RF safety guidelines proposed by the FCC could have an impact on the Amateur Radio Service. The standards being considered (at press time) are the same as those already adopted by the IEEE and the American National Standards Institute.

Possible ramifications for hams include new questions in the licensing test pool, tougher regulation of RF radiation in new products, and a heightened awareness of possible hazards from exposure to RF. *TNX W5YI Report, Issue 19, October 1, 1993.*

Making Copies

The FCC has published a "Policy on the Private Printing of FCC Forms." Under the Commission's rules, blank forms may be reproduced by private companies at their own expense, provided:

- The form must be comparable in quality to the original document without change to page size, image size, configuration of pages, folds or perforations, and matching as closely as possible the paper weight, paper color, and ink color.
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TNX W5YI Report, Issue 19, October 1, 1993.

Hams Fight Arson

Ham operators in Oakland, California, are patrolling the East Bay hills in an effort to stop a recent rash of arson fires. Four volunteer hams are on the lookout team working in cooperation with local fire authorities.

Officials hope the additional presence will help to curb the purposely-set fires. The latest list of arson cases has reminded residents of the fire storm that killed 25 people in the bay area back in 1991. *TNX Oakland Repeater Association, Oakland Tribune, and Westlink Report, No. 658, September 30, 1993.*

Mega-Micro QSO

Paul Lieb KH6HME and Chip Angle N6CA recently set a new 902 MHz terrestrial distance record of 2,469 miles (3,973 km). The CW contact, with signals just out of the noise, came at 0136 UTC on August 23.

For the next four hours, the pair tried unsuccessfully to make contact on 2304 MHz. A frequency near 144 MHz was used for the liason. The equipment used for this historic achievement was designed by N6CA. *TNX Westlink Report, No. 658, September 30, 1993.*

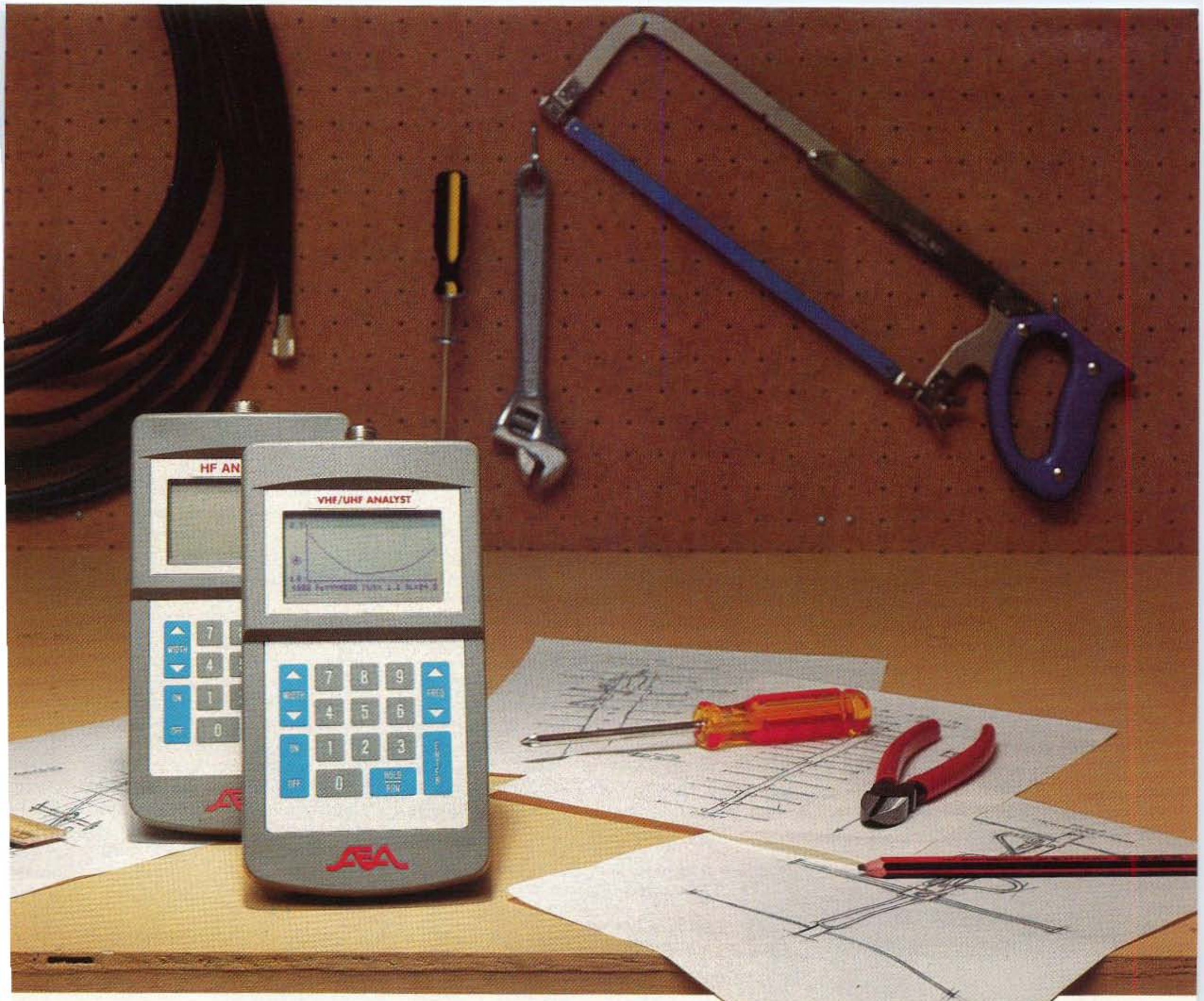
Gert Alert

The Miami-based Sociedad Internacional de Radio Aficionados (SIRA) activated its emergency 20 meter net during hurricane Gert, while 100 mph winds slammed into the Atlantic coast of Central America on September 15. Net control station operator Rafael Estevez WB4ESB handled relief communications with many amateur stations as 65,000 people were evacuated along the Costa Rican and Nicaraguan coastlines. Weather bulletins issued by the National Hurricane Center in Coral Gables, Florida, were also transmitted to Central America, after being translated into Spanish. *TNX W5YI Report, Issue 19, October 1, 1993.*

Rules Change: No Big Deal

So far the concensus is there has been no significant change in amateur radio activity in the wake of the FCC's recent "Relaxing Restrictions on the Scope of Permissible Communications in the Amateur Service." The new Part 97 rules went into effect on September 13, permitting limited business communications on the ham bands.

Under the relaxed rules, hams can now make appointments, give weather report information to the National Weather Service, and order food. Fears that the VHF bands would become a pizza ordering service so far appear half-baked. *TNX W5YI Report, Issue 19, October 1, 1993.*



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For more information on the SWR-121VHF/UHF (120-175MHz, 200-225MHz, 400-475MHz) or the SWR-121 HF (1-32MHz) Antenna Analyst, call AEA's Literature Request Line at (800) 432-8873, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for best pricing.

Connect with us

Deluxe Communications Audio Board

Enhance your audio with this practical add-on.

by David Curry WD4PLI

Have you ever wanted to improve the audio quality of your old receiver? Would you like to add technical improvements to a modern receiver? Though state-of-the-art ham transceivers and communication receivers have improved audio design, there are many benefits to building your own auxiliary audio section and implementing it to your receiver. Or, for the truly ambitious, use it as part of your own home-brew communications receiver.

The strategy here is to simply add several audio processes in series to achieve an improved audio output signal. My desire to design something like this was purely selfish. I wanted my long-wave receiver (a Watkins Johnson R-1401) to have some bells and whistles like my Kenwood TS-430S. I'm also in the process of building my own receiver for LF, and I wanted a good audio section to follow the RF section. This audio board will do both nicely.

The first section of the audio stages is an adjustable bandpass filter, providing control of either the frequency or the bandwidth without changing the volume or other parameters. The original bandpass filter circuit appeared in the December 1992 issue of *RF Design*, in an article written by Jefferson Hall and Alvin Connelly. It was an excellent article and I quickly built the circuit, much to my satisfaction. After a short time, however, it was apparent that more circuitry was needed to eliminate a carrier that was within the passband, so I added a simple notch filter. This very effective design was by Randy Seden WD6ELU. The combination of a notch filter and variable bandpass filter can improve receiving conditions, but for weaker signals more circuitry is required.

An additional circuit that adds this improvement, especially for CW, is a regenerative audio stage with adjustable frequency and "Q." This type of circuit has been virtually left behind in modern radio equipment, yet it offers many advantages, considering its simplicity. One of the greatest things about a regenerative or Q-multiplier is the ability it has to reject noise and to peak the desired signal. As the regeneration is increased, the sideband noise drops, which improves your signal-to-noise ratio. The final addition to the audio board is what I call a "digitizer" circuit, which eliminates background noise for CW signals. This is nothing more than a comparator used as a variable threshold detector. The digitizer compares the audio signal to a voltage reference, and provides a square-wave or digital output. The comparator will sometimes trigger on noise that just crosses over the threshold point, so a second comparator is used as a "window," allowing the digitized CW signal (which is stronger) to pass, but not the weaker noise pulse. Low-pass filtering is used to clean up the square-wave signal to a more natural tone. Finally, an audio output circuit that has appeared in virtually every radio handbook was chosen for the speaker section.

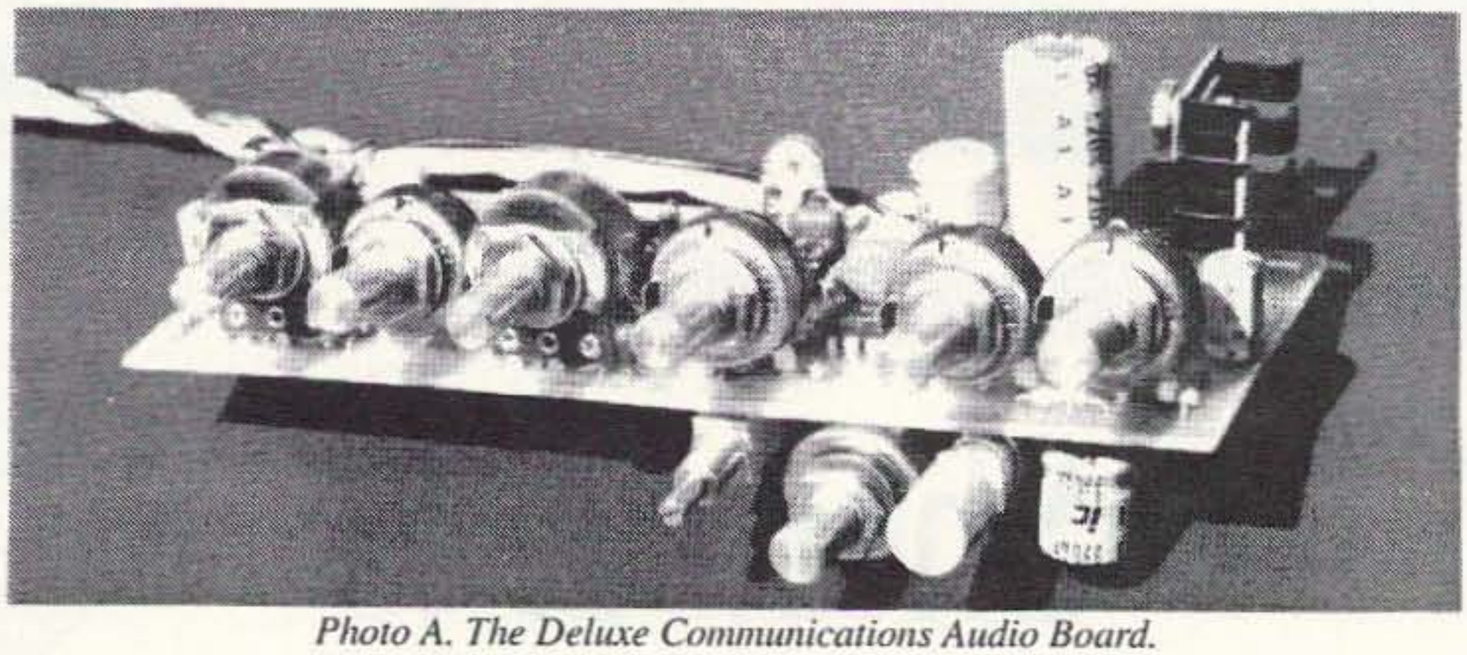

Photo A. The Deluxe Communications Audio Board.

I originally discovered the circuit in a SAMS book written by Walter Jung, *Audio IC Op-Amp Applications*. Low noise and low standby current are the hallmarks of this legendary circuit, using very common components. So let's review: A variable bandpass filter, followed by a variable notch filter, followed by a Q-multiplier, then a digitizer, then a 5 watt audio output section. WOW! With these devices in this particular order, it is very possible to do wonders with your receiver.

Circuit Description

The schematic shows a lot of ICs and parts, but don't let that fool you! The circuit is rather simple and can be followed easily at the top left corner, labeled "Audio Input." C1 is simply a DC blocking capacitor, while R1 sets the overall gain of the first section. If a very low audio signal is connected, R1 can be decreased in value to increase the gain. U1a, b, c, and d are all low-noise quad op amps, which keeps the size down. The filter frequency is adjusted with dual-gang potentiometer R7. The bandwidth is adjusted with R6, which controls the amount of feedback to U1a. The entire top portion of the schematic is the variable audio filter section.

The next stage is the notch filter located directly below U1. U2a and c sections provided a 180-degree phase shift of the frequency controlled by R13a and b. Using two sections of notch filtering provides a very deep null with steep skirts. Summing amplifiers U2b and d provide the nodal point where the phase-shifted frequency meets the original signal and is subtracted to almost zero. U2 is also a low-noise quad op amp. Output of the notch section is applied to R24, which is the regeneration control for the regenerative preamp. The regenerative preamp is located by itself on the right side of the schematic. U3a and b make up a dual low-noise op amp and, as you can see, feedback is applied in desired amounts from the output of U3a to U3b and out to the U3a input again. C10, R27, C9, and R25 and 26 provide the adjustable frequency response for the filter. The potentiometer marked "Q" is adjusted once to allow smooth control of regeneration with R24. If oscillation develops, rotate R28 to the point were oscillation just ceases. The frequency control has a fairly wide frequency range to facilitate most CW signals. The audio signal is sampled at the output of U3a, and directed to switch S1. Normally, S1 is out or OFF, which applies the signal directly

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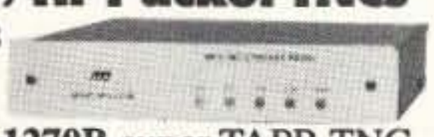

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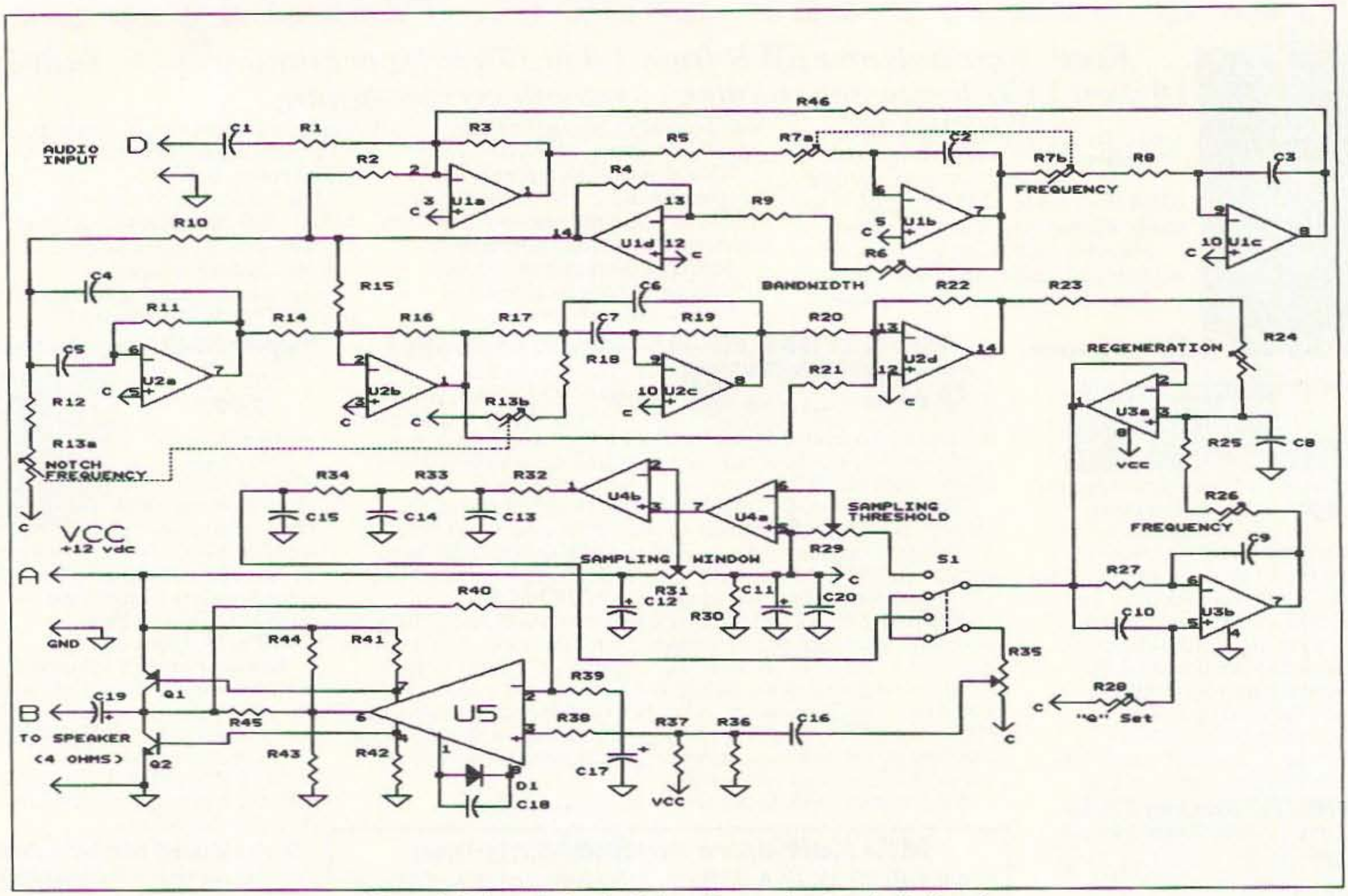

Figure 1. Schematic for the Deluxe Communications Audio Board.

to the audio amplifier stage U5. However, if the digitizer is desired, the signal is routed to comparators U4a and b. The same low-noise dual op amps are used here as with U3. Though not really intended to be used as comparators, the Tl072 or LF353n op amps provide a softer comparator, making the threshold point easier to adjust. Potentiometer R29 is the input threshold control to the first comparator U4a. The signal that triggers the comparator will provide a square-wave output at U4a that is the same frequency as the input signal.

During weak signal conditions some residual noise may slightly trigger the first comparator, creating a small noise spike that is usually lower in amplitude at the output of U4a. To help eliminate this, a second comparator is used, sampling the signal that has the largest square-wave output from U4a by adjustment of R31. R31 is set to not trigger on other noise that has a lower amplitude. U4b provides us a square-wave representation of the signal to the low-pass filter. R23, R33, R34, C13, C14, and C15 comprise a low-pass filter arrangement that attenuates the high frequency components of the square wave, providing a cleaner, more listenable tone. It also lowers the square-wave amplitude to a level that can be used by the audio power amp stage. The audio power amp uses a class AB op amp to drive power transistors Q1, and Q2.

The biasing for these transistors is done within the chip itself. This provides good audio quality at low and high volume levels since the bias is internally etched in U5. Volume is adjusted by R35. Power amp gain is set by R40. Usually there is plenty of gain to drive a common 4 or 8 ohm speaker. Diode D1 is a clamping diode to eliminate any latch-up that might occur if the speaker became shorted. C18 rolls the high frequency off just above 2.5 kHz. Resistors R43, R44, and R45 are used to set the gain and bias for Q1, and Q2. R41 and R42 are part of the biasing and power to U5.

Building Notes

The double-sided circuit board makes building this project very easy. *Remember to solder both sides of this double-sided PC board because the holes are not plated-through.* Note that potentiometers R26 and R29 are located next to switch S1 on the solder side of the board. This helps to fit more controls in a smaller space. R24 *must* be installed before R26. Similarly, R31 *must* be installed before S1, and R30 before R35. A small 5 watt heat sink is sandwiched between Q1 and Q2, and screwed securely.

Many resistors are mounted vertically on the circuit board. A small square on the layout sheet indicates this configuration. A longer rectangle denotes a horizontally-mounted resistor. Be sure to solder all pads on the component side of the circuit board that have connections to any components. The connection points to the speaker, power supply, and audio input are marked on the layout sheet. All points marked "C" on the schematic are connected together as a common bias-point reference. There are no "C" connections to be concerned about during assembly.

Operation

Connect the speaker and the audio input cable to the appropriate points on the circuit board, then apply power. The advised minimum voltage for this circuit is 12 VDC, with up to 18 volts recommended. The higher voltage will help avoid any distortion at high volume. Turn all component-side controls counterclockwise.

Push S1 in to bypass the digitizer section.

Turn the far right hand control clockwise to a comfortable level.

The controls are in this order (from left to right on the component side): Bandpass Filter Frequency, Bandpass Filter Bandwidth, Notch Filter, Q Multiplier, Digitizer Sampling Window, Volume. Under the circuit board are: Q Multiplier Frequency, Digitizer Sampling Threshold, Digitizer Bypass Switch. Take time to experiment with these controls. The Q multiplier and digitizer controls take getting used to. Remember that with a Q multiplier you must have the frequency control at *exactly* the same frequency of the desired signal. The more regeneration you apply to the Q multiplier, the more

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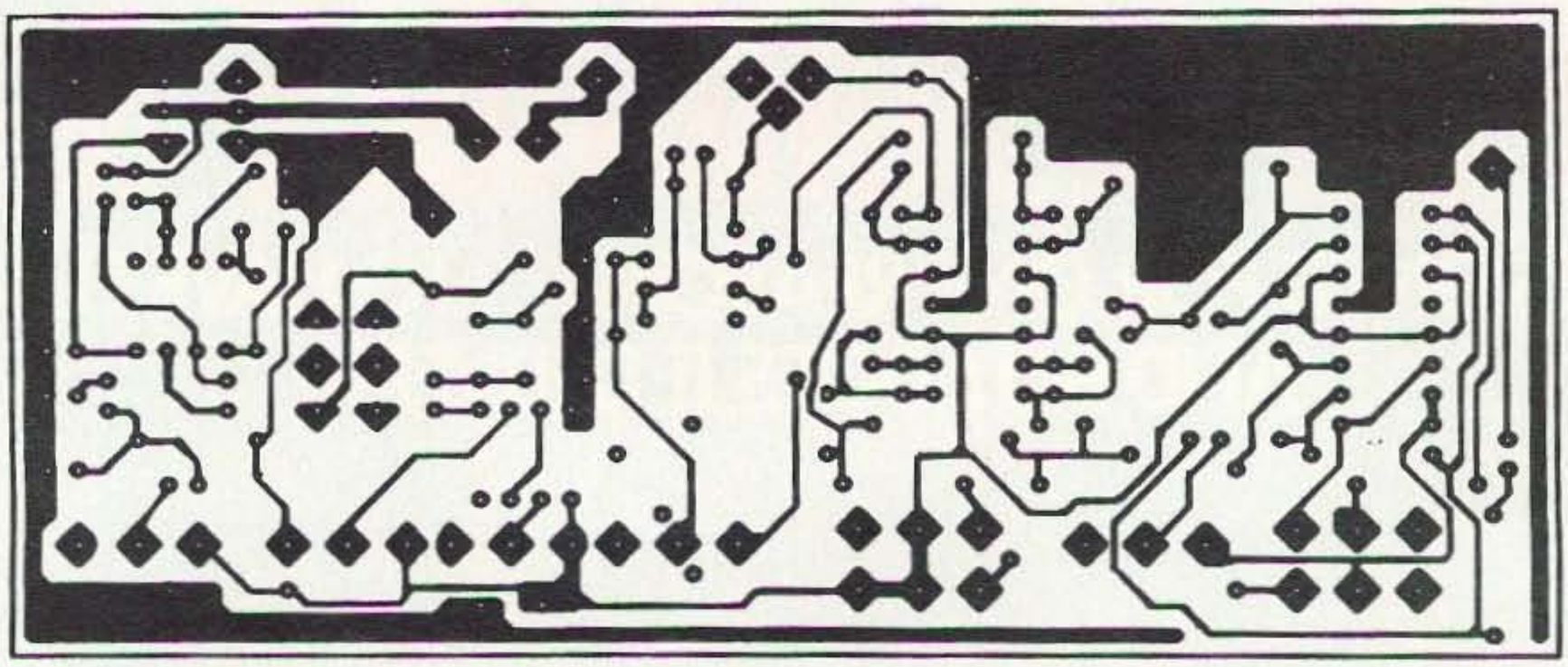

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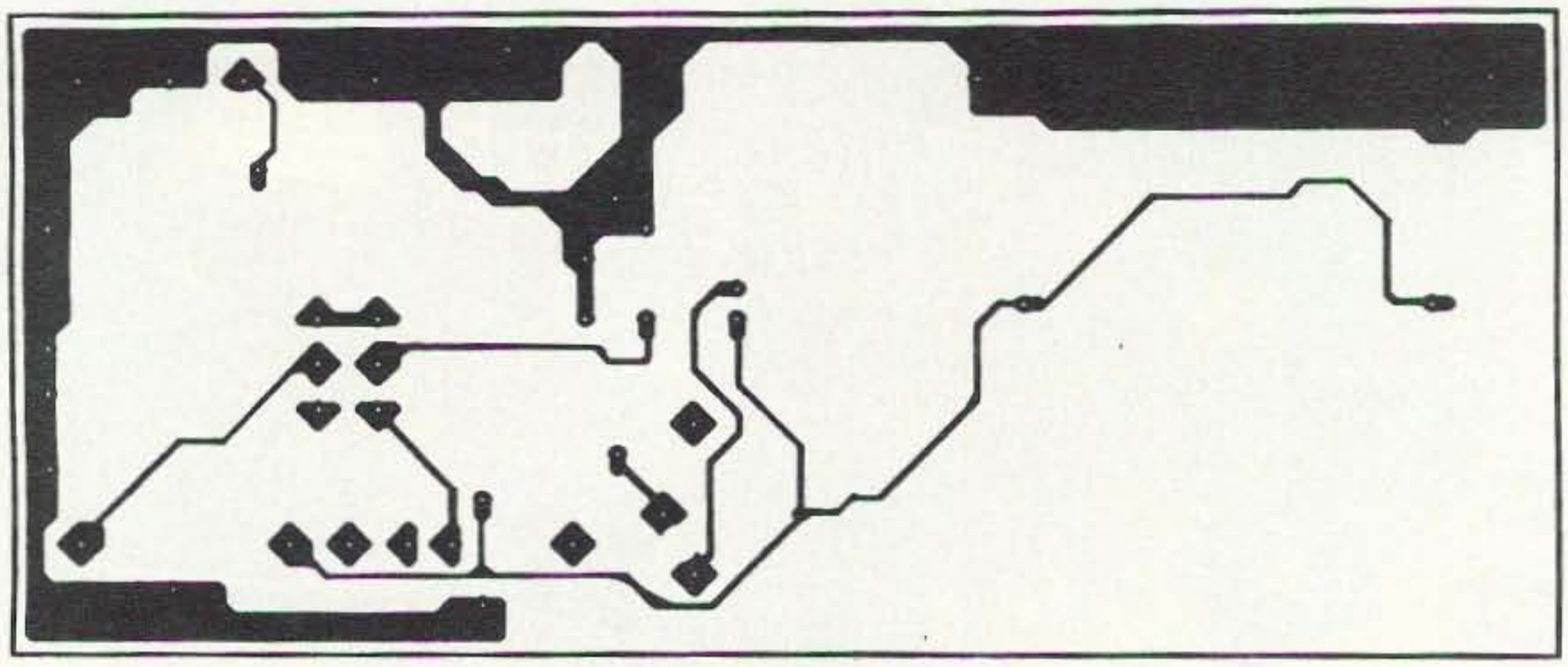

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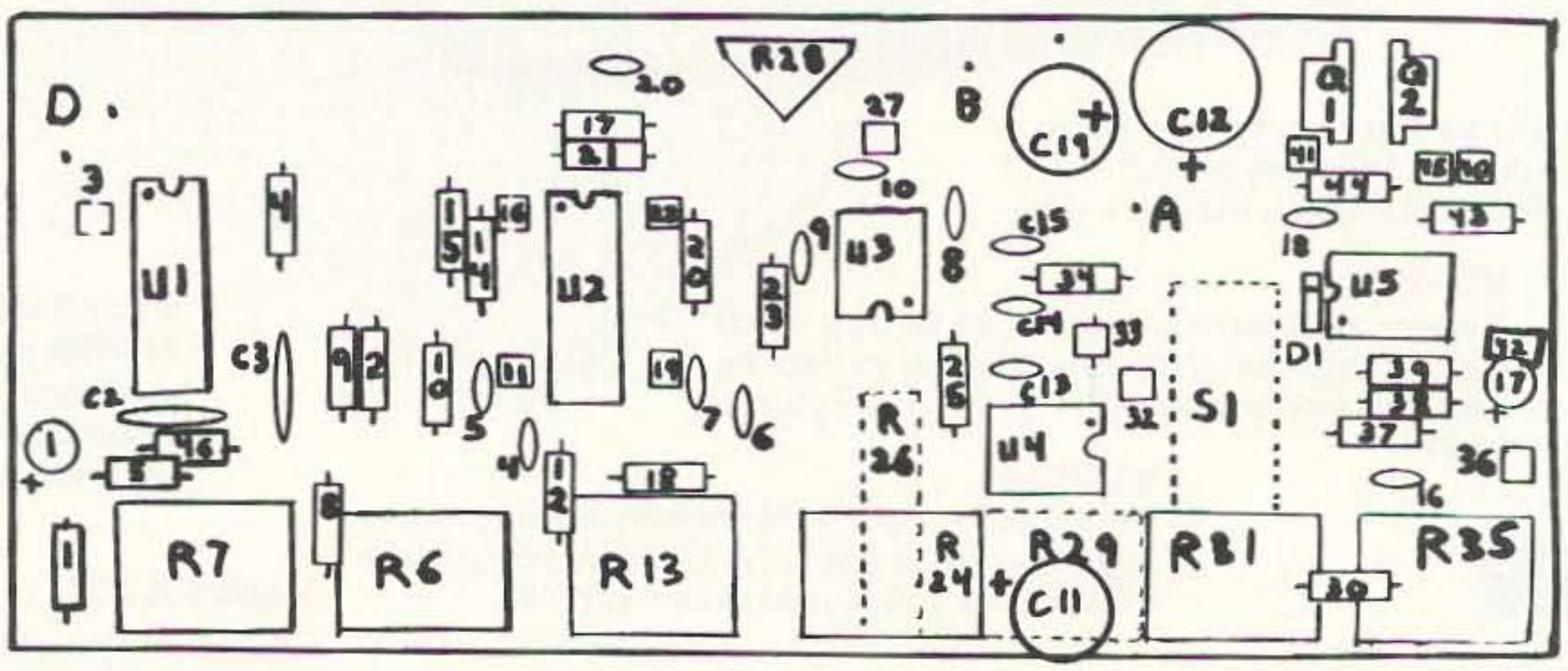

Figure 2. Double-sided PC board layout: a. Solder side; b. Component side; c. Parts placement diagram.

this requirement must be met. Another consequence of using large amounts of regeneration with the Q multiplier is that the CW signal becomes elongated, like a bubble. You can hear this effect distinctly. The digitizer can minimize this effect by triggering on the top portion of the elongated waveform, and then using the window comparator control to shore up the pulse width. Simply put, both controls can adjust the duty cycle when heavy regeneration from the Q multiplier is needed. During regular operation, I recommend notching any undesired signal first, then apply the bandpass filter. Sometimes the Q multiplier works very well to improve SSB or voice communication, but over-driving with too much output volume from the receiver will degrade it's ability to peak the desired signal.

Conclusion

This audio output section will provide improved reception. It is perfect for an easy weekend project, or for someone who wants to "go all the way" and build a complete receiver from scratch. This design matches perfectly to an NE602 mixer or product detector. I would like to thank the authors for engineering these fine circuits, and Randy Seden for his computer design of the notch filter section. 73

See Parts List on page 16.

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Parts List

Part #	Description	Purchase
C1,C17	4.7 µF electrolytic	Digi-Key
C11,C19	100 µF/16 VDC electrolytic	Mouser: 140-XRL25V100
C12	2200 µF/16 VDC	
C13,C14,C15,C16,C20	0.1 µF/50 VDC disc	
C18	27 pF/50 VDC disc	Digi-Key: P4449
C2,C3	0.01 µF/50 VDC poly.	Digi-Key: P3103
C4,C5,C6,C7,C9,C10	0.0047 µF/50 VDC poly.	Digi-Key: P3472
C8	0.047 µF/50 VDC poly.	Digi-Key: P3473
D1	1N914 diode	
Q1	TIP32B PNP power transistor	
Q1,Q2 H/S	5 watt heat sink	
Q2	TIP31B NPN power transistor	
R1	33k ohm resistor 1/4 watt	
R10,R17	316k ohm resistor 1/4 watt, 1%	Digi-Key: 316KX
R11,R19	634k resistor 1/4 watt, 1%	Digi-Key: 634KX
R12,R18	274 ohm 1/4 watt, metal film, 1%	Digi-Key: 274X
R2,R3,R46,R14,R15,R16,R20,R21,R22	100k ohm resistor 1/4 watt, 1%	Digi-Key: 100KX
R24	50k ohm potentiometer	Mouser: 31CW405
R26	100k ohm 25-turn potentiometer	Mouser: 594-43P104
R28	10k PC mount trim pot.	Mouser: 32RM401
R29,R31,R35	10k ohm potentiometer linear	Mouser: 31CW401
R36,R37,R40	22k ohm resistor 1/4 watt	
R38,R39,R43,R44,R45	1k ohm resistor 1/4 watt	
R4,R30	10k ohm resistor 1/4 watt	
R41,R42	470 ohm resistors 1/4 watt	
R5,R8,R25,R27,R32,R33,R34	6.8k resistors 1/4 watt, 1%	
R6	500k ohm potentiometer, linear taper	Mouser: 31CW505
R7,R13	50k ohm dual potentiometer, audio taper	Calrad: 25-397
R9,R23	4.3k ohm resistor 1/4 watt	
S1	DPDT switch PC mount	Digi-Key: EG1003-ND
S1B	Knob for S1	Digi-Key: EG1092-ND
U1,U2	TL074 low noise quad op amps	
U3,U4	TL072/LF353N op amp	
U5	LM301AN op amp	

A complete kit is available for $76.23 ppd.; a PC board with complete instructions is available for $22 ppd. (CA residents add sales tax) from Curry Communications, 737 North Fairview Street, Burbank, California 91505.

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Resolving 2 Meter/Cable TV Interference

A winning strategy for keeping the peace, and staying on the air!

by S.M. Yost NM8R

Is your 2m packet station in danger because of interference (TVI) it causes to the local cable TV system? Knowing your options, responsibilities, and how to track down the problem can put you back in the driver's seat. This article walks you through the entire process toward resolving this difficult issue: the technical details, how to deal with your neighbors, and how to work successfully with your cable company.

The story starts the same way, and is echoed on packet BBSs across the country: "HELP! My neighbors are up in arms, and mad as heck. I'm interfering with their cable TV. If I don't find a solution soon, my new packet station will have to go QRT. Can anyone help?"

The plea usually goes unanswered, and when it dies off the BBS, with it goes another amateur's hard-earned privilege to enjoy part of his hobby.

Worse, it's not only packet operators who can suffer. Amateur-caused cable television (CATV) interference can rear its ugly head during 2m FM voice operations as well. So, even if you're not packet-equipped (and shame on you if so!), read on . . .

KI8W BBS>NM8R (B,K,L,R,S)
S WB8HSL
MSG# TO FROM DATE TITLE
7258 WB8HSL NM8R 930907 HELP W/2m CATV INTERFERENCE
ENTER MESSAGE/ CTRL-Z TO END

OM—Pulled the message about your CATVI problem from the Bulletin Board tonight. I understand your frustration, but hang in there; this problem can be solved! I had the same difficulty here. I fixed it, though, and I'm still on the air, with happy neighbors to boot. It takes three steps to solve this matter, so let's get started. First, you need a little background.

Long ago it was established that every radio service—commercial, government, and amateur—had its own frequency assignment. These assignments were formed into an orderly structure throughout the radio spectrum. A latecomer, however, called cable TV, added a silent partner to the plan. Silent, because cable TV's coaxial media (versus the ether used by the original tenants) ingenuously allowed room for coexistence. Coax allowed two worlds, the off-air services and CATV, to occupy the same spectrum, separated by only a few mils of copper braid. One is free to roam the ether, while the other exists only within the confines of a coaxial cable. When everything works properly, one never knows the other exists.

Shielding—the basis for this coexistence—is the issue in your case. Because CATV runs a shielded, closed system, it is permitted to borrow frequencies already in use by other services. Nothing leaks *out* to QRM the off-the-air users, and conversely, nothing gets *in* to interfere with the CATV system. This may be great in theory, but how does it stand up in practice?

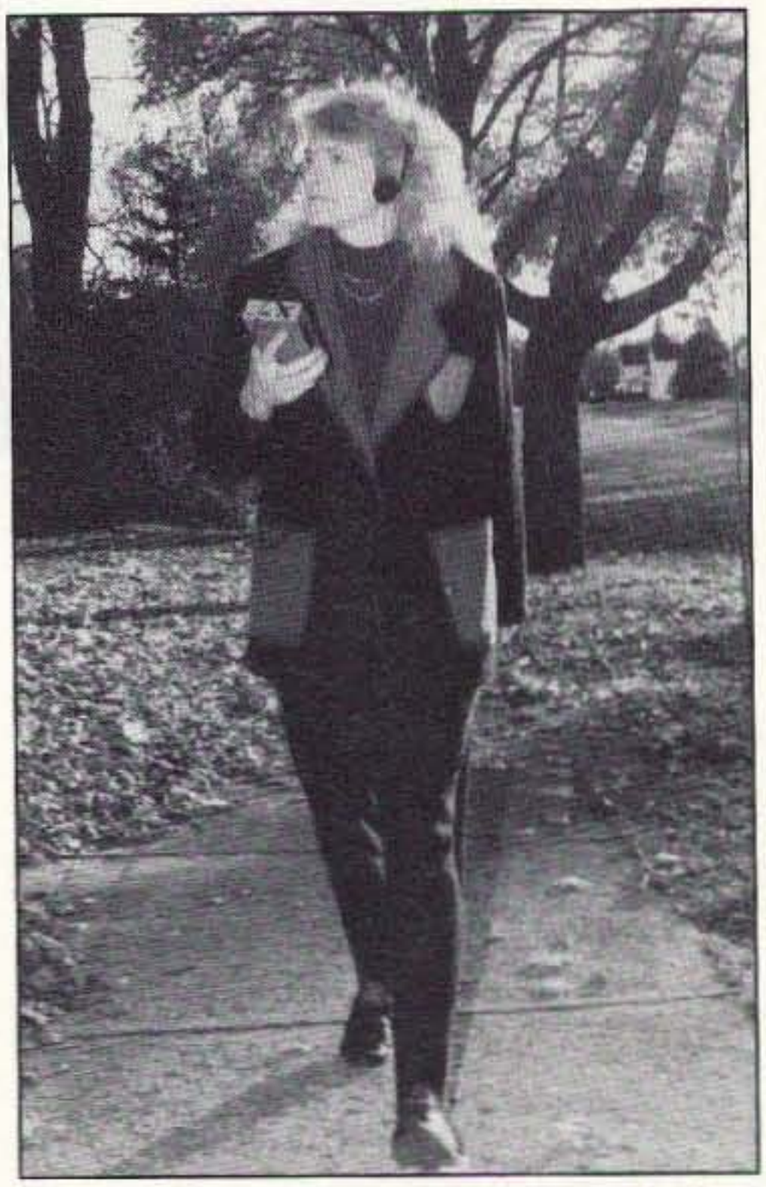

Photo A. Your foot survey for CATV leaks is easy and can be low profile. Who would suspect that this amateur operator (N8HGM) is sniffing out a CATV leak in her neighborhood, rather than just grooving to a tune on her Walkman? Conducting your leak survey while driving is also very effective, but don't forget to pay attention to the road!

Where the Rubber Meets the Road

Unfortunately, there are many things which can degrade a CATV system's shield integrity. When this happens, the door is opened for signals from the outside to get in, and for cable signals to get out. You didn't mention it, but I'll bet the interference is *only* on CATV channel 18, and *only* when you are on 2m. (I'll bet your HF gear, the "traditional" television interference source, isn't guilty at all this time.) Further, I'd wager it's not a harmonic or spurious output from your 2m rig. Consider this: Cable TV assignments are spread throughout the VHF and UHF spectra. They not only share the traditional TV band plan, but also many frequencies *around* it. All told, CATV signals occupy frequencies already in use by aircraft, broadcast TV, public safety services, and VHF amateur radio. Specifically, the video portion of cable channel 18 is centered at 145.25 MHz . . . get the picture?

A cable signal is very weak in relation to the signal you can accidentally inject with your 45 watt, packet-equipped 2m station. Once your signal gets in, it's not even a fair match! Plus, it doesn't take much of a CATV shield breach to let in an ample amount of renegade, 2m energy.

The Open Door

After you've pondered that for a moment, you should be wondering: "If my problem is one of getting into the cable system, why even mention their signal getting out?" The reason is simple: This is where the shared spectrum concept comes to the unexpected relief of amateurs. The shield break that is letting your 2m signal in is spraying wideband video signals over the nearby area. The FCC takes a dim view of cable TV leakage, and for good reason. They don't want jumbo jets thrown off course by escaping "I Love Lucy" reruns! As a result, the FCC requires that cable companies check their systems for leaks, to prevent this. Also, limits are set on the amount of radiation permitted to escape from a CATV system. Lastly, the FCC requires prompt action to resolve leaks.

That covers the theory part. The second step of the three-part plan is foot patrol. Basically, what you'll be doing is scouting your

Continued on page 21

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FTH-2008/7008	IC2/4GAT/24AT
	IC-A21/U16

Landmobile HT's
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MAXON, MOTOROLA,
YAESU: FTH 2008/7008
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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** CDF Matching case set for DF-1 ....**$12.95**
FHT-1 SlyFox Foxhunt transmitter kit .**$129.95** FHID-1 Voice ID option.....**$29.95**
CFHT Heavy duty metal matching case set for FH T-1 .....**$29.95**

TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....**$99.95** CTG Matching case set.....**$12.95**
TG-1WT Fully assembled TG-1 and case **$149.95**

TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit .....**$129.95** CURC Matching case set.....**$12.95**
URC-1WT Fully assembled URC-1 and case **$189.95**

DIGITAL VOICE RECORDER

Chatterbox digital voice storage unit will record your message of up to 20 seconds. Time is split up into four 5 second blocks which can be played separately or cascaded for longer messages. An LED display shows message location and current mode for easy operation. Nifty built-in interfaces allow simple connection to transmitters for automatic keying when the PTT is initially closed or after it is released. You can even loop your rig's mike through the Chatterbox. For contest or fun use, the CB-1 can drive an external speaker. Includes a built-in electret mike. For that finishing touch, add our matching case set.

CB-1 Voice recorder kit .....**$59.95** CCB Matching case set **$12.95**

FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....**$24.95** CSCA Matching case set.....**$12.95**
FR-1 FM receiver kit.....**$19.95** CRR Matching case for FR-1.....**$12.95**

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Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stabilty to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.

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SCN-1WT Assembled SCN-1 and case.....**$89.95**

STEREO PEAK HOLD BARGRAPH

Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistance display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete intructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....**$39.95** PH-15 Dual Log bargraph kit.....**$39.95**
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New low-cost microwave. Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

SG-7 Complete kit.....**$89.95**

FM RECEIVERS & TRANSMITTER

Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion, ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.

FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz).....**$29.95**
CFR Matching case set .....**$12.95** FT-146 Two Meter FM transmitter kit **$79.95**

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Imagine taking this cute little 20 Meter SSB/CW rig on business trips or vacations, there's feature galore with this beauty ! A DDS (Direct Digital Synthesis) synthesizer tunes in 10 Hz steps, two VFO with memory and digital RIT with freq display! Convenient features like a dial fast button allows you to hop around the band and dual selectable AGC allows comfortable operating. Instant, one-touch WWV reception for quick band condition checks and microprocessor control with built-in Iambic CW keyer that has digital readout of speed! Perky 10 watt RF output (only 1 1/2 S units below 100 watts) can be turned down for QRP. Includes hand mike with handy Up/Down buttons for easy remote tuning. This rig's a joy to operate, with performance equal to units costing hundreds of dollars more and with some features not found on any rig at any price! Covers the 20 M band 14 -14.5 MHz plus 15 MHz WWV. Our easy to follow instructions have you assemble the kit in simple "bite-sized" sections that are tested as you build, assuring you of a rig that works first time. Experience the pleasure of saying the rig here is home-brew! Available in kit or fully wired.

SX-20 SSB/CW transceiver kit .....**$349.95** SX-20WT Fully assembled SX-20 .....**$429.95**

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FX-50 kit (6 Meters).....**$149.95** FX-146 kit (2 Meters) **$149.95**
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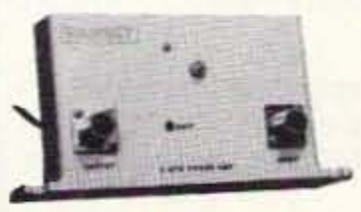

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Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has 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.

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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..**$12.95**

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Pick the unit that's right for you. All units transmit a stable signal in the 88-108 MHz FM band up to 300' except for High power FM-4 and PB-1 Phone bug that go up to 1/2 mile.

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SS-70 Scrambler /descramblerkit.....**$29.95**
CSSD matching case set **$12.95**
SS-70WT Assembled SS-70 and case set.....**$69.95**

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.....**$24.95**
Matching case set, CAR **$12.95**

AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit **$24.95**
CAM Matching case set.....**$12.95**

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugur 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..... **$12.95**
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QRP TRANSMITTERS RECEIVERS LINEAR AMPLIFIERS

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 **$12.95**

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.

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CHR, Matching case **$12.95**

QAMP

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 **$12.95**

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CIRCLE 34 ON READER SEVICE CARD

Resolving 2 meter/Cable TV Interference

Continued from page 18

neighborhood with a portable FM radio, so put on your sneakers!

Recon!

Though it's the cable company's job, you can track down the leak source (they call it an "egress") yourself. But why would you *want* to? Don't get the wrong idea—you won't fix any leak you find. That's up to the CATV company. You'll see in a moment, though, why it's helpful to know the source of the shield breach causing the leak. For now, be satisfied that it may save you some embarrassment if the source is in your own home! Before starting, however, carefully heed the following warning: *Do not trespass on other people's property* while performing your self-styled leak survey. It's not worth a load of No.7 shot, or a tangle with a Doberman, to find the leak! Ham radio needs your picture in the local paper because you hooked up a homesick foreign exchange student with her family or ran a battery of phone patches for weary servicemen through MARS, *not* because of an article about your arrest for trespassing! 'Nuff said?

For our purposes, you can perform a leak survey handily from the sidewalk, or from your car. Don't do it from other people's yards without their permission (and even with their permission, only with great care).

So . . . how do you do it?

Sniffing It Out

CATV systems inject a special modulated RF carrier into their system to act as an "odorant," sort of like the gas company does. If they have a shield break—an egress—this tone-modulated radio frequency carrier, or tracer, intentionally escapes the cable and they sniff it out with equipment carried in their vans. Luckily, you can use a portable FM broadcast band (BCB) radio to do the same! Just like your nose finds a gas leak because of the odorant injected, your portable FM radio can find a cable TV leak.

Here's how to put your amateur version of the sniffer to work. First, determine what frequency the tracer is on in your area. Do this by placing an FM BCB portable radio near your own cable TV coax. (What? No CATV in your home? Then try this test with a cooperative neighbor, or even better, the one who is complaining.) Disconnect the incoming CATV coax from the TV or VCR and, with an FM radio close by, tune until you come across a raucous whoop-whoop-whoop tone. If the carrier injector is turned on, you *can't* miss it. In my area this carrier resides around 107.8 MHz, although in some locales it's placed in the middle of the FM band. Once you know the tracer carrier's frequency, drive or walk your neighborhood, listening for this obnoxious tone. (Hook the coax you pulled for this test back up, first!)

Don't be surprised if you encounter a number of cable TV leaks in your search. Not everything you will hear, however, is a leak the cable company needs to be concerned about. There *is* a permissible amount of radiation, tolerated by the FCC. You'll quickly learn to sort out the weak ones from the strong ones.

Note, too, that the sensitivity of a car's FM BCB radio is greater than the squelch setting of the commercial sniffers the CATV companies use. As a guideline, you're interested in strong leaks within a few block area of your QTH. A strong leak would be one where you hear "S9" more than 50 feet from its source. I find the car radio works best for the general search, and a portable radio for pinpointing the source.

Just remember this clue, Sherlock: Where their signal escapes, your signal enters.

What to Look For

Once your sniffer has helped you zero in on a possible leak, you need to turn to your observation skills. As you drive the system, pay particular attention to pedestal junction block housings (those 12" square by 3'-high metal boxes), and any pole-mounted distribution amplifiers. Also, scan the overhead cables for any that may have been damaged by falling branches. At a residence, the leak source can be damaged or water-corroded cable, especially in the drip loop where it enters a house. Also look for loose connectors or unterminated splitters or cable runs. Devices a subscriber puts on his line, such as cheap (poorly-shielded) coax, lengths of 300 ohm twinlead(!), and game switches, can breach the system's integrity, too. One other possibility to be aware of is the illegal tap. Take the safe path and let the cable employees "discover" these.

Why go through the hassle of hunting down the leak yourself? You don't need to. But it will help, and might even favorably impress the CATV company if you can tell them where you think the egress is located. Possibly you can even guide the CATV tech, saving him time in his search.

Contacting the Cable Company

The last step toward a solution is to make contact. (This should be easy; you're a ham, remember?!) Once you're at this point, simply pick up the telephone and call the cable company.

First, some tips to make your effort more successful:

Plan what you will say *before* calling. Your goal is to get one point across, clearly: You're the one who is causing the interference (*that* will get their attention), and you want to resolve the matter quickly, to their benefit as well as yours. Speak and act professionally—it will make a more favorable impression. Ask to speak with the System Manager, his assistant, or a member of the Engineering Department. (You may prefer to visit the cable company's office and deliver your message personally. If you're the charming, amiable type, the doors will open quickly.) After you've clearly stated your reason for contacting them, run down the following list of points to discuss: Explain

the problem and how you know the things you do. (Expect them to be curious how you know about the technical aspects of their system.) Use the word egress. (They prefer it to leak; it sounds less threatening.) Did you find anything in your own search for the egress? If so, tell them now.

Have they encountered this problem before? How did they resolve it?

Keep in mind it's not always a fault of their system that causes the leak—oops, egress. It can be devices the subscriber puts on the line. They should be as interested in these, however, as defects in their own system. Either can allow CATV signals to escape, or permit outside signal entry. It's all in how you present it.

Don't pepper your speech with ham "Q" signals. Even though we talk this way, CATV people won't find it intelligible, or amusing.

Inquire if the cable company noted any leaks in your area at their last FCC-mandated leak survey. (They refer to this survey as

CATV Notes

CATV Frequency Assignments

Knowing what frequency is used (and shared) by a particular CATV channel can be useful in troubleshooting CATV problems. Table 1 can help you determine CATV channel frequencies from the cable company's decoder, whether your local system uses letter or number designators. Only cable TV channels 2 through 13 correspond directly with the off-air channel frequencies. From that point, CATV channels bound across the spectrum, borrowing slices of RF real estate along the way. Although it's not shown on this chart, in some systems frequencies as low as 5 MHz are used! (Source: *Scientific Atlanta*.)

FCC Rules Governing CATV Service

Part 76 of the FCC rules is on the mind of every CATV system operator. This section governs how he operates his CATV system, and spells out the technical standards he must follow. The *FCC Bulletin* reproduced here in part (FOB Bulletin No. 17), is a checklist CATV operators can use to ensure compliance. Rules 76.601 and 76.611 are of particular interest (and help) to amateurs. Rules 76.613 and 76.614 apply in the special case of cable TV frequencies shared with aeronautical services. Keep in mind that some leakage is tolerated; you might hear leaks during your tone-sniffing survey that are entirely legal. How much radiation is tolerated? FCC rules state that, at 2m frequencies, a leaking CATV signal's strength cannot exceed 20 microvolts per meter at a distance of 10 feet. You'll probably have no way of knowing the actual field strength of any leaks you encounter. Note them all, anyway, following the guidelines given in the main article, for the benefit of the service technician. He'll be able to sort out the strong ones.

Reverse Psychology

In some areas, amateur repeaters at the low end of the 2m band have long suffered QRM *from* leaking CATV signals. The concepts described in this article work for tracking down these leaks and resolving them. Think of it this way: If leaking CATV signals are ruining 2m repeater operation, surely some ham in the area is getting into *their* system, too . . . Use a little reverse psychology to solve this one!

What to do if the Tracer is Off

Occasionally, lightning or equipment failure will knock a cable company's FM band tracer system out of service. If so, you'll have to resort to conducting your search with different equipment. Your 2m mobile rig and 2m HT, or a scanner, will fill the bill. (Be aware of your state's laws regarding scanners in automobiles, if you employ one for the search.) Although these methods won't be as inconspicuous as a Walkman or the FM receiver in your car, they will work. Instead of a tone, you'll be searching for the actual audio portion of a cable TV channel. Here's how: Refer to Table 1 for the audio sideband frequency of a CATV channel within the tuning range of your 2m rigs or scanner. I suggest channels A through E, as these lower frequencies carry farther once they've escaped the cable. After programming your rig, drive or walk the area listening for the audio portion of the TV channel you've targeted. Zero in on it in the same manner as described in the main article for the FM receiver. Use a scanner or your mobile 2m rig with an external antenna for the general search, and an HT for pinpointing leaks on foot.

What to do if the FM Tracer is Gone!

Depending on how progressive, or financially flush, your local cable company is, they may have upgraded their leak tracing system beyond the FM band leak tracer. The new generation of leak tracer uses specialized equipment which searches for actual video radiation on channels A, B, or C. These are aeronautical frequencies, slightly above the FM band. Why the switch from a perfectly good system that was also easy for *us* to track? One incentive for the cable operator is that the new system frees FM band frequencies for commercial use. Cable systems sell an entertainment product, but no one would pay to hear a repetitive whooping tone! (Unless, of course, the customer happens to be a ham—the type who parks his receiver on WWV for hours on end . . .). If your cable system *has* made the switch, use the tracking methods described in "What to do if the Tracer is Off."

Portable TVs as Leak Detectors

It's tempting, but leave the portable TV at home; it won't work well as a CATV leak sniffer. The video component of a leaking signal weakens too quickly with distance. Beyond five feet or so of an egress, a consumer-grade TV will not detect a leak source. Also, note that only CATV channels 2 through 13 correspond directly with the frequencies of off-air TV, so it's difficult to tune the entire range of cable channels.

Neighbor PR

A little premeditated public relations effort with your neighbors goes a long way. Really now, why be hard-headed about it? Try a gentler approach. I always start with: "I'm *sorry* that I'm affecting your TV/radio/telephone . . ." It can be positively disarming, and that can work in your favor. Ditto with the cable company.

What to do when the Problem is Wrapped Up

When an RFI case of any type is finally wrapped up, I make a call to tie the ribbons on it with my neighbor. I do this to get his agreement that it is resolved, or (put the words in his mouth if necessary) "99% better, and acceptable."

Also, call the cable company and leave a message for your contact person to say thanks. Our CATV system manager went so far as to tell me to encourage other amateurs to contact him if they encountered similar problems. You can open the door for your brother and sister amateurs with this follow-up call.

Lastly, write down what you did and learned. Others can benefit from this knowledge! Share it with your local club, repeater group or packet organization.

High-Pass Filters . . . One Thing *Not* To Do

A local amateur, N8LDQ, also experienced serious CATVI shortly after my situation was resolved. Interestingly, he found that a high-pass filter, a typical TVI *solution*, was *causing* the cable system shield breach at a neighbor's home. It was a poorly-shielded L/C unit which let 2m energy in and cable energy out. Although it would have been a fine approach to an HF-related source of TVI in an off-air TVX case, in the cable system it was a Pandora's box (or gateway).

The Cable Company Field Tech and You

Try to meet the cable company technician who performs the investigation and repair work. There are two reasons to do this. First, if you impress him as a technically competent and helpful individual, you'll enhance the image of our hobby. This will help your case, and those who follow you. Secondly, you might *learn something!* (Then pass it on at your next ham club meeting!) Keep in mind the poor tech's lot: He enters the home of strangers, deals with their smoke and pets, must figure out and fix the problem, all while playing referee between the subscriber, his company and possibly even you! If you can ally the CATV company tech, your job of resolving the matter will be more effective, and quicker to succeed.

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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

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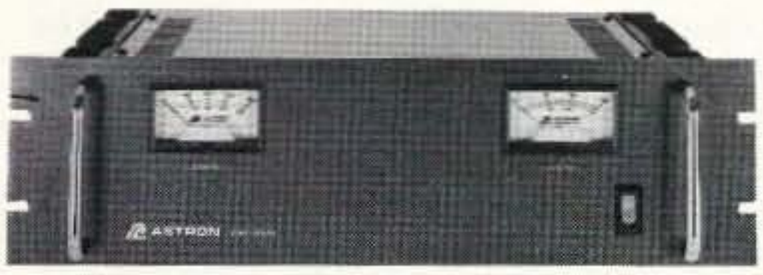
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



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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

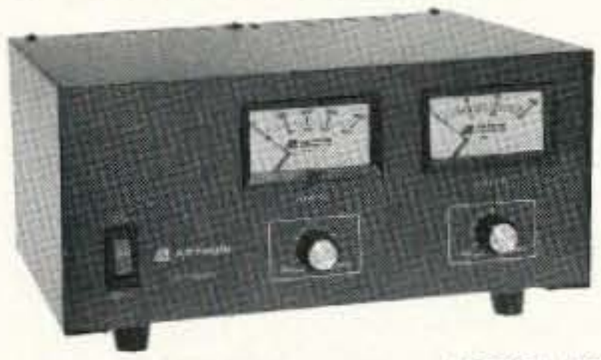
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 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

S—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

the Cumulative Leakage Index). It's not a good point to open the conversation on, but can be worked in during the visit.

Be prepared, also, for the possibility that your neighbors have not yet registered a complaint with the cable company, and you made it there first.

Once again: The basis of your position is that you are entering and QRMing the cable system because it has some type of shield integrity problem. Likewise, their signal is getting out. You are licensed to transmit over the air on 2m; they are not! The problem is theirs, whether it's a subscriber's poorly-shielded jumper, or their own damaged cables. You've even helped them locate it! Both economics (lost revenue due to mad subscribers) and the FCC inspire them to return their system to a shielded, leak-free condition. Remind them of this, ever so politely. Always end with a polite "thank you," noting you are willing to assist.

Now, reread the last paragraph, pump yourself up, and go! In the unlikely event your contact attempts are rebuffed, a letter to the system manager is the next recourse. Keep copies for reference. You might need them later on. That's it, the third and final step!

CATV CH	CONVTR CH	STANDARD VIDEO	AUDIO
2	2	55.25	59.75
3	3	61.25	65.75
4	4	67.25	71.75
5	5	77.25	81.75
6	6	83.25	87.75
A2	1	109.25	113.75
A1	37	115.25	119.75
A	14	121.25	125.75
B	15	127.25	131.75
C	16	133.25	137.75
D	17	139.25	143.75
E	18	145.25	149.75
F	19	151.25	155.75
G	20	157.25	161.75
H	21	163.25	167.75
I	22	169.25	173.75
7	7	175.25	179.75
8	8	181.25	185.75
9	9	187.25	191.75
10	10	193.25	197.75
11	11	199.25	203.75
12	12	205.25	209.75
13	13	211.25	215.75
J	23	217.25	221.75
K	24	223.25	227.75
L	25	229.25	233.75
M	26	235.25	239.75
N	27	241.25	245.75
O	28	247.25	251.75
P	29	253.25	257.75
Q	30	259.25	263.75
R	31	265.25	269.75
S	32	271.25	275.75
T	33	277.25	281.75
U	34	283.25	287.75
V	35	289.25	293.75
W	36	295.25	299.75
AA	38	301.25	305.75
BB	39	307.25	311.75
CC	40	313.25	317.75
DD	41	319.25	323.75
EE	42	325.25	329.75
FF	43	331.25	335.75
GG	44	337.25	341.75
HH	45	343.25	347.75
II	46	349.25	353.75
JJ	47	355.25	359.75
KK	48	361.25	365.75
LL	49	367.25	371.75
MM	50	373.25	377.75
NN	51	379.25	383.75
OO	52	385.25	389.75
PP	53	391.25	395.75
QQ	54	397.25	401.75

Table 1. Scientific-Atlanta *frequency channel plan.*

In the Meantime

At all times you should be making an effort toward good public relations. If you favorably impress your neighbors with your efforts, and maybe even self-impose some quiet hours until the problem is cleared up, they'll have a better impression of you and of our hobby. (Also, in the future they might overlook the fact that your kW on 40m makes their phone chirp a bit. You can reap the benefits of this PR effort down the road, too!) You should tell your neighbors you are working with the cable company to resolve the problem. Explain as much as they want to know. Keep relations good, and try to enlist their help in your troubleshooting efforts. Besides being the right thing to do, allying yourself with your neighbors is the most prudent path to follow. You may even *need* their assistance at some point to pressure the CATV company to resolve the matter.

If, after all this (and only as a last measure), no positive results are attained, write your FCC Field Office. Addresses are in the ARRL's *FCC Rule Book*. This is a last resort, though. My philosophy is that if you present yourself in a friendly, positive, and reasonable manner, you'll receive excellent response from your cable company. More often than not they will be ready to resolve the problem and will welcome your assistance. Case in point: My local cable company took less than 24 hours to solve my CATVI problem once I brought it to their attention.

I also recommend you obtain a back issue of *QST*, October 1990. On page 42, two Cable TV employees, who also happen to be hams, offer some insight in the "Hints and Kinks" column. Your library can probably obtain a copy of that page through interlibrary loan, depending on their copyright agreement. Another reference well worth obtaining for your shack library is the *Interference Handbook* by William Nelson WA6FQG. It treats a wide range of interference subjects, including that of CATVI, in depth.

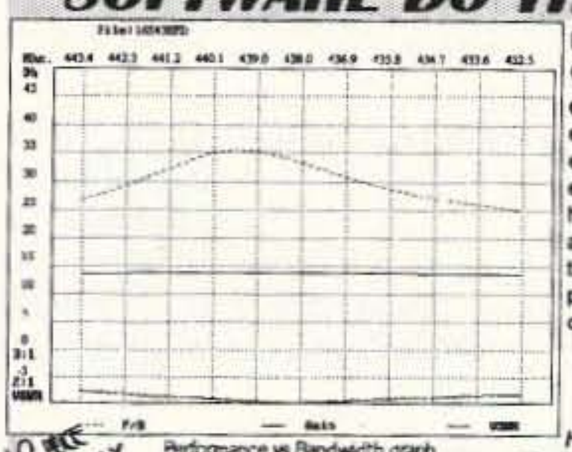
It's late, and time for me to sign off. I'll leave you with these final thoughts: You want this resolved, and you don't want your neighbors ticked at you. They probably blame you, even though it's likely that the problem is the cable system's shortcoming, or even their own fault! Keep their viewpoint in mind though: Everything was fine until "that ham down the street" went on the air. So do things right, be helpful; but remember—*you are licensed* to use the airwaves. Persist! 73

Part 76—Cable Television

Rule/Reference	Suggested Procedure
Leakage Tests	
Rule: 76.601	Conduct leakage tests once a year to show compliance with leakage standards in Rules Section 76.605. Maintain complete test data from annual tests for 5 years. Note: Performing regular monitoring and leakage repairs in accordance with Section 76.614 will ensure that your system complies with leakage standards.
Cable Television Basic Signal Leakage Performance	
Rule:76.611	Conduct a test once a year to establish conformance with the Cumulative Leakage Index.
Interference from a Cable Television System	
Rule: 76.613	Stop operation immediately and correct any condition that threatens radio navigation or other safety-of-life services. Before reactivation, submit an interference report to the Field Operations Bureau of the Federal Communications Commission. Await response from Engineer in Charge before resuming operation.
Regular Monitoring	
Rule: 76.614	Provide for a program of regular monitoring for signal leakage by checking the entire plant every 3 months when using aeronautical frequencies. Maintain a log of leakage sources, probable causes, and corrective action taken for 2 years.

Excerpt from FCC FOB Bulletin No. 17, revised edition, March 1991.

CAN YOUR ANTENNA SOFTWARE DO THIS?



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CIRCLE 29 ON READER SERVICE CARD

73 Review

by Dave Martin W6KOW

Number 6 on your Feedback card

The HANDI-Finder

North Olmstead Amateur Radio Depot
(NOARD, Inc.)
29462 Lorain Rd.
N. Olmstead OH 44070
Telephone: (216) 777-9460
Price Class, partial kit: $27.95

Build this versatile, accurate DFer semi kit in an evening.

Reasons for owning radio direction-finding equipment are many. DF gear can be used for locating a source of unintentional interference, documenting jamming, or for what is probably the best justification of all: The fun of T-hunting with a local group of transmitter hiders and hunters.

To get beyond the hand-held-next-to-the-body method of determining the bearing to a transmitter, some specialized gear is needed. Even at VHF and UHF, often-cumbersome DF antenna arrays are often seen connected to exotic equipment carried by serious DFers. By contrast, the HANDI-Finder DF device marketed in partial kit form by North Olmstead Amateur Radio Supply Depot is small enough to be hand-held, is easy to use, provides a sharply defined bearing, and is inexpensive. Its only apparent disadvantage is 180-degree ambiguity; if you don't know the general direction of the signal, you will have to move until the bearing changes to solve the problem of whether you are receiving the "front" or "back" of the signal.

Designed by Bob Leskovec K8DTS and based on a circuit published for use by the Coast Guard Auxiliary, the HANDI-Finder becomes the antenna for an ordinary hand-held radio on either FM or AM. A carrier is needed to make the system work. The HANDI-Finder works by switching at an audio rate between two antennas. In addition to hearing the signal's modulation, the operator hears a constant audio tone—until the plane of the two antennas is perpendicular to the signal path. The tone then nulls sharply, indicating the bearing to the target transmitter, which is 90 degrees to the antenna plane. Modulation on the carrier is unaffected; only the tone nulls.

"Getting into the open, however, demonstrated that the HANDI-Finder works as advertised."

How It Works

Powered by a 9 volt radio battery, the circuit is based on a single CD4047B IC that contains an oscillator and a flip-flop that provides complementary symmetrical square-wave outputs. Switched at an audio rate between two antennas, the switching-rate audio tone is heard unless both antennas are receiving the signal at the same time and are therefore in phase.

Building It

The North Olmstead kit includes a 1-5/8" x 6" circuit board with all of the electronic components mounted on the board. Working carefully, I finished the circuit board in 45 minutes. Not included in the kit are the antenna elements, coax and connector, handle, battery, and two 1/8" pop rivets to mount the battery holder.

For antenna elements, I used two 18" lengths of 3/32" brass welding rod. (My nearby welding supply store simply gave me two rods—enough for two sets of antennas—rather than writing up such a small order.) The vertical parts of the antennas are the receiving elements, and the distance between them can be optimized for a particular frequency band. For DF work mostly on 2 meters, I settled for a spacing of about 14 inches. After forming the U-shape elements, I soldered crimp-type wire connectors that are bolted to the circuit board.

The 13-page construction and operations manual suggests using a paint-roller handle to hold the HANDI-Finder. I chose a $1.42 plastic model that is threaded at the bottom and fits a painter's extension pole. A vise and hacksaw came in handy. Attaching a 6-foot length of 50 ohm coax and a BNC connector completed the building project.

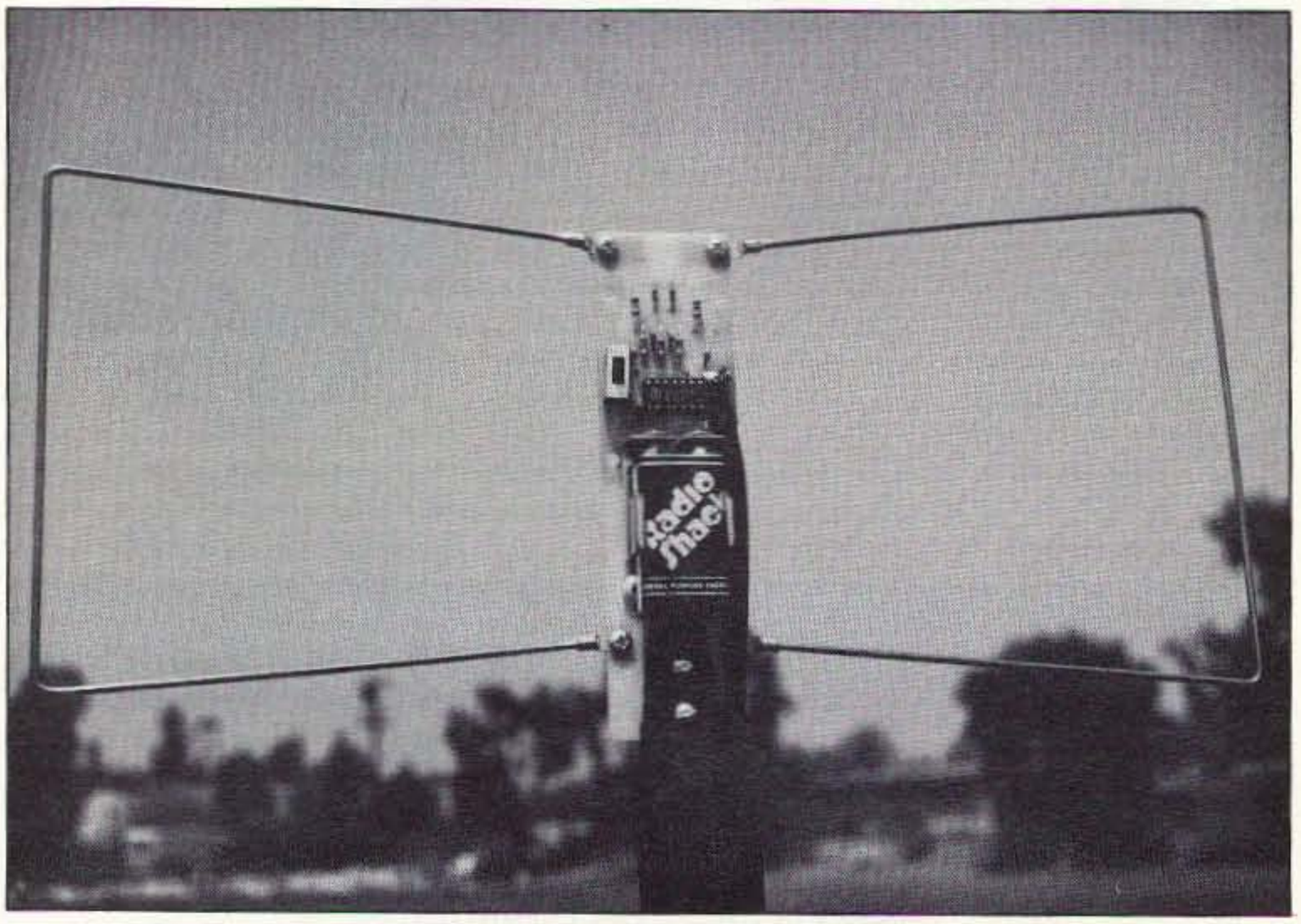

Photo A. The HANDI-Finder kit was easy to assemble in less than an hour.

Using the HANDI-Finder

First experiments were near my house—too near, as it turned out. The manual notes that used indoors, too close to buildings or even large trees, multipath signals will provide multiple nulls and no clear indication of bearing. Early experience confirmed this.

Getting into the open, however, demonstrated that the HANDI-Finder works as advertised. The audio tone is apparent even on weak signals, and there's a sharp null when the antenna array is perpendicular to the bearing to the transmitter.

The final test was to talk my wife into driv-

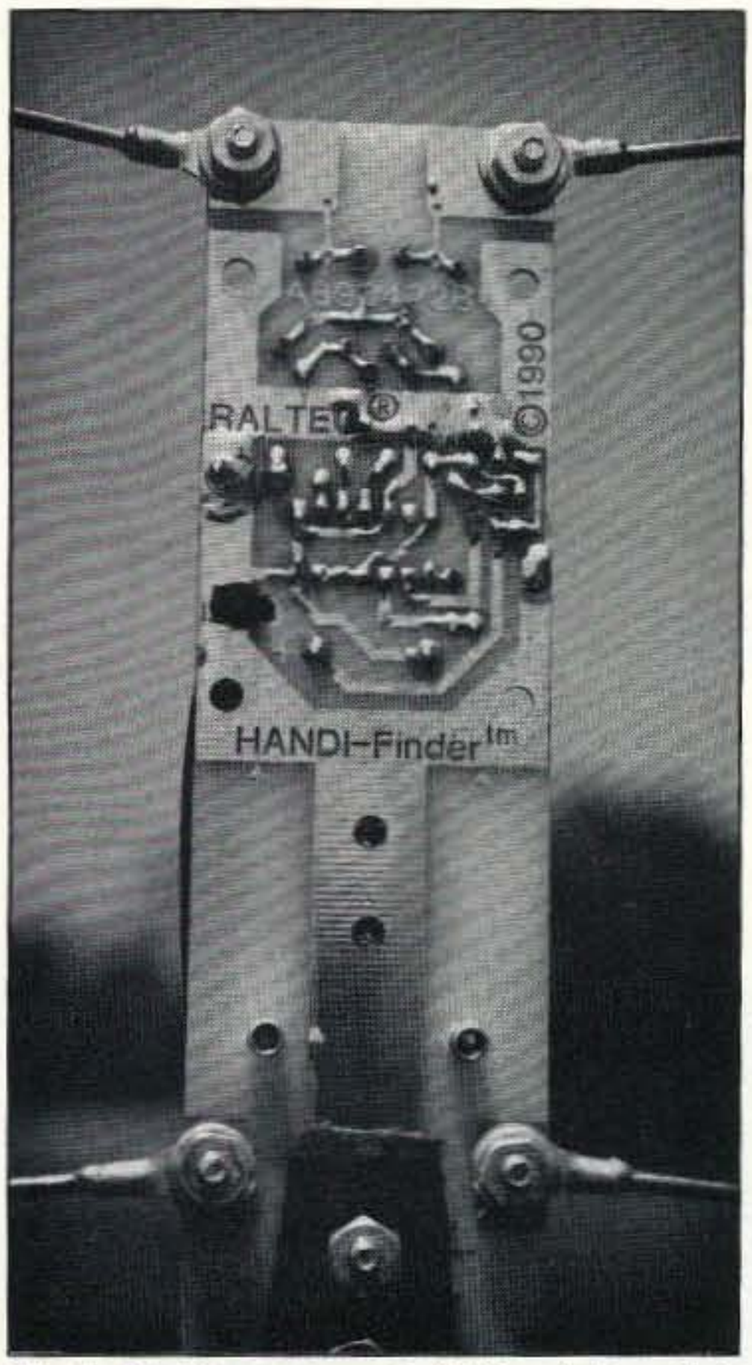

Photo B. The compact, lightweight unit is powered by a 9V battery and mounted on a paint-roller handle.

ing around as I simulated a T-hunt with the HANDI-Finder on its paint pole outside the car. I cheated by knowing approximately where the transmitter was—the continuously-broadcast, low-power ATIS (automatic terminal information service) AM signal associated with the control tower at an airport about six miles from my house. This target was picked because I knew I could get quite close to the transmitter without driving to the top of a mountain.

We played the game. First we solved the ambiguity problem by driving far enough to get a consistent bearing shift. I found that "picket fencing" associated with weak signals heard while underway mobile prevented getting a distinct null; we pulled to the curb a lot. Within 20 minutes, though, we were close to the airport, and driving around it confirmed that the ATIS antenna is on top of the control tower.

The Bottom Line

The HANDI-Finder works well on any carrier-based signal that its IC can hear. By changing the antenna elements, the unit should work as low as 50 MHz and as high as 450 MHz. The circuit could also be used with a pair of directional antennas that would solve the ambiguity problem from one location—at the expense of hand-held portability.

In its simplest form, using a hand-held radio with a HANDI-Finder offers versatile, accurate, easy-to-use direction finding for about $35. How could you beat that? 73

Five-Element T-Match VHF Yagi

Excellent performance characteristics on 2 meters.

by Marty Gammel KAØNAN

I finally decided to get started on a long-overdue new yagi for my rooftop antenna farm, here in Minnesota. I needed a clean pattern with about 9 to 10 dB gain for FM repeater and simplex work.

I have tried several different types of antennas in the past, but I've never tried using the "T" match with a half-wave balun. So, I looked in the *ARRL Antenna Book*, 15th edition, for guidance. The balun looked easy.

Due to our harsh winters, I needed to enclose the balun, and I also needed a good solid mount for the "T" match feed point. I chose a plastic box from Radio Shack that measured 2-1/2" by 4-5/8" to house the balun. The beam itself was easy, using a 5'-long square boom from an old TV antenna as a starting point. After removing the old elements, I decided to use a close standard spacing of 13" for reflector-to-driven-element spacing. I wanted a close-spaced first director, so I used 9" for driven-element-to-first-director spacing. For second and third directors, I used 15-1/2" and 17" spacing. The 1"-square boom was big enough for this small, 5'-long antenna. I used 3/8" diameter aluminum tubing for all the elements and the "T" match bars.

As an extra feature on this antenna, also from the *ARRL Antenna Book*, 15th edition, I added a ferrite bead choke on the quarter-wave line section of the balun. The local electronic surplus house proved to be a source for cheap ferrite beads. I also wound the half-wave section of coax into a four-turn choke to fit into the plastic box. The combination of the ferrite beads and the four-turn choke gives good isolation of the feedline and avoids radiation from the feedline shield. The dimensions for the "T" bars came from standard design lengths for gamma match parts. The "T" match design gives a very clean design, without skewing.

Photo A. Balun assembly, ready to install.

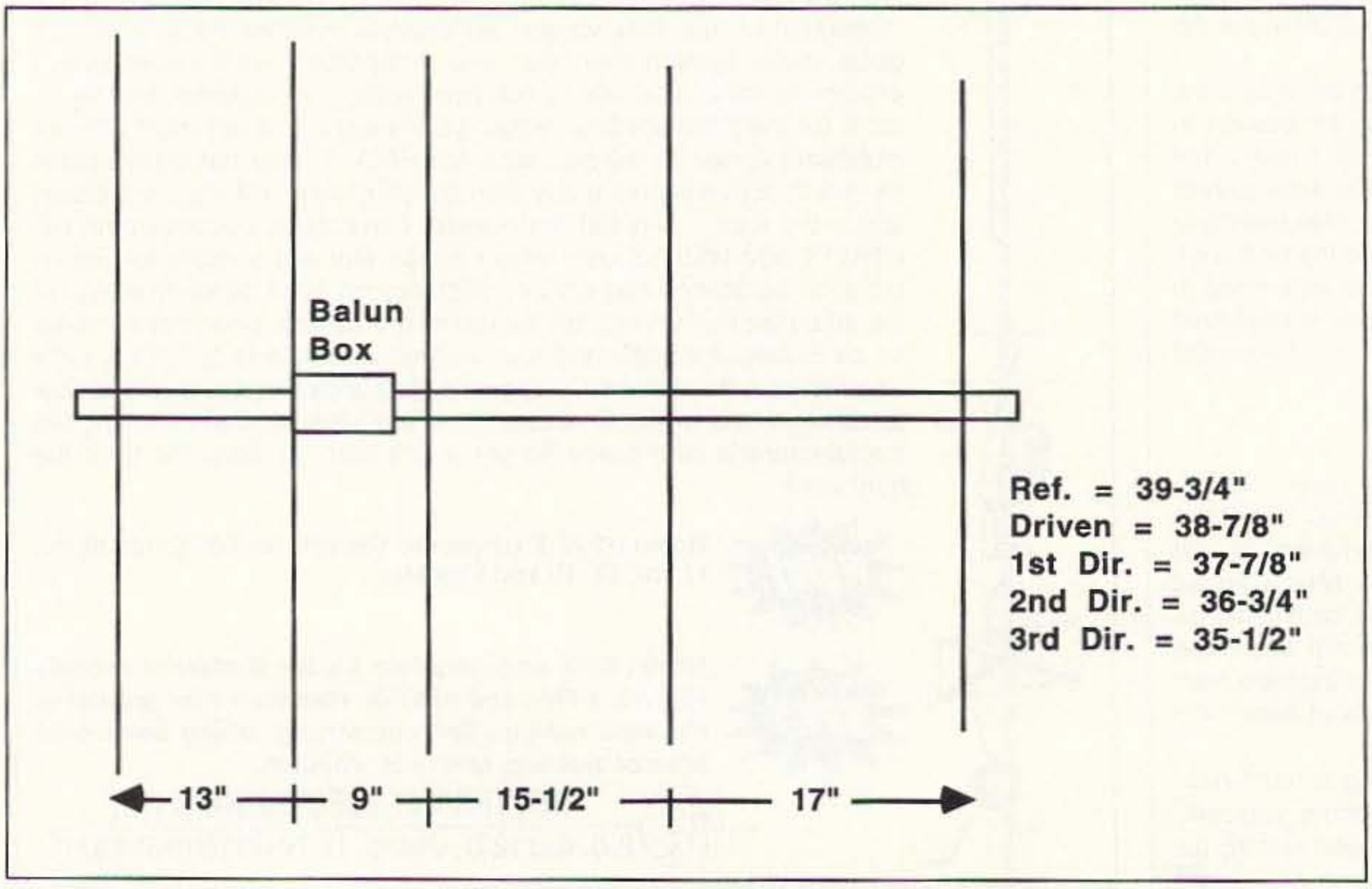

Figure 1. Five-element 2 meter beam.

Building the Beam

Once all the old elements have been removed from the boom, mark where you need to drill to mount all five elements. I found that by mounting the elements in the center of the boom, the spacing for the "T" bar straps was more manageable. The beam will also look better. If you can use a drill press to make the element holes, they will probably be more exactly perpendicular to the boom. After the holes are drilled, try

fitting the 3/8" tubing in each hole and check for squareness to the boom with a square.

Cut all the elements to length, and flatten one end of each of the two 6-1/2" match bars—about 1/2" will do. Drill a 1/8" hole in the flattened area and round off the corners (see Figure 2). Attach all five elements to the boom using the 1" stainless steel screws.

Now drill holes for mounting the SO-239 and the 1" #8 bolts in the plastic box, and attach the SO-239 with three of the four bolts (see Photo B).

Assembling the Choke and Balun Assembly

Start with a piece of RG-59U about 14" long and prepare both ends as shown in Figure 2. Do the same to a 26-1/2" piece for the other balun section. Allow 3/4" on each end of both coax sections for dressing the ends. Wind the longer section of coax into a four-turn coil. Tape the coil temporarily in a couple of places, just to hold it until the finished balun is installed in the plastic box. Solder the shields from both sections of coax together (see Photo A). Install the balun assembly in the balun box; be certain all connections are correct. Install a closed-end crimp-type connector on each end of the center conductor of half-wave coax. Install the 1" #8 bolts through the crimped connectors using washers, and apply a washer and nut to the outside of the plastic box. After doing this, remove the tape from the coil. Install as many ferrite beads as you have room for on the end of the quarter-wave coax section; I had room for six ferrite beads. Solder a closed-end crimp-type connector to the shield and then connect it to the fourth mounting bolt for the SO-239 panel-mount fitting. Solder the center conductor to the center terminal of the SO-239.

Apply Crystal-Cote or some other type of sealer to everything in the balun box. Attach the "T" match bars to the balun box, and bend the ends of the metal strapping around the driven element and match bar. Then drill holes to bolt the straps to the tubing (see Photo B). You will need about 1-3/8" between the "T" bars and the driven element. Spacing for the strap should be about 4" from the center of each 1" #8 stainless steel bolt on the balun box. Fashion a mounting bracket to connect the SO-239 to the boom. It must be a metal bracket to provide the needed electrical connection between the boom and the balun. I used a piece of plumber's perforated strapping that was in my junk box, and cut it to shape with tinsnips. Mount the bracket to the boom with a sheet metal screw (see Photo B). Drill a weep hole in the lowest corner of the balun box for drainage once the box has been mounted on the boom.

Check all connections, nuts, bolts, and screws, and then mount the antenna on a non-conducting mast, ready for tuning. Tape the coax to the boom and bring the coax down the mast, away from the antenna.

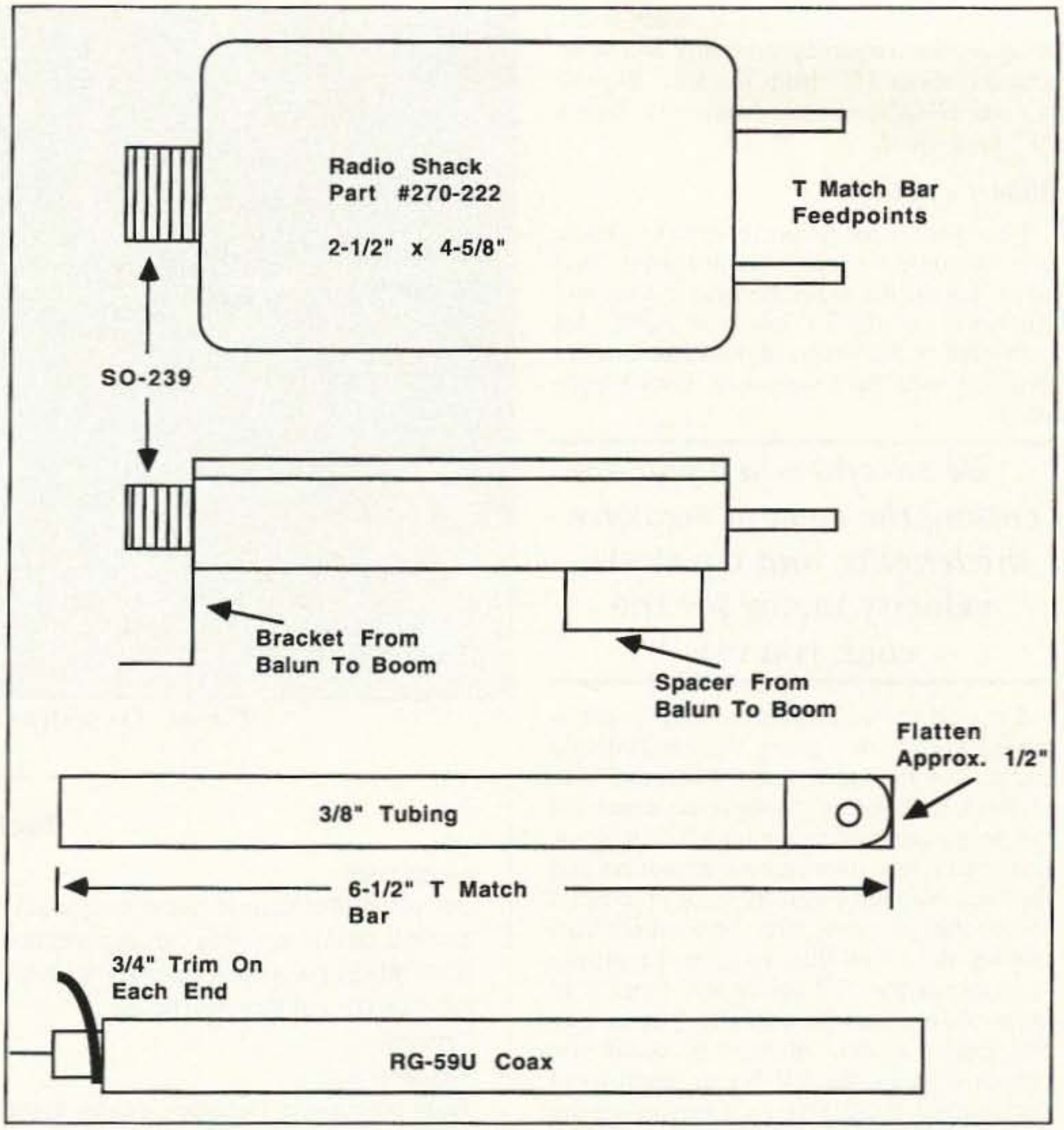

Figure 2. Balun box for 2 meter yagi.

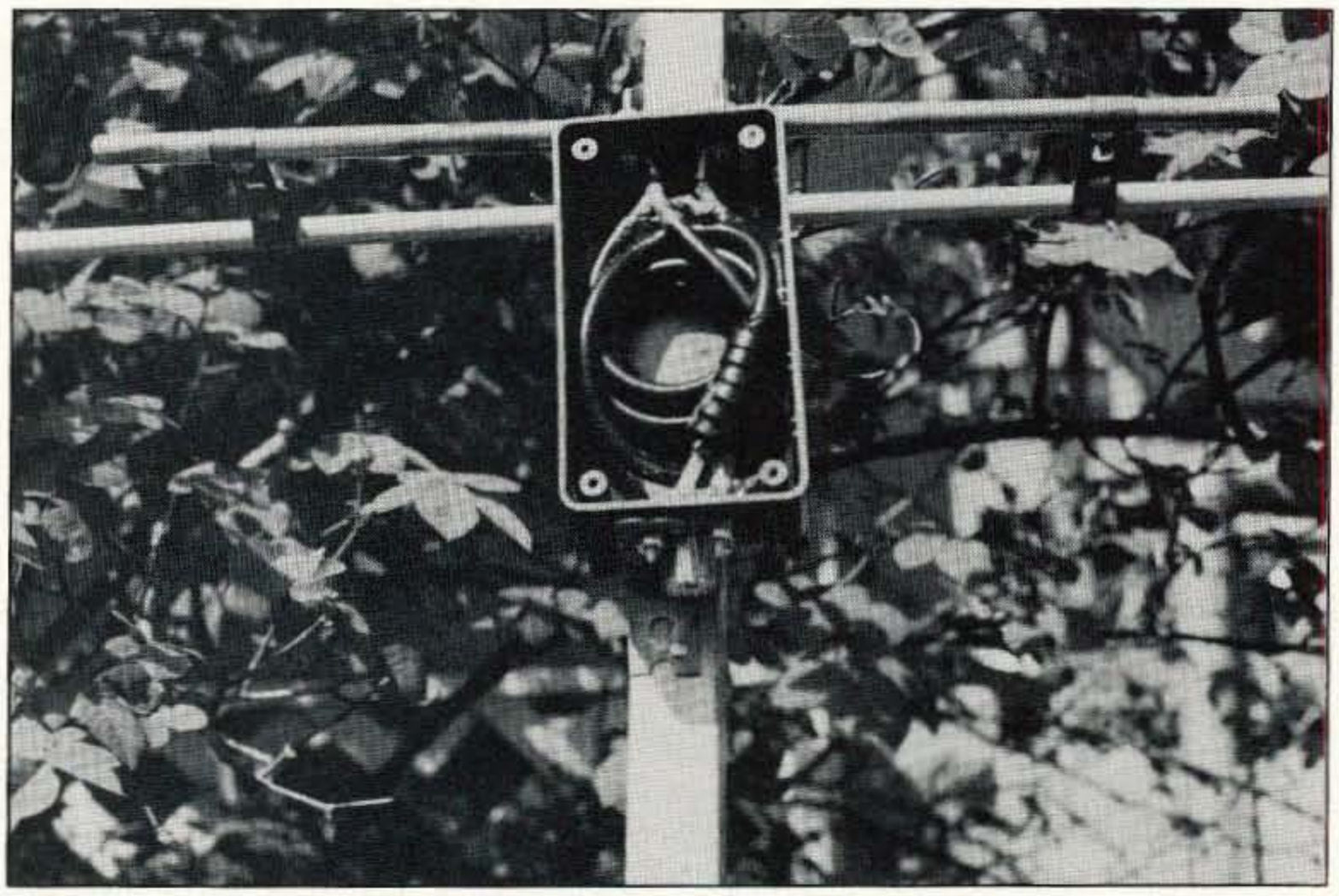

Photo B. Close-up of balun box. Note the "T" match bars and the driven element.

Tuning the Completed Antenna

Tuning the antenna is easy. Connect the coax, SWR meter, and your radio to the antenna. Check the SWR at the top, center, and bottom of the frequency area of design. By noting the pattern of the SWR curve you will know whether to move the match bars in or out for the best match. Move only about 1/8" at a time, rechecking the SWR curve as you go.

Mine was very close to the center of the designed-for frequency, and only had to be adjusted about 1/8" from the text. *Be sure to make all adjustments of the straps on the "T" bars equal.*

Builder's Notes

I bought the ferrite beads and the plastic box to make a clean weatherproof feed point, but all the aluminum came from my stockpile of old TV antenna parts. All hardware is common, and can be bought from any local hardware or building supply store.

***"Be careful when you are cutting the coax to measure the lengths, and* check the velocity factor for the coax you use."**

I cut all the aluminum to length with a tubing cutter; this gives a more finished end than if you cut it with a hacksaw. Each element is installed through the center of the boom and fastened with a 1" #8 stainless steel screw (two screws are not needed for each element). Any type of non-metal spacer that you have may be used for supporting the balun box, to give the proper spacing for the "T" bar straps. I put a 1" sheet metal screw through the plastic box and spacer to hold them in place. If you cannot find an old TV boom, most local scrap metal dealers sell aluminum square and round tubing.

Be careful when you are cutting the coax to measure the lengths, and *check the velocity factor for the coax you use*. My RG-59U had a velocity factor of 66%. The number of ferrite beads is not critical, but they do stop radiation back down the coax shield. Be sure to drill or file the hole for the center of the SO-239 just big enough, but not so big that you get a sloppy fit—it does have to seal out the weather. Tune the antenna before you weatherproof and seal up the plastic balun box in case you may not have wired the connections right. Make nice neat pigtails on your coax ends so that they will be easier to attach. This design, with its close spacing, gives a very clean pattern of radiation, with at least 9 dB gain and a front-to-back ratio of 32 dB.

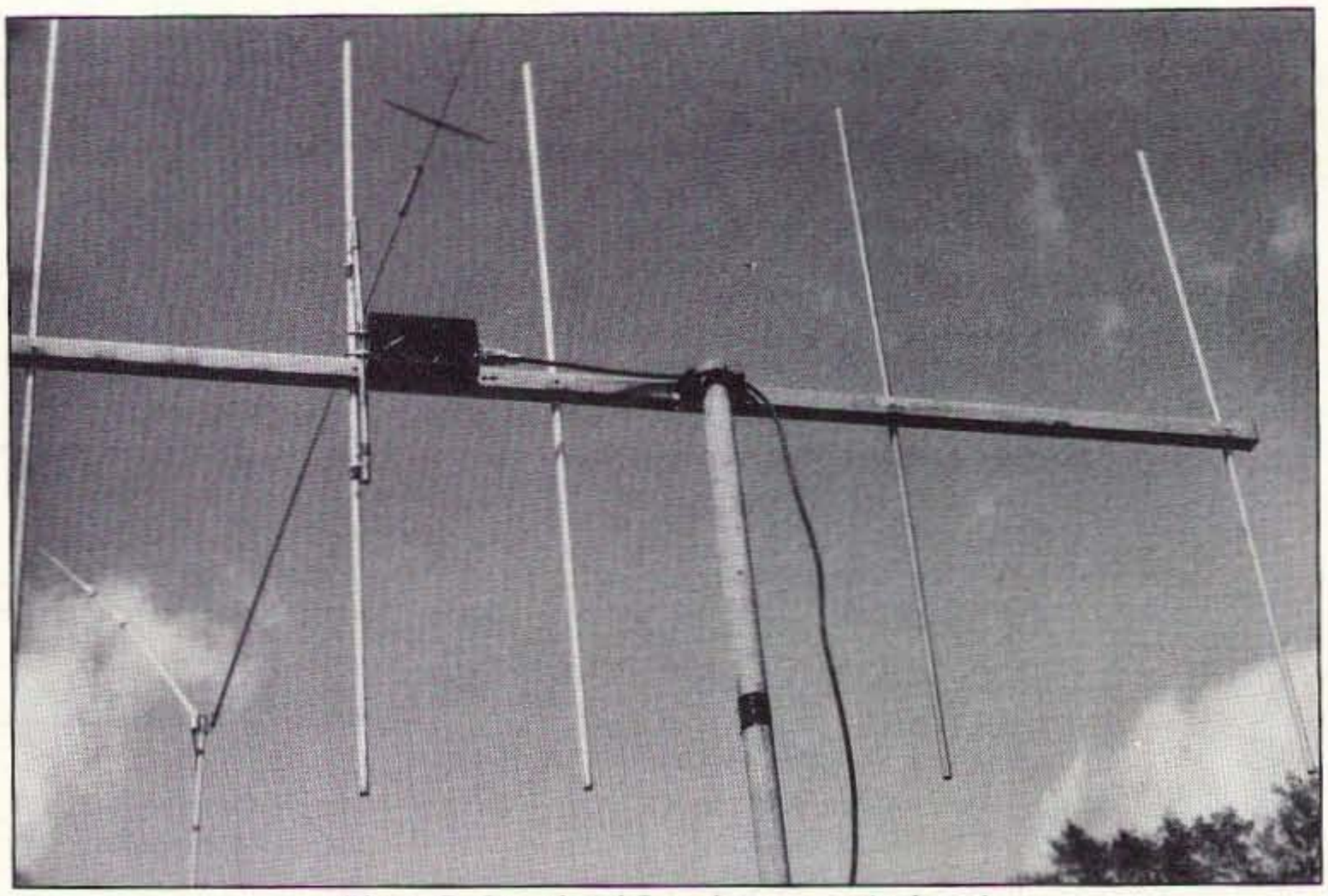

Photo C. Completed five-element vertical yagi.

Tools List

Electric drill
3/8" drill bit (for holes in boom for elements)
1/4" drill bit (for removing old elements from boom)
3/32" drill bit (for #6 bolt holes for SO-239 mounting)
5/32" drill bit (for #8 screw holes)
Tinsnips
Electrical tape
Waterproof sealer (for balun; can be spray or brush-on)
Plumbers' strapping or thin copper or aluminum (for balun, and "T" bar to driven element mounts)
(Optional) drill press for drilling all holes
(Optional) 9/16" drill bit for SO-239 to balun box center hole, or you can use a 1/2" drill bit and file as I did.
Solder and soldering gun (for crimp type connectors inside balun)

Many thanks to John Berglund KØUBA for his help in editing. If you have any questions, send them along, with an SASE, to me at 1703 Hewitt Ave West, St. Paul MN 55104-1128. 73 and happy hamming.

Parts List

5'-long 1"-square aluminum boom (old TV antenna type)
2-1/2" by 4-5/8" plastic box (Radio Shack #270-222)
3/4" by 1" spacer (wood, plastic, etc. for balun box mounting)
5 to 8 ferrite beads to make a ferrite choke (see text)
12.5" section of RG-59U coax (finished length) (see text)
25" section of RG-59U coax (finished length) (see text)
2 pieces 3/8" by 6-1/2" aluminum tubing ("T" match bars)
1 piece 3/8" by 39-3/4" aluminum tubing (reflector element)
1 piece 3/8" by 38-7/8" aluminum tubing (driven element)
1 piece 3/8" by 37-7/8 aluminum tubing (first director)
1 piece 3/8" by 36-3/4" aluminum tubing (second director)
1 piece 3/8" by 35-1/2" aluminum tubing (third director)
2 #8 by 1" flathead bolts for attaching "T" match bars to balun box
6 #8 by 1" flathead self-tapping stainless steel screws (for elements)
2 #8 by 1" flathead self-tapping stainless steel screws (for balun mounting)
4 #6 by 3/8" flathead bolts with nuts & washers (for SO-239)
1 SO-239 panel mount fitting (for feedline attachment on balun box)
2 1/2" by 3" metal straps (for attaching "T" match bars)
4 #6 by 3/8" flathead stainless steel bolts with nuts & lock washers
3 crimp-type closed-end connectors (for coax connections inside balun)

You may have to find a few assorted bolts and washers in your junk box to complete this antenna (see text.)

Remote Tuned Active Antenna

Tune this easy amplified HF antenna without leaving your chair.

by Ken Cornell W2IMB

The March 1993 issue of *73 Amateur Radio Today* contained an article that I wrote covering an active antenna using a MOSFET. As described, it is a very broadband device. By adding a tuned input circuit, a desired frequency range coverage can be increased in sensitivity and selectivity. The problem arises as to how to tune the remote antenna from the radio shack.

The practical solution is to use a varactor, also called a tuning diode. A varactor acts as a capacitor with an adjustable value which can be changed by applying a variable positive bias voltage.

The antenna circuit is shown in Figure 1. The varactor (V) is placed across the tuned circuit (L1/C1) in series with a 0.1 µF capacitor that acts as a voltage blocker and a bypass. The variable voltage is fed to the varactor via an RF choke.

Due to the basic design, the antenna is basically a monobander; however, the construction cost is minimal and two antennas can be fabricated from a 10' length of 1-1/2" white PVC pipe.

Varactors are not a common item found in every mail order catalog, but I have found two sources: Hosfelt Electronics, 2700 Sunset Blvd., Stuebenville OH 43592; and DC Electronics, P.O. Box 3203, Scottsdale AZ 85271. Hosfelt has a variety and I have used their Motorola type SMV16623M (catalog #MV1662/S) that comes in three matched units for $1. DC Electronics offers a variety of sizes that include AM tuning diodes with capacity ranges at 450 pF. I have ordered some of these to try out.

The tuned circuit (L1/C1) and the varactor (V) have to be resonant through the desired amateur band. For 80 meters, I used a small 5/16" diameter by 1" long coil form and wound 50 turns of #28 enamel wire. C1 is a 5-to-6-mm 50 pF trimmer. Try 100 turns for 160 and 25 turns for 40 meters. I usually wind more turns than my target value as it is easier to remove turns than add them. A small slug tuned form would also help in zeroing in on the desired range.

I used a 1-1/4"-wide by 3-1/4"-long piece of perf board for the circuit and mounted the parts on both sides to permit insertion in the PVC pipe. Pipe caps are used at both ends and the coax cable is fed through the bottom cap. The antenna is a piece of 1" diameter aluminum tubing 4-1/2' long. Assembly is the same as described in my original article.

The receiver coupler is shown in Figure 2. The variable voltage output to the varactor is fed through a length of insulated hook-up wire that is taped to the coax cable. A 6-32 S.S. machine screw is mounted in the base pipe cap to accept same.

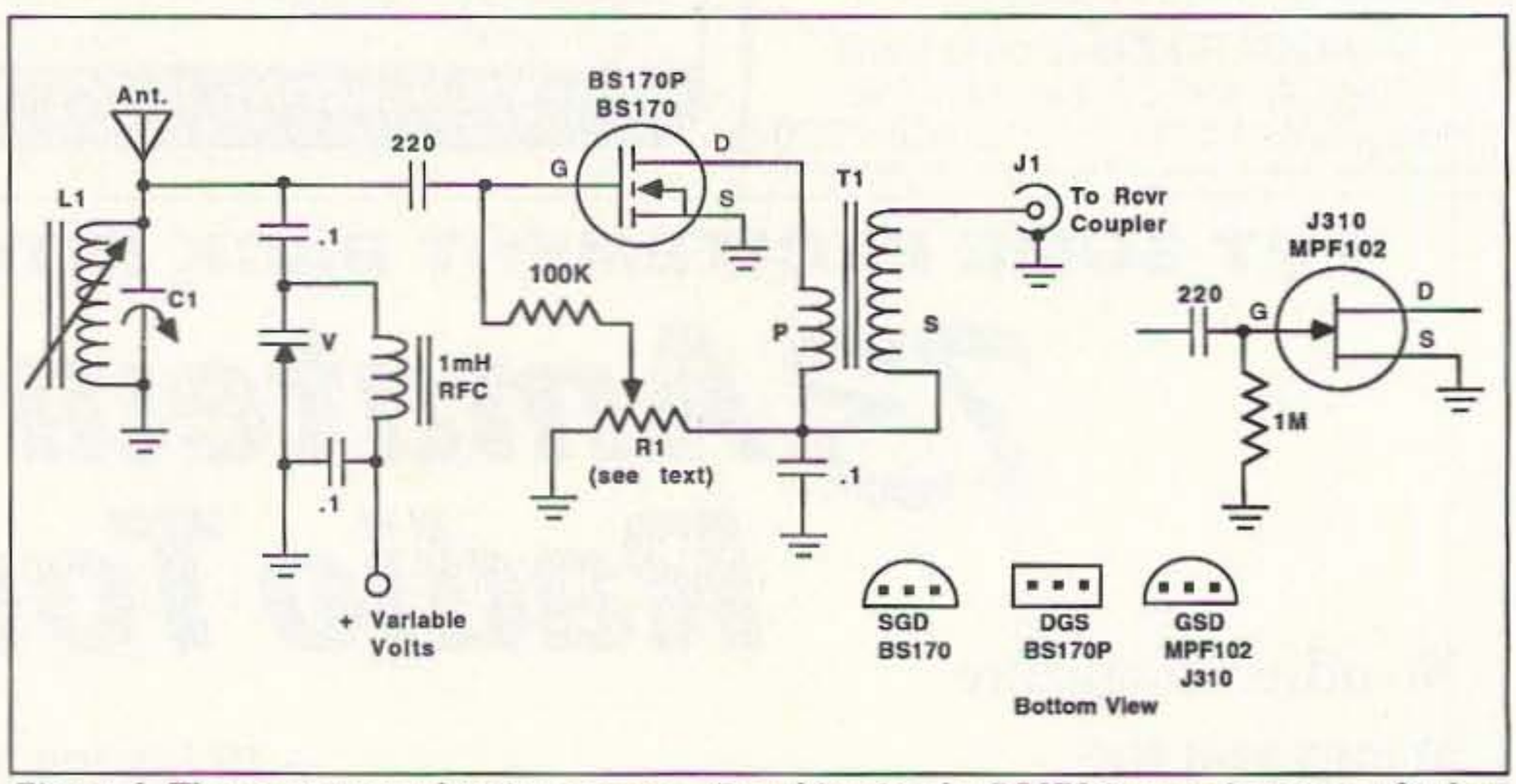

Figure 1. The remote tuned active antenna. Gate bias for the BS170 is most important for best performance. I used a 100k potentiometer for R1 and, after the proper setting was found, I measured the resistance each side of the potentiometer and replaced with same value 1/8 watt resistors.

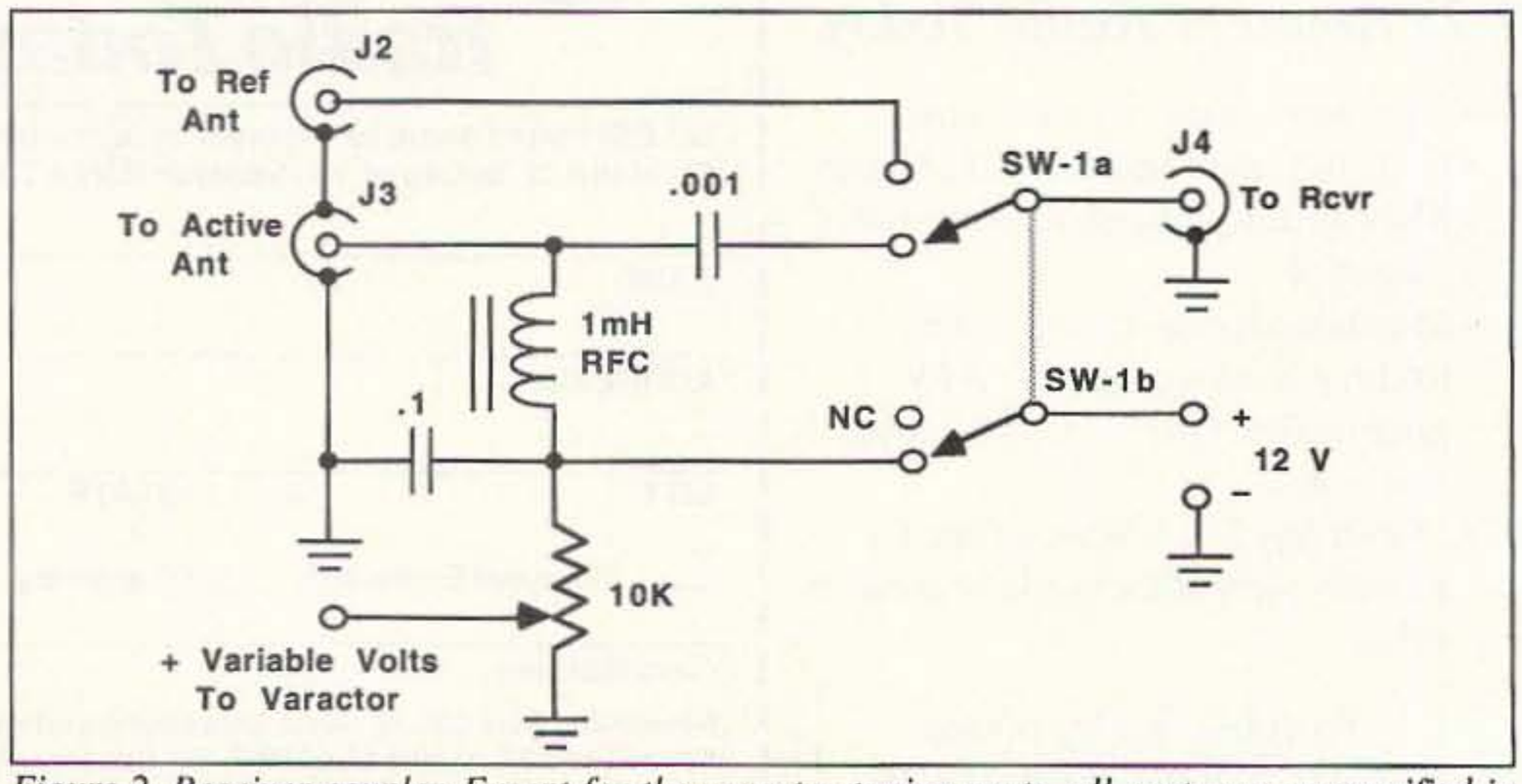

Figure 2. Receiver coupler. Except for the varactor tuning parts, all parts are as specified in my original article.

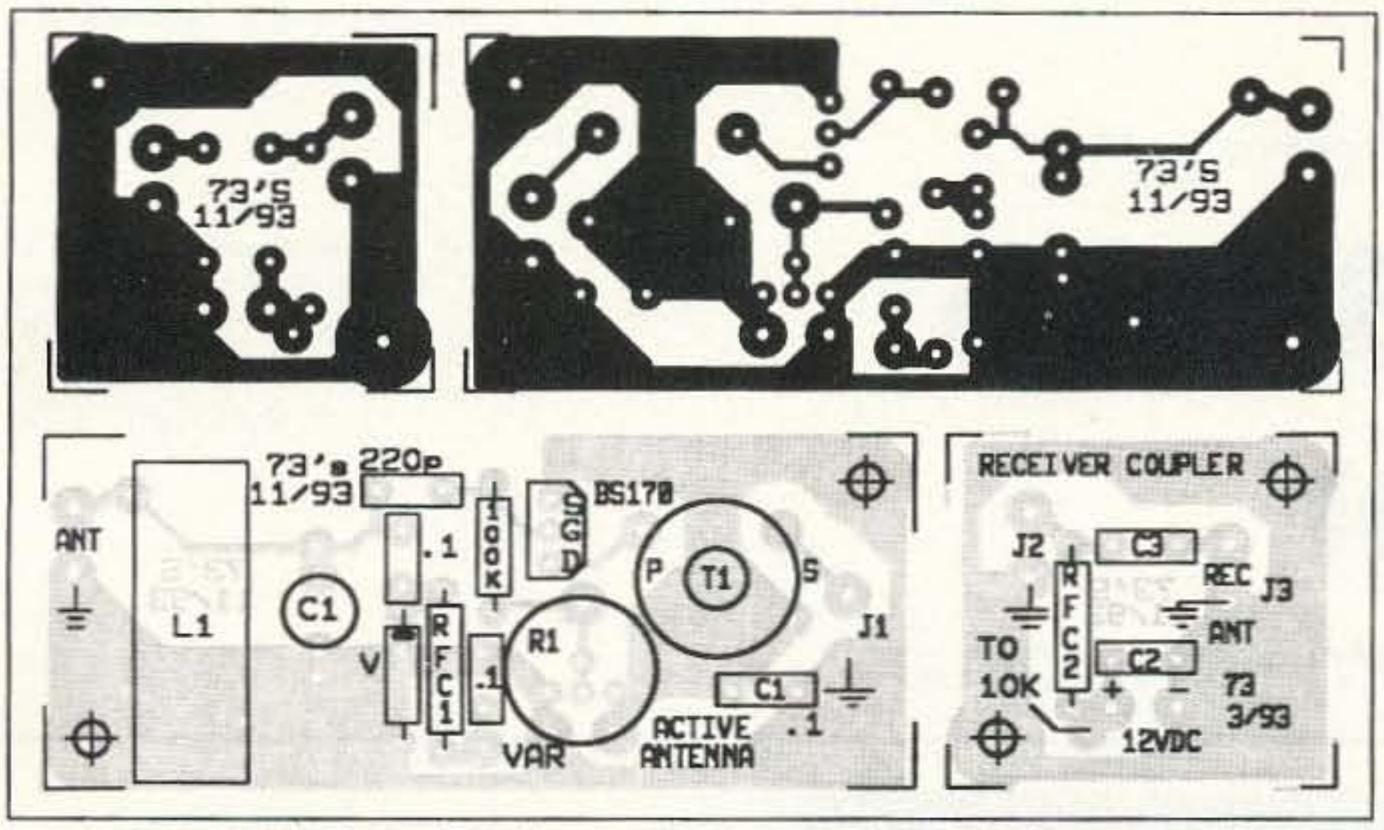

Figure 3. PC board pattern and parts placement diagram.

For the experimenter, a JFET can be substituted for the MOSFET. This minor circuit revision is shown in Figure 1a. 73

Parts List

L1	To suit frequency range desired. I would suggest that you consider RF chokes for the inductance. They are cheap and come in many values to suit any frequency range desired. Consult your L/C vs. Frequency Chart (found in most handbooks).
C1	50 pF trimmer capacitor. Used for frequency adjustment if needed.
V	Varactor. I suggest using VMAM109. It has a range of 450 pF @ 1 volt and 30 pF @ 9 volts (DC Electronics).
Capacitors	Are all disc type with 35 volt rating.
Resistors	All 1/4 or 1/8 watt carbon type.
R1	100k potentiometer. RS #271-284 or equivalent. See text.
R2	10k potentiometer. RS #271-1715 or equivalent. (Addition to the original receiver coupler design.)
RFC	1 mH for HF and higher values for MF to LF.
T1	See text.
SW1	SPDT switch.
J1, J2	Your favorite coax connectors.
BS170, BS170P	Available from Digi-Key Corp., P.O. Box 677, Thief River Falls MN 56701; (800) 344-4539.

Drilled and etched PC boards are available from FAR Circuits, 18N640 Field Ct., Dundee IL 60118, for $4.50 plus $1.50 S & H.

73 Review

by Charles Warrington WA1RZW

Midland 73-005 Transceiver

A full-featured HT at an entry-level price.

Midland Consumer Communications Division
1690 North Topping
Kansas City MO 64120
Telephone: (800) 643-5263
Price Class: $239

My first 2 meter rig was a digitally synthesized Heathkit mobile which utilized lever switches to change frequencies. It was a neat little unit that took me 40 hours to build and was a dream to use. Then one night, some low-life crumb decided to steal it, along with my '67 Plymouth Belvedere. Two days later the police recovered the car—stripped, of course. No tires, no wheels, no radio! That adventure kept me off the 2 meter band for a while. It also taught me one major advantage of using an HT as a mobile rig: You CAN take it with you when you go.

Sure, you sacrifice some output power and certain conveniences with an HT, versus a dedicated mobile. But, if you live or drive in the city, you'd better have some practical method of protecting your rig from theft. The only sure-fire method that I know of is to yank the rig! Consider the HT as a possible solution. An HT can sit on the seat next to you, keep you in voice with the local repeaters, and offer versatility that a mobile can't match. Simply remove the cigar lighter plug and the BNC coax connector, and you're good to go.

Of course, this illustrates only one of the many reasons why HTs have become so pervasive in recent years. If you're thinking about buying an HT, first you have to get past the Future Shock of what's out there. There are many to choose from! One way to narrow the field would be to ask: How much does a good 2 meter portable cost? Well, how much have you got?

Money is No Object

When I first laid eyes on Midland's latest venture into the amateur radio marketplace, I thought, "Hey! Not bad for a $400-ish HT." I immediately delved into the liquid crystal display and buttons without ever checking into the price. (Herein lies the difference between purchasing and playing with a review unit.)

Well, I kept the test rig by my side for several weeks, happy as a clam, until I noticed the Model 73-005 in a catalog, sporting a *$239 price tag*. What? Midland can offer this sophisticated, surface-mount technology, microcomputer-controlled, 2 meter transceiver for less than 250 bucks? (In case you haven't shopped around, this price falls into the "rock-bottom" range.) So, how good could it be?

First Glances

Now, you're probably thinking, "Yeah, right. For that price it's probably a real no-feature cheapie." But the 73-005 HT is no slouch. This is a nice little radio!

The actual transceiver is a tiny 5-1/2" high by 2-1/8" wide by 1-5/16" deep. (I grew up pre-Nintendo, so I still find myself in awe over the cramming of so much electronics into such a small package.) Still, the Midland is somewhat larger than the very smallest rigs that I have seen. You can attribute much of that size to the big duckie and optional high-power battery. Even so, this unit has a clean look, and is quite small enough.

The LCD panel is easy to read, and it is *flat*. Many HTs on the market have convex panels that are susceptible to scratches. Midland's design avoids that problem.

Tough Enough

I like to carry an HT with me whenever I go mountain biking or hiking. They are very nice to have with you in the woods and in the mountains. You can stay in touch, listen around, or just know that you could summon help in the event of an emergency. One thing you don't need on the trail, however, is a fragile piece of gear.

The new Midland is solid. Very solid. The transceiver is constructed on a die-cast aluminum chassis. It resembles a commercial transceiver, which is no surprise, considering Midland specializes in commercial gear.

This radio is also equipped with a PTT LOCK feature. This deactivates the PTT button to prevent accidental transmitting.

Design

This baby is a tad more conservative in design than many of the latest HTs. It looks more like a police portable than some of those Star-Trek-looking amateur models I've seen lately. Still, I'll give Midland good marks for ergonomics.

The VOLUME and ROTARY CHANNEL SELECTOR controls are easy to adjust without looking at them. The push-buttons on the front pad were designed for daintier digits than mine, but I can still push them one at a time—even

with *my* sausage fingers. These buttons are of the rectangular rubber variety. They feel like the erasers of 16 tiny new pencils.

Say, where's the squelch knob on this thing? It was cleverly "sawed off" at the factory. The owner's manual describes this as a "set and forget" type knob, and I kinda like it. It reminds me of a child-proof cap on a medicine bottle. I don't like to constantly ride the squelch, anyway—it really isn't necessary. Still, if you're a knob twiddler, you may find this feature irritating. Tough twiddling on the Midland.

On the left side of the 73-005 you will find the usual-looking rubber-covered PTT button. Just above it is the FUNCTION button, which combines with the front panel buttons to offer a wide array of features. Below the PTT is a LOCK button which mechanically holds the battery onto the transceiver.

EXTERNAL SPEAKER and MICROPHONE jacks are located on the unit's topside, next to the BNC ANTENNA jack. In between the VOLUME and CHANNEL knobs is a little red LED. This indicator lights when the unit is transmitting. The light becomes dim as the battery weakens, indicating a charge is needed.

On the right side all you will find are a carry strap loop and an EXTERNAL POWER connector. This connector, like the MICROPHONE and SPEAKER jacks up top, has a little rubber plug to help keep water and dirt from entering.

There are two more buttons on the front of the 73-005 you need to know about (aside from the touch pad, of course): the CALL and the SQUELCH/MONITOR buttons. The CALL button will generate a 1750 Hz repeater access code when depressed along with the PTT button. This BURST TONE ENCODER is unusual on rigs manufactured for the U.S. market. The 1750 Hz tone is common in Europe, but rarely used in the States. The SQUELCH/MONITOR button simply shuts the squelch circuit off while it is depressed. Push it to hear weak signals that are barely breaking through.

The LCD display indicates frequency, channel step, and special functions. These include PAG (Paging), DUAL (Dual Watch receive), APO (Automatic Power Off), DUP (semi-Duplex operation), F.L. (Frequency Lock), T.SQ (Tone SQuelch), P.L. (PTT Lock protection), C.SQ (DTMF Code SQuelch), S (battery Save), B (Busy scan—rather than the pause scan default mode), and + and – (repeater offsets). The LCD also displays the memory address number and memory mode. The number line style meter across the bottom functions as an S-meter on receive, and as the RF power meter on transmit.

Special Attractions

The Midland 73-005 has more functions than you can shake a stick at. Let's take a look at some of the highlights:

- •Large Capacity Nickel Cadmium Battery Pack
- •LCD Control Panel
- •Multi-Function Scan
- •20 Memory Channels
- •Repeater Offset and Reverse Switches
- •Tone Squelch + (P/L)
- •Dial Lamp (LCD)
- •Battery Save Function/Auto Power Off
- •Instant Squelch Defeat/Monitor
- •Speaker/Mike and 12 Volt Input Jacks

"Probably this rig's best feature is its hot receiver section."

Note: The Tone Squelch Module is an accessory, as is the oversized (high-power) 12 volt battery pack. A 12 volt wall charger and a speaker/mike are also available.

The 73-005 comes standard with some nice features. The DTMF (Dual-Tone Multi-Frequency) encode touch pad has become a staple in the market. But not all HTs have the decode feature as well, which allows you to emulate a personal pager of sorts. The LCD screen displays the number being decoded and "beeps" when activated.

Probably this rig's best feature is its hot receiver section. The receiver is up to (low-end) commercial specs. 60 dB adjacent channel rejection is better than most. It is a highly selective radio with a very respectable 0.16 µV (12 dB SINAD) sensitivity as well.

The receiver has extended range capabilities. You can dial up some local police and other agencies for the heck of it. You can also hear the National Weather Service. The VCO stays locked from 135 to 170 MHz.

The transmitter will put out 5 watts with an automotive 13.8 VDC power input. The Midland is not real picky about DC power; it will run happily on anything from 5 to 15 VDC. The circuit is reverse-polarity protected.

Note that the center pin of the 12 volt input jack is negative.

The transmitter section gives you plenty of choices when it comes to output power level. The B/PT.L button selects HIGH, MIDDLE, or LOW power operation. With the optional 12 volt battery, this will give you a choice of 5, 2.5, or 0.35 watts output. With the standard 7.2 volt battery you can select from either 2 watts out on HIGH or MIDDLE or 0.35 watts out on LOW power.

Semi-duplex operation is available by using two different memory frequencies. The 2/DUP button along with the FUNCTION button will get you into DUPlex mode. You can also swap the transmit and receive frequencies by pushing the C/SC/M along with the FUNCTION button.

You can select a frequency with either the ROTARY CHANNEL SELECTOR, or by direct entry to the keypad. You can adjust the channel steps with the 3/STEP and FUNCTION buttons along with the ROTARY CHANNEL SELECTOR knob. For repeater use, press the 7/SB button along with the Function button to switch from – offset to + offset to simplex operation. The offset is adjustable, too.

The Battery-Save function gives you even more choices. This function allows you to reduce the current drain to 1/3 during receiver standby. In this mode the receiver takes a sample once every single second. This is great for working voice out in the field, but it can be a problem receiving packet. Pressing the 5/SAVE button while pressing the FUNCTION button (located just above the PTT) toggles this feature on and off. The unit also has an Auto-Power Off function.

Midland shipped an accessory tone squelch board with the review unit. The Tone Squelch control allows you to gate a signal through the receiver squelch only when a particular CTCSS (Continuous Tone Controlled Squelch System) tone is being received. On transmit, you can similarly generate this particular subaudible tone to ac-

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Specifications

Frequency Range	144-148 MHz TX, 130-170 MHz RX		
PLL Lock Range	130-170 MHz		
Modulation Type	F3		
Channel Steps	5, 10, 12.5, 20, 25, 50 kHz		
Antenna Impedance	50 ohm, unbalanced		
Input Voltage Range	5.0-16.0 VDC		
Nominal Voltage	7.2 VDC		
Current Drain (approximate):			
	Transmit	13.8V	
		Hi	950 mA (5W)
		Mid	650 mA (2.5W)
		Low	350 mA (0.35W)
		7.2 V	
		Hi	650 mA (2W)
		Mid	650 mA (2W)
		Low	350 mA (0.35W)
	Standby	0.35 mA	
	Save	0.15 mA	
	Auto pwr off	0.7 mA	
RX	(144-148 MHz ham band only)		
Sensitivity	(12dB SINAD) less than 0.16 µV		
20 dB quieting	Less than 0.25 µV		
Distortion	Less than 5%		
Squelch sensitivity	0.16 µV max		
Audio output power 250 mW	10 % distortion at 8 ohms		
TX			
RF output power	5W (13.8V) max		
	2W (7.2V)		
Max deviation	+/- 5	kHz	
Freq stability	+/- 10 ppm from -20° C to +60° C		
Spurious & harmonic emissions	Less than -60 dB		
Dimensions	152 x 63 x 34 mm		
Net weight	300 g (with battery and antenna)		

Midland 73-005

Continued from page 35

cess "closed" repeaters or particular individual stations.

This miniature board took me all of 10 minutes to install, and five of those were spent looking for a small screwdriver. The clamshell housing comes apart lickety-split after removing just four screws. Inside there is a very neat array of microcircuitry. The thumbnail PC board sticks to the main board with its own adhesive backing and a tiny multi-pin plug makes all the connections. To operate the TONE SQUELCH feature, press the 4/T.SQ button while pressing the FUNCTION button. If you want to real get tricky, you can *simultaneously* utilize both the sub-audible TONE SQUELCH and DTMF CODE SQUELCH. Two independent subaudible tone frequencies can be programmed into the memory banks. Tone frequencies are selected via the ROTARY CHANNEL SELECTOR.

Conclusions

For this review, I shoved the Midland 73-005 unit into my backpack, tossed it onto the passenger seat of my car, and clipped it to the handlebar bag on my mountain bike. It's been on hikes in the mountains, to the beach, everywhere. Let's cut to the chase. Money *is* important to most of us and this rig is priced quite reasonably. It offers more features than you will probably need. The receiver is hot and the rig is very sturdy. You can lock the PTT button and the operating mode to prevent improper operation. That's handy if you're active outdoors.

The speaker audio is very good. To get better audio you will probably have to fork over quite a bit more money. I found this to be a cool radio, too. I didn't have a problem with the output power circuitry turning into a hot hamburger during normal use. (I don't usually rag-chew on 2 meters.) The aluminum chassis does a good job dissipating heat.

This is not the easiest HT to program. This article should give you a good feel of the essential operating hieroglyphics. Still, the Midland *will* perform well for you—just don't forget to bring the instructions along. The manual is detailed with plenty of illustrations to get you through.

Midland has made a triumphant return to the amateur radio business after a long hiatus. They have done a fine job with the 73-005 hand-held transceiver. Their next project is a UHF model, which is already in the works. 73

Melt Your Way to Better Breadboards

Discover the Macro Surface-Mount breadboard method.

by Brad Thompson N1JIJ

Chances are, you build one or more breadboard versions of your amateur radio projects before you commit them to a printed-circuit board layout, or you may even skip the PC version altogether and simply package the breadboard.

But if the fun's wearing thin and you're "bread-bored," your standard construction method may be at fault—no single breadboarding method meets everyone's needs. For example, perforated grid board and wire-wrap techniques work well for logic and low-frequency analog circuits, but lack an adequate ground plane for RF applications.

Isolated pads carved into sheets of unetched copper-clad laminate solve the RF ground plane problem but are totally immovable, as are through-hole Teflon standoff insulators. Terminal strips soldered onto copper-clad solve the relocatability problem, but they're relatively bulky and add to board height.

Enter the Macro Surface-Mount breadboard method, or MSM for short. Using the MSM technique, you keep your breadboard's copper-clad ground plane intact and install connection pads wherever they're needed. You can easily remove unwanted pads and relocate their replacements and, as Photo A shows, you can even build breadboards on almost *any* substrate—from window glass to business cards.

Best of all, you won't tie up much "bread" in your breadboards—the raw materials cost a penny or two per connection, and the tools you'll need are available nearly everywhere.

What are the secret ingredients? The connection pads consist of disks of thin single-sided copper-clad printed circuit board laminate punched from sheet stock with a $3 hand-held paper punch (see Photo B). Hardware-store hot-melt adhesive secures the pads to the ground plane.

Forming the Pads

Printed-circuit board material consists of one or two layers of copper foil laminated onto an insulating sheet. While most of us are familiar with the thicker sizes sold for fabricating one- or two-sided etched circuit boards, the PC board industry also uses millions of square yards of thinner stock to manufacture the inner layers of multilayer boards.

For MSM breadboard applications, you can use single-sided epoxy/Fiberglas board (commonly designated as G-10 or FR-4 stock). Material of 0.012" insulation thickness laminated with 1-ounce (0.0014") copper works well—a common hand-held paper punch easily penetrates the laminate, and normal levels of soldering-iron heat won't delaminate the copper.

To create MSM connection pads, you slide a piece of laminate into your paper punch and squeeze. The pad will pop out like a miniature tiddlywink unless you place a finger over the punch's exit side.

If the remaining laminate sticks to the punch, work it free with a twisting motion. To prevent cuts while handling the sharp-edged laminate, wear a pair of lightweight cotton gloves.

No one will ever mistake a paper punch for a precision tool, and the fit between punch and die is typically rather sloppy. Thus, squeezing the punch forms a raised lip or burr on an MSM pad's copper surface. If you punch through the board's insulated side (i.e., with the insulation in contact with the steel punch and the copper side against the punch's die) the copper burr overhangs the pad's edges and reduces the insulation path.

Also, epoxy/Fiberglas material acts as an abrasive, further wearing the punch. When the edges of pads exhibit a torn rather than sheared appearance, discard the punch or relegate it to paper and cardboard.

MSM's Electrical Properties

While epoxy/Fiberglas laminate and hot-melt glues offer dielectric strength of approximately 500 volts and 650 to 1300 volts per mil of thickness respectively (i.e. a 12-mil board should withstand 6,000 volts), the practical working voltage for an MSM pad cemented to a ground plane falls well below the dielectric limit.

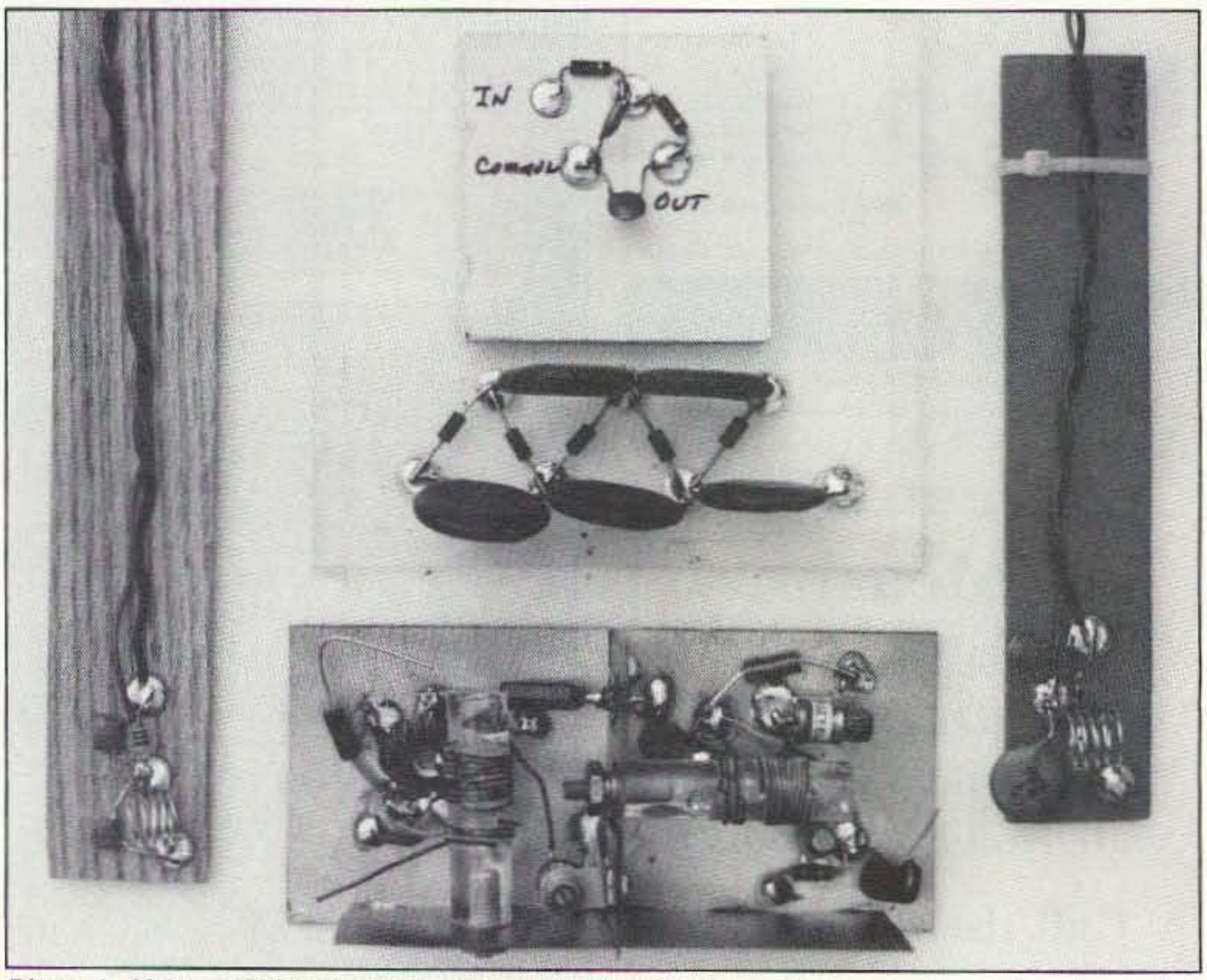

Photo A. Using MSM techniques, you can build circuitry onto almost any surface from plate glass to business cards to wood to Plexiglas.

In practice, the creepage path across an MSM pad's edge from copper to ground plane determines the voltage flashover margin. While a ring of hot-melt glue around and beneath a pad may raise flashover voltage, glue thickness and thus flashover voltage is hard to control.

As a guideline, printed-circuit board design rules impose a 150 volt limit for trace-to-trace clearances of 0.025". Thus, adopting a maximum working voltage limit of 50 volts for a 12-mil (0.012") MSM pad-to-ground plane separation will provide a conservative safety margin. Of course, if you're using an insulating substrate, pad-to-pad flashover and substrate breakdown voltage limits will apply.

Pad area and dielectric layer thickness value determine the capacitance of an MSM pad mounted over a ground plane. For a worst-case assumption of no glue layer, calculated capacitance of a 1/4" diameter copper pad and 12-mil epoxy/Fiberglas dielectric layer is 1.06 pF (picofarads).

In practice, edge effects increase and the thickness of a hot-melt glue layer decreases capacitance. A cluster of four MSM pads measured 1.08 pF per pad, a value reasonably close to the theoretical capacitance.

Dissipation factor (DF), a measure of a capacitor's AC power loss, varies from 0.001 to 0.120 for hot-melt adhesives, a range that brackets G-10 and FR-4 laminates' DF of 0.018—given the small amount of adhesive used, RF losses won't present a problem in most MSM breadboards.

Applying the Glue

Use a sharp hobby knife or single-edged razor blade to shave a 1/8" by 1/8" by 1/16" thick flake from a hot-melt glue stick. Size and thickness of the flake isn't critical, but too little glue won't fully wet a pad's underside and too much glue will form a messy-looking ring around the pad. A little practice will demonstrate the proper amount of glue to use.

Place the glue flake on the substrate using tweezers or needle-nosed pliers. Put an MSM connection pad (copper side up) over or against the flake. Using a small (20 watt) soldering iron, tin the pad's surface with 60/40 rosin-core solder.

As the solder melts, so does the glue, which secures the MSM pad to its substrate after cooling. While the glue remains liquefied, you can slide the pad to a slightly different location. If you incorrectly place a pad, simply reheat and remove the pad. Use a section of copper braid or solder wick to absorb leftover glue.

You can obtain MSM materials and tools locally, with the possible exception of thin-substrate copper-clad PC laminate. If your local surplus outlet doesn't stock the laminate, check mail-order surplus dealers who advertise in *73*.

Also, contact local printed-circuit board manufacturers and PC laminate suppliers for availability of scrap and leftover material. To get started, you can purchase a 3" by 5" trial sample, enough for over 200 MSM pads, from the author for $4 postpaid (see address at end of story).

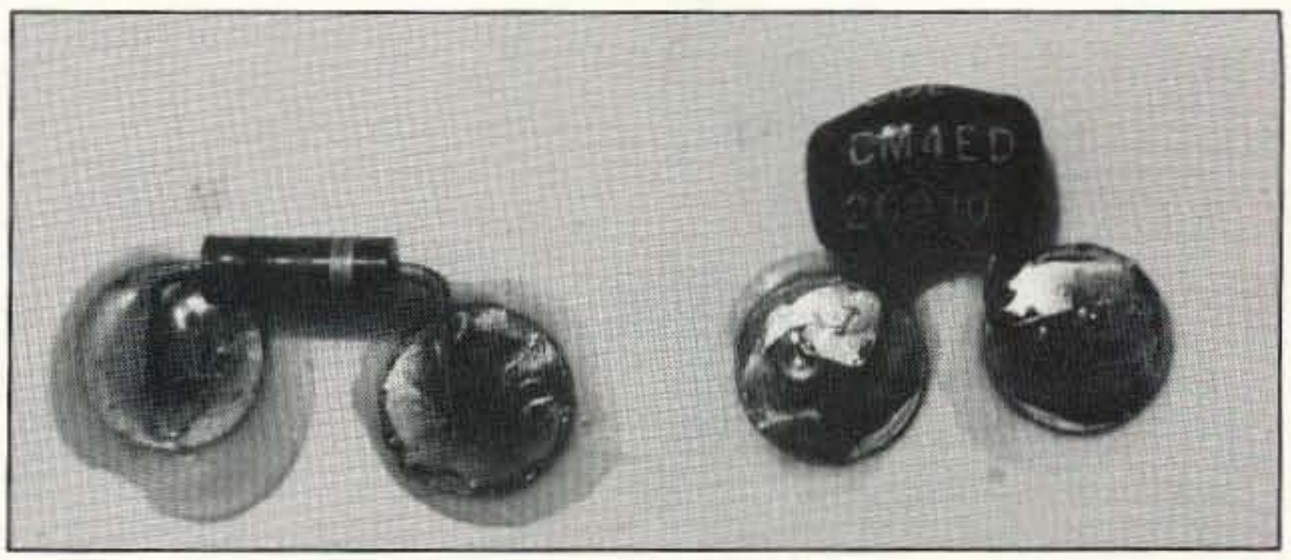

Photo B. A tight-shot of the MSM connection pads.

Assembly Techniques

Before soldering a component to a pad, trim and tin all of the component's leads. Bend a lead to form a "foot" and place the "foot" on the pad. Apply a soldering iron to the lead and pad, simultaneously melting the solder and softening the glue. Adjust the pad's position, if necessary, and remove the iron. Allow the glue to cool for approximately 30 seconds before moving the part or bending its leads.

As noted, MSM pads can slide on a "bearing" of molten glue, but the first component lead soldered to the pad effectively pins the pad in place. While the first connection is the most difficult to make, subsequent connections go more easily.

Use a hemostat or locking tweezers to hold a component while soldering. Grasping the lead between component and connection helps keep excess soldering heat out of temperature-sensitive components.

For best results, use a low-wattage soldering iron—a 20 watt iron with a 1/16" tip works well. To solder leads to a copper-clad ground plane, use a larger iron of 40 to 50 watts capacity. Apply enough heat to make quick, clean connections and minimize softening of the glue securing adjacent component pads.

If you're installing MSM pads over a ground plane, use an ohmmeter to check for pad-to-ground short circuits caused by excess solder or too-long component leads.

To make connections between pads, use light-gauge solid- or stranded-conductor wire. Solid wires hold their shape when bent, an advantage when routing many conductors among pads. You can use thermally-strippable magnet wire for interconnections, but for best results trim and tin individual wires before soldering to pads. Tinned copper wire strung with sections of insulating tubing also works well.

Layout Suggestions

While the MSM method encourages a free-form approach to breadboarding, you'll get best results by planning your layout before you place a single pad. Proceeding from input to output, convert your schematic to a component-placement diagram. Allow a 1/4" circle for each MSM pad at a connection point. If you're using a copper-clad ground plane, allow a margin of approximately 1/4" to 1/2" around the ground plane's edge for mounting holes and a shielding box, if required.

Route power busses parallel with the substrate's edges. In general, you'll find that MSM layouts can closely follow a circuit's schematic diagram, easing troubleshooting and modification.

Given a copper-clad ground plane, there's no excuse for insufficient RF filtering. You can liberally sprinkle bypass capacitors from MSM pads and power-distribution points to ground. When bypassed on either side, a low-value resistor passed through a clearance hole in a shielding partition serves as a feedthrough insulator.

You can use DIP (Dual-Inline Package) components in a predominantly analog- and discrete-component MSM layout via "dead-bug" and "porch" techniques. In the dead-bug approach, you place the part with its pins in the air and bend power and ground pins to contact MSM pads and the ground plane respectively. Use individual pins as connection points for wiring—AWG #30 wirewrapping wire works well.

As an alternative, you can mount DIP components on sections of perforated board or salvaged printed-circuit board, wiring the ICs as a socketed subassembly and then securing the "porch" board to the ground plane with hot-melt adhesive. If your design consists mostly of DIP components, build the circuit on perfboard and tack on discrete parts via MSM pads.

If you experiment with nontraditional circuit substrates (e.g., cardboard or unused ashtrays), consider the substrate's mechanical and electrical properties. While an MSM pad and its glue provide a margin of insulation, wood, paper and cardboard lose mechanical strength and can become conductive when wet, causing electrical sneak paths.

Glass and plastic substrates offer superior insulation but require careful handling and mechanical mounting. In general, remove dirt, grease and corrosion products from surfaces before applying hot-melt glues. Otherwise, MSM pads may separate from the substrate due to poor glue bonding.

You can use a transparent plastic box with a removable lid as an enclosure for an MSM circuit by building the layout on the box's lid. However, the plastic may soften beneath each MSM pad, so apply minimum soldering heat for best results.

If you're uncertain about selecting a particular combination of substrate and hot-melt glue, conduct a pull test by attaching an MSM pad to the substrate and soldering a

1/4 watt resistor to the pad. Allow two minutes for the glue to bond. Secure the substrate in a vise.

Using pliers to grasp the resistor's unsoldered lead, apply a steady pull at a 45-degree angle with respect to the substrate. If the glue bond fails before the resistor fractures or the soldered connection peels, choose another glue or substrate.

When assembling an MSM breadboard, remember that bends in a component's leads help alleviate mechanical stress induced by soldering heat. Also, raising a component's body above the substrate improves heat dissipation and provides clearance for cross-under wiring.

Depending upon formulation, hot-melt glues soften at temperatures ranging from 70 to 163 degrees Celsius. Therefore, avoid designs that heat the substrate or dissipate large amounts of power into MSM pads via component leads. Provide longer component leads for extra cooling.

Assembly Ideas

As an alternative to a paper punch, you can use sheet-metal snips or even heavy-duty scissors to cut rectangular pads and bus strips. However, circular pads are free of sharp corners which can cause short circuits.

Lightweight copper-clad material forms easily-assembled shielding partitions and enclosures. Use EMI-suppression conductive adhesive-backed copper tape to form corners of shields and for seam coverage. For permanent tape-to-substrate bonds, tack-solder the tape and substrate at 1/4" intervals.

If you're modifying or repairing a conventional printed-circuit board, use MSM pads as tie points for discrete components. While it's preferable to secure MSM pads to an area of ground plane, in most cases you can also cover signal traces with pads. Trace-to-pad capacitance will amount to only a fraction of a picofarad per pad, and stray signal coupling shouldn't present problems.

Drawbacks to MSM technology include a tendency for reheated pads to slide on a glue "bearing." Use a scribe or soldering aid tool to hold a recalcitrant pad in place. Also, after repeated soldering and unsoldering, a pad's glue bond may weaken, forcing you to replace or reglue the pad.

Hardware built with MSM breadboards tends to spread in two directions, forming shallow layouts that are great for troubleshooting but somewhat hard to package for some applications.

While the author has used MSM technology for several months, MSM remains an experimental assembly method—long-term effects of storage, shock and vibration resistance, and repeated thermal cycling remain unexplored. In the tradition of amateur radio experimentation, the author releases MSM technology to the public domain. Your comments are invited.

NOTE: To obtain a 3" by 5" sample of 12-mil single-sided copper-clad laminate for experimental MSM pad fabrication, send a check or money order for $4 (U.S.) postage and handling to: Brad Thompson N1JIJ, 100 Powdermill Rd., M/S BX-233, Acton MA 01720. 73

Hot-Melts for Hams

If your workshop includes an electric glue gun, chances are you're already familiar with the varieties and brands of hot-melt adhesives typically stocked by hardware stores. If not, here's a review of what's available.

Hot-melt glues come in three varieties. Polypropylene adhesives are yellowish white in color and slightly translucent. Ethylene vinyl acetate (EVA) glues are colorless and translucent. Polyamide glues are opaque and dark amber in color.

You'll find all three types in 1/2" or 1/4" diameter sticks of various lengths. You'll also find hot-melt sealants and caulking compounds—avoid these, as they don't adhere adequately for MSM applications.

In exploratory pull tests, all three types of hot-melt glues provided strong bonds—typically, components' bodies fractured before either solder or glue bonds ruptured. However, pads secured with white sealer/caulking compound failed during a moderate pull, well before component failure occurred.

Peel strength of copper on G-10 or FR-4 board stock is approximately eight pounds per inch of width. Various hot-melt adhesives offer peel strengths ranging from 13 to 45 pounds per inch of width, and thus an MSM pad's foil-to-Fiberglas bond will fail before the actual glue bond between pad and ground plane fails.

A $0.25 single glue stick yields hundreds or thousands of connections, and a carton of sticks probably represents a lifetime supply for most amateurs. However, hot-melt adhesives offer all kinds of interesting possibilities and chances are, you'll use more than you expect.

Beyond MSM assembly, hot-melt glues offer additional applications for amateur radio. For example, you can tack wires in place, secure heavy or bulky components to a substrate, and mount subassemblies in cabinets. However, hobbyist-grade glue guns typically provide poor control of glue flow and produce unwanted stray filaments of glue.

Use a clean soldering iron operating at reduced voltage via a variable-AC transformer to daub beads of melted glue stick where needed. Hot glue adheres to everything (fingers included) and can cause burns, so wear gloves and use caution when applying the glue. Periodically wipe the iron's tip on a damp sponge to remove overcooked glue residue.

When applying hot-melt glue to large metal objects, note that the metal acts as a heat sink and may weaken glue bonds. Warm the metal beforehand for best adhesion.

Maxi-Loop 80

Here's a tried-and-true indoor favorite you can build.

by Richard Q. Marris G2BZQ

Those of us who frequent the lower HF bands (80 and 160 meters) know that sometimes the signal we want can sink into the ambient noise and disappear. This applies to both amateurs and shortwave listeners. The noise in question appears to be an amalgam of a number of sources—some radiated, some atmospheric, and some man-made.

Many hams resort to the use of a multi-turn tuned loop antenna for reception. Unfortunately, many are then disappointed with the resulting lower signal strength. Still, the loop's directional properties can reduce some of the noise. So, a preamplifier is inevitably used between the loop and the receiver. This increases signal strength, but also amplifies the noise.

Such lower HF loops are usually capacitor-tuned multi-turn affairs, with a single coupling turn. The loop's wire turns are spaced close together or are even touching.

The loop receiving antenna has been with us since the first days of wireless. It is usually seen in the form of a small-space domestic antenna. It is also used for direction finding (DF), especially in ships fitted with earlier radio telegraphy equipment. I know, because I collect old wireless books and I often used physically small-size MF and lower HF direction finding loops during WWII. Their performance was often impressive.

A review of the literature shook my poor old brain box, producing the realization that these older-type loops were mostly very, very efficient, small in size, and very sensitive. They usually had their multi-turns spaced well apart. I also recall that during more recent experiments with multi-turn small-dimension transmitting loops, the problem called "proximity effect" had been encountered, usually from the wire turns being too close together. The proximity effect may occur in cases where insulated turns are close-wound (e.g. one wire turn apart). As the turns are brought close to each other, the current density around the circumference of each conductor gets redistributed. The result is a loss in sensitivity or signal strength. For any reader who is interested, the proximity effect is analyzed more deeply in the *ARRL Antenna Book* (16th edition), and in other textbooks.

"The loop receiving antenna has been with us since the first days of wireless."

I decided to experiment to try and improve the loop's sensitivity (i.e. signal strength) and selectivity (to reduce the ambient noise level and other interference). The experiments compared various turn spacings and various methods of coupling to the receiver. For the initial experiments, a convenient suitable-size cardboard carton was used as a simple frame. A reel of PVC covered hook-up wire and a roll of masking

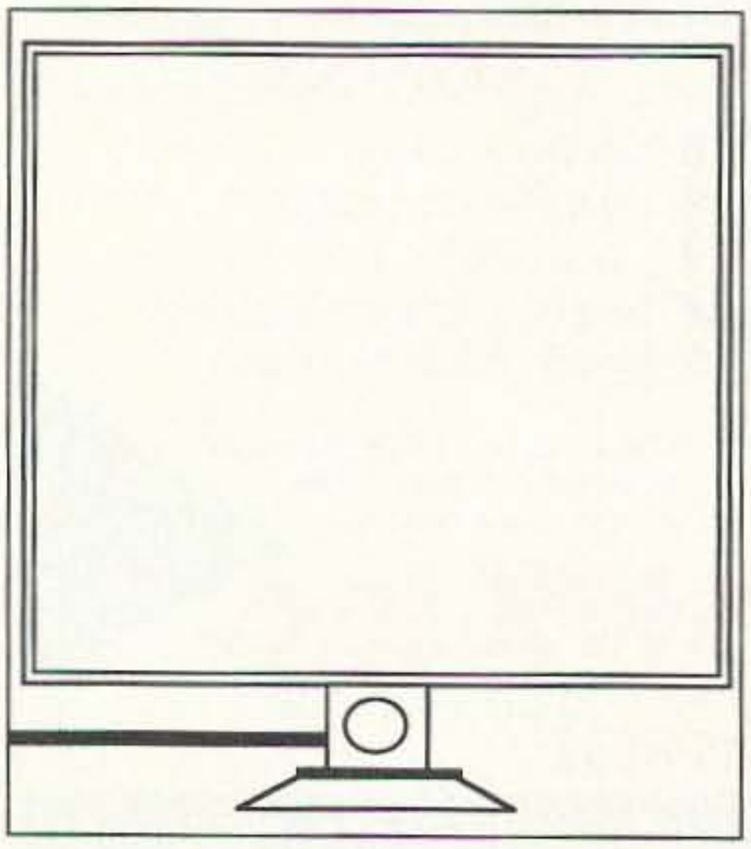

Figure 1. Maxi-Loop 80 antenna profile.

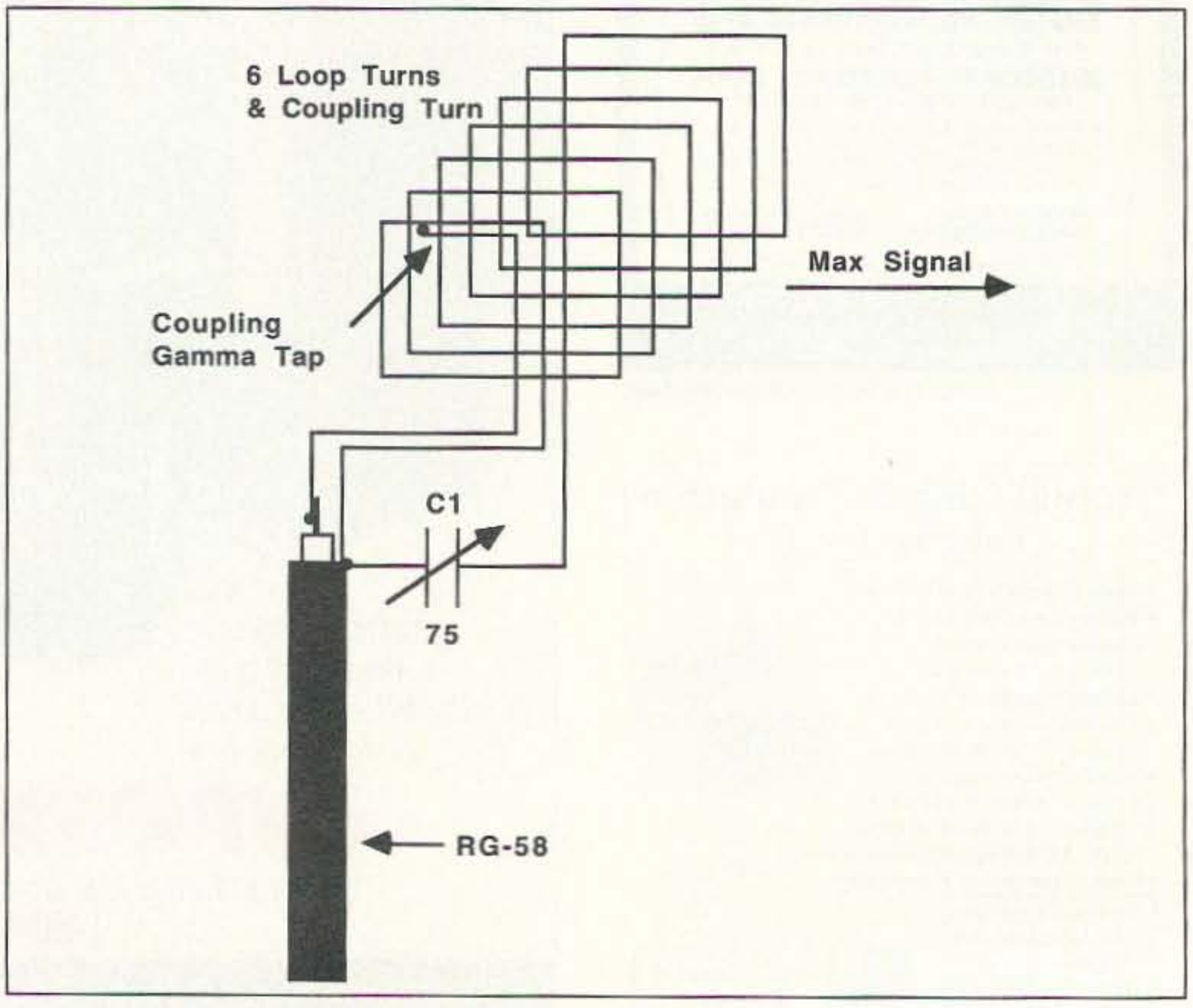

Figure 2. The antenna's electrical circuit.

PacTOR / AMTOR Without a TNC

G4BMK's **BMK-MULTY** software, in addition to unequaled AMTOR performance, now does PacTOR with any ordinary RTTY terminal unit such as CP-1, CP-100, TU-170, ST-6, ST-5000, ST-6000, etc., plus we now have an adapter for PK-232. IBM-PC or compatible required.

Detailed literature upon request. Base version with AMTOR, RTTY, CW and Audio Spectrum Analyzer $95. Base + PacTOR $145. Extended version also includes HF WEFAX and SSTV reception $125. Extended + PacTOR $165. PacTOR alone $50. PK-232 Adapter $49. Shipping $3. VISA/MasterCard accepted.

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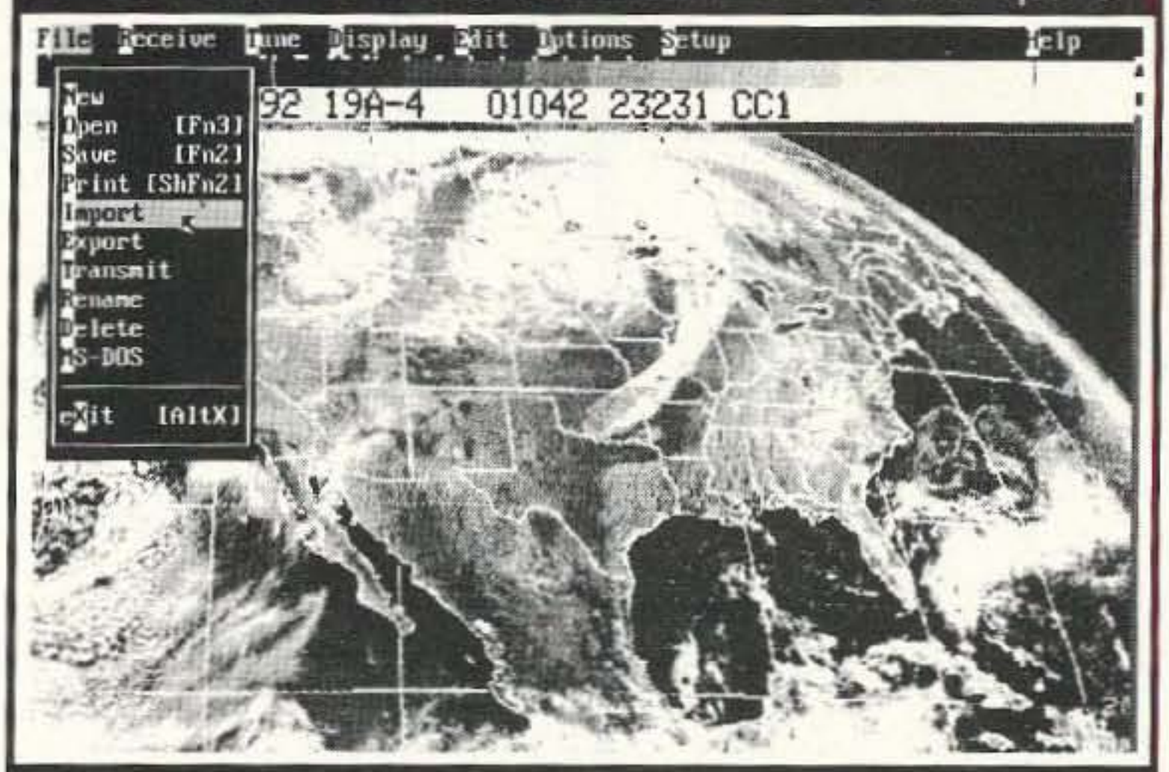

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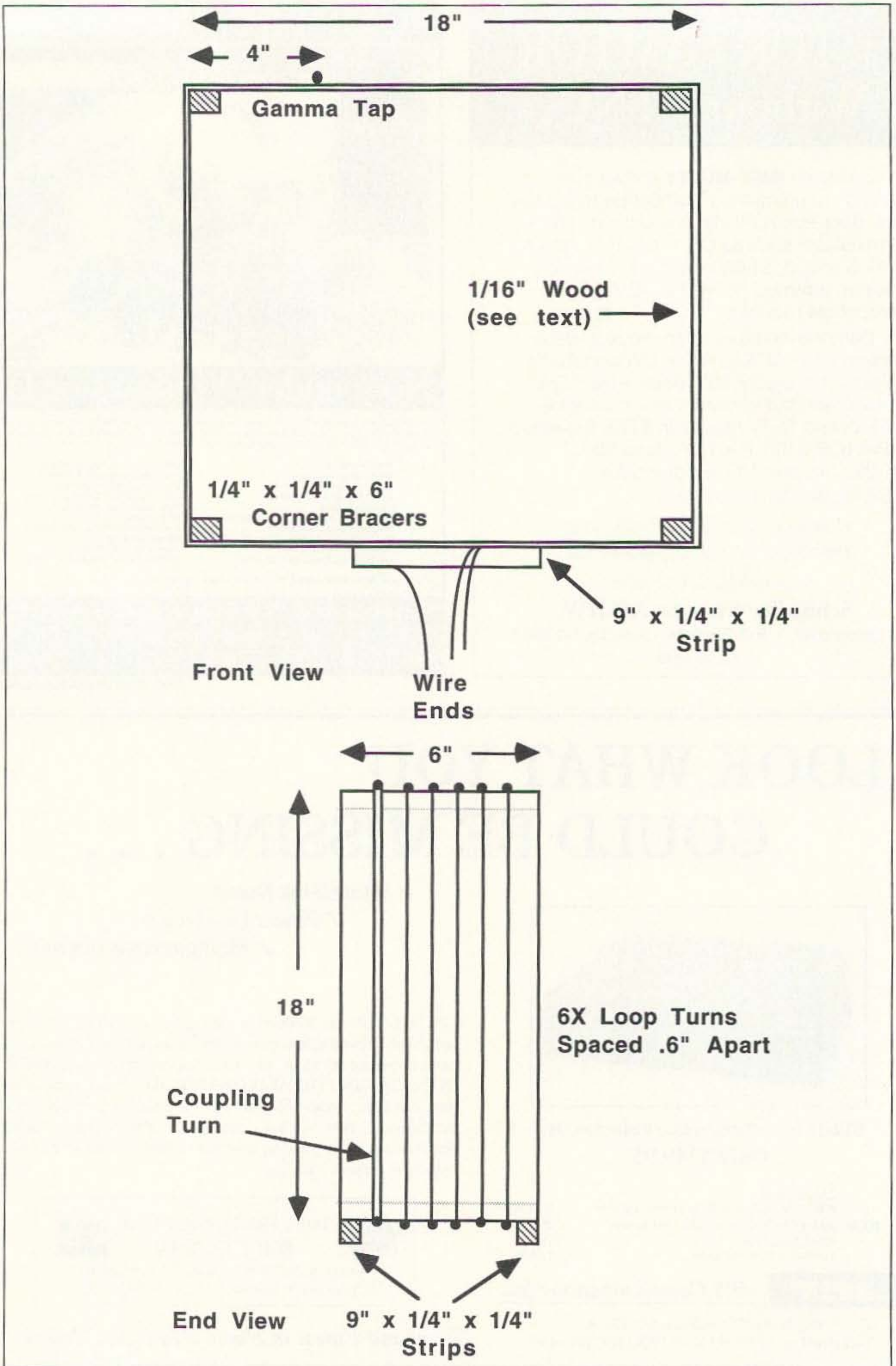

Figure 3. The Maxi-Loop 80's frame and winding.

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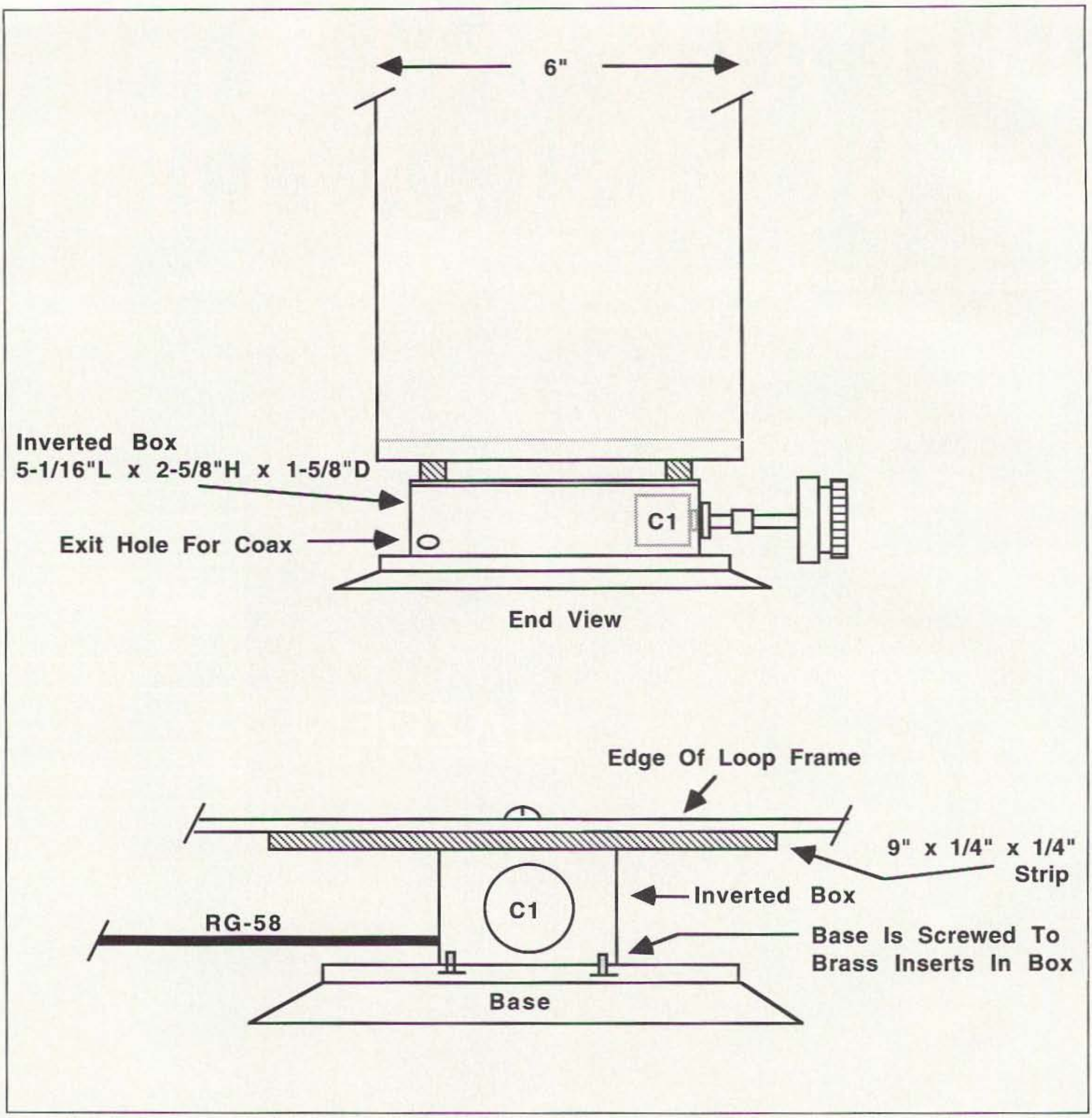

Figure 4. Mounting the antenna frame on the box.

tape held things in place and allowed for quick alterations. After several hours' work, using a frequency around 3.5 MHz, I wrote down a loop specification:

1. To be usable indoors, the loop must be small, lightweight, and decent to look at.

2. The goal is maximum sensitivity (i.e. greatest signal strength) with maximum selectivity.

3. A minimum of 1/8 wavelength of wire would be necessary, as performance falls off when proceeding with much less.

4. The estimated size was 18" x 18" x 6" using six wire turns spaced at 0.6" apart, from conductor center to conductor center.

5. A form of gamma match coupling would be used in preference to the usual loop coupling turn.

6. To obtain the absolute best results the loop would be an 80 meter band monobander.

Design Description

The resulting loop profile is shown in Figure 1. The loop frame is neatly pivoted on the flared base with a small plastic box, which encloses the resonating variable capacitor and sundry wiring.

The circuit, Figure 2, shows a six-turn loop resonated by a 75 pF variable capacitor. The coupling to the receiver is a form of "gamma" match which, in the original cardboard carton experiments, was proved to provide better sensitivity than the more typical coupling turn. The frequency range is 3000-5000 kHz, with excellent sensitivity. Note: If C1 is replaced with a 200 pF variable capacitor, this will give a frequency range of 1750-5000 kHz, with performance falling off somewhat below 2500 kHz but still usable. A slow-motion drive would then be required with C1 = 200 pF.

The resulting performance, throughout the 80 meter (3.5 MHz) band was lively, with a high degree of signal strength and good selectivity reducing the ambient noise level substantially. A preamplifier was not necessary with a good superhet communi-

cations receiver, and this is with the loop on a table indoors alongside the operating position. However, it must be remembered that the results from such a loop may vary from location to location and operator to operator.

Construction

The lightweight box-style mainframe is shown in Figure 3. It consists of four obeche wood panels 18" x 6" x 1/16". (Obeche appears to be similar to balsa wood, but stronger.) Of course, 1/16" ply, or other wood, could be used, with an increase in weight.

The four panels 18" x 6" are corner-glued together, with 1/4" x 1/4" molded wood corner bracers, as shown in Figure 3. Two 9" x 1/4" x 1/4" mounting/bracing strips are glued at the bottom, as shown in Figure 3.

Onto the frame wind six counter-clockwise turns of PVC-covered single-conductor 0.6 mm-diameter hookup wire, with the turns spaced at 0.6" apart from conductor center to conductor center. The same wire is used for the gamma match coupling turn, which is tapped onto the main winding 4" from the top left-hand corner (Figure 3) of the first turn. It is run alongside the first loop turn and touching it as shown in the circuit. The turn's ends (about 3") are secured by running them through small holes drilled in the 9" x 1/4" x 1/4" bracing/mounting strips, and they can be pruned back later during wiring. To keep the turns exactly 0.6" apart, a blob of glue should be placed on them at the frame corners. Note: After initial tests, the loop frame (and turns) should be varnished outside and inside with polyurethane varnish. This makes the somewhat flimsy loop frame/winding (Figure 3) quite rigid.

Figure 4 shows the plastic box (5-1/16" x 2-5/8" x 1-5/8"), which has a thin metal lid fastened with four corner screws into brass threaded corner inserts. The metal lid is not used.

First, C1 is mounted in the box end center, as shown, and the mainframe loop is secured to the box with two screws with washers and nuts (Figure 4). The two screws pass through the 9" x 1/4" x 1/4" bracing strips, and the inverted plastic box.

Using the discarded metal box top as a drilling jig, drill four holes through the flared mounting base, which is a rigid, colored plastic picnic plate, which loses its original identity when inverted and screwed to the box.

The RG59 coaxial feedline to the receiver is brought through a hole in the side of the plastic box, as shown, and is 48" long. It is cleated to the inside of the box.

After completing the simple wiring inside the box, the inverted plastic plate is screwed to the box.

Testing and Operation

After plugging the coaxial feedline into the receiver, which is tuned to 3500 kHz, C1 is rotated to resonance. This is repeated at 3800 kHz (4000 kHz in the U.S.A. and some other countries). There should be a frequency overlap at either end of the 80 meter band. The prototype tuned from approximately 3000 to 5000 kHz.

Tuning to various stations over the 3.5 MHz band, you should find that there is very adequate signal strength, with excellent selectivity and low ambient noise. The directivity of the loop is the usual figure-eight polar diagram, with maximum signal off the ends, and minimum on the flat side of the loop. However, due to the coupling method employed, one lobe is larger than the other. Though the purist may shudder at this, it is an advantage as it reduces other unwanted stations' interference on the reciprocal bearing (i.e. 180 degrees), and is a quite deliberate feature of the design. I haven't needed a preamplifier as there is quite adequate signal strength with the loop indoors at this location in a built-up area. The loop should be kept well clear of the room walls and metal objects and wiring and pipes, etc.

Using a 2 watt QRP transmitter as an experiment, it was possible to load up the loop. However, with those thin loop wire conductor turns, it is unlikely that the transmitted results would be very acceptable.

"It is absolutely essential that the loop is deactivated on transmit, otherwise the whole transmitted power will arrive at the receiver input, with quite devastating results."

Though the construction is very simple, it must be followed as closely as possible as the design has been targeted at the 80 meter band only, and I've been somewhat amazed how critical the turn spacing appears to be to get maximum signal strength.

The transmitting amateur will obviously be using the loop with a receiver, and the main antenna on the transmitter. It is absolutely essential that *the loop is deactivated on transmit,* otherwise the whole transmitted power will arrive at the receiver input, with quite devastating results. The method that I adopted is to "short" the RG58 loop feedline at the point where it enters the receiver. This can be done with a manual switch, relay, or RF-operated device. Whatever the method adopted, it should be tried with great care at low power and then at gradually increased power. 73

References

The following are some of the textbooks used for reference. The first two are readily available, whereas the others are collector's items. Such older textbooks should not be scorned, as the conclusion that I've reached is that some of the older loop designs were probably superior to many of the present-day designs. Such books can often be found at flea markets, etc.

1. *Antennas* by J. Kraus.
2. *The ARRL Antenna Book*, 16th edition.
3. *The Admiralty Handbook of Wireless Telegraphy*, 1938.
4. *The Radio Designers Handbook*, 1953, by Langford-Smith.
5. *The Handbook of Technical Instruction for Wireless Telegraphists*, 1942, by H.M. Dowsett and L.E.Q. Wallen.
6. *Radio Techniques*, by A.G. Mills, 1943/44.
7. *Outline of Wireless*, by L.B. Turner, 1921.
8. *Measurements in Radio Engineering*, by F.E. Therman, 1935.

Parts List

1	Box	5-1/16" x 2-5/8" x 1-5/8"	Tandy/Radio Shack 270-233
1	Variable capacitor(C1)	75 pF	Jackson C809 or C802, or similar small ceramic variable capacitor
4	Obeche	18" x 6" x 1/16"	Or alternatives—see text
1	Length moulded wood	1/4" x 1/4"	
1	RG58 coaxial feedline with suitable coaxial plug	48"	
1	Baseplate (see text)		
1	Knob and extension shaft for C1		
1	50-foot reel of PVC-covered single-strand wire		0.6 mm conductor

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A one-day delay due to poor weather conditions was the only snag in the launch of four new satellites carrying amateur radio payloads. Conditions for launch require that wind speeds not exceed 30 mph, horizontal visibility be at least 1,970 feet, and the cloud ceiling be 820 feet or higher.

On September 26, 1993, at 0145 UTC, the 59th rocket of the European consortium Arianespace lifted off from its South American launch pad carrying seven satellites bound for an 800-km-high polar orbit. The sidebar shows the sequence of events following engine ignition. While this launch was the 31st for an Ariane 4 booster, is was only the third time an Ariane 4 had been used without any strap-on boosters and the fourth time for the ASAP (Ariane Structure for Auxiliary Payloads) platform. The ASAP is a donut-shaped mounting plate for small satellites near the base of the main payload.

The Ariane 40 used for V-59 stands 180 feet tall with a lift-off mass of 240,000 kg. It is a three-stage vehicle capable of placing 4,670 pounds of payload into the desired polar orbit. The first stage (L220) is built by Aerospatiale, and is powered by four liquid-fueled Viking V engines. The second stage (L33) is built by MBB Erno, and is powered by a single Viking IV engine. The first and second stages use a biliquid fuel. The third stage (H10) is built by Aerospatiale, and is powered by a cryogenic liquid hydrogen and oxygen fueled HM-7B engine.

Most Ariane launches are for communications satellites destined for geostationary orbits over the equator. The main payload on V-59 was SPOT-3, an earth observation satellite used for earth imaging and mapping. Its mass is almost 10 times that of all the other satellites on the mission.

Of the six small satellites launched, two were based on the microsat design from AMSAT-NA, four were of SSTL (Surrey Satellite Technology Ltd.) design, and one, *Stella*, was a space geodetic satellite from CNES (Centre National d'Etudes Spatiales). Stella was mounted under SPOT-3, inside the payload adapter.

The two microsat-type satellites were ITAMSAT, now known as ITAMSAT-OSCAR-26, and EYESAT-A, now called AMRAD-OSCAR-27. Both were built from designs originally from AMSAT-NA, but with changes and upgrades. IO-26 is dedicated to amateur radio service while AO-27 is primarily for commercial uses and was constructed by Interferometrics, Inc. of Vienna, Virginia.

The three SSTL-style spacecraft include KITSAT-B, now known as KITSAT-OSCAR-25, POSAT-1, which may be named POSAT-OSCAR-28 and HEALTHSAT-1. K-O-25 from SaTReC (Satellite Technology Research Center) of Korea is dedicated to amateur use. PO-28 from LNETI in Portugal is primarily to stimulate space application efforts in Portugal and may be available for some ham operation. HEALTHSAT-1 from SSTL is to be used by medical schools, universities, hospitals and documentation centers in Africa. It carries no equipment for amateur radio use, although its downlink is in the 420-430 MHz band. In Europe this is not a ham band.

The first signals heard from the new hamsats were those of AO-27 on 436.8 MHz. Within a day all of the satellites had been heard and were being loaded with software and successfully commanded by ground stations. The SSTL craft carry 16.5-foot-long gravity gradient booms that are deployed after all tumbling motion has been dampened by on-board computer control. PO-28 and HEALTHSAT-1 were both stabilized within a few days. Boom deployment was accomplished first on PO-28 and later on HEALTHSAT-1 by SSTL. Control of KO-25 was accomplished from the group in Korea.

Last month's column contained descriptions of the frequency plans for the new hamsats and further data on their operation. While they will provide more digital communications for hams on earth, other onboard experiments like KO-25's color camera will furnish new excitement for those interested in the scientific aspects of amateur radio satellites.

The End of *ARSENE*

On September 25th a group of French ground-control stations for *ARSENE*, the recently launched French hamsat, made a series of attempts to recover control of their satel-

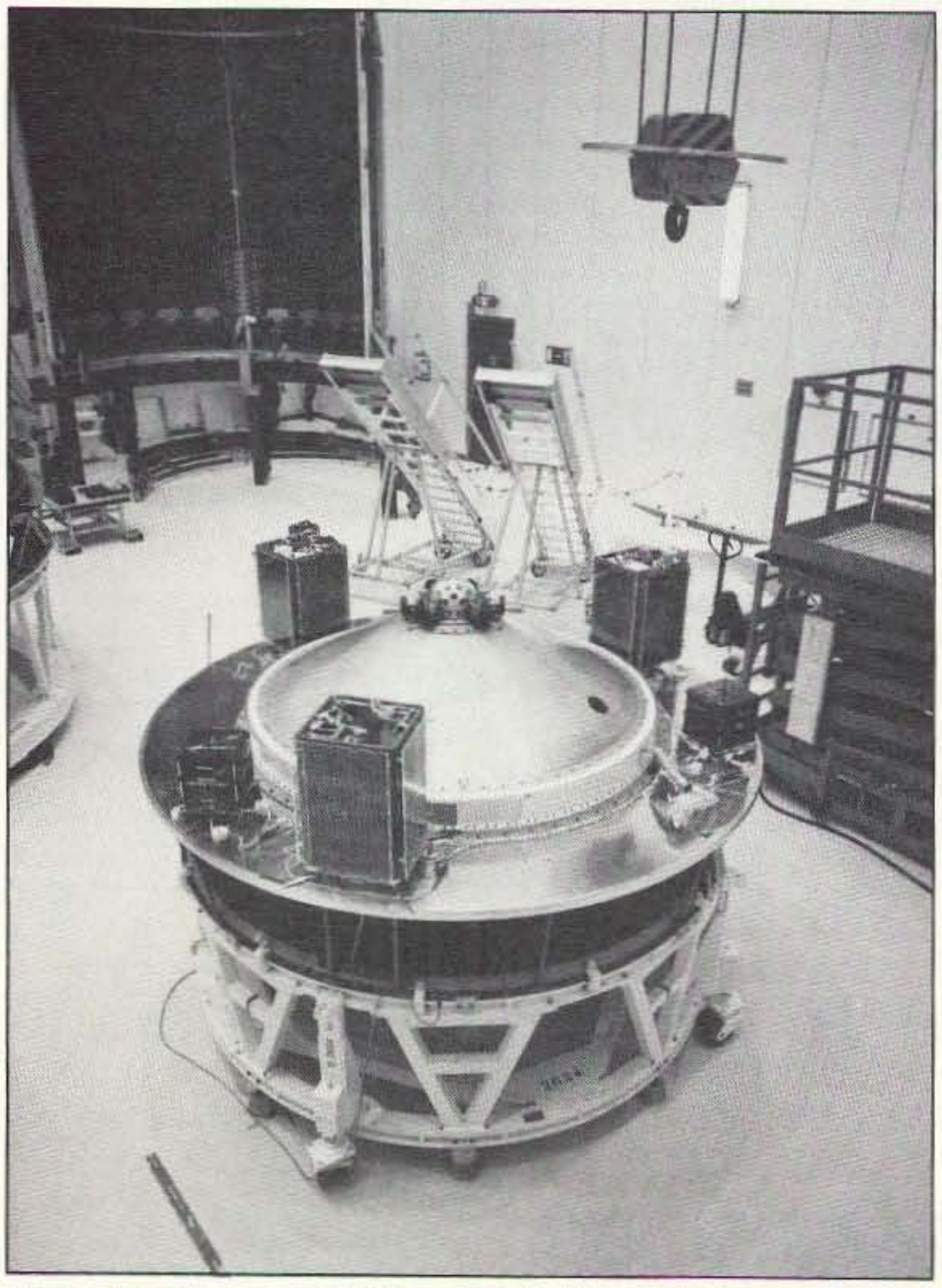

Photo A. Preparing the microsat payloads for the V-59 flight. (Arianespace photo.)

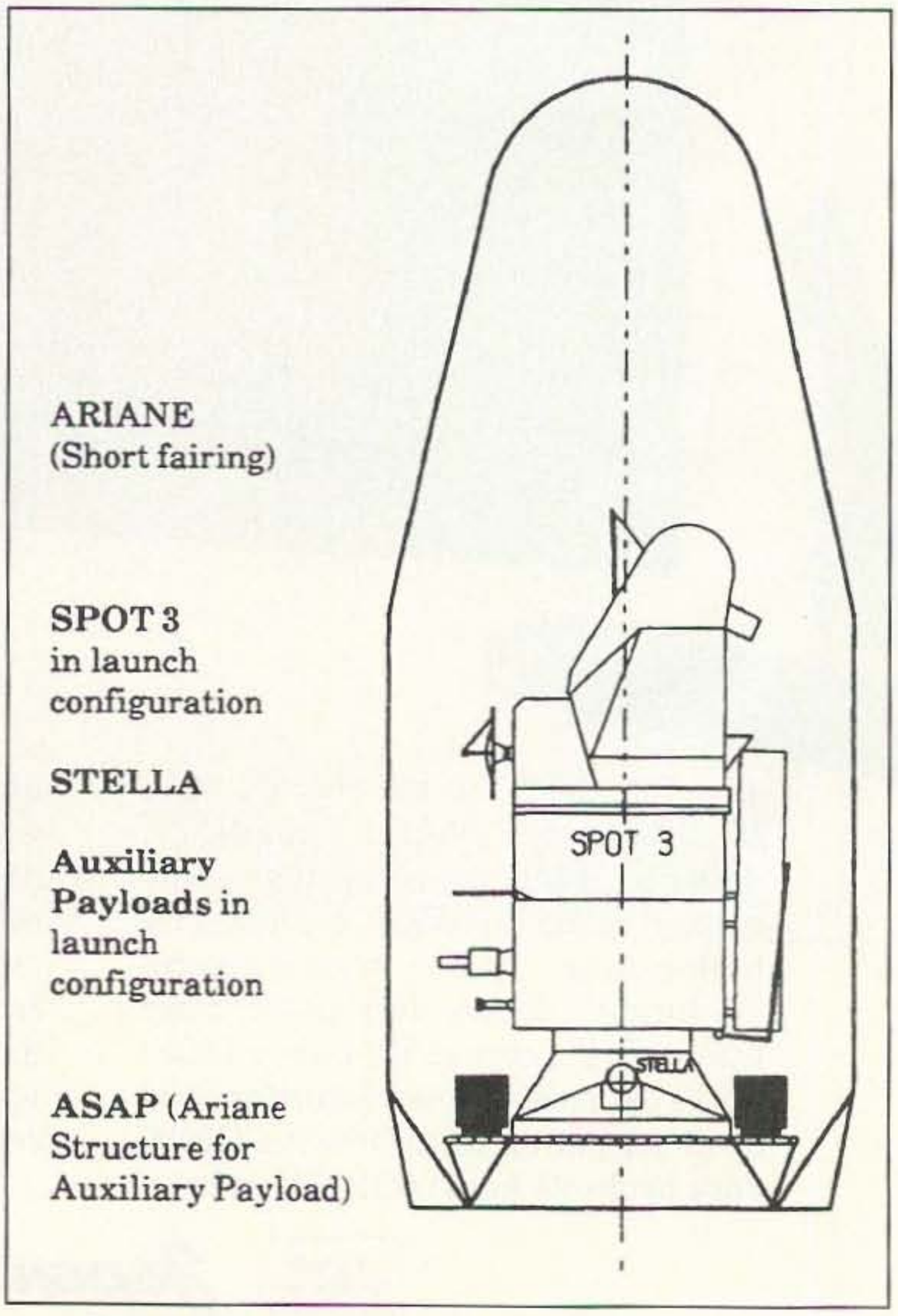

Figure 1. Ariane payload flight configuration. (Arianespace drawing.)

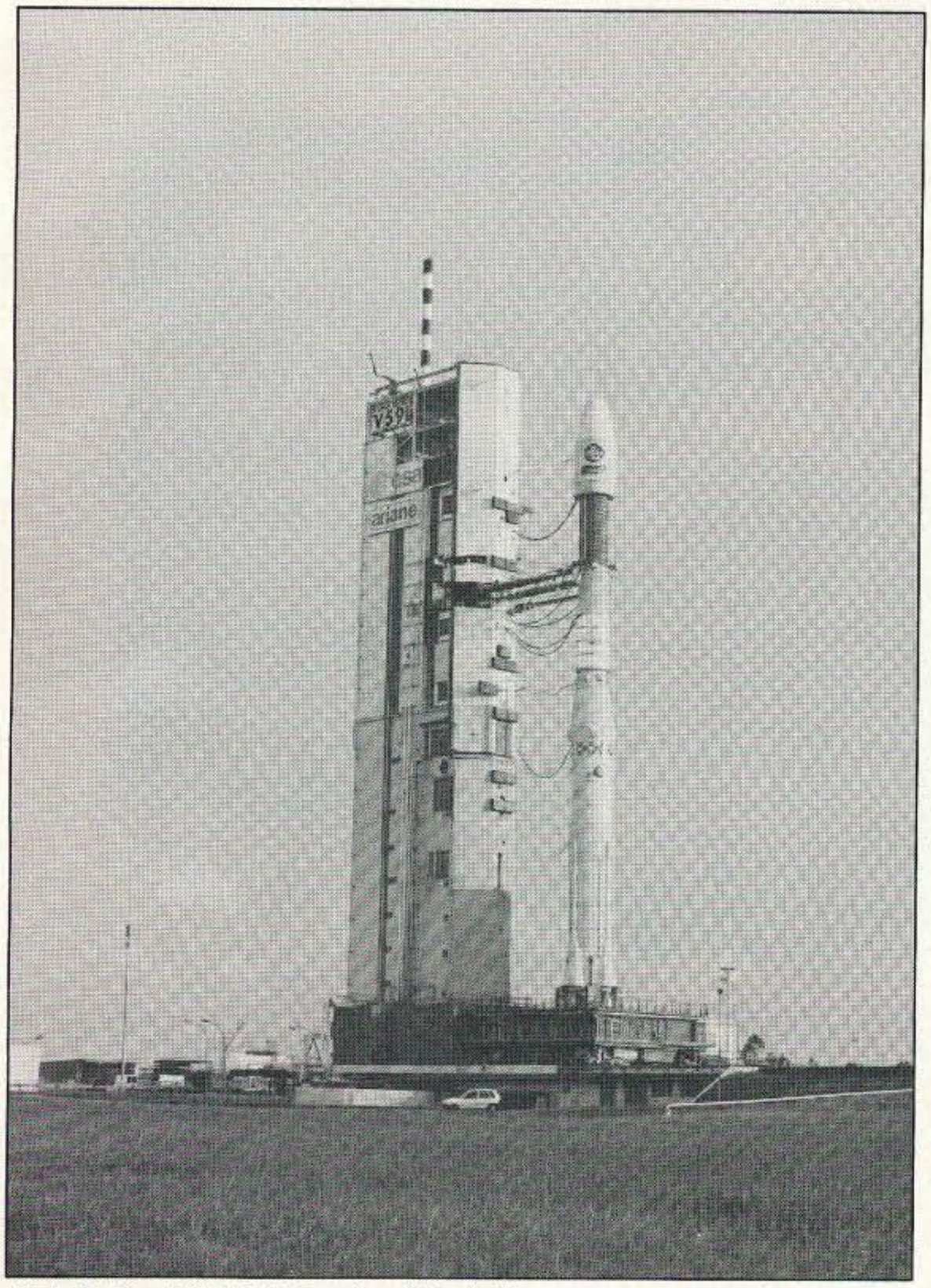

Photo B. The ARIANE 40 launch vehicle (without strap-on boosters) into preparation on its table before liftoff, Kouru, French Guiana, September 25, 1993. (Arianespace photo.)

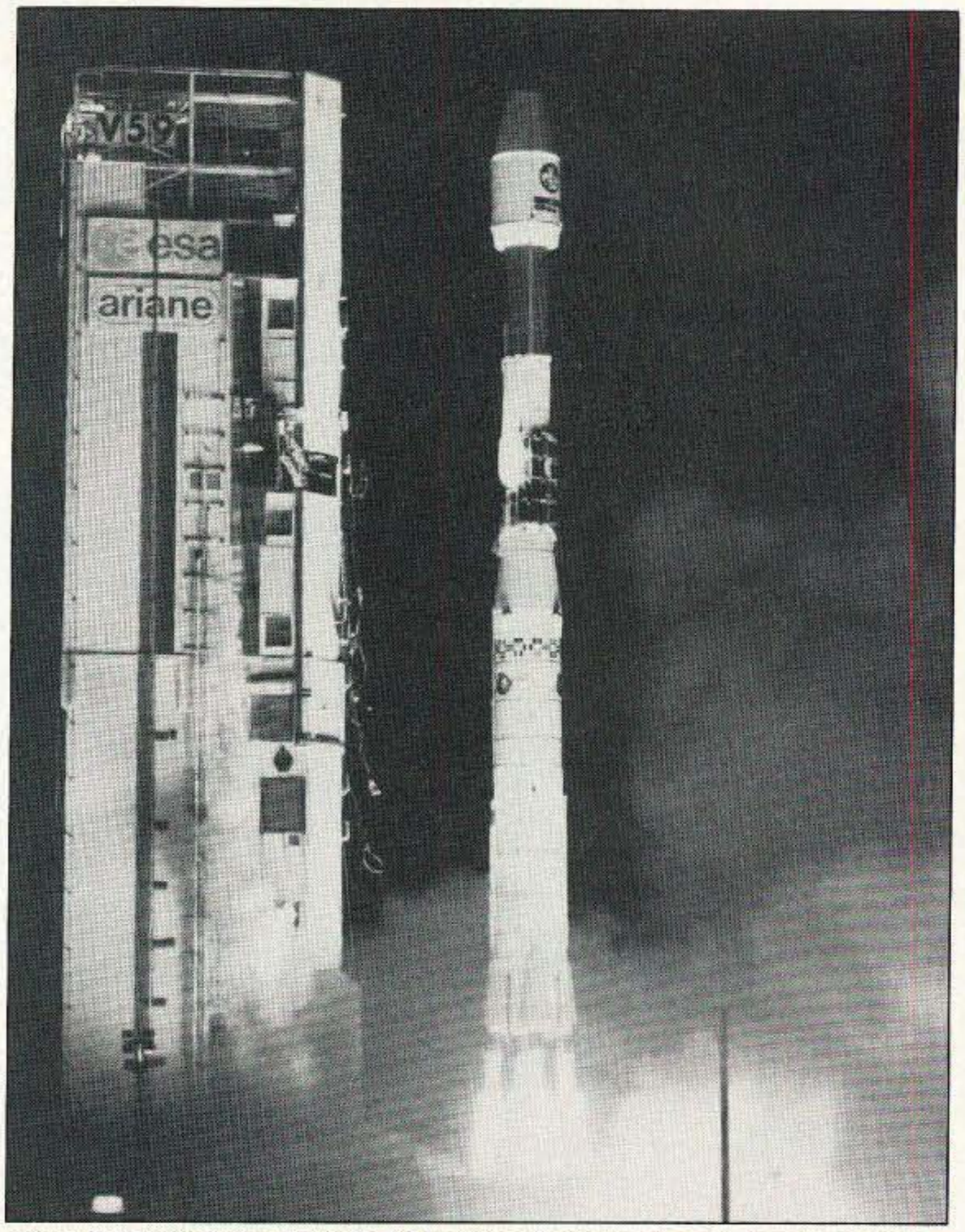

Photo C. Liftoff of the ARIANE 40 launcher (without strap-on boosters), Kouru, French Guiana, September 25, 1993. (Arianespace photo.)

lite. Since launch, *ARSENE* has had problems. The 2 meter transmitter did not function and commands to the satellite were not always executed.

The F5ELL UHF moonbounce station was used to send a long series of telecommands on 70cm to *ARSENE*. The F5ELL system includes a 26-foot parabolic dish and 2,000 watts power. F5PL monitored the *ARSENE* downlink on 2.4 GHz with a 23-foot dish. Nothing was heard after several attempts. It is likely that the satellite has experienced a catastrophic failure. Some efforts will be made to regain control, but prospects are not high in France.

Many stations made contacts through the *ARSENE* transponder. It is hoped that the groups responsible for this ambitious satellite will use the experience gained to build another.

73

Flight Profile of V-59

00:00	Ignition
00:04	Liftoff
02:39	First stage separation
03:48	Fairing jettison
04:48	Second stage separation
04:53	Third stage ignition
16:44	Third stage shutdown/orbit injection
17:17	SPOT 3 separation
20:39	STELLA separation
22:56	KITSAT, POSAT, HEALTHSAT separation
24:27	EYESAT, ITAMSAT separation
26:34	Third stage avoidance maneuver
29:00	End of Ariane mission 59

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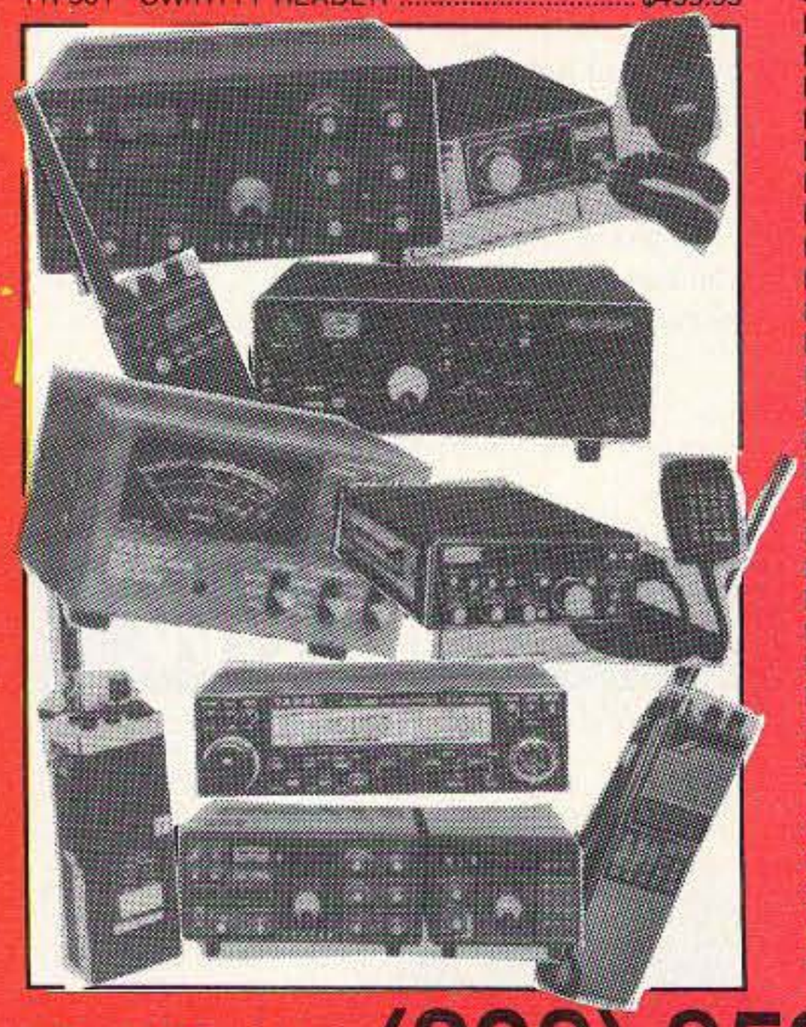

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CIRCLE 254 ON READER SERVICE CARD

RTTY LOOP

Number 13 on your Feedback card

Amateur Radio Teletype

Marc I. Leavey, M.D., WA3AJR
6 Jenny Lane
Baltimore MD 21208

Last month, I hinted at a modification to the Flesher RTTY terminal unit that would enable it to run as an interface to some of the popular RTTY software. This month, thanks to information provided by Joe Masur AA5YA, of Perkins, Oklahoma, I can offer a way to accomplish this transformation.

This modification is for the Flesher TU-470 terminal unit. I do not have information regarding other Flesher units, but I'd like to hear of information developed in this vein by any of you.

General Information

Begin by unplugging the unit and removing the two rear screws. Slide the modem out of the case. Remove the one screw holding the main fuse and push it aside. For RS-232 operation, it is advisable to disable the loop supply by lifting CR7 and CR8. Then install a 4.7k 1/4 watt 5% resistor in the resistor position marked with "RX" between R20 and R25.

If you don't like to make up plugs, you can purchase a Radio Shack female DB9 to female DB9 serial cable, and cut it in two. You will have a spare three-foot piece for later use. All the cables will fit inside the DB25 connector housing.

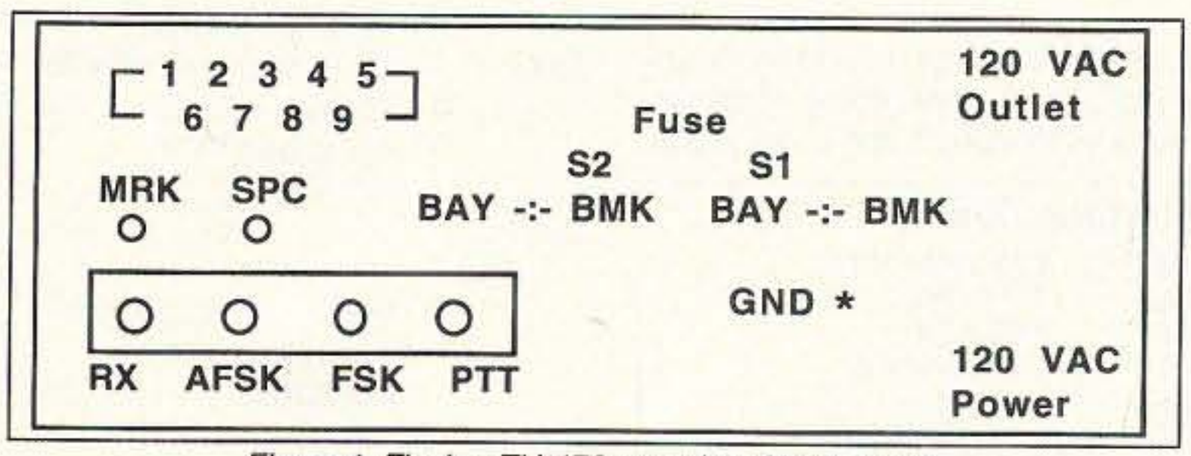

Figure 1. Flesher TU-470 rear view. Not to scale.

You will have to enlarge the outlet hole some, or pick one that will fit. You can also purchase three Radio Shack audio cables, double male, and cut them in two, as you will need five total: three to the radio and two to the scope. You could add the extra cable and then have the choice of operating AFSK or FSK. When marking the quad board, mark jack, and the DB9 connector locations, leave enough room at the outer edge for the terminal unit case.

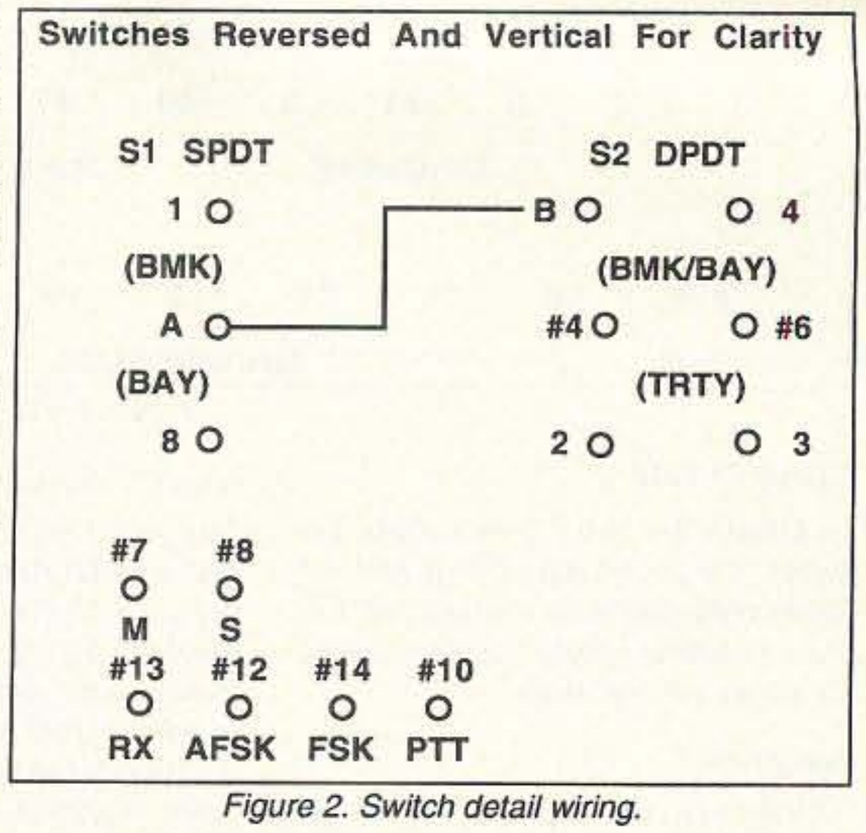

Figure 2. Switch detail wiring.

All of the cable grounds do not have to go to any special pins on the terminal unit, but pins 23 and 24 are not used. Use pins from 15 to 22 to make up the neatest arrangement, in any order possible.

Quad Jack Phono Board

Unsolder and remove the 25-pin connector from the PC board. Be careful not to damage the solder-through pads. Line up the quad jack board on the inside of the unit and mark with a pencil at each end on the rear frame. With a small file or Dremel tool remove 3/16 inch of the PC board between your pencil marks, or until there is enough room to insert the phono board. Mark and drill the mounting holes for the phone board and set aside.

DB9 Connector

Remove the loop supply plug and unsolder the lead to the PC board. Mark and form this hole to fit the connector and drill the two mounting holes. Cut and solder a three-inch length of proper color-coded wire to each of the eight pins and set aside.

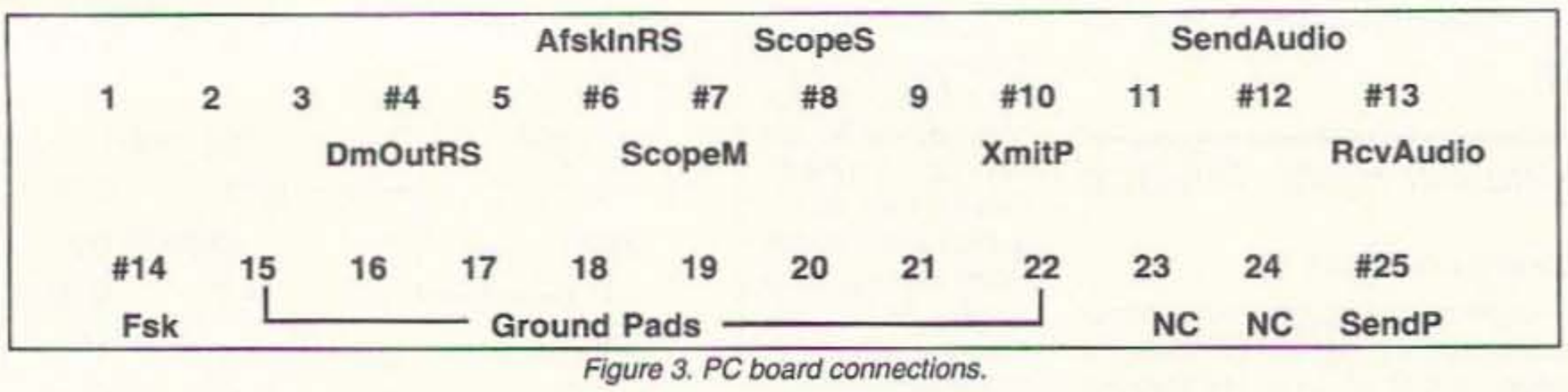

Figure 3. PC board connections.

Scope Outlets

Locate the two scope outlets between the phono jack board and the DB9 connector. Mark and drill the 1.4-inch mounting holes. Solder on wires as above and set aside.

Switches

Find the correct placement for the switches. Check to see that the fuse block can be mounted and that there is clearance, then drill a 1/4-inch hole for each switch. Do not install.

Wiring and Mounting Quad Board and Scope Jacks

Cut all lead lengths for neatness and short runs while making the connections. Solder all the ground lugs on the quad board in series with one wire with enough lead on one end to go to the ground lug on the terminal unit and the other end to go to the scope outlet ground lugs. Solder a three-inch wire to each center lug on the quad board and mount the board. Install the scope jacks. Solder the quad board ground wire to the terminal unit ground lug and the other end to the scope jack ground lugs. Then add one more wire to any convenient ground pad on the PC board and back to a scope jack ground lug.

Solder the four quad board and the two scope wires to the following PC board pads:

10	PTT	(XmitP)
12	AFSK	(SendAudio)
13	RX	(RcvAudio)
14	FSK	(Mark/Space)
7	MARK	(ScopeM)
8	SPACE	(ScopeS)

DB9 Connector and Switches

Install the connector and solder PC board wires:

5	BLUE	(Signal Gnd)	to a ground pad
7	GRAY	(SendP)	to pad 25

Solder a three-inch wire to #4 and #6 on S2 and install. Solder one three-inch wire to A on S1 and install. Solder A-S1 to B-S2 and to the PC board solder:

#4 to pad 4 (DmOutRS)
#6 to pad 6 (AfskInRS)
From the DB9 connector solder wires:
1 (RED) and 8 (WHITE) to S1
4 (GREEN), 2 (ORANGE), and
3 (YELLOW) to S2.
*** DOUBLE-CHECK YOUR WORK! ***

Mount the fuse block and the fuse. Slide the modem back into the case and secure with the two screws. This completes the modification to the terminal unit.

Any communication program that uses pins 2, 3, 5, and 7 of the run using the TRTY position. Operation details include the following:

Terminal Unit: Serial cable to computer
Front panel push-buttons to correct shift, etc.
Cables: RX to radio audio OUT
AFSK: AFSK to radio audio IN
PTT to radio PTT jack
FSK: FSK to radio MARK/SPACE/ FSK input jack
PTT to radio RTTY/ KEY jack
Switches: S1 S2
BMKMULTY
BMK BMK (set software to TXR1/RXR1)
BAYCOMM
BAY BMK TRTY
NC TRTY

Now, I defer to Joe for all of the in-

Parts List

#	Description	Radio Shack No.
1	Quad Jack Phone Board	RS-274-322
1	Pkg. shielded phono jacks	RS-274-346
1	DB9 male connector	RS-276-1537
1	SPDT toggle switch	RS-275-613
1	DPDT toggle switch	RS-275-620
3	3-foot audio cables	RS-42-2366
1	RS232C female/female cable	RS-26-116

RS232C Interface Data

PIN 1	RED	DCD	BMKMULTY RX
PIN 2	ORANGE	RXD	TRTY RX
PIN 3	YELLOW	TXD	TRTY TX
PIN 4	GREEN	DTR	BMK/BAY TX
PIN 5	BLUE	GND	SIGNAL
PIN 7	GRAY	RTS	PTT/FSK KEYING
PIN 8	WHITE	CTS	BAYCOMM RX
PIN 9	BLACK	RI	BMKMULTY FAX/TUNER

formation on this rather extensive, but useful, modification. As he points out, with the ability of the Flesher TU-470 to work on these modes, there is no reason to cart one of these off to the flea market. Conversely, if you spot one at a bargain, you might just be inclined to give it a shot.

I look forward to hearing from you all, with the results of such future efforts. Thanks to Joe for the hard work, and all the information.

Now, having done all of this, getting the software to run with is a piece of cake. Just send a self-addressed stamped envelope for a current list of the "RTTY Loop" software disks, collections of programs available for the IBM PC compatible computers out there. Email sent to me on CompuServe (75036,2501), Delphi (MarcWA3AJR), or America Online (MarcWA3AJR) will be similarly answered. I look forward to your comments and questions online, or in the mail. I hope all of you have a good holiday season, and with all that is happening in the world, may we all look forward to a 1994 of peace for all the peoples of the world. 73

Number 14 on your Feedback card

CARR'S CORNER

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Falls Church VA 22041

Building Small DC Power Supplies, Part 1

Hams and other electronic hobbyists often need small, low-voltage, low-current, DC power supplies. Most solid-state circuits require these power supplies. Indeed, if you look at solid-state circuits published in this magazine you will see that +5 VDC, +9 VDC and +12 VDC are the most commonly specified DC power supply voltages. We also see the same voltages in negative polarity used sometimes, as well as variable voltages (e.g. 0-12 VDC). Current ratings for this class of DC power supply vary from 100 mA to 5 amperes, with 1 ampere being by far the most commonly seen. This month we will take a look at how these DC power supplies are selected and designed. While DC power supply theory has gone far beyond the material presented here (watts/cu. in. are way up and lbs./watt are way down in commercial supplies), these supply circuits are easy to build with components that are available at almost any parts distributor (including Radio Shack).

Safety First

The DC power supplies described in this article operate from 115 VAC, i.e. residential wall current. There is an unfortunate and very stupid belief that this type of current is only moderately dangerous. Indeed, when I worked as a biomedical equipment technician in a major hospital, I overheard an intern claim that 115 volts from the wall isn't dangerous because they taught him in medical school that it's the current not the voltage that kills. I leaned over the table and asked him if he'd passed high school physics on his way to an MD degree. Allowing, rather arrogantly that he had, I asked him if he'd ever heard of Ohm's Law. I then muttered to some people who were with me, "If he learned the rest of his med-school lessons the way he learned that one, will someone please shoot him on sight if he comes into the emergency room while I'm unconscious." The real fact is simple and brutal . . . so don't ever forget it: 115 VAC from the wall is potentially fatal. IT WILL KILL YOU if given a chance. A few guidelines will help:

1. Never work on a circuit that is plugged in.

2. Work on a dry, insulated flooring (I keep a masonite mat under my workbench stool).

3. Use a 1:1 isolation transformer to convert the one-side grounded AC power lines to a floating local power system.

I can't give you all of the information you need for safety under all circumstances, so please, please, please use some good sense when working with AC power.

The Basic LVLC Power Supply

Figure 1 shows the basic low voltage low current (LVLC) DC power supply sans switching and fusing. The basic components of the power supply are: transformer (T1), rectifier (BR1), ripple filter capacitor (C1) and a bleeder resistor (R1). We will take a look at other components, such as voltage regulators, later. But first, let's discuss the function of the basic components.

Transformer. The transformer (T1) serves to reduce the AC voltage from the power mains to a level required by the DC circuits to be served by the power supply. We will shortly discuss what voltage and current ratings are needed for any given application.

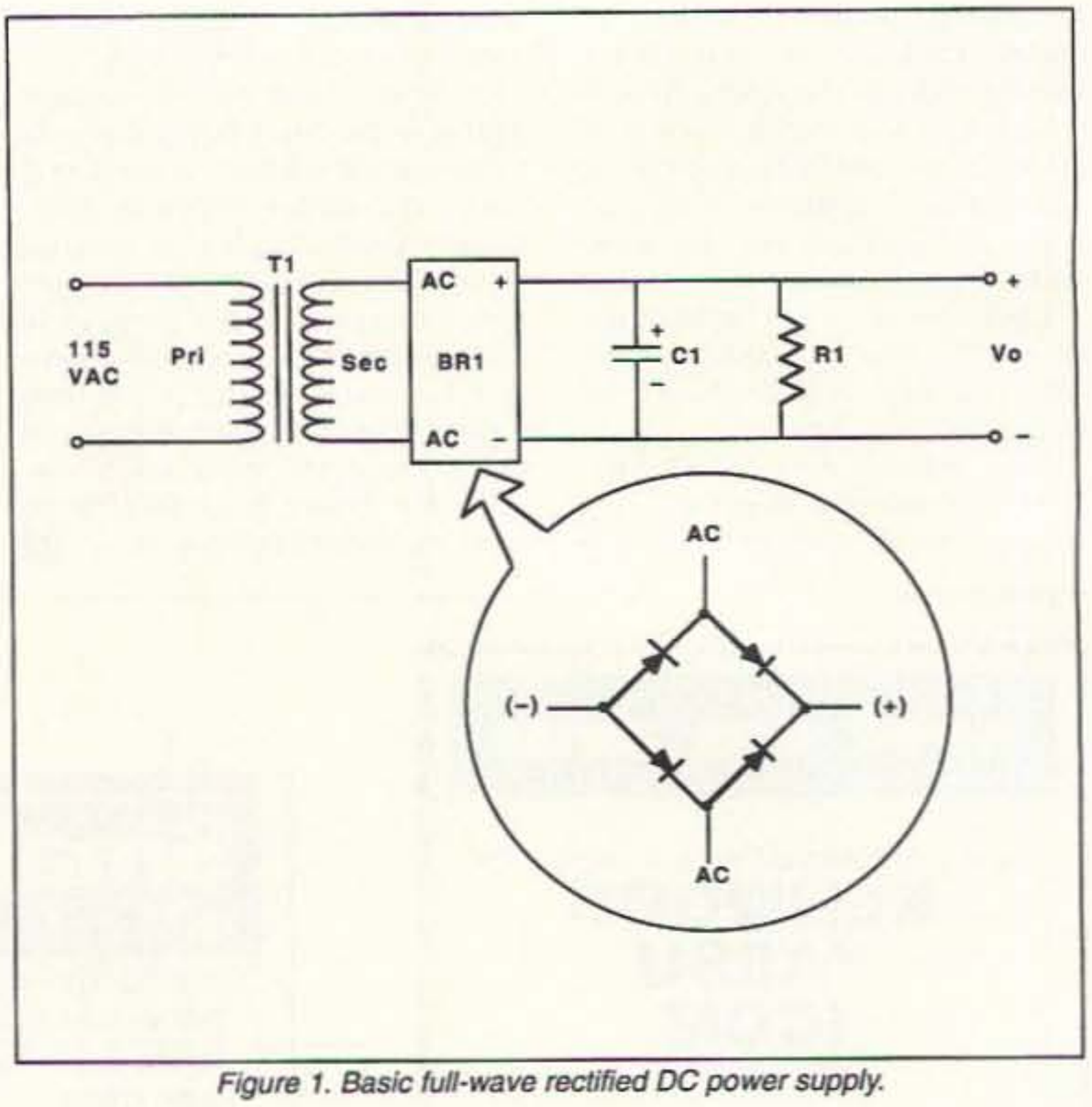

Figure 1. Basic full-wave rectified DC power supply.

Rectifier. The rectifier consists of diodes that convert bidirectional alternating current (Photo A) from the power mains to unidirectional pulsating DC (Photo B). There are two basic classes of pulsating DC: half-wave rectified and full-wave rectified. The half-wave rectified type only uses half of the AC input waveform, while the full-wave version (shown in Photo C) uses both halves of the AC waveform. Note that there are no spaces between the "humps" of the full-wave rectified version. In the half-wave rectified form there would be a flat line between humps representing the time taken by the rejected half wave. The output frequency of a half-wave rectifier equals the AC line frequency (e.g. 60 Hz in USA and Canada); the output frequency of the full-wave rectified pulsating DC is twice the line frequency (e.g. 120 Hz in USA and Canada).

In Figure 1, a "bridge"rectifier is shown in the circuit. An inset shows the "innards" of the bridge rectifier, which is a ring of rectifier diodes.

Ripple filter. The pulsating DC from the rectifier is almost as useless to solid-state electronic circuits as AC. The ripple filter smoothes the pulsating DC to make it much nearer to the pure kind-you-get-from-a-battery DC.

Bleeder resistor. The bleeder resistor serves two purposes. First, there is the issue of safety. Charged capacitors can be dangerous. While 12 VDC is not usually dangerous to intact humans, it can produce damage to circuits. In addition, if you wear a ring or watch or other jewelry, it is possible for the current stored in a large low-voltage capacitor to cause a nasty burn. Not likely, maybe, but life is full of nasty little "not-likely" surprises. The second use

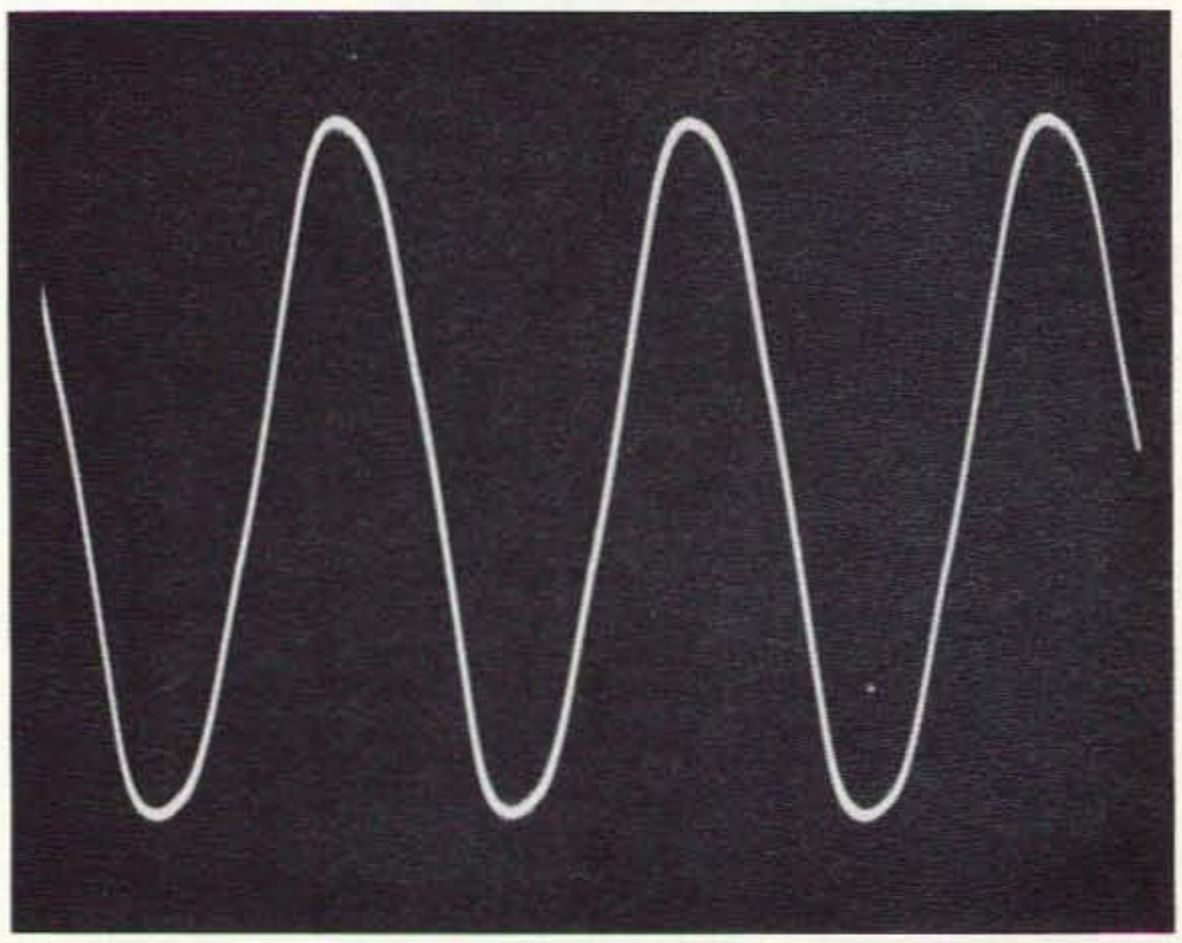

Photo A. The 60 Hz AC input to rectifier.

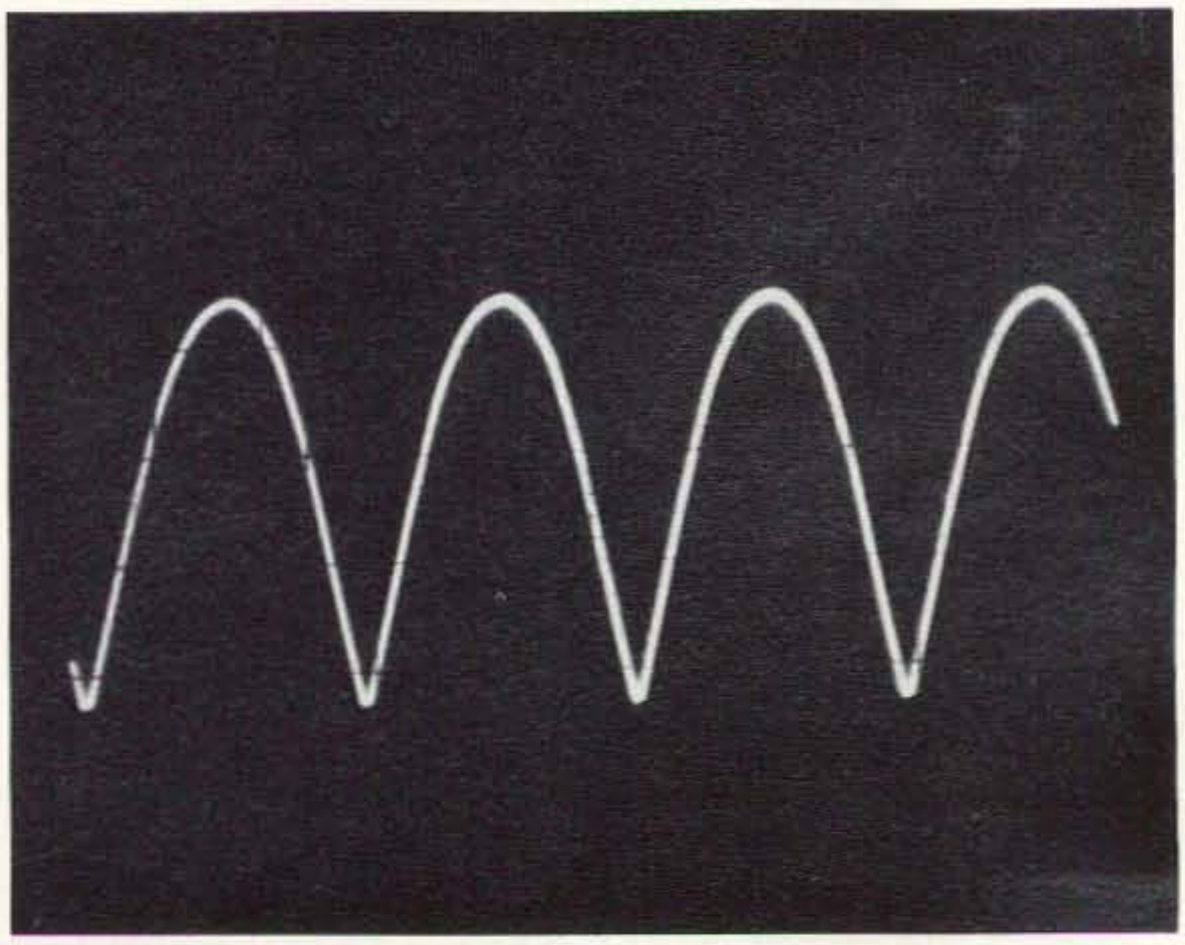

Photo B. Full-wave rectified pulsating DC output of rectifier.

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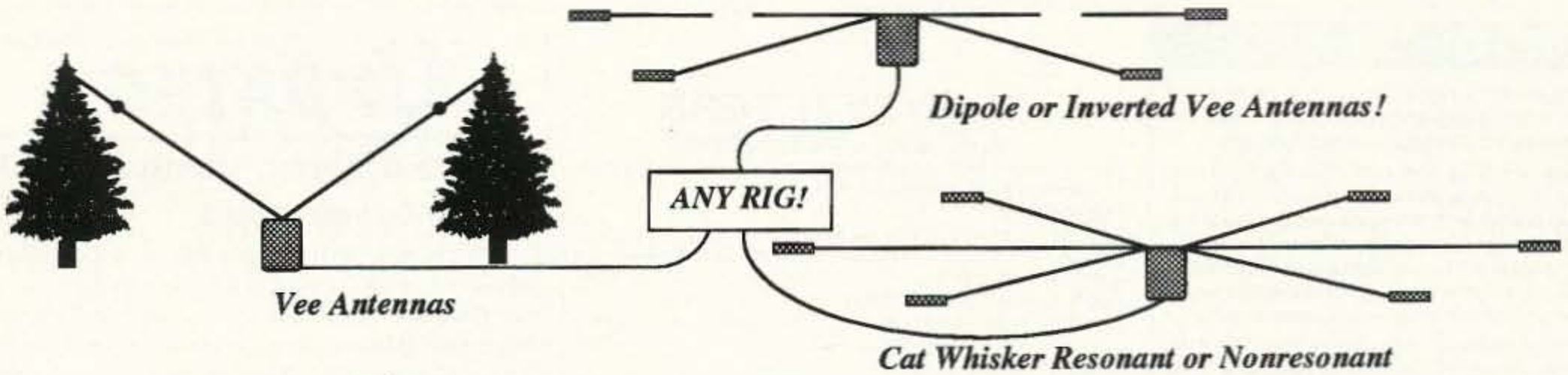

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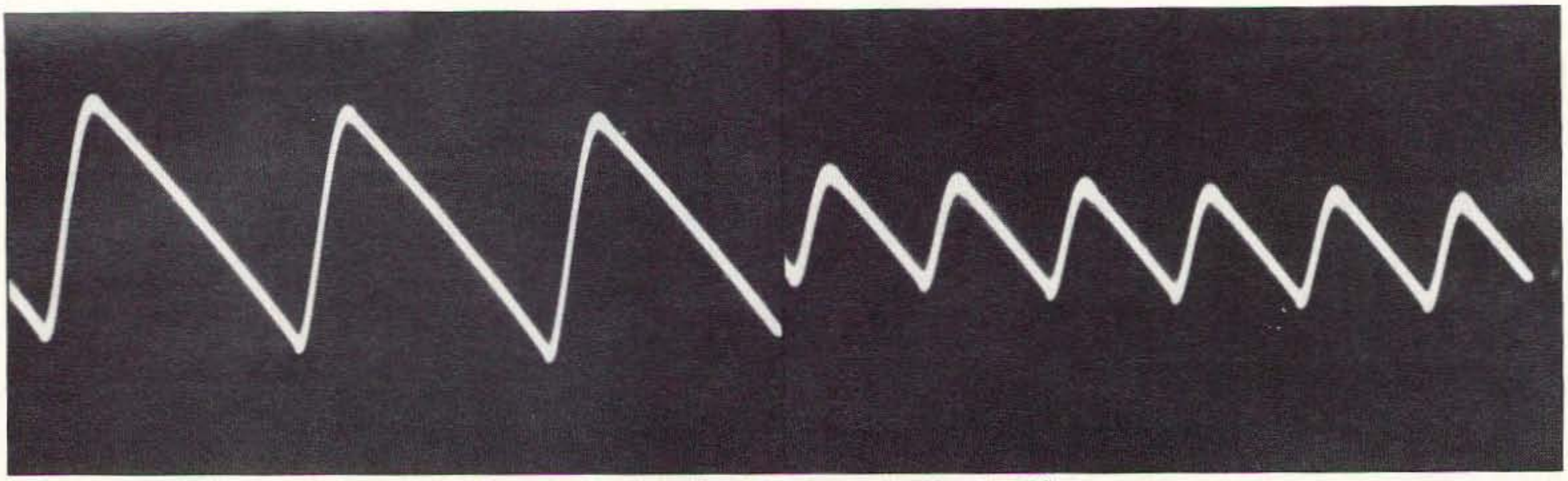

Photo C. a) Ripple with 100 µF filter; b) ripple with 1,000 µF filter.

for the resistor is to provide a minimal load to the rectifier. I've seen high-current low-voltage power supplies cause problems for marginally rated filter capacitors when the load was removed. It seemed that the pulsating DC peak voltage rose dramatically.

Component Ratings

The rectifier should be selected according to two ratings: peak inverse voltage (PIV), also called peak reverse voltage (PRV), and the forward current. The PIV rating is the highest reverse bias voltage that the diodes inside can tolerate without destruction. The general rule to follow is this: The minimum PIV rating should be greater than 2.83 times the RMS voltage rating of the transformer (T1) secondary winding. The reason for this value is that the diode will see the peak voltage from the transformer (1.414 Vrms), and this voltage charges the ripple filter capacitor (C1) to the same level. Thus, the reverse bias voltage seen by the rectifier is 2 X (1.414 Vrms), or about 2.83 Vrms. This minimum PIV rating is not usually a problem. Indeed, you can eliminate the problem altogether if you use 1,000 volt PIV diodes or bridge rectifiers. If you go to most parts distributors, you will find 1,000 volt PIV ratings on most of the diodes available.

The transformer (T1) is selected to produce the required voltage. The average voltage across the filter capacitor after only a few cycles (milliseconds) will be about 0.9 times the peak voltage, or VC1 = (0.9)(1.414)(Vrms). Thus, a 12.6 VAC "filament" transformer will produce nearly 16 volts across the filter capacitor.

The current rating of the transformer secondary winding should be twice the expected maximum load current. For example, if you are building a 1 ampere DC power supply, then use a 2 ampere transformer. This guideline assumes that full-wave rectification is used. Many times I've violated this rule, and gotten away with it largely because the circuits I've built generally use a lot less than the maximum current. The maximum 1 ampere (1,000 mA) current drain usually only occurred briefly. However, 2 ampere transformers are easily available, so the guideline makes sense. Also, if you violate the rule, check the transformer's operating temperature with the thumb test: Run the power supply for about five minutes, unplug it from the AC power mains (safety first!) and then quickly and gingerly touch the transformer's metal frame with your thumb. If it runs hot enough to burn then it's running at too high a current load.

The filter capacitor has two ratings to consider: capacitance and working voltage direct current (WVDC). The WVDC rating refers to the maximum voltage that the capacitor can tolerate on a continuous basis. I am generally quite conservative about this rating. First, assume a 20 percent tolerance: The minimum allowable WVDC rating should be 1.2 times the maximum pulsating DC that will be applied to it. I generally prefer a 2X margin, rather than 1.2 margin. Generally, whenever one sees a piece of equipment that has frequent problems with the filter capacitors "going west" it can be traced to using a supposedly safe but low margin of safety. In other words, for a power supply with a 12.6 volt transformer, which outputs about 16 volts peak, use a 25 VDC capacitor at minimum, and prefer 35 WVDC and 50 WVDC models.

The capacitance required for the ripple filter depends on the degree of ripple suppression required, and the ripple frequency. The ripple frequency of half-wave rectified power supplies is 60 Hz in North America, so these require about twice the capacitance as full-wave rectified power supplies (120 Hz ripple frequency).

Photo Ca shows an AC-coupled (to eliminate DC offset) oscilloscope presentation of the ripple present on a lightly loaded 1 ampere 12 VDC power supply with a 100 µF filter capacitor (C1 in Figure 1). Without changing the settings of the oscilloscope, Photo Cb shows the same power supply, under the same conditions, when a 1,000 µF is used in place of the 100 µF capacitor. Note the substantial reduction of ripple.

In some cases, the ripple reduction of Photo Cb is good enough. However, there are many cases where a considerably better degree of ripple suppression is needed. Those cases require a voltage-regulated DC power supply . . . which is the subject of next month's column. 73

Number 15 on your Feedback card

UPDATES

Active Antenna Using a MOSFET

by Ken Cornell W2IMB

Please refer to the above article in the March 1993 issue, page 32. The parts list correctly sets the values for RF chokes 1 and 2 at 1 millihenry; however, the schematic depicted them (incorrectly) as 1 microhenry RFCs. TNX to Victor Bennight for spotting the mistake. The author makes another good point. He suggests that you set the R1 pot to its mid-point before applying power. (Adding a series resistor would provide an additional margin of safety for the MOSFET.) 73

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Number 16 on your Feedback card

Radio Direction Finding

Joe Moell P.E. KØOV
P.O. Box 2508
Fullerton CA 92633

Testing the Ramsey Foxhound

You can tell that a ham radio activity is gaining popularity when established manufacturers begin to supply equipment for it. Until recently, hidden transmitter hunters (sometimes called foxhunters or T-hunters) had to build their own gear or buy it from a few companies specializing in radio direction finding (RDF) sets, such as Doppler Systems and BMG Engineering.

The big three manufacturers from JA-land aren't making T-hunt products yet, but at least one well-known US mail order company has begun to supply this growing market. Last winter's Ramsey Electronics catalog announced two new items of foxhunting gear. The "SlyFox" transmitter is still futureware as of this writing, but the DF-1 "Foxhound" direction finder is available at hamfests, from dealers, and by mail order from the factory (see Photo A).

A Versatile TDOA Set

Mobile VHF T-hunters usually use a Doppler unit with its ring of antennas, or the amplitude-based RDF method (beam, attenuator, and S-meter). In contrast, the Foxhound is a "homing" type of RDF set. Homing RDFs have two vertical antennas—dipoles in this case—spaced less than a half wavelength apart, plus some sort of left-right indication (LEDs, meter, or tone pitch change).

There are two look-alike kinds of homing RDFs: switched cardioid pattern and time-difference-of-arrival (TDOA). Of the two, hams prefer TDOA units because they work with unmodified VHF-FM transceivers and do not require an RF attenuator at the receiver input. The DF-1 is a TDOA unit, similar in principle to a number of sets that have been developed since the early 1980s.

RF diodes in the Foxhound switch the receiver input rapidly back and forth between the two antennas at about 1 kHz (see Figure 1). When the incoming signal wavefront arrives at one antenna before the other (as for transmitters #1 and #3), the antenna switching produces pulses out of the receiver's FM discriminator, heard as a tone mixed with the received audio.

The phase of these pulses is detected within the DF-1 circuitry, activating the left or right indicator as appropriate. When the two antennas are equidistant from the source (as is transmitter #2 in Figure 1), no tone is heard and no LEDs light. A sharp null in the tone gives a precise line of bearing to the fox.

Using a homing RDF set is easy. Watch the indicators and listen to the RDF tone while you hold the unit and turn slowly. You should hear two distinct nulls in the RDF tone, 180 degrees apart. You are facing the direction of incoming signal when the tone is nulled and movement to the left makes the "turn right" indicator come on. Conversely, your movement to the right makes the "turn left" LED light. If the opposite happens, do an about-face and try again.

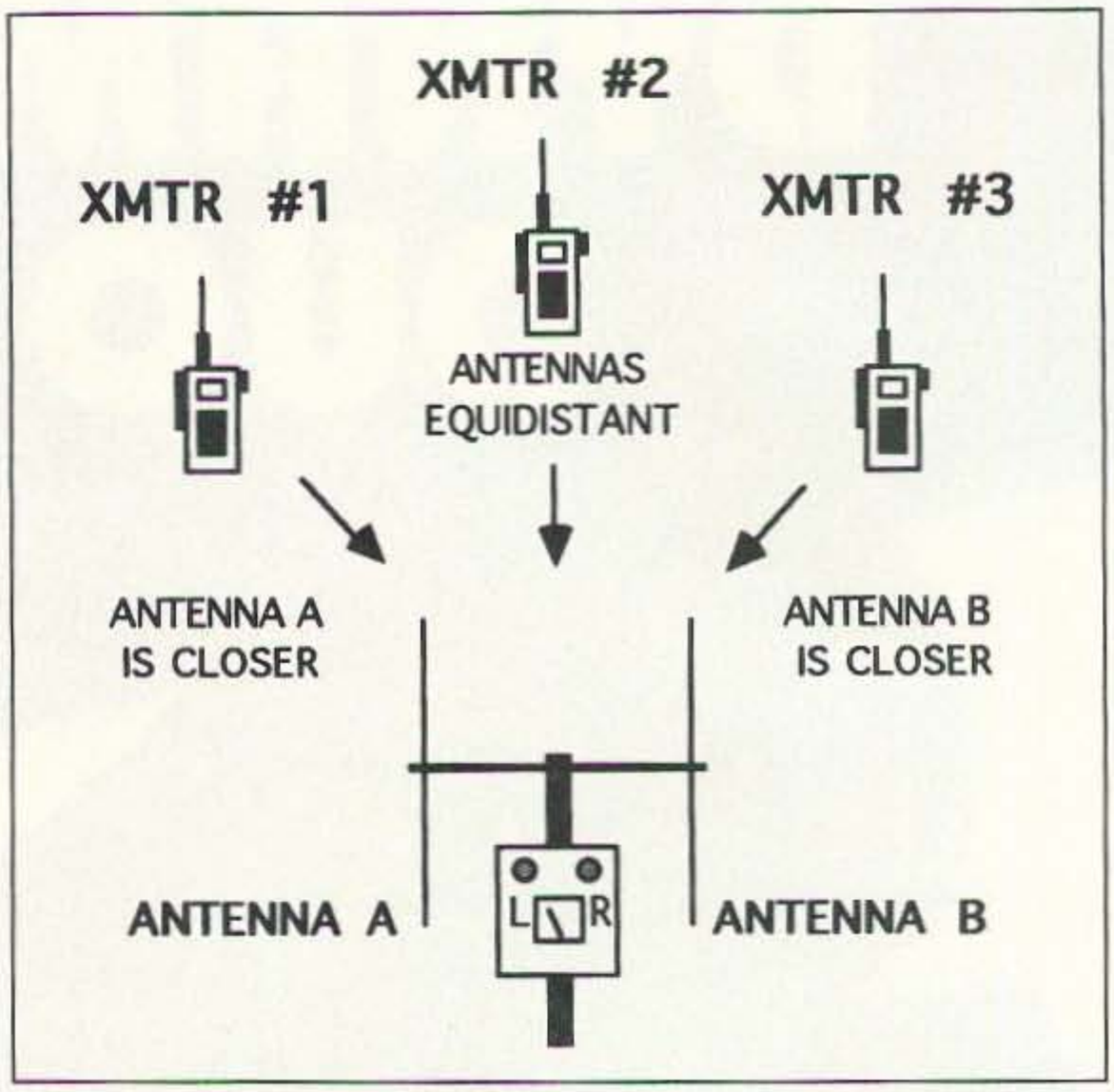

Figure 1. TDOA RDF sets such as the Ramsey Foxhound find direction by determining which of its two vertical antennas is closest to the transmitter.

By walking, turning, and following the null and lights, you home in on the fox. The Foxhound is designed only for on-foot "sniffing." Using it in motion on a vehicle would be unsafe, unless you build a special rotating antenna system with extended coax lines so that the antenna pair is outside the vehicle and the rest is inside.

The DF-1's manual cover lines proclaim that it "works with any radio, any frequency." Not exactly. TDOA sets need carrier-type signals, such as CW or FM. They aren't designed to track SSB or broadband impulse noise. The receiver must have an FM detector. AM and product detector sets will not work with it.

The two TDOA antennas must be less than a free-space half-wavelength apart. The PVC-pipe-frame antenna pair described in the manual (23-inch spacing) is intended for 2 meters, but will work over a wide frequency range. You can use it with your extended-receive-range handheld or scanner to track signals in the business and maritime bands below 250 MHz. For higher bands, the dipoles must be shorter and closer.

Theoretically, the supplied whip set works on 6 meters, but the nonresonant antennas and short spacing results in too little DF tone from the receiver. A bigger antenna system is needed below 108 MHz. Portable use of the DF-1 on 80-10 meters is not practical because an effective antenna set would be excessively large.

If At First . . .

The Model DF-1 kit (Photo B. Price $59.95) includes a circuit board, all necessary components, meter, gain control, whip antennas, miniature coax, and instruction manual. You will need a case for physical protection and for meter and gain control mounting. The optional Model CDF case set (Photo C., $12.95) includes a clamshell enclosure which is predrilled and lettered, plus all essential hardware.

An antenna framework is not provided. The manual shows how to make a frame for 2 meters from inexpensive PVC pipe and fittings. The whips mount on small circuit boards inside the pipe. (See Photo D.)

Ramsey supplied their Revision 1.0 kit for review. The circuit board was marked DF4 Rev 1.4 10/12/92. It took me one evening to populate the board and another to construct the antenna system. Aside from minor part discrepancies and some missing hardware, it went smoothly.

When I set up my test transmitter and powered up this early version, the performance was disappointing. Sometimes the meter would "hang" or bounce for no apparent reason. RDF indications were not trustworthy. The right indicator was on most of the time and the left indicator seldom came on.

Probing the DF-1 board with a scope showed clock noise and oscillation at the active tone filter output and on the Vcc lines. The favoring of one indicator appeared to be caused by asymmetry of the antenna switching waveform, which should be a

Photo A. Aha! It's in the trashcan! Jason McLaughlin KD6ICZ shows how to "sniff" out a hidden 2 meter transmitter with the Ramsey Foxhound. The unit connects to the antenna and earphone jacks of his handie-talkie.

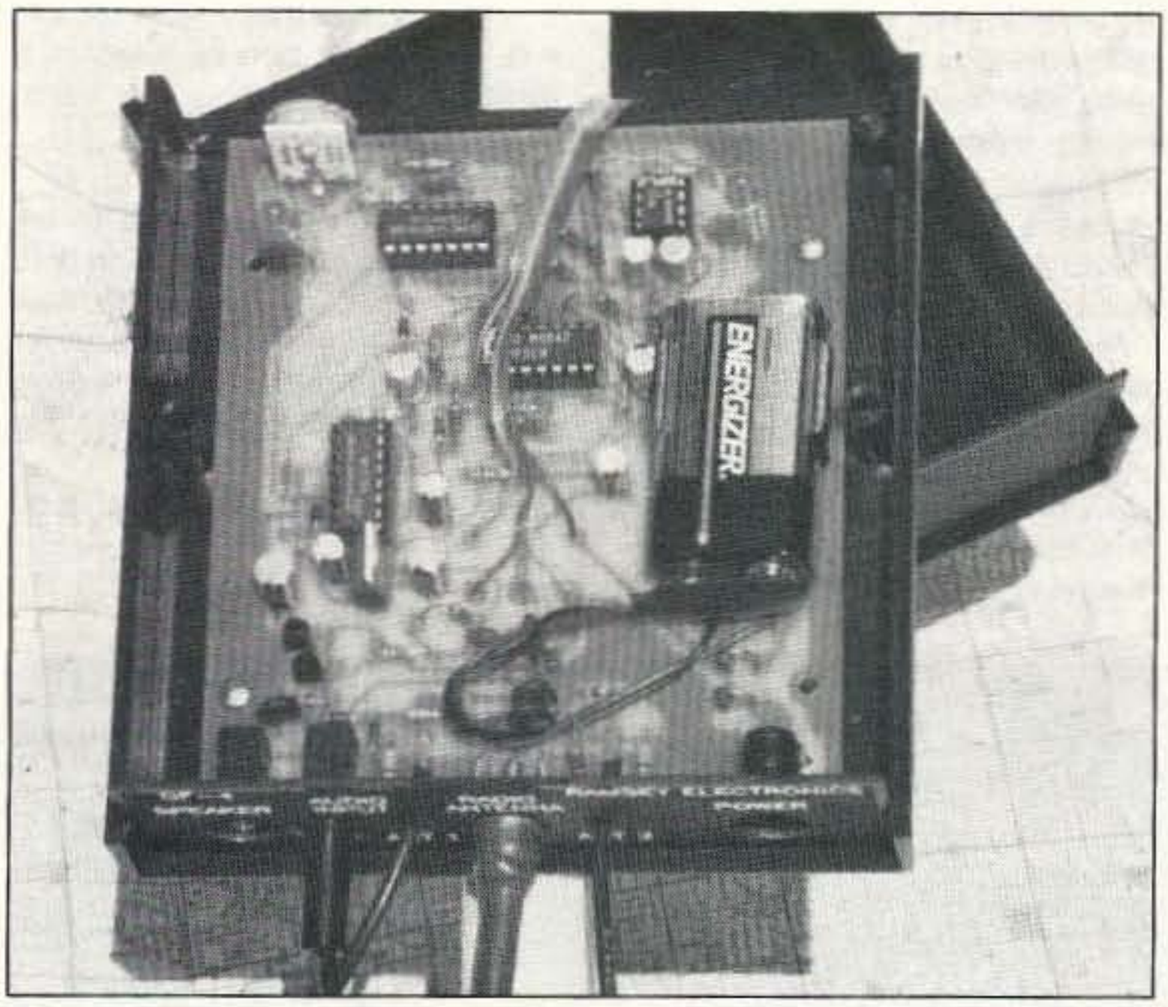

Photo B. The spacious circuit board is easy to assemble. For ease of troubleshooting, I used ribbon cable instead of the supplied short jumper wires to panel components. The Ramsey-recommended 9 volt battery is shown, but I later changed to 12 volt power.

Photo C. The DF-1 circuit board is designed to fit into the optional CDF plastic case. Coax and connector locations on the revised board are different from this original model. It's wise to order the case and board at the same time to be sure they are compatible.

50% square wave to minimize harmonics in the DF tone at the receiver output. A couple of electrolytic capacitors were installed according to the instructions, but were not observant of correct polarity for this circuit.

I suggested some circuit changes to Ramsey Electronics engineer Tom Hodge WA2YTM and he agreed to review the DF-1 design. A few weeks later, a Revision 1.3 kit arrived. Its new circuit board (DF1 Rev 2.0 5/13/93) had fixes to provide a square-wave switching waveform, better supply filtering, and proper capacitor polarity. Several glitches in the manual had been corrected and there were no missing parts.

After another session with the soldering iron (it went much faster the second time), the new board was ready to test. Now, with a fresh 9 volt battery, I was able to get good metering null and usable left-right indications with my test fox.

Raise the B+

The Foxhound uses a MF5 active filter IC, which is temperamental about its power source. When Vcc dropped from 9.5 to 7.8 volts after a few hours, it went into uncontrollable oscillation. Duracell specifies end-of-life of a standard MN1604 alkaline battery at 4.8 volts. Thus, much of the battery's capacity is wasted by replacing it at 7.8V.

I substituted a series pair of 6 volt Duracell 7K67 batteries in place of the MN1604 battery. These "J-size" batteries are widely sold for replacement in TV remote controls, etc. Each 7K67 has the same ampere-hour rating as an MN1604. Although DF-1's current drain is slightly higher at 12 volts than at 9 volts, the J's last much longer because they can be used to near end-of-life voltage.

Performance of the DF-1 is noticeably better on 12 volts, compared to 9 volts. The meter circuit is much more sensitive and the left-right indicators flicker less. I couldn't find holders for the J batteries and the tabs would not take solder, so I pried out the tabs, crimped them to stranded wires, and hooked the wires to the connector from an old 9V battery. Double-sticky foam tape holds the batteries to the board.

The Foxhound has a power jack on the bottom panel for external supply. If you don't mind another dangling wire, you can use it to supply 12 volts to the board. If you do this, be sure to remove all internal batteries. The steering diode in series with the battery was deleted when the board was revised. If you don't remove internal batteries, the external source will attempt to charge them with no current limiting. Damage to batteries or your supply could result.

Foxhound Pluses and Minuses

Most TDOA sets require you to listen carefully to the DF tone to detect the exact null. The DF-1 is the first set I have seen with a panel meter to help you find the null. Usually your ear is the best null detector, but the meter is useful when hunting in locations with lots of acoustic noise, or when there is heavy voice or tone modulation on the bunny's signal.

Plugging the DF-1's audio cable into your receiver disables its speaker. The only way to hear the hidden T and its tone null is to plug an earphone into a jack on the bottom of the DF-1. I don't like a tangling earphone cord when I'm tramping through the brush. Furthermore, the mini-jack supplied by Ramsey is the wrong size for my ICOM earplugs, so I added a 1-1/2-inch speaker inside the DF-1 case. The speaker is wired to the normally closed terminal on the DF-1 earphone jack, so an earphone can still be used if desired.

With no audio from the radio, both LEDs are off. It's easy to forget to turn off the Foxhound's power after the hunt. To remind you to save the battery, you may wish to add an LED power-on indicator.

In Conclusion

The Foxhound adds sniffing capability to your RDF arsenal for less than 73 bucks. Its left-right LEDs give an unambiguous direction indication. The spacious circuit board is well documented to help you build and modify it to your particular needs. When powered by a 12 volt supply, its performance on 2 meters is comparable to competitive TDOA RDF sets for on-foot foxhunting.

If you already have an early model DF-1, I recommend upgrading it to the latest circuit for best performance. John Ramsey told me his company will provide modification instructions on request. Ramsey Electronics is at 793 Canning Parkway, Victor NY 14564; telephone: (716) 924-4560.

Remember that there are certain RDF situations where all TDOA units work poorly. Horizontally polarized signals are much more difficult to track than vertical, because signal reflections are enhanced relative to the direct signal on the vertical whips. Weak signals may be masked by noise from antenna switching. A properly polarized beam or quad is needed in those special situations.

Tracking in severe multipath (inside a building, for instance) is difficult with a TDOA, too. But when signals are strong, vertical, and in the clear, the TDOA will give sharper bearings than a beam, and bearings will be easy to get even if the fox transmitter is changing power. 73

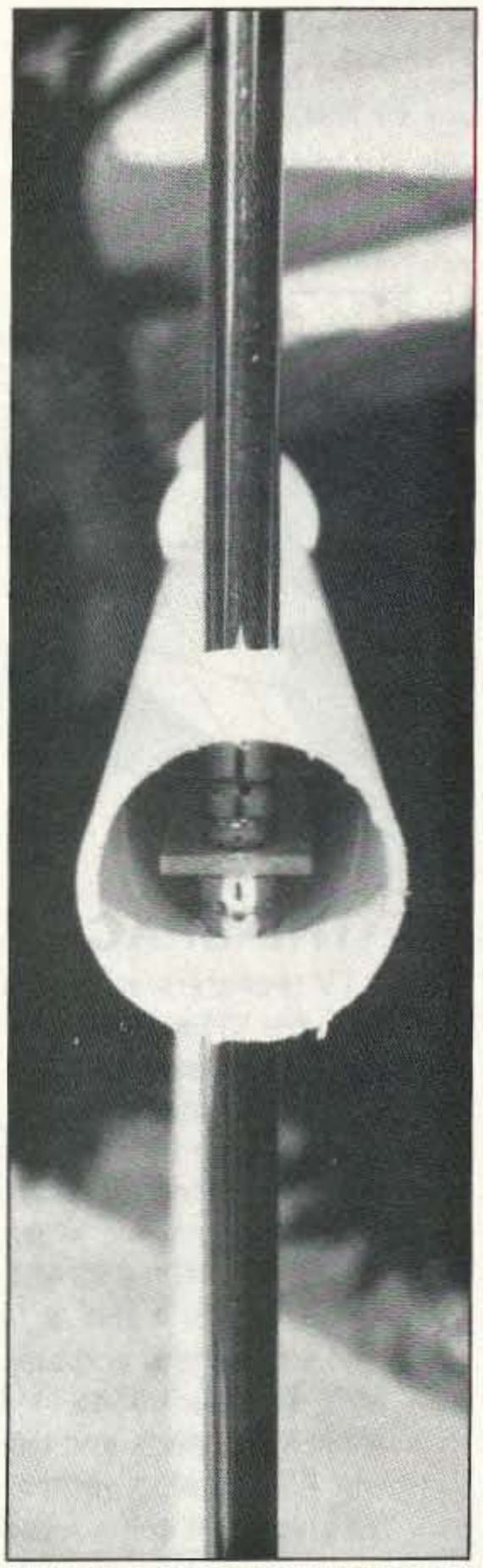

Photo D. A close-up end view of one antenna. Ramsey supplies the telescoping whips, small circuit boards to mount them, and miniature coax. You provide the PVC pipe frame.

Number 17 on your Feedback card

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
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New Resources

At the beginning of every school year, I like to force myself to search out new resources to use in the classroom with my ham radio classes. There are lots of commercially prepared materials that are highly publicized that I use year after year to prepare the kids for the license exams. I realize, however, that it's important to continuously be on the lookout for new resources and new ideas.

With the delay of school opening in New York City due to the asbestos crisis, I've had time to peruse some wonderful new teaching aids and materials that I'll be adding to my program. In the spirit of sharing, I'll describe the new resources I'll be incorporating into my ham radio curriculum.

Alpha and Zulu

Riding The Airwaves With Alpha and Zulu by John Abbot K6YB is a delightful soft-covered book that uses comic book characters, the Phonetico, to prepare you to take two different amateur radio license exams, the Novice and the No-Code Tech. One-hundred-and-twelve comic strips review all the questions and answers. If you look closely at the Phonetico characters you will notice that each one of their bodies is made up of Morse code "Dits" and "Dahs" that form the correct symbol for that character's letter.

After each cartoon page is a testing page. The answers may be found on the following page on the bottom left side. There are puzzles, connect the dots, word searches, games, and projects throughout the book.

This book will be a fine addition to any teacher's library. It retails for $15 from Artsci, Inc., P.O. Box 1428, Burbank CA 91507; (818) 843-4080.

The Art of Science

If you're a teacher working with older or more advanced students you should take a look at a book called *The Art of Science* by Joe Carr K4IPV. This book is an excellent resource and guide for teachers and students alike that addresses the practical "how to do it" phase of scientific experimentation.

Joe discusses how to choose the type of experiment best suited to your application, how to keep professional quality scientific records, how to make accurate measurements and correctly estimate errors, how to present your results like a "pro," how to think critically about your theories, and how to spot fallacies in the arguments of others.

For the serious students who participate in science fairs, there are valuable lessons in this book. Too often we forget to teach the basics of scientific inquiry and we neglect to give the students the tools they need to be creative yet exacting in their efforts.

The book is available from Hightext, P.O. Box 1489, Solana Beach CA 92075; (619) 793-4141.

Slow-Scan Program

The ham radio students in my classes always enjoy working with Slow-Scan TV. John Langner WB2OSZ has a terrific package available for $229.95. Pasokon TV is the interface, software, and manual, assembled and tested.

Here are some features: It can send and receive all popular modes. The interface fits inside the computer. It can

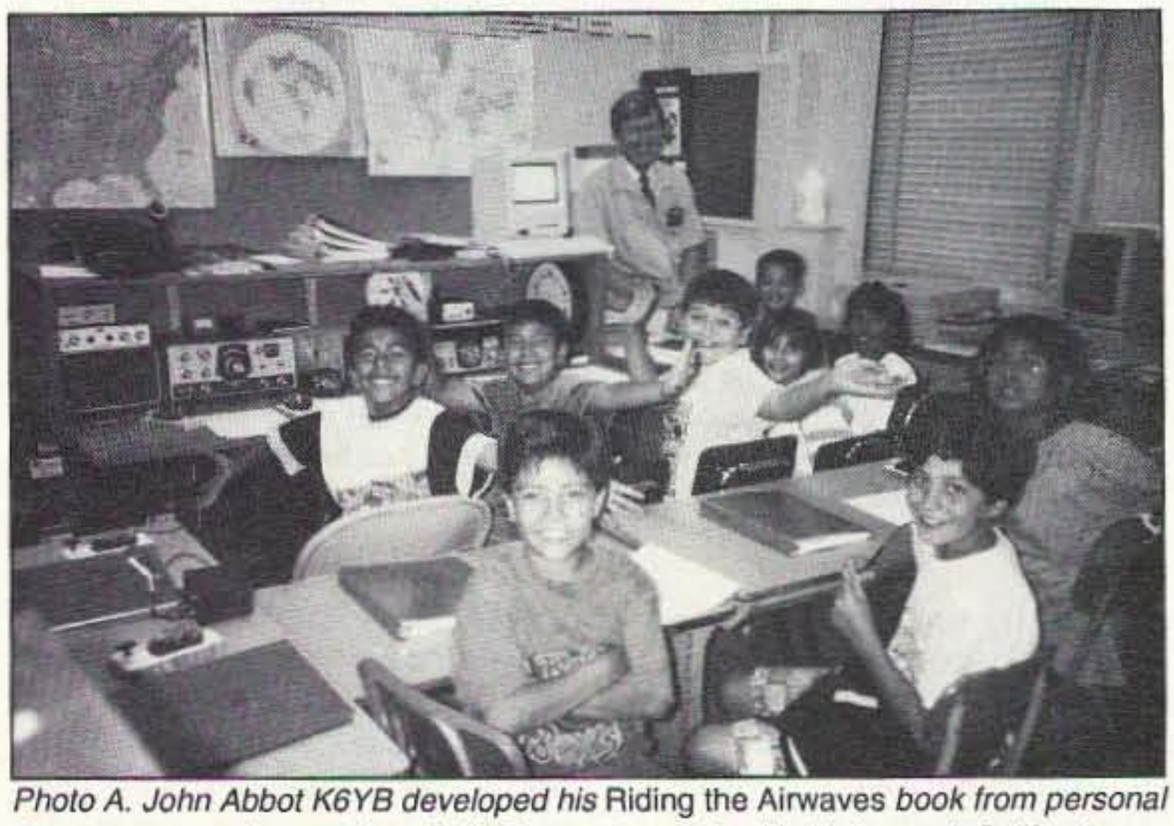

Photo A. John Abbot K6YB developed his Riding the Airwaves *book from personal classroom experience at Los Feliz Elementary School in Hollywood, California.*

read and write popular image file formats. It has user-defined menu items for running external programs, such as N9AMR's HiRes32. It displays color pictures in real-time during reception. It has an on-screen tuning indicator and has automatic fine tuning of signals up to 100 Hz off frequency.

The hardware requirements are as follows: IBM PC/AT or compatible, one empty expansion slot, '286 or later CPU, 640K memory, VGA display adapter, and a color monitor.

These wilderness and adventure stories, *Night Signals*, *Hostage In The Woods*, and *Firewatch*, will enchant and enthrall any youngster. The characters are easy for most kids to identify with. My students enjoy the fast-paced action and they like the way ham radio has been incorporated into the story. These books will be highly motivational and a fine addition to your classroom library. They retail for $5.95 each.

I cannot stress enough how important it is for teachers to keep *themselves* stimulated with new and challenging materials in the classroom every term. You owe it to yourself as a professional, and you certainly owe it to your students, to utilize the latest techniques. So, avail yourself of new resources whenever possible.

One great place where teachers can meet to exchange ideas is on the CQ All Schools Net every Tuesday and Thursday at 17:30 UTC on 28.303 MHz. Listen up for net controls Carole WB2MGP, Gordon WB6NOA, and Jim N4MDC. 73

"I cannot stress enough how important it is for teachers to keep themselves stimulated with new and challenging materials in the classroom every term."

Contact John for further details at 115 Stedman St. #M, Chelmsford MA 01824-1823; (508) 256-6907.

Cynthia Wall

Authoress Cynthia Wall KA7ITT was one of the guest speakers at a seminar I conducted at the Texas Hamcom last June. She spoke about the series of books she has written that are being sold through the ARRL. I was very pleased to have a chance to meet with her and to read her three terrific books. I see the potential for using them in the classroom.

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PS Form 3526, January 1991

QRP

Number 18 on your Feedback card

Low Power Operation

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

[Editor's Note: Observant readers of this column noticed last month's material was a repeat of the column originally printed in June 1992. We don't know how this happened. Michael passed in a new column but we somehow substituted an old one. We apologize to Michael and to his loyal readers.—Ed.]

Back to the Future

A transmitter's output must be as clean as possible. Just because it only produces 5 watts of output is no excuse for a dirty signal. That's the purpose of the output filter—to make sure the signal is clean. This month, I'll show you how to design an output filter for your latest creation.

Of course, the reason we need an output filter in the first place is simple: A transistor amplifier generates buckets full of harmonics. Without a properly designed filter, these harmonics would cause all sorts of problems to other stations and even other services. Unfiltered transmitters can produce interference to devices not in the amateur bands, such as your neighbor's TV, stereo, toaster, and so on. Never place a transmitter on the air without a harmonic filter!

The Output Filter

So then, the purpose of an output filter is to keep unwanted harmonics from ever reaching the antenna. We do this by designing a filter to *cut off* at a frequency just above the one we want to keep. In a 40 meter transmitter, the operating frequency is 7 MHz, of course. A good cutoff frequency for our output filter would be just above 7 MHz. Most output filters for the 40 meter band have a cutoff frequency of 8 MHz. Some may be lower, some may be a bit higher, but all will be around this range.

Frequencies under 8 MHz will be allowed to pass to the antenna. Those above the cutoff frequency will be attenuated. Depending on the type of filter, this attenuation may be as great as 60 dB. The amount of attenuation required is based on the amount of RF power too. A 5 watt transmitter is allowed a greater amount of harmonics than a transmitter running 100 watts. Get your rule book out and you'll see that transmitters under 5 watts are to have their harmonic contents under 30 dB down. A 100 watt transmitter must have its harmonic contents reduced to 40 dB down from the fundamental frequency. In either case, the larger the number in terms of dB, the better the filter works.

The amount of attenuation required will determine the type of filter required. In many simple QRP transmitters, a single coil and two capacitors comprise the output filter. The more sections you have in the filter's design, the better the filter. The amount of attenuation is measured as ripple. The less ripple, the better the filter. Ripple is measured in dB.

The Coils

In today's filter circuits the coils are almost entirely wound on toroid cores. Not only is a toroid self-shielding, it also allows a large amount of inductance in a very small package. You would be hard pressed to find a output filter in today's equipment not using some sort of toroid cores.

In filter design, we need to know several fundamental items: cutoff frequency, core type, input and output impedance, power handling capacity, and physical size.

Given a cutoff frequency in MHz, we need to first find the proper core to use in our output filter. This is best done by looking up the core's characteristics on a chart or table. You can get one of these tables from any of the companies selling cores. The *ARRL Handbook* is also a good source.

As a good rule of thumb, a type 2 core is good from 80 meters to about 30 meters. Above 30 meters, a type 6 core is a good choice. I've seen some applications where a type 2 core was used for 20 meters and type 6 material on 30 meters.

Don't be duped into thinking the color of the core is etched in glass. I've been bitten by this bug before. Just because the core is yellow, don't assume it is type 6 material. Be especially careful of hamfest or surplus toroid cores. A mislabeled core in your next rig could be a hard problem to track down.

The amount of inductance required will also dictate the required core. There are two more factors that need to be addressed: wire size and, to a certain extent, output power.

I have found that wire size has little to do with the final inductance of a coil wound on a core. Before I get hate mail from Mike WA8, let me say most hams don't have the specialized equipment to measure the exact inductance of a homemade coil. If the plans call for 24 turns of number 26 gauge wire but all you have in your junk box is 24 gauge, then use it. You won't be able to tell any difference in the final output of your project.

On the other hand, if the coil needs to be wound with six turns of number 12 gauge wire, you can't really substitute six turns of number 22 gauge wire either. Most high-power (high-current) applications will require a thicker gauge of wire to handle the current flow, be it RF or DC. The core size and type will also have to be determined to handle the power at the required inductance. A larger core will be required to hold larger wire to get the same amount of turns required.

Inductance Values

Output filters of 0.01 dB of ripple have become somewhat standard with QRP transmitters. A better filter would have 0.1 dB of ripple. You'll see about a two percent loss in power, but you'll gain a 10 dB improvement in attenuation.

The desired filter frequency will be: Fc = Fo (1.15). Use 7.2 MHz for Fo: Fc = 7.2 x 1.15 = 8.25 MHz. The filter cutoff frequency (Fc) is 8.25 MHz.

From the chart, for a 0.1 dB ripple, seven-pole filter, the value for L1 is 11.32. So, L1 - L3 = 11.32 / 8.25 = 1.35 µH.

From the same chart, the value for L2 = 12.52. So . . . L2 = 12.52 / 8.25 = 1.15 µH.

This tells us the required amount of inductance for each of the coils in our transmitter. The number of turns will be calculated next, but first we have to see what type of core we'll use.

I happen to have a handful of T-50-2 cores, so that's what I'll use. According to the table supplied by Amidon, a 2 mix core is good from 1 to 30 MHz. This same table provides us with an important factor required for calculating the number of turns: the AL value. This tells you the µH per 100 turns of wire on the core. The AL value for the T-50-2 core is 50.

So, turns required =

$$100 \sqrt{\frac{\text{desired L (µH)}}{\text{AL value.}}}$$

$$L1 - L3 = 100 \sqrt{\frac{1.35}{50.}}$$

L1 and L3 require 16 turns of wire.

$$L2 = 100 \sqrt{\frac{1.15}{50.}}$$

L2 requires 15 turns of wire.

Capacitor Values

This takes care of the coils. Now for the capacitors required in the filter. Again from the table, C1 and C4 = 3759.8. C1 - C4 = 3759.8 / 8.28. C1 and C4 are 454 pF; use the standard value of 470 pF.

C2 - C3 = 6673.9 / 8.28. C2 and C3 are 806 pF; use the next standard value of 820 pF.

By using the information available to us, we can calculate the values required to keep our transmitters clean. Give the old calculator a try and create your own QRP machine. 73

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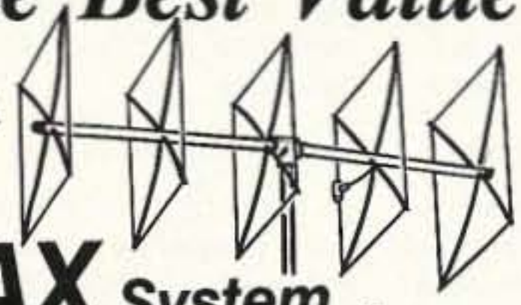

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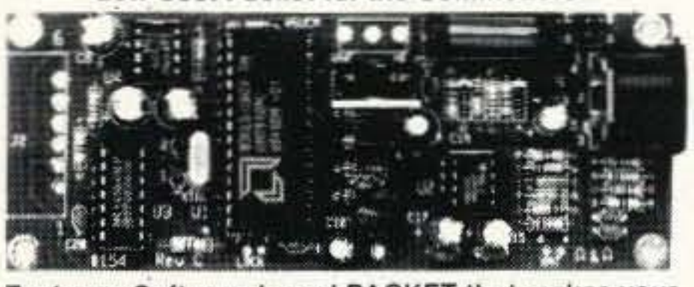

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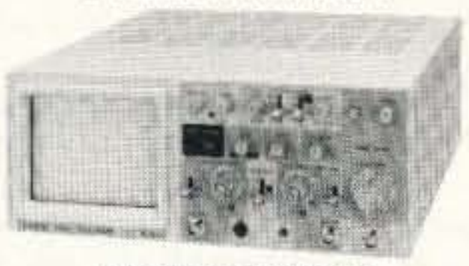

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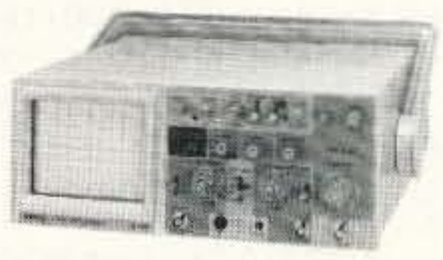

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PACKET & COMPUTERS

Digital Amateur Radio

Jeffrey Sloman N1EWO
P.O. Box 636
Franklin IN 46131

Getting Started with TCP/IP, Part 3

Wow! I guess you ARE interested in getting a TCP/IP station on the air. At least that is the way it looks from here. I have received *hundreds* of email requests for information about software and IP addresses. My Internet mailbox overflowed, so I lost some of the queries, and I just couldn't possibly answer all those requests—not enough time in the day. So, I'll do the best I can, and try to clear up the confusion that a transposition of letters caused in the first installment of this series, and give you the best information that I have about IP address coordinators.

In the first column I told you to get a copy of JNOS version 1.08c from USCD.EDU via anonymous FTP. Well, forget that. Here is the CORRECT information:

Location: UCSD.EDU (note the correction from USCD.EDU)

Directory: hamradio/packet/tcpip/wg7j

Filename: JNOS107B.EXE

Those of you who have managed to get later versions of JNOS, this is fine. The choice of 1.07b is based on its stability and availability, but later versions will work. Keep this in mind because this version is available in the directory noted above. The 1.07b version will be available on the *73* BBS, in the "Packet and Computers" area (8). You can reach the *73* BBS at (603) 924-9343, 2400 baud, 8N1. Note that this is a relatively large file and the slow speed of the *73* BBS should convince you to try other places first.

Uncoordinated Coordination

I thought most of you would be able to find your local AMPR coordinator, though I expected a few requests for help. Well, after receiving hundreds of messages via Internet mail, I realized that maybe some of you were having some trouble. I have to do something, but answering each of your cries for help is not a practical route. So, here (in the sidebar) is the list of the official volunteer AMPR coordinators. THIS IS ALL THE INFORMATION THAT I HAVE. I cannot tell you how to contact these people or exactly which one is the coordinator for your location.

Look on the list and take your best shot. It has been sorted by location, to make it easier for you. Also, the last column is the *subnet* for the coordinator's area. This can also be a clue for you. Find someone with an IP address and look for the matching subnet. Remember that these people are volunteers—please be friendly and courteous with your request. If you think that you might want to run more than one station, request more than one address. Though the specific information that the coordinator will need may vary from place to place, if you contact them via packet radio, try to include at least the stuff below to decrease your chance of being asked to provide more information:

Your name.

Your call.

A mailing address.

A phone number.

The county, town or city, and zip code where the station will be located.

You may have to wait a little while for a reply, try to be patient. If you want to get started, but don't yet have an address, you can use the official "test" network. This is any address in the 44.128.XXX.XXX range.

An Important Note About Packet Radio

While I always enjoy corresponding with you via packet radio, I simply cannot do business that way. Because I do not want to have even the appearance of impropriety, I just cannot answer any mail that refers to the column and then asks for help. Please, if you need help, use commercial email or paper mail. I can be reached on the Internet:

jsloman@bix.com

and by US mail:

N1EWO

P.O. BOX 636

Franklin IN 46131

Thanks for your understanding. Note, too, that I still want to hear from you on the amateur packet network. Please, just restrict this traffic to pleasantries or questions that relate to ham stuff with no reference to the column.

More Than Error Correction

Though I had planned to get started on the tutorial this month, I had to clear up the confusion caused by typos and whatnot. Now I don't want to completely frustrate those of you who have managed to get the software and an IP address, so let's take what space is left to at least begin the tutorial. (Next month will be dedicated to the tutorial.)

JNOS and Its Files

The heart of making JNOS work is a set of text files that configure the program and provide information to it. Though they all must be in good shape for things to work, the central focus is on a configuration file called AUTOEXEC.NOS. Like a combination of DOS' CONFIG.SYS and AUTOEXEC.BAT, AUTOEXEC.NOS contains hardware and software configuration information and commands for the program to carry out on startup. It is the arcane and not-so-logical stuff in this file that will make or break your station.

Unfortunately, the exact format and syntax of AUTOEXEC.NOS varies not only among implementations of NOS, but even among versions of the SAME implementation. To get you started with JNOS, we'll look at one of the most confusing and absolutely required sections of AUTOEXEC.NOS as it works with JNOS (and most other NOSs, thank goodness).

The section is reproduced here in Figure 1. These are the statement(s) that attach the communication device(s) to the program. Our example here is to connect a TNC to a comm port. Later on we'll look at more advanced stuff like Ethernet.

Any of the lines that begin with "#" are comments, and shown are lines for all four comm ports. The active one is com1, since it is not preceded by "#."

The attach command instructs the program to connect a hardware device to the program. The parameter "asy" is an abbreviation for "asynchronous," the type of communications device. The next value "0x3f8" is the base address of the communications port, you probably don't need to change the values from the standard ones listed here. Following the base address is the IRQ (interrupt). This is also a standard value for each port. The next parameter, "AX25," tells JNOS what sort of interface this will be. There are other values which we will discuss later.

The value "tnc0" is an arbitrary name that is used to refer to the interface you are creating. This name can be nearly anything, and should probably NOT be tnc0. Many users name it by frequency—01, 03, 05, etc.—to make it easier to understand what is going on. If your station will not necessarily stay on one frequency, name it anything that seems meaningful to you.

The next two numbers are buffers; don't change these until you know more. This is another advanced topic which we will discuss. The last number is the baud rate of the port. Note that it is set to 4800 here. Why? Because the program may have difficulty decoding the information from the TNC if it comes at a higher rate, but the messages from the TNC will seem intolerably slow at 1200 or 2400. This is a good compromise. One way to tell if you have the port speed set too high is the presence of corrupted or "nonsense" calls in the "just heard" list.

Keep It Simple, Stupid

The other absolute requirement for NOS to operate is that the TNC be made to operate in KISS (Keep It Simple, Stupid) mode. In this mode, JNOS takes over the operation of the TNC. There is a small script included as part of the AUTOEXEC.NOS that is designed to turn your TNC's KISS mode on (most TNC command sets require a simple "KISS ON" com-

```
                # ————————ATTACH THE TNC————————
  attach asy     0x3f8 4 ax25 tnc0 2048 256 4800     # COM1
# attach asy     0x2f8 3 ax25 tnc0 2048 256 4800     # COM2
# attach asy     0x3e8 4 ax25 tnc0 2048 256 4800     # COM3
# attach asy     0x2e8 3 ax25 tnc0 2048 256 4800     # COM4
```

Figure 1. One of the critical sections of AUTOEXEC.NOS.

AMPR NETWORK VOLUNTEER COORDINATOR LIST

Region/Country	Coordinator	Callsign	Subnet
Calif: Sacramento	Bob Meyer	K6RTV	44.002
Calif: Silicon Valley-San Francisco	Douglas Thom	N6OYU	44.004
Calif: Santa Barbara/ Ventura	Don Jacob	WB5EKU	44.006
Calif: San Diego	Brian Kantor	WB6CYT	44.008
Calif: Orange County	Terry Neal	AA6TN	44.01
"Eastern Washington, Idaho"	Steven King	KD7RO	44.012
Hawaii & Pacific Islands	John Shalamskas	KJ9U	44.014
Calif: Los Angeles-S F Valley	Jeff Angus	WA6FWI	44.016
Calif: Antelope Valley/ Kern County	Dana Myers	KK6JQ	44.017
Calif: San Bernardino & Riverside	Geoffrey Joy	KE6QH	44.018
Colorado: Northeast	Fred Schneider	KØYUM	44.02
Alaska	John Stannard	KL7JL	44.022
Washington state: Western (Puget Sound)	Dennis Goodwin	KB7DZ	44.024
Oregon	Ron Henderson	WA7TAS	44.026
Texas: North	Don Adkins	KD5QN	44.028
New Mexico	J. Gary Bender	WS5N	44.03
Colorado: Southeast	Bdale Garbee	N3EUA	44.032
Tennesee	Mark J. Bailey	N4XHX	44.034
Georgia	Doug Drye	KD4NC	44.036
South Carolina	Mike Abbott	N4QXV	44.038
Utah	Matt Simmons	KG7MH	44.04
Mississippi	Phil Akers	WA4DDE	44.042
Massachusetts: Western	Bob Wilson	KA1XN	44.044
Missouri	William Simmons	WBØROT	44.046
Indiana	Jacques Kubley	KA9FJS	44.048
Iowa	Ron Breitwisch	KCØOX	44.05
New Hampshire	Gary Grebus	K8LT	44.052
Vermont	Ralph Stetson	KD1R	44.054
Eastern & Central Mass.	Don Hughes	KA1MF	44.056
West Virginia	Rich Clemens	KB8AOB	44.058
Maryland	Howard Leadmon	WB3FFV	44.06
Virginia	Jim DeArras	WA4ONG	44.062
Virginia (Charlottesville Area)	Jon Gefaell	KD4CQY	44.062
New Jersey: Northern	Dave Trulli	NN2Z	44.064
New Jersey: Southern	Bob Applegate	WA2ZZX	44.065
Delaware	John DeGood	NU3E	44.066
New York: NYC & Long Island	Bob Foxworth	K2EUH	44.068.1-32
New York: ENY	Bob Bellini	N2IGU	44.068.64+
New York: WNY	Paul Gerwitz	WA2WPI	44.069
Ohio	Gary Sanders	N8EMR	44.07
Chicago-North Ill.	Ken Stritzel	WA9AEK	44.072
South/Central Ill.	Chuck Henderson	WB9UUS	44.073
North Carolina (East)	James Curran	KA4OJN	44.074
North Carolina (West)	Charles Layno	WB4WOR	44.075
Texas: South	Kurt Freiberger	WB5BBW	44.076
Texas: West	Rod Huckabay	KA5EJX	44.077
Oklahoma	Joe Buswell	K5JB	44.078
Pennsylvania: Eastern	Doug Crompton	WA3DSP	44.08
MontanaSteven Elwood	N7GXP	44.082	
Colorado: Western	Bob Ludtke	K9MWM	44.084
Wyoming	Reid Fletcher	WB7CJO	44.086
Connecticut	Jon Bloom	KE3Z	44.088
Nebraska	Mike Nickolaus	NFØN	44.09
"Wisconsin, Upper Peninsula Michigan"	Pat Davis	KD9UU	44.092
Minnesota	Gary Sharp	WDØHEB	44.094
(Minn-Twin Cities area only)	Andy Warner	NØREN	—
District of Columbia	Don Bennett	K4NGC	44.096
Florida	Bruce La Pointe	WD4HIM	44.098
Alabama	Richard Elling	KB4HB	44.1
Michigan (Lower Peninsula)	Jeff King	WB8WKA	44.102
Rhode Island	Charles Greene	W1CG	44.104
Kentucky	Tyler Barnett	N4TY	44.106
Louisiana	James Dugal	N5KNX	44.108
Arkansas	Richard Duncan	WD5B	44.11
Pennsylvania: Western	Bob Hoffman	N3CVL	44.112
N&S Dakota	Steven Elwood	N7GXP	44.114
"Oregon: NW & Portland, Vancouver WA"	Tom Kloos	WS7S	44.116
Maine	Carl Ingerson	N1DXM	44.118
	unassigned		44.12
Kansas	Dale Puckett	KØHYD	44.122
Arizona	David Dodell	WB7TPY	44.124
Southern Nevada	Earl Petersen	KF7TI	44.125.0-126
Northern Nevada	Bill Healy	N8KHN	44.125.128-254
Puerto Rico	Karl Wagner	KP4QG	44.126
	TEST		44.128
"Tak Kushida, JH3XCU Joly Kanbayashi"	Japan	JG1SLY	44.129
Ralf D. Kloth	Germany	DL4TA	44.13
Paul Taylor	United Kingdom	G1PLT	44.131
Robby Soebiakto	Indonesia	YB1BG	44.132
Jose Antonio Garcia. Madrid. (EA4DQX @ EA4DQX)	Spain	EA4DQX	44.133
	Italy	I2KFX	44.134
Barry McLamon	Canada	VE3JF	44.135
John Tanner	Australia	VK2ZXQ	44.136
Gerard Van Der Grinten	Netherlands	PAØGRI	44.137
Peleg Lapid	Israel	4X1GP	44.138
Matti Aarnio	Finland	OH1MQK	44.139
Lennart	Sweden	SMØIES	44.14
Per Eftang	Norway	LA4JL	44.141
Marco Zollinger	Switzerland	HB9CAT	44.142
Krzysztof Dabrowski	Austria	OE1KDA	44.143
	Belgium	ON7LE	44.144
	Denmark	OZ1EUI	44.145
Eddie Manolo	Phillipines	DU1UJ	44.146
Wayne Knowles	New Zealand	ZL2BKC	44.147
Ted	Ecuador	HC5K	44.148
Thomason FAN	Hong Kong	VS6YHJ	44.149
Iztok Saje	Slovenija	S53FK	44.15
Pierre-Francois Monet	France	FC1BQP	44.151
Luis Suarez	Venezuela	OA4KO/YV5	44.152
Pedro Converso	Argentina	LU7ABF	44.153
Demetre Valaris	Greece	SV1UY	44.154
Paul Healy	Ireland	EI9GL	44.155
Bela Markus	Hungary	HA5DI	44.156
Raul Burgos	Chile	CE6EZB	44.157
Artur Gomes	Portugal	CT1DIA	44.158
Kunchit Charmaraman	Thailand	HS1JC	44.159
John	South Africa	ZS6BHD	44.16
Erny Tontlinger	Luxembourg	LX1YZ	44.161
C. Costis	Cyprus	5B4TX	44.162
Chuck Hast	Central America	TI3DJT	44.163
Otto Morroy	Surinam	PZ2AC	44.164
Andrzej K. Brandt	Poland	SP5WCA	44.165
	Korea	Unknown	44.166
"Lakshman (`Lucky') Bijanki"	India	VU2LBW	44.167
Bolon	Taiwan	BV5AF	44.168
Kunle	Nigeria	5NØOBA	44.169
Sinisa Novosel	Croatia	??	44.17
	Serbia	??	44.171
Ekendra	Sri Lanka	4S7EF	44.172
(no one has volunteered yet)	Mexico	XE??	44.173
Luiz F. Catalan	Brazil	PP5AQ	44.174
Jose Amador	Cuba	CO2JA	44.175
Abdul-Hamid Sadka	Turkey	TA2LA	44.176
Karel Odehnal	Czech Republic	OK2XTE	44.177
Karen Tadewosyan	Russia	RA3APW	44.178
Tom Clark	Outer Space	W3IWI	44.193

mand). We will cover this part of the file next month. In the meantime, if the TNC does not seem to initialize correctly try this: Talk to the TNC with any communications program, ensuring that the communications speed (baud rate) matches the one you chose in the AUTOEXEC.NOS. Check your manual for how to get your TNC into KISS mode. Send the command(s) and exit the program. Start NOS, and you should be all set.

Next time we'll get into more meaty stuff. Sorry for the confusion—I hope it's cleared up now. 'Til then 73 de N1EWO. 73

ATV

Number 20 on your Feedback card

Ham Television

Bill Brown WB8ELK
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

Super Portable ATV Repeater

One night while I was visiting with Mike Henkoski KC6CCC, we decided to try to build a lightweight ATV repeater with a minimum number of components. The idea was to come up with a compact battery-operated system that could be easily transported (or even backpacked) to a remote site to act as a temporary relay during a special event or emergency. To test it out in the field we chose to launch it into the stratosphere with a weather balloon. From our planned maximum altitude of 100,000 feet we could potentially link up two ATV stations that were 800 miles apart (provided the repeater was midway between them).

The System

In order to eliminate the filtering and shielding required of an in-band repeater, we went with a crossband system that received on 915 MHz and transmitted on 434 MHz (see Figure 1). Mike KC6CCC designed a home-brew receiver taken from a commercial surveillance system that provided us with a complete receive board on 915 MHz that outputted video and audio directly. Note that you could also use a crystal-controlled receive board with a companion IF strip available from P.C. Electronics for this part of the repeater.

The transmitter consisted of a P.C. Electronics 80 milliwatt micro-ATV board (with companion subcarrier strip) which drove a PA5 power amplifier module. This combination gave us a 5 watt sync tip output while only drawing a little over 1 amp of current.

The repeater ID consisted of an Elktronics VDG-1 with an external timer. It would be better to go with a video-operated relay (eg: a VOR-2) instead of the timer, but we used what we had in the shack at the moment.

To keep the total repeater as light as possible, we used five D-cell lithium batteries (7.5 Ah). Although usually very pricey, we found a good source of very reasonably priced surplus lithium packs (10 D-cells) from S&G Photographic, telephone: (215) 474-7663. One pack should give you around 10 hours of operation (five hours using just five cells). Where weight is not critical, you will probably want to use a 5 Ah rechargeable gell-cell pack.

Mike KC6CCC built a pair of quadrifilar helix antennas (one for each band) for our flight test since we wanted a good pattern below the balloon repeater. For a hilltop or remote site, you will probably want to go with a linearly polarized omni or gain antenna system, depending on the area you want to link up.

Photo A. Mike KC6CCC, Mike WA6SVT, and Curt N6TWB fill three balloons to lift the ATV repeater.

The Flight Test

About 24 hours after tossing the potential repeater components into a big pile, we had the ATV repeater wired up and mounted in a lightweight styrofoam package. The modules were fastened to a piece of foamcore and surrounded with one-inch-thick styrofoam for insulation. We powered up the repeater and discovered that the transmitter section was badly overloading the receiver board. Fortunately, Mike Collis WA6SVT arrived on the scene and went to work bypassing the power leads while Mike KC6CCC shielded the receiver with copper foil. After spacing the antennas about five feet apart (the 434 MHz helix dangled below the payload), we finally came up with a fully functional crossband ATV repeater that performed well. The entire repeater (complete with batteries) weighed in at a mere six pounds!

We loaded everything up and headed for the hills above KC6CCC's house in San Clemente. We decided to launch the repeater with three small weather balloons. As Mike WA6SVT held onto the repeater, the balloons whipped about in a strong 10-15 knot wind. The possibility of crashing the repeater into the ground at takeoff was very real. Mike solved the problem by walking over to the edge of a cliff and tossing the re-

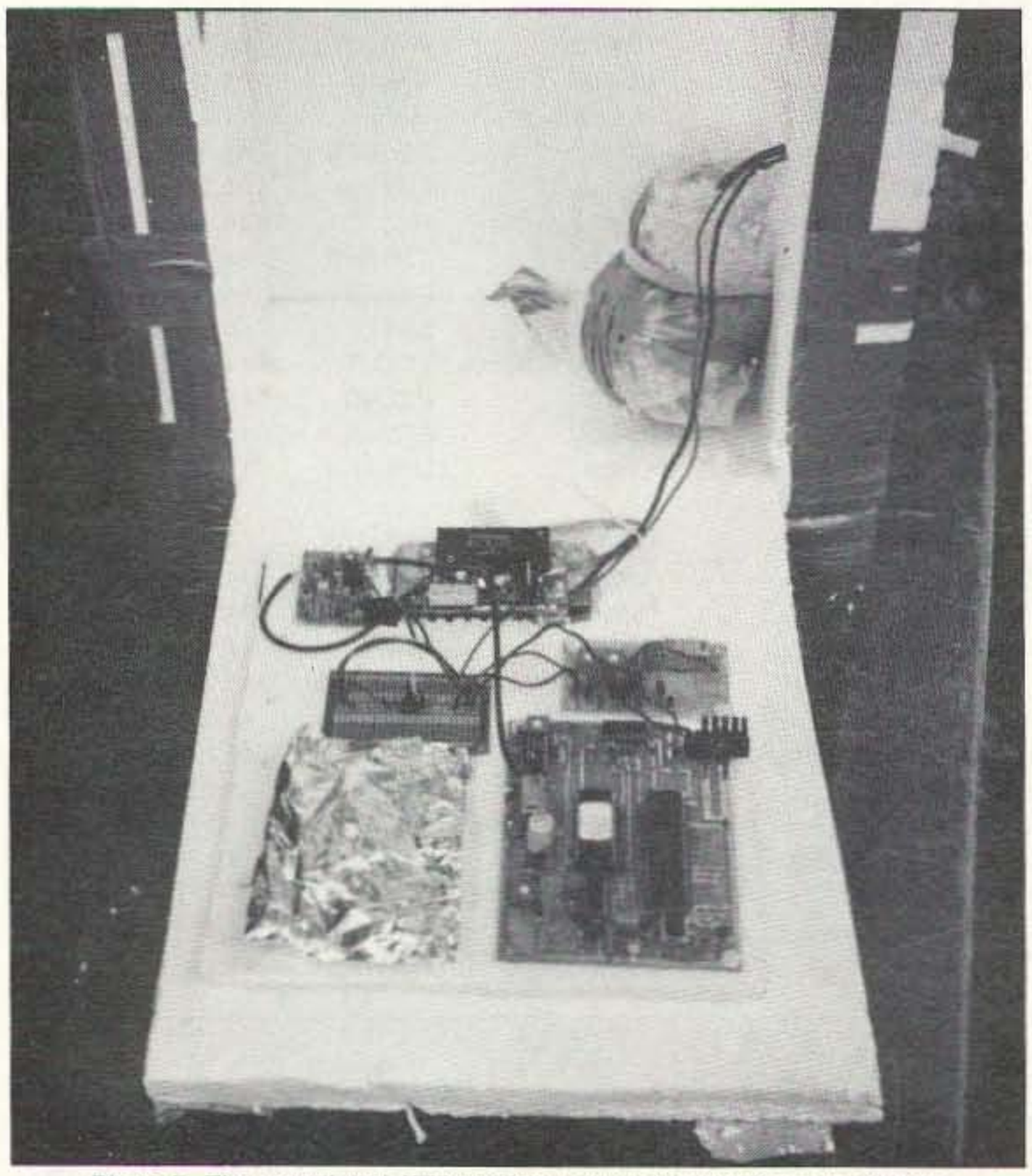

Photo B. The completed ATV repeater next to its styrofoam enclosure.

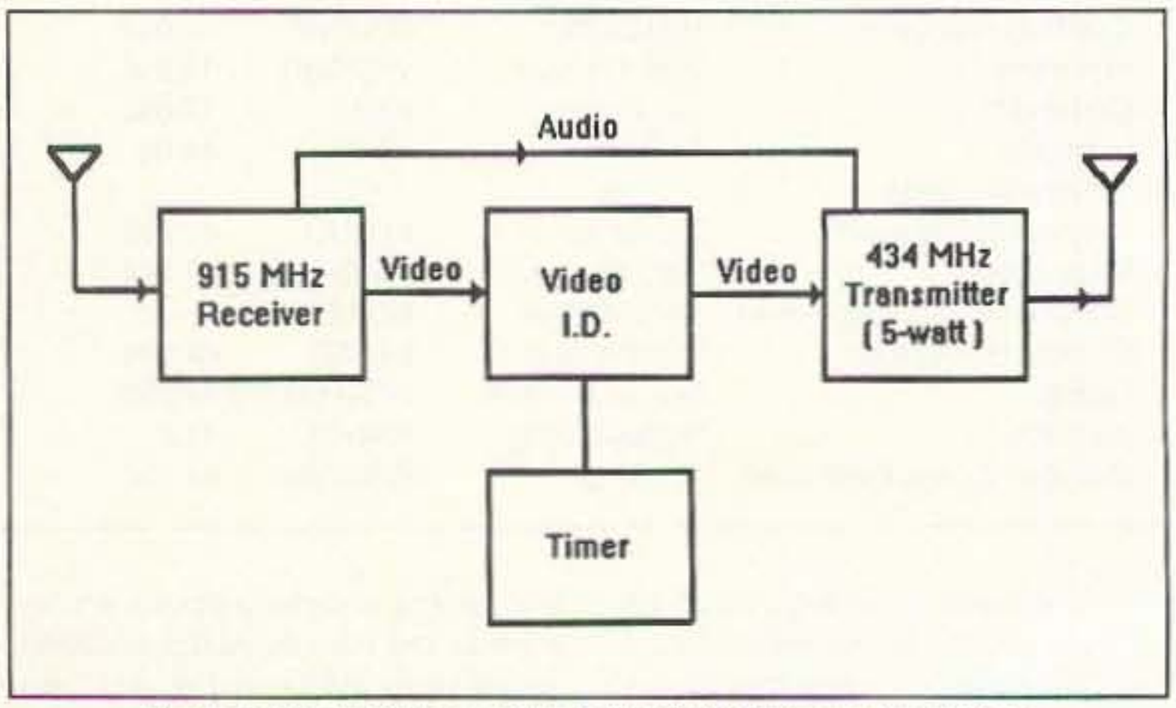

Figure 1. Block diagram of the lightweight ATV repeater system.

peater over the side! Just like taking off in a hang glider, the balloon repeater headed slowly off to the edge of space.

The 5 watt transmitter power provided most stations within 100 miles of the repeater with P5 color reception throughout the three-hour flight. Two stations in the area were capable of transmitting up to the repeater on 915 MHz during our flight test. We were able to send color video through the repeater from the launch site when we had our antennas oriented properly and Sam Lutweiler K6VLM could access the repeater with P2-P5 signal levels from his location in La Mirada (about 50 miles to the north). He could even repeat through the system using just 1 watt of uplink power.

It was such a clear day that we were able to see the balloons with binoculars and even observed two of them bursting at 72,000 feet. The repeater started descending with one balloon still intact and landed near the top of Mt. Elsinore near a dirt bike park.

Curt N6TWB and Jon N6ZYX Toumanian were chasing the repeater with DF gear and quickly spotted the remaining balloon bobbing above the repeater as it rested on a ridge about a mile ahead of them. As they rounded a curve and arrived at the landing site, they were surprised to see that the balloon and repeater had disappeared. They walked past some nearby pickup trucks at the dirt bike park and heard a strangely familiar beeping sound coming from the back of one of the trucks. It turned out that one of the dirt bikers, Tom Vetter, had beaten the chase team to the repeater and was about to call us for the reward! Although our wallets were a little thinner, we did recover the repeater. The repeater survived the flight in excellent condition and we hope to fly it again soon to test it out with different combinations of in and out frequencies. For example, a future flight may use 434 MHz in with either 919.25 or 1253.25 MHz as the output. 73

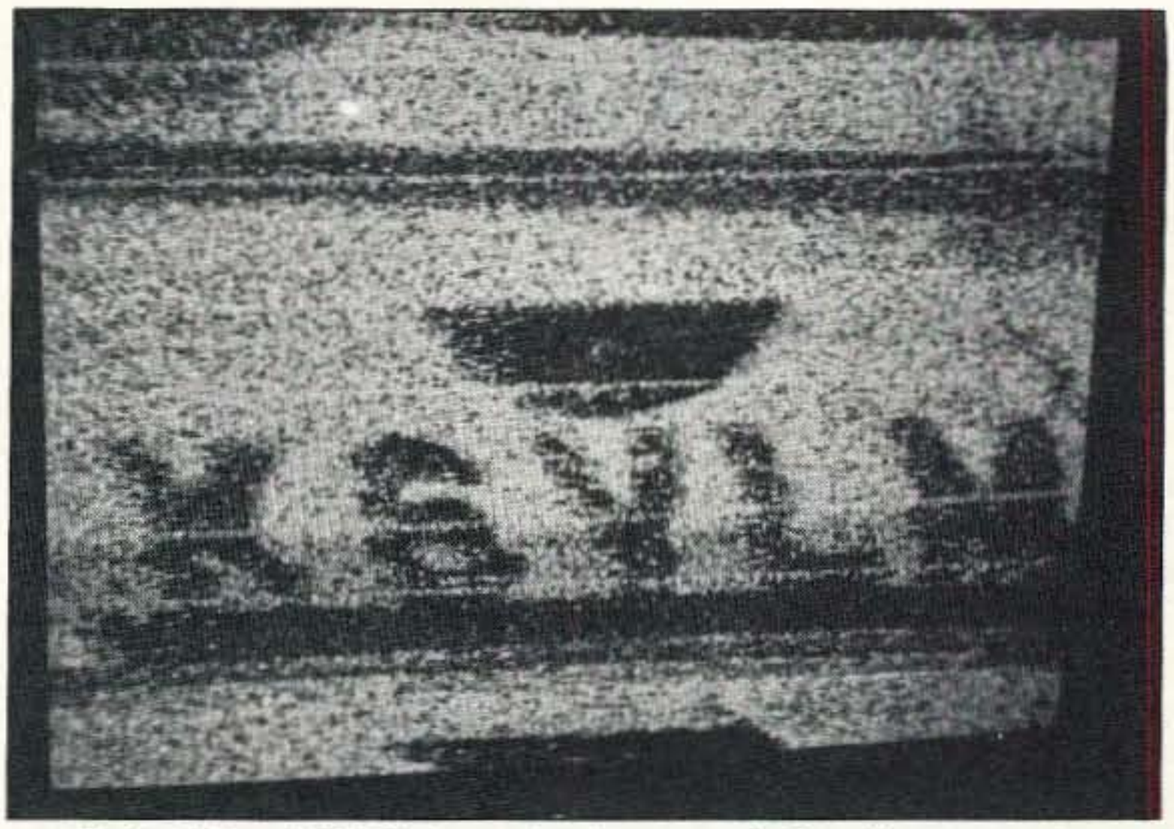

Photo C. Sam K6VLM's 1 watt signal, as seen via the airborne repeater.

Number 21 on your Feedback card

ABOVE & BEYOND

VHF and Above Operation

C. L. Houghton WB6IGP
San Diego Microwave Group
6345 Badger Lake Ave.
San Diego CA 92119

Microwave Waveguide Construction: Detector Mounts and Transitions

This month I would like to pass on information about constructing microwave waveguide components. I want to cover diode detector transitions and other bits and pieces, in response to several questions. Where can you find these? The answer is they can be found at swap meets and such. If you can't find them, you can construct them at home out of very junky waveguide scrap, with just a little effort. The construction doesn't require close tolerance work; suitable devices can be constructed in any home workshop. The units you construct should have a usable frequency span of an octave or more.

The best waveguide to select for construction is brass because it can be soldered with a heavy soldering iron (300W or so), or even a small torch is OK. Aluminum can be used, despite the fact that it cannot be soldered without special fluxes. This can be done, but I feel that it's not very effective. I don't use the special aluminum soldering fluxes. They are costly, and my experience with them has given poor results. Let's get on with the construction and remove the veil of secrecy from these useful microwave components.

Finding Waveguide

Where do you get material for this construction project? Well, waveguide can be purchased new from suppliers at nearly $4 a foot, but most suppliers have a minimum order value far in excess of what you are probably willing to spend, pretty much removing that source from our list. What I prefer to do to remedy this situation and to keep prices low is to select some scrap sections of used waveguide at swap meets. These can be part of an attenuator or other obscure Old World test or filter section. These waveguide pieces can best be described as a short section of guide with something in the middle of the section that is not desirable and would make good doorstop material. The modification is to cut off the middle section and toss it into the junk box or scrap metal box.

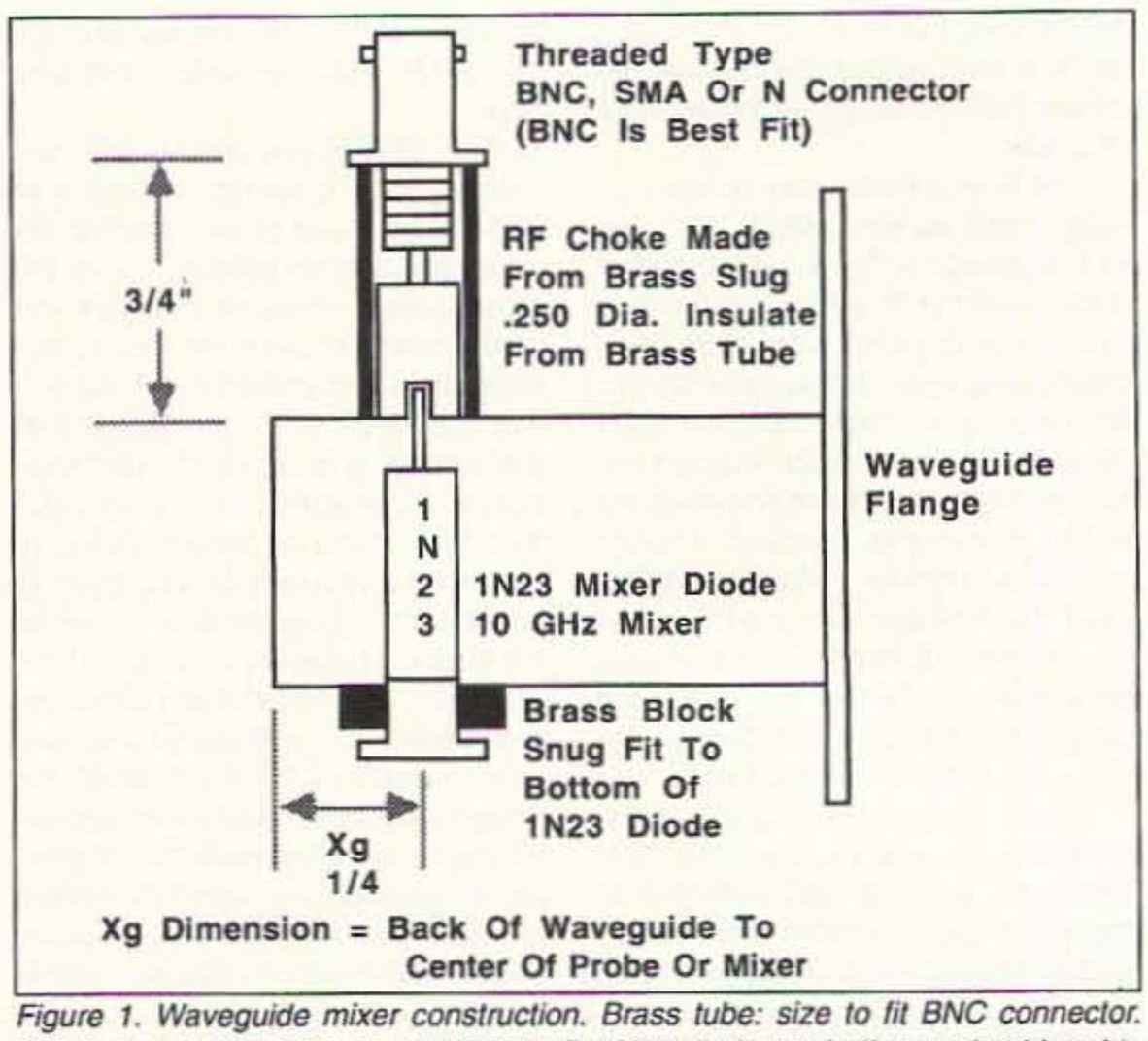

Figure 1. Waveguide mixer construction. Brass tube: size to fit BNC connector. Brass choke: 0.250" long, with hole to fit 1N23 diode, and other end soldered to connector. Insulate from brass tube with Scotch tape. Ground the diode's bottom end in the brass block. The dimension for Xg is 1/4 wavelength, modified by the velocity change in waveguide, or (Xg). The length is 1/4 Xg. For further data, see the BASIC program in the sidebar to compute Xg.

The more obscure the guide section looks, the more inexpensive the part will be. I always try to locate something in the surplus market that was bent into something special, with an appearance more like a pile of worms than waveguide. The reason

for picking up these obscure sections of waveguide is simple: We only want the flange end and about an inch of waveguide behind it for our applications. The rest can be junked. Usually these special bent pieces will yield two flanges and short sections of guide. That's all we need to construct either a detector mount or a transition to coaxial connectors for our use. In these applications we can use SMA, BNC, or even type N coaxial connectors.

Any connector can be used; the important point is where the coaxial connector's pin is located in the waveguide in respect to the shorted rear end of the guide. Basically, the detector mount construction is almost the same as for a transition. The detector mount difference is due to the diode decoupling capacitance. In this way it varies from the transition, which does not require any decoupling. Whichever unit you construct, the design principles are the same.

Let's start with a detector mount construction and its capacitance decoupling. To obtain this output capacitance for the diode detector, a small circular tower (pipe) is built on top of the waveguide to accommodate this capacitor. The capacitor is constructed out of a solid piece of brass round stock that is cut to size, allowing a fit when insulated inside the tower pipe. This makes it an RF short at microwave levels, hence it is an RF choke. Together with the diode mounted in the waveguide, this tower connects with the business end of the diode and connects it to the coaxial connector for easy use. The RFC (brass rod) decouples the RF at microwave frequencies, giving good isolation from the waveguide RF to detector output at low frequency RF, usually 145 MHz. The RFC is not apparent at 145 MHz.

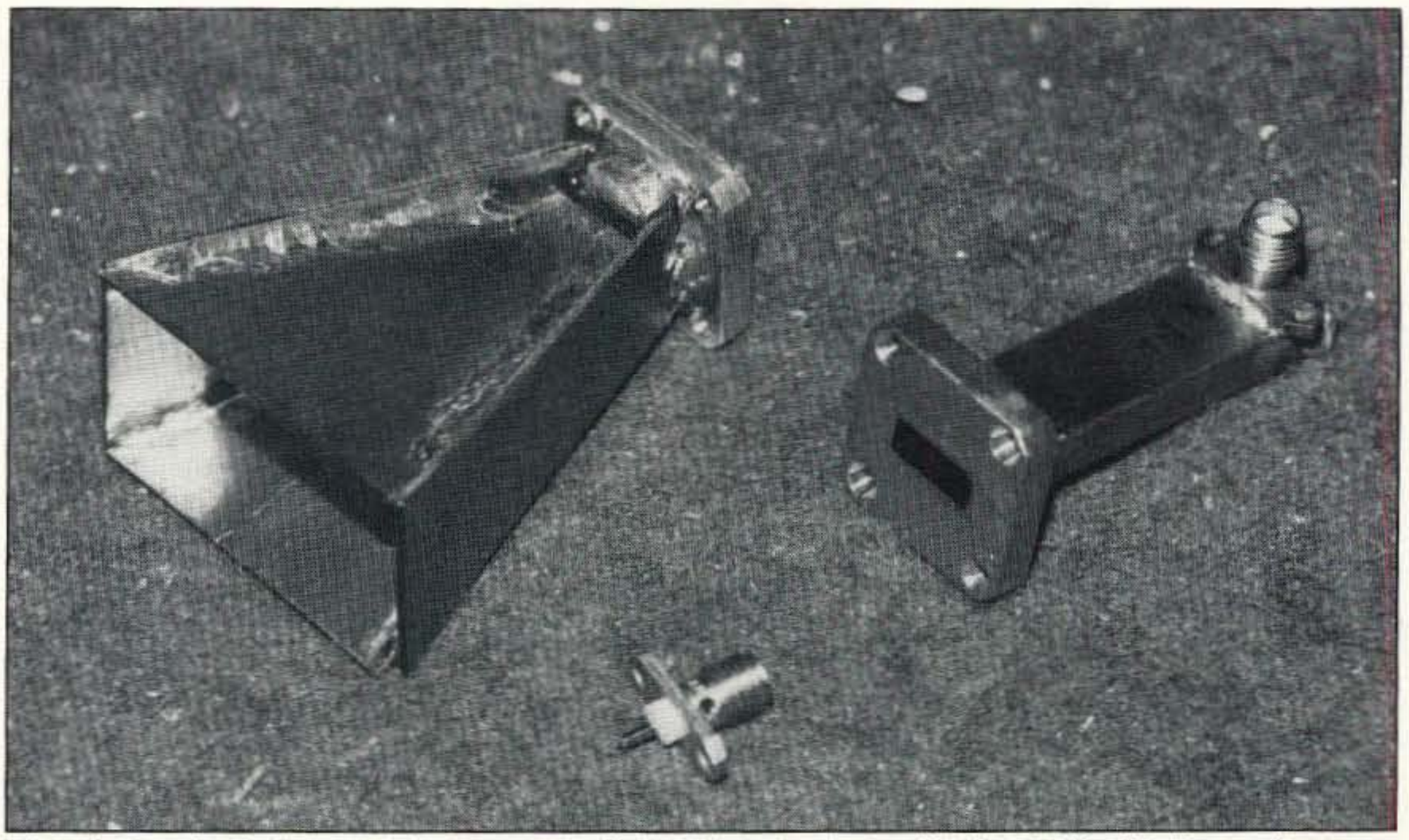

Photo A. Example of a homemade horn constructed from PC board and a transition for 24 GHz. Note the small coax connector center for size comparisions. Photo by WA5VJB.

Well now, how about a little boring math? This is needed to construct these devices for your desired frequency or different waveguide type. This formula is good not only on 10 GHz but also on almost any frequency for which you have a section of waveguide, even 24 GHz. The calculations are needed to determine where to position the diode or coaxial probe. The computer program in the sidebar gives the required spacing needed for proper operation. I have made the pro-

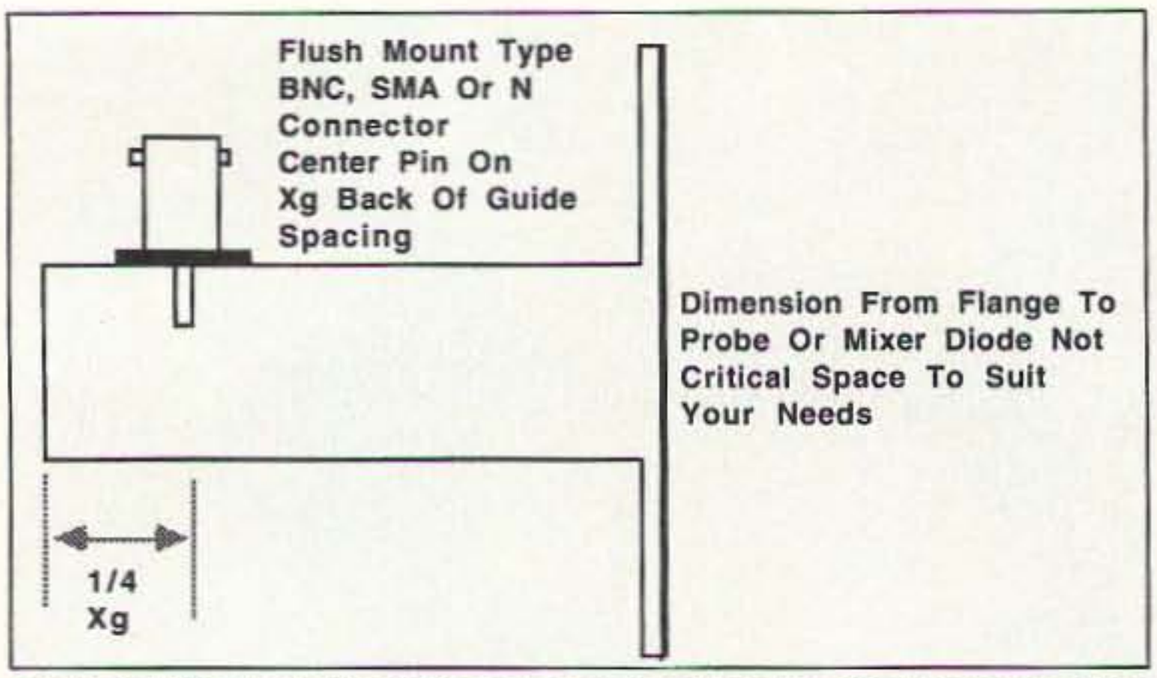

Figure 2. Waveguide transition construction. Solder the coax connector direct through the mounting hole in the top of the waveguide. The pin on the connector should be 0.1" long for 24 GHz and 0.2" long for 10 GHz. SMA center pin diameter is OK for 24 GHz; for 10 GHz the diameter of the pin should be 0.050".

gram short and easy to use—no frills here.

The calculations depend on just what type of waveguide you are using and what frequency you wish to optimize your device for. Table 1 includes some of the more popular waveguide types and lists both their "WR" number and the older equivalent "WG" number. To match waveguide up I have also included the guides' inner and outer dimensions so you can compare the guide you have to the table for identification. Normally, for 10 GHz WG-16 is used, but WG-17 can also be used. As a matter of fact, you can mix sections of both WG-16 and WG-17 without much extra loss; this works reasonably well. Just bolt up as best you can with the smaller waveguide centered about the larger waveguide's opening and drill the larger guide bolt holes to match the smaller bolt pattern. Then connect them up.

I don't mean to say that you can use several conversions between two points, but rather that in a line of, say, WG-16 you can terminate the end in WG-17 with little change in loss compared to a proper termination. We have observed additional losses in the 0.4 dB range for this adapting. Not much of a price to pay for making something usable. See Table 1 for dimensions for your frequency selection. XG is the dimension for a guide wavelength, which is shorter than free-space wavelength.

Computing Guide Wavelengths

The guide wavelength program (see sidebar) in BASIC requires only the broad width of the waveguide and the frequency of operation to compute the guide wavelength. Guide wavelength is different from free-space wavelength and must be accounted for. "X" is calculated for free-space wavelength at sea level and some humidity is entered into the calculation. It uses a fudge factor instead of using the more familiar 300,000 figure. The guide wavelength is then divided by 4 (step 84) and this is the quarter-wavelength dimension needed for the probe or diode placement in your selected waveguide. The probe is centered about this dimension from the rear inside point of the waveguide in both applications.

Now for some practical applications in the real world. If you go and check these calculations out against existing transitions and mixer diode mounts that you might have, I hesitate to tell you, but there will be some glaring errors. Primarily, the errors in sizing will happen because the part being measured was designed for some other frequency that we are not aware of. When we think of material being suitable for 10 GHz, remember that some of the commercial equipment was designed for use at 12 GHz and this could be part of the error observed in the calculations. Any other errors can be attributed to the free service that I offer, and will be taken in the same regard. To place a "forgiveness" factor in any calculations you could make the rear wall a little longer and place a solid metal plug to fit the inner waveguide dimensions. Adjusting this metallic plug will allow any error in assembly to be effectively adjusted out of the unit. It requires more construction but is a fine-tuning method.

Construction Details

Actual constructed mounts are depicted in Figure 1 for the transition and Figure 2 for the waveguide mixer mount. I think it has been shown that being off a few thousands will not have much effect on the quality of your mount. However, when you construct anything with waveguide, having any material like solder inside the guide will have a detrimental effect and will increase the device's loss. These materials include various solders and fluxes, water, any obvious metal particles, or burrs on the edges. The mating flanges can be commer-

cial or homemade, and should be flat to mate well with each other.

The only trick with old flanges or home-brew flanges is to make sure that the surfaces are flat. To be sure, lightly file any rough edges to approximately flat. Then place a sheet of light grade emery or sandpaper on a small section of junk glass. Sand the flange and waveguide with the flange face-down on top of the glass plate. Sand flat on the sandpaper/glass, moving with a circular motion. In this way you will guarantee that the flatness of the glass sanding table will be transferred to the waveguide flange. After a few passes on this sanding table it will be obvious how well this method works. The high and low spots are very evident on the sanding just completed. When the flange is uniform in appearance, it is flat.

Well, that's it for transitions. The main point is: Don't let junky-looking waveguide remain in the scrap heap. Even the most wormy-looking section can be put to use if it has a one- or two-inch straight section. The coaxial part of the probe should enter the waveguide about half of the waveguide's small dimension for good coupling. SMA connectors have quite small probes. In this case, build it out with a small brass tube about 1/16 inch in diameter to make the probe wider. Remember, dimensions can be very forgiving. High accuracy is not required in construction. A milling machine is not required.

Mailbox

Raymond Clancy of Westminster, California, writes, "Where can I locate surplus LNAs to convert, as per your May '93 column?"

Well, Raymond, that's the paradoxical question, as they are where you find them. I have responded to several newspaper advertisements for satellite service and have had lots of rejections, but one strike. I believe this method could be tried in almost any city to attempt to locate some used LNAs. These are not much use to commercial dealers; these dealers should be your best bet. Some dealers don't want to talk about used units, they'd rather do a sales pitch on new systems. I guess some business owners don't want to redistribute used material, perhaps because they fear competition for new sales. In this case stress that the units will be torn apart and that they are not going back into satellite service, but into amateur radio service instead.

Some shops will hustle you for a high price, without knowing the LNA's condition, presumably because they are still trying to sell you a new unit. You just have to get by that barrier. For the time being, since you are located in the Los Angeles area, I would suggest you go to the swap meets, particularly at TRW, which is in the Los Angeles area. Cost for most units as is should be no more than $5. That's the typical price I have found for swap meet units. And don't overlook the local non-ham swap meets—there are a lot of people getting rid of their satellite systems. The bottom line is that if the asking price for an old 80-to-100-degree LNA is over $5, they're asking too much. That is, unless the unit is new, from stock, and never used. I paid $25 for my first LNA and $35 for the first 12 GHz LNB. What a price to pay for education.

Mark WØPMX wants information on the Mitsubishi M57716. I looked at my reference material and could not come up with the data. RF Parts Co., a *73* advertiser, lists many of the modules for sale, but not the M57716. What Mark needs is the pinout information and spec sheet for the device. Does anyone out there have the information for him? He is at 4810 Indiana St., Golden CO 80403. I am sending off to Mitsubishi for data on their modules, and I hope to get back to you soon with data.

Well, as I write this column I am getting ready for the last weekend of the ARRL 10 GHz contest. The plan this month is to operate near our local area and get as much activity up and running as possible. I will be operating SSB with 10 watts power output to a 30-inch dish. I plan to bring my older system, a wideband FM unit, to be able to work those stations using wideband. This year N6IZW and I plan to test a video system with our narrowband rigs on 10 GHz. W6VLF and N6OYJ plan to do similar work at the other end of the test link. The test will be to attempt a two-way contact on 10 GHz video. It's just a preliminary test and I'll fill you in on the results next month.

Don't let video operation or SSB operation displace wideband FM operation. All modes have their place, and I have had lots of fun with wideband FM just experimenting and trying different modes of operation.

Well, that's it for this month. As always, I will be glad to answer questions concerning this and other related subjects. Please send an SASE for a prompt reply. Best, 73 Chuck WB6IGP. 73

TABLE 1.

WR #	WG #	OD-inch	ID-inch	Freq. GHz
WR-90	16	1.0 X .5	.9 X .4	8 - 12.4
WR-75	17		.75 X .375	10 - 15
WR-42	20	.5 X .250	.420 X .170	18 - 26
WR-34	21	.420 X .250	.340 X .170	22 - 33

Figures for WG-16 (8 TO 12.4 GHz):

Frequency	10000	10050	10368	10500	MHz
XG=	29.978	29.828	28.914	28.550	MM
XG=	39.703	39.359	37.320	36.553	MM

Figures for WR-42 (18 TO 26 GHz):

Frequency	24000	24193	24240	MHz
XG=	12.491	12.391	12.362	MM
XG=	15.407	15.221	15.167	MM

Formula to figure your own:
Xg = Guide Wavelength
$Xg = X / \sqrt{(X/2a)^2}$ where X = wavelength in MM and
a = Guide ID width (WG-16 = .9 inch)

COMPUTER PROGRAM IN BASIC FOR COMPUTING XG

Example of sample calculation:
Wavelength in MM = 299780 / freq. in MHz
Example: 28.9139 MM = 299780 / 10368 MHz)

Guide Wavelength Program

```
 1 REM PROGRAM COMPUTES THE GUIDE WAVELENGTH "Xg"
 2.REM OF SPECIFIED WAVEGUIDE SUCH AS WG-20 OR 16
 3 REM FORMULA USE Xg=WAVELENGTH/SQR
   (1- WAVELENGTH/2*a)^2
 4 REM FOR WAVEGUIDE 16 OD= 1 INCH BY .5 INCHES  A=.9 INCHES
 5 REM FOR WAVEGUIDE 20 OD= .5 INCH BY .250 INCH A=.170
 6 REM PROGRAM FORMULA COMPUTES IN MILLIMETERS
 8 INPUT "DIMENSION 'A'OF YOUR WAVEGUIDE IN INCHES",A
10 INPUT "FREQUENCY IN MHZ     ",F
22 X=299780!/F
23 PRINT "WAVELENGTH FOR FREQ SELECTED ",X," MM"
24 B=2 *(25.4*A)
65 G=X/(SQR (1-(X/B)^2))
80 PRINT "Xg GUIDE WAVELENGTH IN MM    ",G," MM"
84 H=(G/4)/(25.4)
90 PRINT "1/4 guide wavelength in inches is ",H,"inches"
94 PRINT
96 GOTO 10
```

Number 22 on your Feedback card

ASK KABOOM

Your Tech Answer Man

Michael J. Geier
c/o 73 Magazine
70 Route 202 North
Peterborough NH 03458

The Case of the Mystery Rig

I'm going to assume that, because you read this column, you're at least somewhat technically inclined. So, I can also assume that you have been to hamfests and have occasionally picked up a "mutt" of some kind, mostly because it was cheap and it looked like a challenge. I know I've bought things I couldn't possibly use, just for the puzzle they presented, or because I rationalized I could sell them after I fixed them. (That almost always turned out to be a bad idea which resulted in my working for about $4 an hour.) Nonetheless, I've enjoyed owning some of the "mystery rigs" that have followed me home now and then, and some of them are still in active use in my station.

What First?

OK, you bought a radio or some other electronic marvel for next to nothing. You know it doesn't work. Where to start? Well, before you plug it in or insert batteries, consider taking a look inside. You might be surprised at what *isn't* in there! Recently, I picked up a Uniden 10 meter rig for a ridiculously low $10. The seller didn't hide the fact that it didn't work, but I sure was surprised to find that the microprocessor had been removed. Ouch.

If the radio looks complete, go ahead and apply power. One exception would be in the case of antique-vintage gear whose electrolytic capacitors might not have seen voltage in many years. By simply turning such things on, you might literally blow those caps to smithereens! A Variac is very helpful with that kind of equipment. Another exception would be if you see any signs of a short: burned parts or a charred PC board. There's no sense in repeating a disaster.

With modern, solid-state gear, a Variac is a bad idea. First of all, modern electrolytics don't blow up (well, not very often, anyway), and second, many devices employ switching power supplies or regulators, and they don't like the gradual power approach one bit. Most just won't work at all below a certain voltage, but will suddenly spring into action above their thresholds, thus defeating the purpose of gradually raising the power. And some will actually malfunction on low voltage in such a way that you think something's broken when it isn't. So, go for the gusto and give it the juice. Just remember, where there's smoke there's fire, and you sure don't want one on your workbench; if you see any smoke, turn the thing off quickly.

Zip

Most likely, though, what you'll see is nothing at all. Or, perhaps, the pilot lights or display will come on but nothing else will happen. Can you fix such a beast?

Sure, why not? Naturally, the best thing you can do is get the schematic. For a currently available or recent-vintage rig, that should be no problem. Unfortunately, many hamfest treasures are older or of oddball origin, and you may have trouble getting the data. If you have packet radio capability, I strongly suggest you put up a notice looking for help. I recently did that after I brought home a Santec HT-1200 2 meter walkie. This older radio falls into the worst of both categories: It's old *and* it's relatively obscure. Yet, within a week I had the diagram and owner's manual in my hand, thanks to a caring ham who also had a broken '1200.

If you've got the diagram, you should be looking at a fairly straightforward repair job. That is, if the previous owner hasn't already botched the rig's insides. Unless the price is *really* low (as it was on the '1200), I avoid any gear which has had obvious tampering. There's an old saying about driving a car: Always drive as if everyone else is crazy except you. I feel the same way about technical work: Everybody else is incompetent. Obviously, that isn't really true, but enough people are that trusting another's work is asking for big trouble.

Which Came First . . .

When exploring a broken rig with a muddy history, it can be hard to tell which problems were original and which were the result of incompetent repair attempts. Let's examine the case of that Santec walkie; it's a great example of what you can run into. When I got it, it had an obviously destroyed tantalum capacitor. The seller pointed to it and told me that "that resistor is blown. That's all that's wrong." The component misidentification and the lack of the radio's back cover told me I was in for some real detective work.

I hadn't yet gotten the schematic but, luckily, there was enough left of the capacitor that I could read its value. The part was charred and the top of it was completely missing. From experience, I knew that the most likely cause of that kind of catastrophic failure in a tantalum is reversed polarity. That's about the worst thing you can do to a radio. Uh oh, could someone really have made that mistake?

It didn't seem likely. The battery pack obviously had been replaced, because its wires had been spliced onto the old connector. But, the positive terminal was connected to the red wire, and the negative to the black, so that seemed normal. Plus, the external power jack had a series protection diode, so reversed polarity there wouldn't make it to the inside. Hmmm, I guess that cap must have blown for some other reason.

More Clues

After replacing the cap, I applied power to the rig through the external power jack. Naturally, the thing didn't

work. Wait a minute, the display came up for a second or two and then quit. A quick check revealed that the blown cap was part of a regulator circuit consisting of a transistor and a zener diode; the zener symbol marked on the PC board was the tip-off that it was a regulator. Both components were blown. Too much voltage? I still couldn't be sure. I replaced them and tried again. This time, the display came on and stayed on, and the keypad even worked (!), but there still was no audio and no transmit. Apparently, nothing but the micro was getting power. Scoping all the pins on the audio power amp chip showed that none had any voltage. I assumed that no power was getting to most of the rig (I was wrong, as you shall see). At this point, the hunt became fruitless because, without the diagram, it just wasn't possible to follow the maze of wires to find out where the power was disappearing. I put the rig away and nearly forgot about it.

A Map

When the schematic arrived, the chase was back on. The first thing I discovered was that the seemingly impenetrable forest of wires and transistors was actually a fairly simple electronic TX/RX switching circuit. But, the Q numbers in the diagram didn't match the ones on the board! Which transistor was which? Wait a minute, there's *another* schematic in here, and it has the right numbers. They must have had more than one version of the board.

Now that I had the correct schematic, I quickly found that the transmit switch transistor was blown. I popped in another one, and the TX LED now worked when I pressed the PTT. I hooked the rig to my dummy load/wattmeter and keyed up. Nothing; the transmitter wasn't working. But I figured that, if I could get the receiver to go, the rest would fall into place. So, I ignored the transmitter and focused on why I had no audio. Why wasn't that chip getting power?

It Ain't Supposed To

Following what appeared to be the DC line of the audio amp chip (the big electrolytic to ground gave it away), I came to . . . a transistor. I should have known: The amp chip wasn't getting power because the squelch circuit was keeping it turned off. Sure enough, the other side of that transistor had full voltage. And, the transistor was good. So, there was something wrong with the squelch circuit. I followed the line back through a couple of transistors to the squelch output of the detector chip and scoped it while I turned the squelch control back and forth. Sure enough, it jumped up and down just fine. That meant that the detector chip was getting power and was, in fact, working. Next, I checked each of the three transistors between it and the squelch transistor. They were good. So were the two diodes. So why the heck wasn't this thing working?

Arrrgggh

I must have spent over an hour going around in circles with this thing. Then I saw it. The wire going to "point B," which was one end of a small coil connected to one of those squelch transistors, was supposed to be for an optional tone decoder, which this radio did not have. That wire shouldn't have been there, yet there it was, going to the microprocessor board. And wait a minute, there was supposed to be a wire sending an "unmute" signal from the micro connected to another point only about a quarter of an inch away. And it wasn't there! You guessed it: Somebody had broken the wire and resoldered it in the wrong place. I moved it back and, wow, the receiver came to life! Now I was getting somewhere.

Can You Hear Me?

A quick check on the wattmeter showed that the transmitter still wasn't working. The diagram showed that the unmute signal enabled the transmitter as well as the receiver, so I had hoped that everything would be fixed. Obviously, the transmitter still wasn't getting power. Or was it? I had never actually listened for it; perhaps it was worth a try.

I set the frequency to 0.52 and keyed it up into the dummy load while listening on my other rig. Son of a gun, there it was, dead on frequency and with good audio! My victory thrill turned to sudden defeat when I realized what that meant: a dead final. Yuck. Sure enough, the final was connected right across the incoming DC line, before the regulator. Nothing there to protect it, and, if the polarity had in fact been reversed, that final would have been a forward-biased diode directly to ground; pretty much a dead short. But then I noticed that there was a 1 ohm resistor between the transistor and the DC line. An ohmmeter check showed it to be 2.6k ohms! I popped in a new resistor and, wham!, 4 watts out, just like it was supposed to be. The resistor had blown, protecting the transistor.

So, the radio was fixed. Well, almost. I was about to consider it finished when I took another look at the battery pack. Yup, the positive goes to the red wire, which goes to . . . I looked at the PC board and saw that positive was going to *ground*. Backward. That connector must not have been the original one, and the previous owner had just assumed the wire coding would be the same. So that was it: The radio had been connected backwards after all. Case solved.

A Thought

Many people assume that a reversed-polarity rig will be completely destroyed. Certainly, reversing the polarity is pretty destructive. Often, however, the regulators and semiconductor switches which are directly connected to the DC line will blow, protecting the rest of the circuitry. Sometimes, as in this case, most of the radio will be fine and well worth fixing.

The End

I hope this little excursion has helped you see what you can be up against when you don't know who else has been inside your new find. Never assume anything, and happy hunting! Until next time, 73 de KB1UM. Hey, anybody happen to have the back for a Santec HT-1200? I have one in good working order that could use it. 73

73 INTERNATIONAL

Number 23 on your Feedback card

Arnie Johnson N1BAC
43 Old Homestead Hwy.
N. Swanzey NH 03431

Notes from FN42

I received a phone call from Dave Benedict W8REN of Troy, Michigan, one evening. I guess that isn't too spectacular, but he had always wanted to know what the "Notes from FN42" meant. Well, for those of you who are involved in VHF/UHF contesting it might not be too good a question, but for the rest of you it might make you wonder.

Somewhere in the "dungeon" I have a booklet from the ARRL explaining the grid system of the earth, but it seem to be hiding, so here comes my simple (hopefully) explanation.

The earth is divided up into grid squares, each measuring 10 degrees of latitude (600 nautical miles) and 20 degrees of longitude (0 nautical miles at the poles and 1,200 nautical miles at the equator). Each square is given a two-letter designation. Each of those squares is further divided into 100 squares, each one degree of latitude and two degrees of longitude with 00 in the southwest corner and 99 in the northeast corner. The coordinates of Peterborough, New Hampshire, are approximately 42° 52.5'N and 71° 57'W. Those coordinates fall into the FN primary square and 42 secondary square bounded by 42° to 43° latitude and 70° to 72° longitude, thus FN42. Hopefully this explanation has not confused anyone.

Regular readers of this column know I'm always trying to get others involved in this wonderful hobby of ours. I try to keep my eye out for examples of people getting involved and report them in this column.

One of those examples is Chris Edscorn NØCUH. Chris works at the Crotched Mountain Rehabilitation Center in Greenfield, New Hampshire. I remember talking to him on one of the local repeaters when he moved into the area. He was looking for some hams in the local area to help him start a ham club at the center. I am happy to report that he found some help and is very busy developing a ham club and teaching those with disabilities the joy of ham radio.

I attended the open house at their new ham shack. One room in the basement of a building has been turned into operating positions and meeting space. Operating the day of my visit were a 2 meter FM transceiver, a 2 meter packet station, an HF station, and a computer used to learn Morse code. There are approximately six operating positions with coax hookups and both AC and DC power available.

The room was very busy that day and very crowded with young people in wheelchairs and on crutches, some helping with the operation of the equipment and others providing information to new young people who came to find out what was happening. Several of the older ham volunteers were there. They had traveled over two hours to get there, and they had done it many times before to help install the antennas and ready the shack. That's dedication, folks, and getting involved!

I was very heartened to see one young lady in a wheelchair spell her name in Morse code on a practice oscillator and to observe the joy in her eyes when she realized what she had done. WOW! What an experience!

Do you want that same kind of joy? It doesn't have to come from working with disabled young people like Chris does. It can come from helping with classes or testing sessions, or helping with public service during emergencies or worthwhile public events. Foster the use of ham radio on the air. Be positive in your attitude toward amateur radio. Don't be part of a problem, be part of the solution.

Finally, December is a holy month for many of our world's religions. I wish all of you the joy, peace, and prosperity that you deserve. May our world's troubles be solved and peace to all mankind endure.

Happy Holidays! 73, Arnie N1BAC.

Roundup

Mellish Reef *Letter from Murray D. Adams, WA4DAN:* Mellish Reef is located at coordinates 17° 24' S, 155° 51' E. Herald's Beacon Inlet is the only part of the reef that remains above sea level at high tide—it is not much more than a sandbar. It's been over 4-1/2 years since the last Mellish DXpedition, but in January 1989 a group reported that the islet was approximately 150' wide by 800' long.

Since the last operation, a couple of major storms have passed through that area; hopefully things have not changed drastically during this interval. The islet is basically pear-shaped. The intent of our operation is to set up two separate, completely self-contained sites as far apart physically as possible to try to reduce adjacent station intermod. One site will be at the north end and the other site will be at the south end.

One site will contain three HF stations while the other site will have two HF plus one 6 meter station. They will strive to listen as much as possible in the U.S. General class bands.

All DXpeditions have certain logistical difficulties to overcome. Mellish Reef is no exception. Heat (there's absolutely no shade) is a concern, along with the effects of salt spray on the equipment and antennas. Fitful rest on this type of DXpedition is a rarity. For some insight on this, read the fascinating account of the AHIA/Howland Island DXpedition earlier this year.

The Mellish Reef team has spent the last six months planning and working on the logistics for this DXpedition. We all look forward to contacting you from the reef.

The callsign for the operation is VK9MM. The operators are: VK4CCR, VK2BEX, V73C, K5VT, VK2BJL, P29DX, WA4DAN, and G3WGV.

We plan to operate CW, SSB, and RTTY.

Power will be supplied by one 4 KVA and two 3.5 KVA generators. 850 liters of fuel will be transported, and in addition, 80 liters of oil.

Equipment has been donated by Dick Smith Electronics, Coman Antenna Co. Australia, Emtronics Australia, GAP Antenna Products, Cushcraft Corp., Heil Sound, Dunestar Systems, and Oklahoma Communication Center.

On arrival, the team hopes to quickly get a couple of the stations operational using one yagi and one vertical while the rest of the team is ferrying gear to the two sites and assembling antennas, tents, etc.

The QSL manager will be Bill Horner VK4CRR, 26 Iron Street, Gyumpie QLD 4570, Australia. Please include SASE/SAE + $1/IRCs. Any donations will be gratefully received and used to offset the high cost of the DXpedition. QSLing will commence by December 1, 1993.

Many thanks to all of the major DX foundations, many national regional and local DX clubs, and literally hundreds of individual DXers whose support has made this DXpedition possible. Our primary objective is to work as many stations as possible and to give as many who need it a new country.

[As most of you DXers realize, the Mellish Reef DXpedition completed its operation several months ago. This report did not arrive at 73 in time for advance notice. I hope to receive an update from WA4DAN in the future.—Arnie]

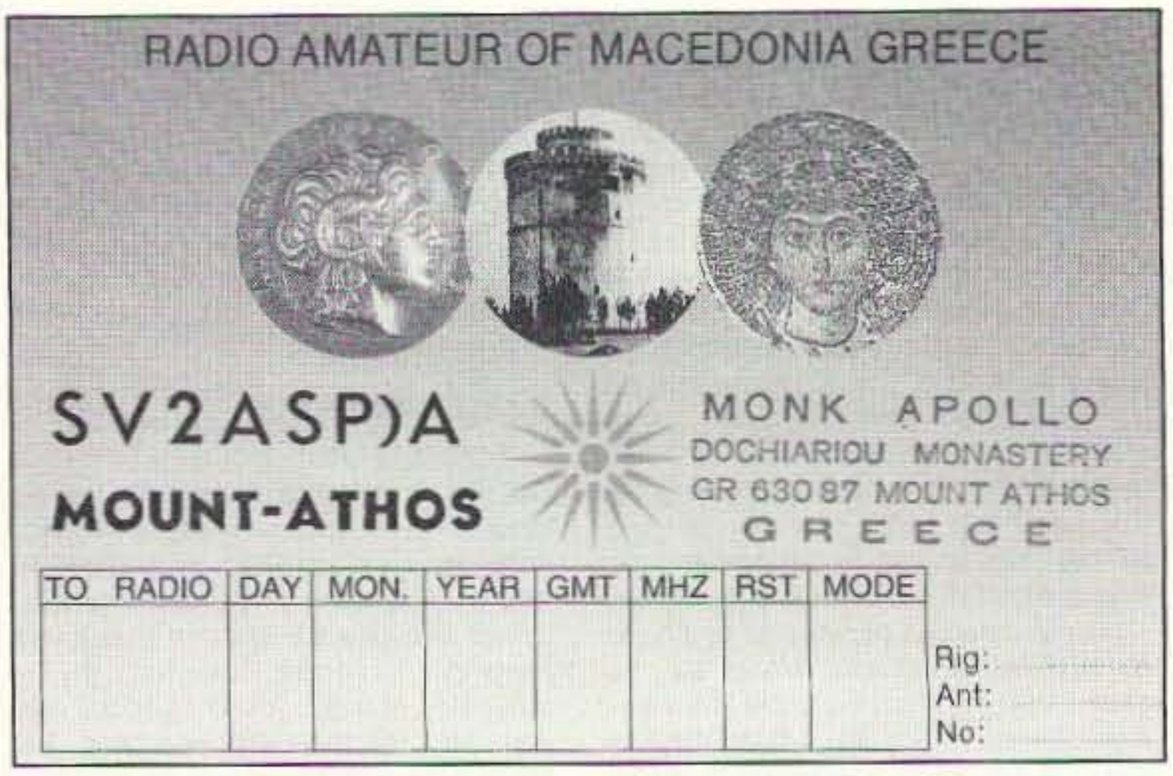

Photo A. The beautiful QSL of Monk Apollo SV2ASP.

USA/Mt. Athos *Letter from Walery Sawka KB2FIV:* I was more than happy to see Father Apollo's SV2ASP statement printed in *73* magazine. Let me explain.

About eight years ago, I visited Mt. Athos for the first time. I fell in love with the beauty, people, and spiritual values of the place. It is still a very unique place on our planet. I have been traveling there every year since, not as a tourist, but as someone who shares. I work with them, pray with them, and share their humble life.

I am also a ham and faithful reader of *73* magazine. Through a short note, I learned about the existence of Father Apollo. After a strenuous walk through rough mountains, we met in the magnificent Byzantine Monastery of Dochiariou. He proudly displayed his 2 meter rig. It was an old Kenwood and some wire dipoles. He loved them and was talking about it with gleaming eyes. He had problems, not only with the Administration of Mount Athos to get an operating permit, but with the power supply as well. The monastery operates the electric generator only during the day for using power tools. The rigid monastery schedule doesn't leave much time for hamming. The donated old Japanese generator is not only noisy but produces 117 volts instead of the European 220 volts.

Father Apollo is working hard, long days and prays long nights. He is friendly, gentle, and always smiling. Two years ago disaster struck—a canister of cooking gas exploded! Father Apollo survived with bad burns of the face and was almost blinded! His being able to see is one of the miracles of the Holy Mountain. And then, last year, there was the unpleasant experience with unauthorized transmission of DJ6SI. With my knowledge of Mt. Athos and all the documentation given to me, I don't have even the slightest doubt that it was illegal. How can the ARRL pass such easy judgment?

Father Apollo's problem might happen to us, too—we can become the victims of unauthorized transmissions, tampering with packets, etc. In my opinion, Father Apollo has become the victim, and I hope his faith in decency and people won't be disturbed again. I am including his famous QSL card so

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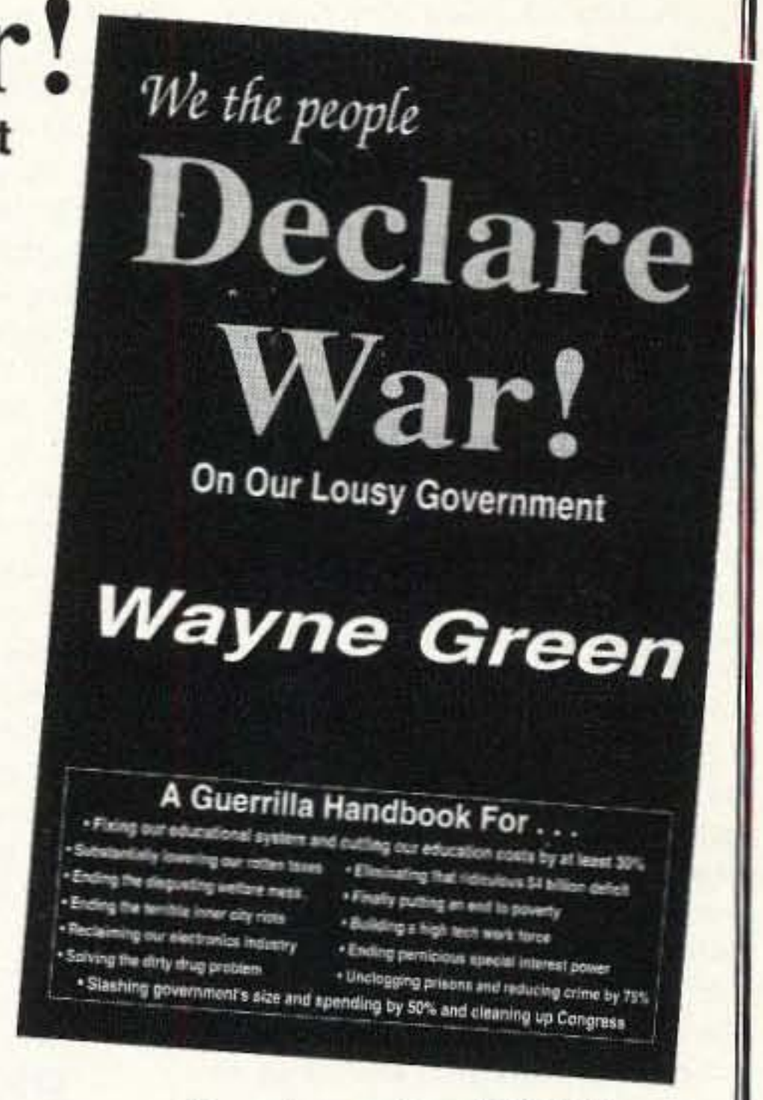

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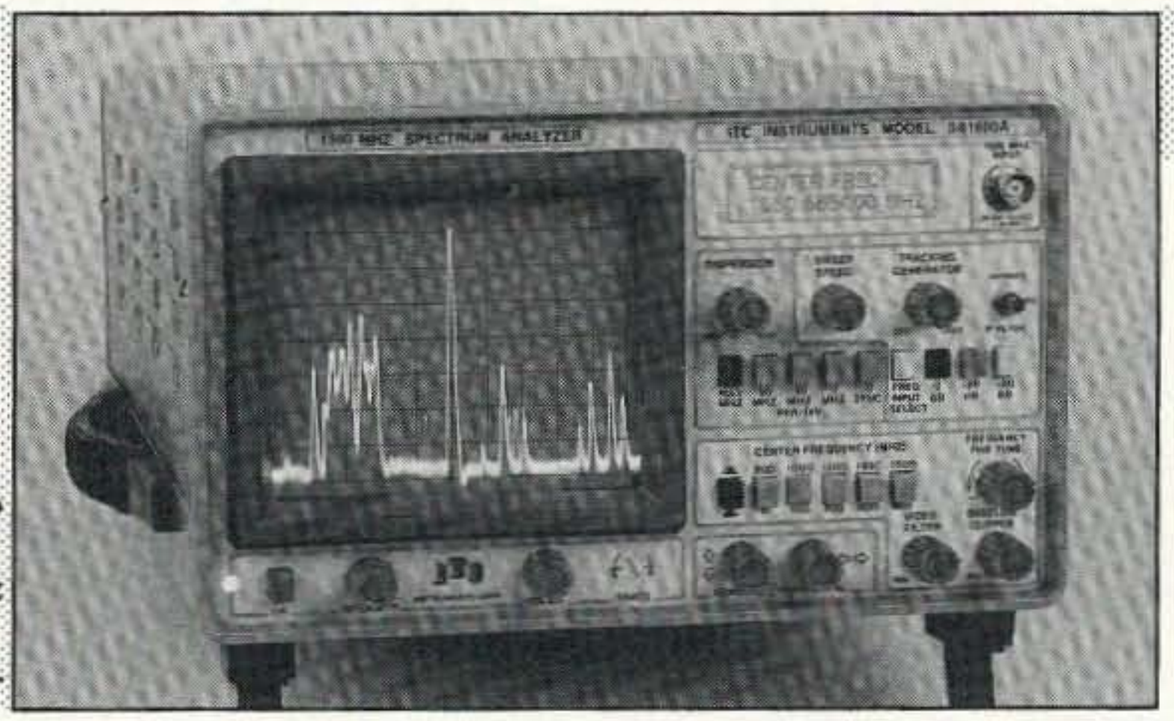

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that others can see what they are missing.

If anyone has any questions, please contact me: Walery Sawka KB2FIV, Box 290, New York City NY 10028.

OKINAWA JAPAN

David Cowhig 7J6CBQ/WA1LBP
AmCon Naha
FBU PSC 556, Box 840
FPO AP 96372-0840

June brought Telecom Week and a demonstration of satellite communications, packet radio, ham TV, ham facsimile using the old NEC mini-fax machines available cheaply here, and eyeball rag-chews in Urasoe City. The packet radio stations used the DX-TERM Japanese language packet radio software which automatically switches into the display mode when it hits a NAPLPS videotext message on packet radio. It was very startling to be watching the kana and kanji of a Japanese packet message moving up the screen when suddenly the computer started to draw a full-color cartoon or map. You have probably seen videotext pictures on the news or weather bulletin channel of your local cable TV system. At the Telecom Week hamfest aspiring YL ham 10-year-old Toshitaka Ayaka, daughter of Toshitaka-san JS6KVP, told me she will take the August JARL ham class in Naha. A video-equipped Apple computer generated this picture of Ayaka, her 6-year-old brother Tsutomu, Toshitaka-san JS6KVP and myself.

NAPLPS attracted many followers in Japan, where drawing cartoons is a very popular hobby. *CQ Ham Radio*, Japan's biggest ham magazine, runs works of art by ham cartoonists every month. Some of these images make it onto the Japanese packet radio and landline computer networks as NAPLPS images. NAPLPS image files are a series of graphics commands which the receiving computer executes to draw a picture. A nice drawing can be sent in a file of 1 or 2 kilobytes' which would require 50 kilobytes or more if sent as a bit-mapped image. You can find NAPLPS software such as NALPVIEW.ZIP and other series of NAPLPS programs in ZIP files beginning with NALP written by enthusiastic Japanese hams such as Roy JM1VSP Kurashima Akihisa on the AMRAD BBS (703) 734-1387, or the Virginia Connection BBS (703) 648-1841 with its super-fast modem. Looking at this collection of pictures and playing with the software will give you an idea of what NAPLPS is like. I translated the documentation from Japanese several years ago. Creating a good NAPLPS file is hard. I would like to blame NAPLPS but the real problem is that I am not an artist.

I hope that all hams throughout the world are enjoying learning about the Okinawan culture and life. My fellow hams on the island are certainly enjoying seeing their news in *73*.

Photo B. Computer-generated picture from Okinawa.

PHILIPPINES

Lorenzo D. Gaston DU1CHD/6
PO Box 27
6116 Silay City, Neg. Occ.
Philippines

DX stations who wish to operate temporarily during their stay in the Philippines must apply for a reciprocal license before bringing their transceiver(s) into the Philippines. Section IX of the Philippine Amateur Radio Regulations states that "The NTC may authorize a person who is a resident and citizen of a foreign country to operate his or her amateur station while temporarily in the Philippines provided he or she is a holder of an appropriate amateur station license and an operator's license or certificate issued by the government of the country of which he or she is a citizen and provided that the same country has a formal or an informal reciprocal agreement with the Philippines. He or she should be encouraged to affiliate with a local amateur club for better camaraderie and fellowship." All reciprocal license callsigns have their original call suffixed by the word "portable" or "mobile," followed by the appropriate DU district number (from /DU1 to /DU9 only, no /DU0). For example, N1BAC will sign N1BAC/DU6 or DU6/N1BAC in Negros Island (IOTA OC-129) when he goes on a DXpedition here. *[I'm ready, Wayne! When do we leave?—Arnie]* NTC Reciprocal Licenses are usually issued with a maximum effectivity period of one year and can be renewed 30 days before the date of the expiration of the license.

The following documents are required when applying for an NTC reciprocal license: (1) Application letter stating your request to apply for a reciprocal; (2) Reciprocity agreement or informal agreement with the Philippines. Either document should come from your country's amateur licensing authority, certifying that it has issued or will issue an amateur radio reciprocal license to citizens of the Philippines who are holders of Philippine Amateur Radio licenses and/or certificates to be able to operate his or her amateur radio station with appropriate privileges while in your country; (3) A certified copy of your license; (4) A list of the transceiver(s) (brand, model, and serial number) you plan to bring to the Philippines; and (5) Certification from your country's amateur radio licensing authority stating it has no objection to your operating your amateur radio station in the Philippines.

The NTC, in the future, may also require other documents or may not require all of the documents listed above, so please write to the Philippine Amateur Radio Association for the latest requirements months before visiting the Philippines. The address is: PARA Secretariate, G/F Remedios Bldg., 55 A. Roces Ave., 1100 Quezon City, Philippines. The phone numbers are 96-40-69 and 98-47-05.

73, DU1CHD/6.

TAIWAN

Tim Chen BV2A
PO Box 30-547
Taipei, Taiwan
China

Hello, everybody! I would like to submit this statement about our activities and the progress of ham radio on this island to the readers of *73* magazine.

All hams are delighted to hear the long-awaited announcement that the Chinese Taipei Amateur Radio League (CTARL) has become the 126th member society in the International Amateur Radio Union (IARU) and its Region III since October 30 and November 7, 1992, respectively. We tried hard over the past years to obtain those very memberships. We are grateful to all those societies over the world for favoring us the votes (71 votes without a nay, unanimous!). We are encouraged and believe that we will have more and closer relationships and cooperation with all concerned in the future.

There was a celebration party held in the Mandarin Hotel, Taipei, on December 12, 1992. Not less than 400 hams and guests were present, and the buffet dinner was served from the evening until midnight. Special guests attending were Legislator Y. S. Lin; Mr. C. Y. Chen, Director of Post and Telecommunications Department, M.O.C.; Mr. Chen Yen, Division Chief of International Department, M.O.F.A.; and many other VIPs.

In April, the government's examination for ham operators will take place in central Taiwan—Taichung City. We are expecting 2,000 or more candidates and those passing will turn out 700 more new stations at the end of the year. The continuing growth of hams will make it possible to hold two examinations every year, beginning in 1993.

CTARL members in Taipei, Taiching, and Kaohsiung cities are in full swing, organized to serve the newcomers. Usually they supply cold drinks, stationery, and code practice for the last dash at the venue at no charge.

The CTARL is going to re-elect the second-term directors and president. I will be retired from CTARL service, but will never cease to be a ham. All visitors from abroad should call as usual if they happen to be in Taipei.

Next month I will report on the expedition to initiate the first BV9 on Quemoy Island. 73

NEVER SAY DIE

Continued from page 4

my own enthusiasm, and you probably could care less about music. Well, that's a shame to miss seeing or hearing beauty. It's probably too late now. Your parents should have opened the worlds of music, art, and books to you. Yeah, art. I've been in every major art museum in the world and have just about every book on Hopper's paintings ever published. Did I tell you about the time I was working on a Guggenheim grant at the Guggenheim Museum on Fifth Avenue? Probably did.

Say, I'm beginning to ramble like Old Indiana Jones. Have you been enjoying the summer Indiana Jones series? I particularly enjoyed the one where he met Sri Krishnamurti. I've always enjoyed K's books and used to go to his lectures in New York. I liked his philosophy, which they got across nicely in the Young Indiana Jones program. I suppose religious fanatics might be upset by his ideas.

Speaking of religion (a no-no), a recent *Newsweek* had an interesting article about the latest scientific ideas on how life got started. I was pleased to see that there are more and more scientists leaning toward the Hoyle theory. I think I mentioned Hoyle's book, *Evolution From Space*, sometime back. I like things to make sense, and this does.

If I can make some time I'd like to start doing a series of audio tapes which would discuss the music, books, amateur radio, and other things I'd like to share with others. A few die-hards got irritated with me at Dayton because I didn't talk about amateur radio the whole time. Heck, I talked for two hours and was only barely started. I did talk about my concerns about the ability of us continuing to keep our priceless frequencies without giving anything much in return as a quid pro quo. But then I've been writing about that theme for years. I'd like to get around to more hamfests to talk, but between music and computer shows, plus a little work to do around here, I've boxed myself in. If I get some spare time I'd like to organize my library and get the barn in better shape. And maybe chase a little DX. I was having fun on 10m until the sunspots killed it.

As soon as I can get set up with a remote transmitter system I'll be looking for duplex contacts . . . mostly on 20m. Oh yes, don't forget, if you talk to JY1, pass along my regards, and tell him I'd like to help him get his educational system out of the basement. Jordan has the only school system they've measured that's worse than ours. We're talking world-class bad, which is a real shame. That's a terrible legacy for his people. The bright side is that their kids are only just a little dumber than ours. But we're working diligently on dumbing our kids down even more, so who knows.

Now, please don't forget to write. Let's at least see a QSL with a rating for a book, gadget, or kit.

Ham Club Responsibilities. How Does Your Club Shape Up?

In my reports to the New Hampshire Economic Development Commission and our humongous citizen's legislature, I was expressing my frustration at their allowing excessively lousy overpriced schools, ridiculously expensive health care, poverty, rampant crime, drugs, and so on to continue . . . while there are some practical, inexpensive solutions to all these problems. I happened to look up the word "civics" in my dictionary. Check it out, since it applies to our beloved hobby, too. "The division of political science dealing with the privileges and obligations of citizenship."

It's the quid pro quo bit again. If you want to enjoy the privileges of citizenship, then you must fulfill your obligations. You can mull over the many privileges you enjoy as an American citizen, then start considering how well you're handling your attendant obligations. Like being an informed voter, for instance. If you were informed, you wouldn't keep sending the same old crooks to Congress, term after term . . . and then ask for term limits to stop you from doing this.

So, what has this to do with amateur radio? The quid is our privilege of using billions of dollars worth of frequencies as our playthings. The quo is our obligation to provide something in return, other than abuse.

What should we be doing? Well, we're supposed to be a technical hobby . . . a training ground for youngsters . . . and for each other. Considering the complications of technology today, it's difficult for us to become experts on everything. This is where our clubs can help. Suppose every club meeting started off with a technical talk by one of the members. One might explain how RTTY works. Another about SSTV. Others could explain about packet, satellite communications, aurora, moonbounce, fox hunting, and so on. You might assign club members the responsibility to learn about spread spectrum, digital radio, digital video, compression algorithms, fractal compression, orthogonal frequency division multiplex, and so on . . . and then have them explain these concepts to the club. Many hands make light work and it's exciting to learn new things. You might even find more hams coming to club meetings, and more getting interested in trying new modes and bands.

I keep reading all of the ham club newsletters I get, hoping to see signs that some of our clubs are taking our obligations as hams seriously. I'm not encouraged. How about your club? Let

Continued on page 82

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NEVER SAY DIE

Continued from page 80

me know if you run across any signs of life.

Psynce

What's been your contribution to the world . . . so far? It's probably just the result of another bit of deformed DNA, no doubt resulting from my father smoking before I was conceived (it was Fatimas then, but it was Camels that eventually killed him), but I've always had this weird urge to somehow contribute something to the world during my short visit. It has to be a genetic problem because I don't ever recall any philosophical discussions along this line with anyone in my family. Or theological either.

Progress seems accepted as being beneficial, so I've always been inclined to do what I could within my limitations to help the world progress. My contributions have admittedly been minuscule, but satisfying to me.

How about you? Have you a feeling on some level that you owe the world a little positive push, or are you satisfied to be just a taker?

There are plenty of things you could do which would put a little more positive spin on our world. It's probably too late to get you to learn to write so you can help others to find out about interesting things, or even just enjoy what your mind provides for them. But, being a ham, there are a ton of scientific areas you could research and help pioneer. You've got a basic understanding of technology which could be put to excellent use. If you don't, you should have. That's part of your ham responsibility. I hope you haven't been cheating on this.

One area wide open for scientific investigation, one which doesn't even have to be expensive to pioneer, is the field of subtle energies. I like the term. I recently attended a conference in Monterey on the subject and was impressed with the progress that's being made. But even more, I was excited to find that this is such a new scientific field that almost anyone can get into it and produce worthwhile data. Yet I only ran into one ham at the conference. Tsk.

Subtle energies? What'n hell are they? That's the great part . . . no one really knows much yet.

Scientists have always been uncomfortable with anomalies. They really hate extra sensory perception and psychokenisis. They hate 'em so much that most scientists refuse to acknowledge that anything of the kind exists. Pathological skeptics. Having had enough proof in my own life that some sort of instant communications is possible over large distances; having had enough fortune-tellers read my tea leaves with incredible accuracy; and having read a hundred or so books about other carefully researched cases, I've been impatient with scientists for so blindly ignoring all this data.

Reincarnation, the soul, past lives, out-of-body and near death experiences, UFOs, and so on are all scientifically unexplainable, despite endless detailed reports substantiating their existence. Of course one problem is the profusion of charlatans, both intentional and unintentional, taking advantage of the situation. Another is that even some of the better mediums fudge at times, trying to make up for the unpredictability of their gifts.

Despite the seemingly endless number of scams, many centered in La-La Land (aka Southern California), often dressed up in scientific-sounding baloney, down there somewhere there may be some important breakthroughs waiting for you to lift the right rock. As a registered skeptic I enjoy the hokum about scalar physics, subliminal tapes, hemisync tones, and so on. If you do get involved with this high weirdo stuff, try not to get swept up as a believer.

So I've put psy and science together to describe a still almost virgin field which is out there ready to be explored. Psynce. I like that better than pscience. If you can harness psy, you'll have it made. ESP, clairvoyance, psychokenisis. Wow! It'll be a lot easier finding out how this stuff works than trying to disprove it, where you have millions of people who've had psychic experiences to face. The last statistics I saw claimed that over 67% of Americans have had a psychic experience. So let's kick some sand in the face of the scientists who won't even try to explore psi and the other anomalies they're ignoring. My experience in Monterey is that you are not going to be alone.

Yes, there's a need for an honest communications medium . . . a publication . . . to help this new field develop. But with many of the potential ads being for unproved products and services . . . and I'm being very kind with that description . . . it's probably still a little early for a magazine. And where would I ever find people to honestly evaluate the products so we'd know what really works and what's baloney? Heck, science doesn't even have a clue as to how the placebo effect works.

So here's a field where the frontiers are still accessible. How does acupuncture work? How does ESP work? Where does herbal medicine fit in? Can rainmakers make rain? What about dowsing? There's a whole world of weirdness out there which needs honest investigation. So, if you have any pioneer spirit, and would like to contribute to the world, there's plenty to do.

Considering the state of scientific research today, you really couldn't ask for a better situation for the independent researcher. You see, the modern scientist's success is measured by the

number of papers published. Being published results in grants, prestige, larger laboratories, and positions on decision-making committees.

One thing scientists know is that it is much easier to publish papers that don't challenge the present orthodoxy. As a result, few career scientists are interested in investigating anything which might cast a doubt on established beliefs. So they work over and over on smaller and smaller areas, and those generous grants keep acoming. The end result is that science today has lost its spirit of adventure . . . and that leaves a wide-open opportunity for the amateur.

If you look back on history, almost all of the major breakthroughs in science were made by amateurs. And most of them had to fight the entrenched scientific community of the day. It took years before scientists recognized the work of Max Planck and quantum mechanics. As Planck pointed out, his new theories were not accepted by the scientists of his day, it's just that eventually the old scientists died.

There are whole worlds of science (and psynce) that are wide open for anyone with the guts and a never-say-die attitude.

Saving Amateur Radio

In line with my normal gloom and doom approaches to our hobby, I fear that, perhaps by accident, someone will be appointed as an FCC Commissioner who has at least a slight grasp of communications and is not just reaping a political reward. As a result, the legitimacy of our exclusive rights to several billion dollars worth of public radio frequencies might be challenged. My proposition is simple: I suggest we spend a little time building at least a feeble leg to stand on should such a day of reckoning surprise us.

You might want to suggest this to your ARRL directors and see how far you get with them. Something like this might give you a hint as to how much of a voice you really have with the League.

Fortunately, past Commissioners in recent years have been too wrapped up with avoiding more mighty matters to notice us, so we've been sailing along in the foolish belief that it is our good works that have preserved our hobby. My thesis is that we'd better damned well re-invent our hobby before the Commissioners notice that we're no longer paying our dues.

I've been enjoying what is essentially another generous government handout . . . the use of our bands . . . but I keep wondering how long it's going to be before the piper comes around, wanting to be paid. One of these days some Japanese firm pushing a new satellite communications system is going to need some channels for the service and is going to start looking closely at all those lovely megahertz we're not using and figure which senators and congressmen will have to be bribed to get those frequencies more productively allocated. Less than one million dollars invested in the right congressional re-election campaigns could free up several billion dollars worth of channels. Our government is famous for outstanding bargains when it comes to congressional bribery. And who were some of the biggest collectors of these bribes in the recent past? Secretary Bentsen and VP Gore!

Hmm, come to think of it, I've been a registered lobbyist for around 20 years or so. Maybe there are some companies who'd like to have some help in getting tons of radio channels so they can sell the equipment to use them? No problem, I know exactly how to go about it.

In my past gloom and doom editorials I've suggested a new reason for our existence, other than the dubious proposition that well, we were a help many years ago. We have to remember that gratitude is one of the least felt of all human emotions and stop betting our whole hobby on it. I've recommended that we establish ourselves in the role which was so successful for us in the 1950s, as the major supplier to our country of high-tech career-oriented youngsters.

In line with this I've been encouraging ham clubs to not just accept youngsters, but to go out and get them. I've some further ideas along this line. I'd like to see the main club activity be the promotion of the hobby instead of just a meeting place for old-timers to kvetch about how bad the bands have gotten lately, what with all those lousy no-coders and everything, and how we need to raise the entry license to 50 wpm, not get rid of the code, and keep out the damned riff-raff.

In the days before the ARRL's Incentive Licensing proposal to the FCC, we had over 5,000 school radio clubs. Now we have only a few hundred left. So what I'm proposing as a major ham club activity is the re-establishment of school radio clubs, under the guidance of local ham clubs.

The school clubs should meet at least once a week. The youngsters would be invited to attend the local ham club monthly meeting where there would be show-and-tells on all of our main ham activities, such as DXing, CW, packet, RTTY, SSTV, repeaters, QRP, satellite communications, moonbounce, ATV, foxhunting, and so on. Then how about a short technical talk on AC, DC, tuned circuits, antennas, feedlines, and so on?

If there a half dozen schools in your area, each might have 20-30 members, and you might be able to get maybe 10 from each school club to come to your club meetings, if you keep 'em interesting. If we only got five new hams each per year out of 50,000 school radio clubs, we'd be adding

250,000 new hams a year to our hobby, and you'd make it much more difficult for me to zip down to Washington and sell out our bands to the highest bidder.

I wish I were exaggerating about how easy it would be to take hundreds of megahertz away from us. And just one attack like that could get the FCC to thinking about how much trouble we are and how little we offer in return for all that aggravation. The next thing you know, pffft. Say, who could we sell our old ham rigs to? I suppose we could put 'em up on 11 meters and join the happy HFers. Yet, considering the sophistication of today's direction finding technology, I dunno.

How much is your ham ticket worth to you? Would you sell it for $100, with the understanding that you'd never operate again? How about a $1,000? What's your price? Okay, I know you've got a price, so we're just haggling. Let's say that the average ham will sell out for $10,000. Then, how much would you be willing to pay to get a license? How much are your ham privileges worth to you?

Some DXers think nothing of spending $100 just to get a new country. We've had hams travel around the world making a business of this. No "donation," no QSL. I've been hamming for so many years I can remember when a "Green Stamp" was a dollar bill. Now, if you want that rare DX QSL you'd better enclose a $20 bill.

If your amateur radio license has a value for you, how much would you pay right now to preserve your privileges? Would you spend $10 a year? $50? $100? Yes, I know, you're a member of the League and they're supposed to be preserving the hobby. Other than threatening to sue the FCC every now and then, in what way are they doing this preserving? I haven't seen them doing diddly to get our crummy bands cleaned up. And that despite the creative ideas I've proposed to help them. Too much trouble, I guess. Let's wait until the FCC really gets fed up with the mess we're making and then sue them if they try to give our frequencies to some outfit willing to buy them via generous gifts to Congress.

No, I don't know of any other outfit doing what needs to be done either, despite there being several almost invisible "national" ham groups. And no, I'm not asking for donations. If I get a big need for money I can go to Sony and explain how for maybe as little as $20 million I can get them 20 MHz of choice microwave channels. Oh, make that $50m, they've got the bucks and I'll need a little extra to do the usual hidden video of my talks with Congress' best. That'll give me something to show at hamfests.

I suppose I'd better put a little disclaimer in here, just in case someone is dumb enough to think I'm serious. We don't give IQ tests as part of the license exam, so now and then I get some really weird letters. I'm often tempted to try and explain that at times I use irony, sarcasm, and even whimsy, to get across a point.

So no, I'm not here with my begging bowl in hand. But instead of asking you for money, I am asking you to cough up some time. Time to either get your local ham club to get into action or to put together a putsch and take the club over so you can get something done. Sure, I wish you'd con a few of your friends into getting *73*. If every reader recruited one more reader, we'd knock the socks off *QST*.

But I know what's going to happen. You're going to tell me you don't agree with everything I write and not chance any put-downs from friends who hate Wayne Green. Hate lovable old me? Lovable old "a spade is a spade" me? I suppose they're still mad at me for trying to get them to stop feeding that lard pile hanging over their belts, and trying to embarrass them into saying something of interest during QSOs.

Please let me know how you're doing on getting school radio clubs going, and send some pictures of the kids you con into trying our hobby. If I don't see pictures I'm not going to believe you're doing anything.

Extraordinary Science Conference

While I was attending a Subtle Energies Conference in Monterey (CA), I came across a promotion piece for a science conference in Colorado Springs. So naturally I zipped out to see what this was all about. The promotion promised all kinds of dumb science scams, but hey, if even one turned out to be worthy of investigation, it would be worth the trip.

The conference surprised me. First, the place was packed with hams. Wall to wall. They even had a ham rig set up and running, generating a comforting sideband garble in the background of their amplifier system for the speakers. Secondly, the hams weren't kooks. Third, some of the conference sessions were very interesting and well done. A couple of them almost got me excited. Alas, most of the rest were crackpots. I get annoyed when someone has this great invention . . . but darn, the prototype got busted on the way to the show . . . it was working just a few days ago. The chap then explains that he doesn't have any of those old letters after his name. After about one minute of talk I knew that anyway. Further, I knew right away that he'd never even bothered to learn the fundamentals of electricity.

So I sat through three days of poorly done videos and non-working demonstrations of preposterous machines. You start it with a battery and it'll generate a zillion watts of power. Sigh.

One of the bright spots was the opening speaker who talked about the experiences he'd had as a dentist with

amalgam fillings and nickel crowns. I'll try to get his book for you and make it available through Uncle Wayne's Bookshelf. If you, or anyone you know, has any fillings or crowns, you've better read this book ASAP: *It's All In Your Head* by Hal Huggins DDS. These could well be causing you all kinds of miseries. The 50% mercury in those fillings leaches out into your system. It's enormously poisonous and can cause Parkinson's, leukemia, multiple sclerosis, diabetes, and so on. Life is tough enough without your having a mouth full of poison feeding into your system. Touch a sensitive milliammeter to your tooth filling and your tongue and see how much current your tooth batteries are generating. And when a battery generates voltage, some of the metal in the battery goes where? Into you, that's where. So why doesn't the ADA stop dentists from putting in amalgam fillings? If they ever admit the liability it could cost dentists billions. So dentists are continuing to poison us.

One of the most interesting and visual of the talks was by Bill Wysock N6UXW, who showed off a Tesla generator which flashed sparks for about 10 feet. If you've got a few bucks and would like to experiment with ultra-high voltages, you might want to look up Bill.

I was disappointed that so few in the audience spoke up to point out that the speakers were ignorant about their subjects. But then, I didn't either. I didn't know how to ask questions of someone with a power generating device who wasn't really clear about the difference between a volt and a watt. Most of these characters were looking for money to finance their work.

But there were enough interesting ideas there to keep an inquisitive ham busy for months. And some ideas could be developed into practical devices. As I pointed out to some young hams who were watching all this with eyes bugging, all you have to do is spend a few weeks learning the basics of electricity and you'll be ready to tackle some of these projects. AC and DC theory isn't difficult. Nor are motors and generators. And learning is exciting.

I might not have zipped out to Colorado Springs for the conference if the Second Annual Boulder Ragtime Festival hadn't been on the same weekend. The two cities are only about an hour and a half drive apart, so I did the conference all day and then drove to Boulder for ragtime concerts at night.

Scott Kirby had driven up there from New Orleans, where he plays on the street. Scott's now being introduced as the foremost interpreter of Scott Joplin in the world. He draws standing ovations. He'll be giving some concerts in San José in November, and later at the Fresno Ragtime Festival.

The disappointing thing for me about many of the ragtime festivals is that most of the performers seem to pride themselves on discovering long-lost rags to play. The reason they were lost is that they never were any good. Like all popular music, only about 1% is worth hearing twice. But oh, that 1%! The good rags are fantastic and addictive, but I doubt there are much more than a hundred of them that are winners.

At the Colorado Springs Extraordinary Science Conference. Standing (left to right): Tony Chellemi KD6IFC, Covina CA; Bill Wysock N6UXW, Monrovia, CA; Rosalie Sorrell KD6KSG, Covina, CA; Skip Juhasz WB2UFV, Colorado Springs, CO; and Jim Hardesty N2DRT, Ithaca, NY. Seated (left to right): W2NSD; Mike Dipersio KC2Q, Bradley Beach, NJ.

So these performers exhume the dead and foul up the festivals. They're tired of playing Joplin's "The Entertainer" and "Maple Leaf Rag," but guess what the audience wants to hear? They want to hear the good stuff over and over. There are about 20 of Joplin's pieces that bring tears to my eyes. They're what I want to hear.

The other superb performer at Boulder was Frank French. I've got to get him up to my studio and do a few CDs for you of him playing Gottschalk and Nazareth, and doing some of his monologues. If I can get you to try my Kirby CDs and a couple of French, you'll see why I'll fly to San José and then drive to Fresno to hear them perform. Or to Boulder.

Kirby recorded "More Damned Good Rags" in my studio this summer, plus some of his own rags. And he's got some corkers.

Well, I had a great time at Colorado Springs at the conference and meeting the hams there, plus the concerts in Boulder. It was a great weekend. And if you old-timers would pay attention, you could meet me at things like this. You can buy a year's pass on Continental Airlines if you're over 62 . . . which most of you are by now. The pass costs about $2,000 and lets you fly once a week for a year. For $2,000 you can fly first-class all year. Yes, Continental flies to Dayton. So Sherry and I zip out to Las Vegas for the CES show, then Aspen for some skiing, and to various hamfests, electronic, computer and music shows. I have my Macintosh PowerBook with me, so I'm able to work wherever I am.

I've been under some pressure from friends to check into some networks, but I've avoided 'em so far. They can be time-consuming. Sherry checks into Prodigy, if you have any traffic for me. The new Prodigy rates seem to have their customers dropping out by the thousands.

Learn To Write

It's unfortunate that our schools don't teach kids to write. Oh, they can put a few words on paper, but that's not really writing. Writing takes some skill, and that means you need to learn how to do it. I don't recall ever being taught how to write, and I notice that the recent books about our school system have the same complaint. If you could see the mail I get you'd get a better idea of how poor American writing skills are.

Yes, it takes some practice and some education, but once you learn it is fun to write. I'll bet you have a book in you, if you'd just let it come out. So get a laptop computer and one of the cheaper laser printers and make it easy. I've tried a bunch of laptops and like the Mac PowerBook best. And they're available used for peanuts these days. I bought a 4/40 Model 140 for under a kilobuck. That's with 4 megs of RAM and a 40 Mb hard drive. That should handle anything you'll need. With it you can answer mail in a couple minutes. You can write spec sheets, ads, manuals, newsletters, and even that book. Maybe some articles for *73*? Once you try a laptop you'll never go back to a typewriter again. Or a pen.

An apology.

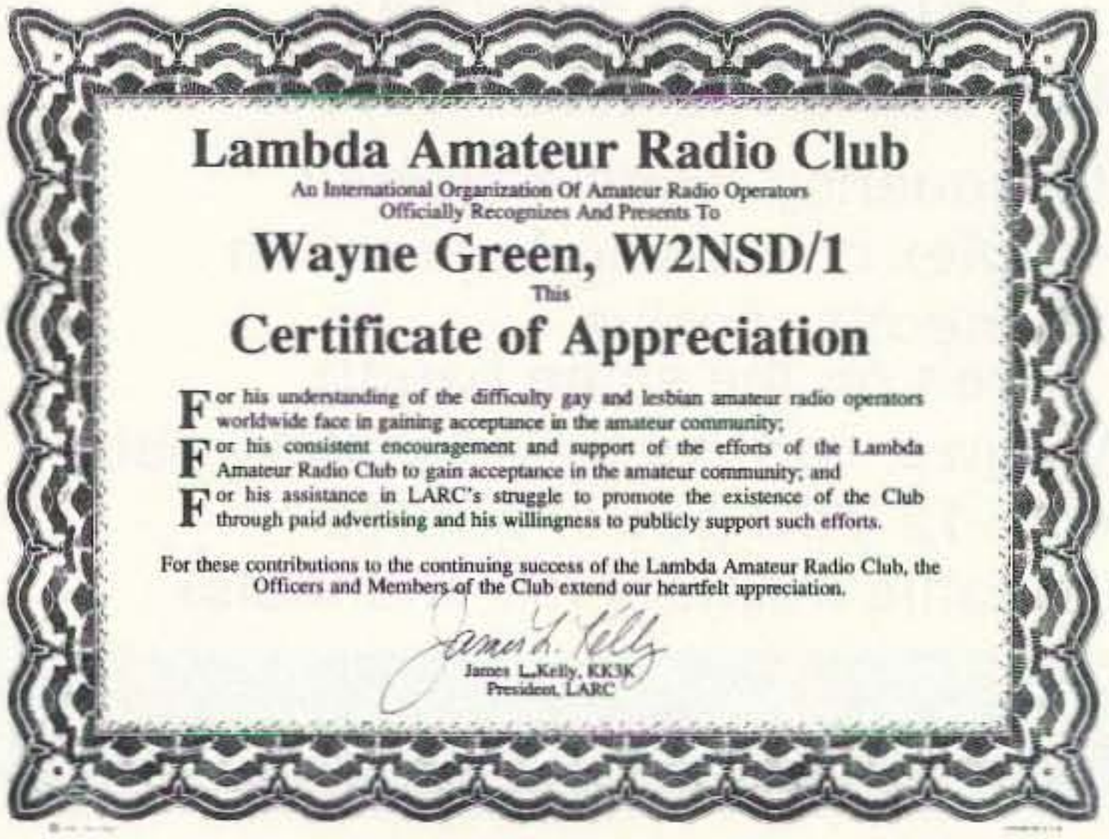
Apparently I have innocently offended one of the more militant homo-hams by my comments about homosexuality in my October editorial, in which I mentioned that I don't condone pedophilia . . . they're messing with children. The *W5YI Report* gaily leaped to defend homosexuality, writing: "Clearly, his behavior is abnormal . . . Green is to be pitied."

I'm not sure I've ever made any claims of being normal. I'm just not that deceptive. But no, I'm not normal. I don't sit home like most normal people, with a six-pack watching ball games on TV and eating pretzels. I don't even like beer, pretzels, or ball games. No one is going to call *that* normal, I hope. I apologize if I offended any child molesters with my editorial.

On the other hand, I sit on the bed and put my pants on both legs at the same time, just like everyone else, so there are many normal things about my life. And, like any true-blue ham, I've been active on OSCAR, have worked over 300 countries, helped pioneer NBFM, was an early user of SSB, RTTY, SSTV, and 6m, have made some unbeaten microwave records, have won all the bigger ham contests for my section, have DXpeditioned from dozens of rare countries, have done moonbounce work, have sat patiently through endless roundtables, have kerchunked thousands of repeaters, and have helped tens of thousands of hams pass the stupid code test with my superb code tapes, which I just happen to think are better than any others anywhere. Only my overweening modesty prevents me from telling you how great I think they really are.

Well, as they say, any publicity is good publicity, so I appreciate what at first glance seems like just one more wearisome Green-bashing attack by W5YI. I also appreciate the letters from other homosexual hams apologizing for the hysterical and unwarranted attack on me by a lone over-motivated gay activist.

One more thing . . . I do wish that W5YI would not encourage hams to sue hams, even though it makes wonderful grist for his pinko paper and no doubt sells subscriptions. 73



Lambda Amateur Radio Club

An International Organization Of Amateur Radio Operators
Officially Recognizes And Presents To

Wayne Green, W2NSD/1

This

Certificate of Appreciation

For his understanding of the difficulty gay and lesbian amateur radio operators worldwide face in gaining acceptance in the amateur community;
For his consistent encouragement and support of the efforts of the Lambda Amateur Radio Club to gain acceptance in the amateur community; and
For his assistance in LARC's struggle to promote the existence of the Club through paid advertising and his willingness to publicly support such efforts.

For these contributions to the continuing success of the Lambda Amateur Radio Club, the Officers and Members of the Club extend our heartfelt appreciation.

James L. Kelly, KK3K
President, LARC

Number 26 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events File Area #11*** *on our* ***BBS (603-924-9343)****. for listings that were too late to get into publication.*

DEC 4

FARIBAULT, MN The annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club, starting with registration at 8:30 AM. Flea Market. Handi-Ham Equipment Auction. Talk-in on 19/79. Contact *Don Franz W0FIT, 1114 Frank Ave., Albert Lea MN 56007.*

DEC 5

HAZEL PARK, MI The Hazel Park ARC will hold its 28th annual Swap and Shop, from 8 AM-2 PM, at Hazel Park High School, 23400 Hughes St. Talk-in on 146.64- (DART). Contact *HPARC, Box 368, Hazel Park MI 48030.*

SPECIAL EVENT STATIONS

DEC 3-5

SAN ANGELO, TX The San Angelo ARC will operate Station W5QX to celebrate Christmas at Old Fort Concho, from 0001Z Dec.3rd-2000Z Dec. 5th. Frequencies: Lower General portions of 40, 20 and 10 meters. For a certificate, send QSL with contact number and a 9 x 12 SASE to: *W5QX, P.O. Box 4002, San Angelo TX 76902.*

DEC 4

FLINT, MI The Genesee County RC will operate W8ACW 1200Z-2400Z, to celebrate their 60th Anniversary. Operation will be in the General 80-15 meter phone subbands, the Novice 10 meter phone subband, and 2 meters. For QSL, send QSL and SASE to *GCRC, P.O. Box 485, Flint MI 48501.*

KALAUPAPA, HI Kalawao County will be on the air, with several SE Stations operating from the site of the Hansen's Disease Hospital, and the historic lighthouse. Phone, CW, and digital activities are planned for all bands, including the Novice subbands. Look for us at the lower portion of each subband. Listen for AH6IO, AH6IN, AH6KY, AH6KX, and others. For a commemorative QSL card, please send your card and an SASE to the home address of the operator contacted.

DEC 11

HOLLY, MI The Fenton Area ARA will operate KB8MBJ 1400Z-2400Z, during the annual Charles Dickens Festival. Operations will take place between 28.300/.500 MHz and in the General portions of the 20 and 40 meter phone subbands. For a special card, send your QSL and #10 SASE to *Bill Coale KB8MBJ, 605 S. Broad St., Holly MI 48442.*

DEC 11-12

TROY, NY The Troy ARA announces its 2nd annual RTTY Sprint. The contest period this year will be from 2100 UTC Dec. 11th-0100 UTC Dec. 12th. Scoring and bands will be the same as the ARRL RTTY Roundup. Logs should be submitted by Jan. 17th, 1994 to *Bill Eddy NY2U, c/o TARA, 2204 22nd St., Troy NY 12180.*

DEC 18

PERRIS, CA Hams of the Orange Empire Railway Museum will operate KC6TKT and other calls 1900Z-2359Z, to celebrate their annual North Pole Limited Steam Train operation. SSB: 28.330 MHz. For QSL, send QSL and #9 SASE to *OERM, P.O. Box 548, Perris CA 92572-0548.*

DEC 18-19

NAZARETH, PA The Delaware-Lehigh ARC will operate W3OK 1400Z-0200Z Dec. 18-19, from the twin Christams cities of Nazareth and Bethlehem PA. Frequencies: 3.965, 7.265, 14.265, 21.365, 28.365. For a certificate, send QSL and SASE to *DLARC, RD4, Greystone Bldg., Nazareth PA 18064.*

DEC 30-JAN 1

PASADENA, CA The Relay Repeater Club will operate Station WB6BNJ, from the Wrigley Mansion, Dec. 30th-Jan. 1st, from 1600Z-0200Z each day. Primary frequency will be 28.460 MHz. Secondary frequencies: 21.335 MHz and 14.260 MHz. This event is in conjunction with the 105th Anniversary of the Tournament of Roses. Amateurs in California/Nevada can contact the Station on 2 meters through the 147.21 repeater, on the half hour, or on 220 MHz, via the Condor Connection, on the hour. For a certificate, send a QSL, with contact number and a 9 x 12 SASE with 58 cents postage, to *Relay Repeater Club, P.O. Box 660081, Arcadia CA 91066-0081.* 73

Number 27 on your Feedback card

NEW PRODUCTS

Compiled by Charles Warrington WA1RZW

ABSOLUTE VALUE SYSTEMS

A new full-featured receive-only SSTV system has been announced by Absolute Value Systems. The new SSTV Explorer is for enthusiasts who don't need transmit capability. This new system will receive most popular color modes and the compact interface plugs into a serial port with no extra power supply required.

SSTV Explorer is priced at $94.95. The package includes the interface, manual, and software on a 3.5" diskette. (A 5.25" diskette is available upon request.) For hams who want to transmit as well as receive, Absolute Value offers Pasokon TV.

Pasokon TV Version 1.2 is a popular PC-based system with an interface that fits inside the computer. Features include an on-screen tuning indicator, a built-in test pattern generator, and automatic fine-tuning.

Pasokon TV can handle all popular SSTV transmission modes and is compatible with IBM 286 or later PCs, ATs, or clones with VGA color, one expansion slot, and 640K memory. The $229.95 price includes interface, software, and manual. For more information contact *Absolute Value Systems, 115 Stedman Street, Chelmsford MA 01824-1823; (508) 256-6907.* Or circle Reader Service No. 201.

AZDEN CORPORATION

A new headset with an attached boom microphone has been announced by the Communications Division of Azden Corporation. The Model HS-03 has a special lightweight design and an audio frequency range particularly well suited for communications applications.

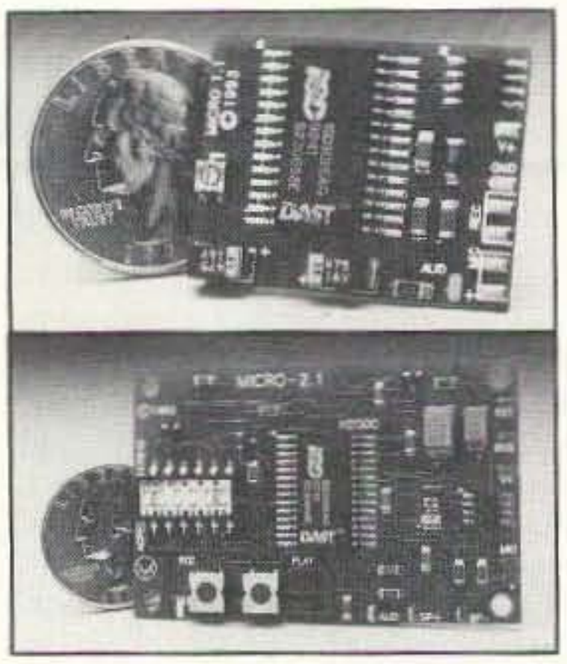
The adjustable headband provides a perfect fit for all sizes. The padded earpieces cover the ear so outside sounds are reduced but not eliminated. Low frequency noise, such as power supply hum, and high frequency interference, such as hiss and static, are

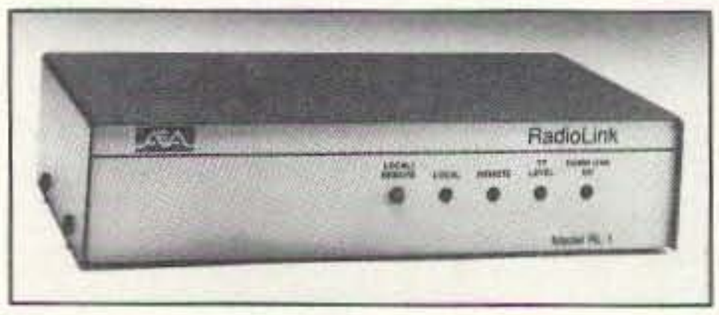
AGRELO ENGINEERING

Agrelo Engineering has introduced two new micro-sized voice recorder identifiers. The Micro 1.1 is small enough to fit in a microphone at 1-1/4" x 15/16". The Micro 2.1 is slightly larger at 1-1/2" x 2-1/2". They are both capable of serving as amateur radio station IDers, beacons, contest identifiers, repeater identifiers, or as foxhunt teasers.

Both are designed around the ISD-2560 voice recorder chip, using direct analog storage technology. The chip eliminates any need for battery backup with its 100-year no-power retention. You can select either 60 or 16 seconds of record time. The circuit also has a 50 mW audio amplifier capable of driving a small speaker.

The Micro 2.1 has all the features of the Micro 1.1, but adds multi-function DIP switches, 5V key output, ID timer, and COR or squelch keying. The Micro 1.1 is priced at $69.95 for the 16-second model and $79.95 for the 60-second version. The Micro 2.1 is priced at $109.95 for the 16-second and $119.95 for the 60-second version. For more information or to order, contact: *Agrelo Engineering, 1145 Catalyn Street, Schenectady, NY 12303; Sales (800) 588-4300, Tech support (518) 381-1057, FAX (518) 381-1058.* Or circle Reader Service No. 205.





AEA

Advanced Electronic Applications has recently introduced two new products that allow you to remote control your HF station utilizing touch-tone technology: HamLink and RadioLink.

works fine even if there is an answering machine on the line.

RadioLink is similar to HamLink, letting you use the touch-tone keypad on your handheld or mobile radio to control your HF base. RadioLink can go between your HF/VHF/UHF transceiver and a repeater or a 220 MHz or UHF full-duplex link.

A demonstration unit has been set up for people who would like to call and try it out. Call (800) 432-8873 and request a brochure with the telephone number and a list of commands. The suggested

Number 30 on your Feedback card

BARTER 'N' BUY

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to the Barter 'n' Buy, Judy Walker, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

The deadline for the January classified ad section is November 11, 1993.

ALL ABOUT CRYSTAL SETS. Theory and construction of crystal set radios. $7.95 each, ppd USA. Send to: **ALLABOUT BOOKS**, Dept. S, P.O. Box 22366, San Diego CA 92192. BNB200

CUSTOM MADE-HAND TOOLED leather products with your initials, name, call letters. Photo's & estimates available. Key rings, wallets, belts, purses, hanging signs, specialty items. Great X-Mas gift. **LEATHER & WEST,** 67 Causeway Rd., West Swanzey NH 03469. (603)352-6256. 9-4 pm. M-F ET. BNB215

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $12. LEARN MORSE CODE IN 1 HOUR. Amazing supereasy technique. $12. Both $20. Moneyback guarantee. Free catalog: SASE. **BAHR-T8**, 150 Greenfield, Bloomingdale IL 60108. BNB221

QSL CARDBOXES & INDEX DIVIDERS. Send SASE. **7-Mike HAMSTUFF,** P.O. Box 14455, Scottsdale AZ 85267-4455. BNB224

NO DSP AUDIO PROCESSING COMPARES TO JPS. Eliminate variegated noises. NIR-10 special, $329.95; NF-60 Notch Filter, $139.50. Satisfaction guaranty. Authorized dealer: **DAVIS RF CO. 24-HOUR ORDERS:** (800)484-4002, CODE 1356. FAX: (508)369-1738. BNB254

QLS SAMPLES- 50 cents. **SAMCARDS,** 48 Monte Carlo Dr., Pittsburgh PA 15239. BNB275

VHF, UHF, QUAD 4+ ELEMENTS: Parts list and assembly instructions for easy construction. Send $10 and SASE, **TODD KI6JE,** MB# 1029, Ridge Park Drive, Concord CA 94518. BNB285

COMMODORE 64 REPAIR. Fast turn around. **SOUTHERN TECHNOLOGIES AMATEUR RADIO,** 10715 SW 190th Street #9, Miami FL 33157. (305)238-4327. BNB295

RADIO RUBBER STAMPS free brochure. **REID ASSOCIATES,** 6680 Mellow Wood, West Bloomfield MI 48322. BNB297

WANTED ELECTRON TUBES, ICS, SEMICONDUCTORS. ASTRAL P.O. Box 707ST, Linden NJ 07036. Call (800)666-8467. BNB307

KENWOOD AUTHORIZED REPAIR. Also ICOM, Yaesu. **GROTON ELECTRONICS,** Box 379, Groton MA 01450. (800)869-1818. BNB310

RCI-2950 OWNERS: New modification manual including Power increase. Clarifier modification. Modulation increase. Operating hints, and more. Parts included. Only $20.00 ppd in U.S. (Missouri residents add $1.15 tax). **SCOTT,** P.O. Box 510408, St., Louis MO 63151-0408. (314)846-0252. Money Orders or C.O.D. BNB340

CONNECTICUT'S FAVORITE HAM STORE. ROGUS ELECTRONICS, 250 Meriden-Waterbury Turnpike, Southington CT 06489. (203)621-2252.BNB355

KIT BUILDERS! Complete list of 136+ kit vendors. SASE + $3.00 USD to: **RUTENBER ENGINEERING,** 38045 10th St. E. #H75, Palmdale CA 93550-AR. BNB365

QSL CARDS — Standard and custom. Your ideas or ours. Excellent quality. Foil stamping available. Many designs and type styles. Catalog and samples $1.00 refundable. **WILKINS,** Dept. A, Box 787, Atascadero CA 93423. BNB370

20 METER SUPERHET C.W. TRANSCEIVERS KIT, $49.95 plus $3.75 shipping. Check/M.O. 1994 Catalog for 2 Stamps. **DAN'S SMALL PARTS & KITS,** 1935 South 3rd West #1, Missoula MT 59801. BNB385

AMATEUR MARKET PLACE. New monthly newsletter listing for sale & wanted Amateur & Computer equipment. C$19.95 or US$16.50. US Hams reap value of $ exchange by buying **Canadian. CALE ENTERPRISES,** P.O. Box 8180, Ottawa, Canada K1G 3H7. BNB405

SATELLITE EQUIPMENT AT 40% TO 50% OFF. Drake, Toshiba, HTS, GI, 25° LNB, $68.95; 7° Ku, $89.00. Wholesale Warehouse. Call (800)851-6534 for wholesale price list. **SATELLITE WAREHOUSE,** Tucson AZ. Fax (602)624-1629. BNB640

VHF-UHF-SHF Large SASE. **VHFer,** P.O. Box #685, Holbrook AZ 86025. BNB660

ELEGANT QSL CARDS AT LOW PRICES Samples $1 (refundable with order). **AACO,** Dept. S312, 1639 Fordham Way, Mountain View CA 94040. BNB670

HAM RADIO REPAIR- All makes and models. Fast, Professional Service. **AFFORDABLE ELECTRONIC REPAIR,** 7110 E. Thomas Rd., Scottsdale AZ 85251. (602)945-3908. BNB700

9 1/2 INCH UTC WALL CLOCK- $26.50 ppd. **GABAY TOOL CO.,** P.O. Box 68, Necedah WI 54646 BNB705

ROSS' $$$$ NEW DECEMBER (ONLY) TELEX-HI-GAIN DX-88, $241.50; 218S, $319.90; 285, $79.90; 335S, $58.00; 383, $129.90; 380S, $81.90; 393S, $520.00; CD-45II, $222.00; HAM-IV,$333.00; T2X, $397.00; KENWOOD, PHONE $; ALINCO, PHONE $; YAESU, PHONE $; ICOM IC-471H, $1,000.00; ASTRON, PHONE $; CUSHCRAFT, A147-22, $150.00; 40-2CD, $380.00; 4218-XL, $145.00; 416-TB, $78.50; A144-10T, $65.00; JERSEY SPECIALITY (J.S.C.) 500 FT. RG-213, $150.00; 500 FT. 9913, $205.00; BUTTERNUT, PHONE $. ALL LIMITED TIME OFFERS. OVER 9035 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY-FRIDAY 9:00 TO 6:00, 9:00-2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. **ROSS DISTRIBUTING COMPANY,** 78 SOUTH STATE, PRESTON ID 83263. (208)852-0830. BNB707

ALINCO DR570 VHF/UHF DUAL BAND MOBILE, less than one year old $465.00, Realistic HTX-100 10 meter $150.00, (I will ship). Keister Whitt, AD4JI, Route 1, Box 25, Ringgold VA 24586. (804)822-7005. BNB710

GIANT SOLAR PANELS $44.00 EACH! Excellent Prices/Solar Equipment/Accessories. Free Information/Send Stamped Envelope, Catalog $3.00. To: **QUAD ENERGY,** P.O. Box 690073, Houston TX 77269. (713)893-0313. BNB715

ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. **DAILY ELECTRONICS,** 10914 NE 39th ST. Suite B-6, Vancouver, WA 98682. (800)346-6667 or (206)896-8856. BNB719

MINIATURE POLICE RADAR TRANSMITTER One mile range, $41 assembled, $31.00 kit, (219)489-1711. P.O. Box 80096, Fort Wayne IN 46898. BNB725

COAX CABLES! Custom built to your specifications. Choose between BELDEN 8214, 8267, 9913, 9258, 8219 and BNC, N or PL-259 connectors. PL-259 Silver Teflon, $1.25 each or 10 for $1.00 each. PL-259 Gold Teflon, $1.50 each or 10 for $1.25 each. Type N $2.75 each or 10 for $2.50 each. BNC male to UHF female adaptors $1.75 each or 10 for $1.50 each. We can supply all your adaptor, cable and connector needs. Competitive prices, quality materials and workmanship! Call or write for catalog and price list. Dealer inquiries invited. R. C. Kontes, 465 Croft, Idaho Falls ID 83401-4419. (208)522-2839. BNB730

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UW1293

Number 28 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

Peace

It is the time of the year when all the world's peoples contemplate brotherhood, goodwill, and peace. Maybe it would do us some good if we could stop contemplating it and start doing it. The world sure is a mess!

In the last year, the former Soviet Union narrowly missed yet another attempt by the old guard to return to the repressive policies of the past. The people of Russia are still coming to grips with the fact that freedom costs.

The beautiful country of Bosnia (formerly Yugoslavia), host to the Winter Olympics just a few short years ago, has been literally destroyed by religious and tribal bigotry. The faces of the children of Sarajevo tell the story.

Botched policy in Somalia has resulted in the deaths of several American (and other) citizens. We went there in peace to do our duty as the leader of the free world. We saved millions from certain death, and the citizens of Mogadishu have paid us back by dragging the dead bodies of American soldiers through their streets.

Haiti is exploding even as I write these words (in mid-October). Once again, the good intentions of the United States are being answered with the barrel of a gun.

The mess hasn't avoided the streets of America, either. The judicial system in the State of California has abdicated its power. The so-called "leaders" of the minority groups living in the Los Angeles area, the very ones who should be concerned with uplifting and providing opportunity for people, are the very ones who make excuses for thugs and criminals. Instead of rule of law, California has instituted rule by mob. Threats of violence and riots seem to be the ways to get what you want out of the California Courts.

This year, for the first time, terrorism reached the shores of America in the form of the bombing of the World Trade Center.

While crimes against tourists are actually on the decrease in Florida, the news media decided to create a crisis so that foreigners are now afraid to vacation here.

The anti-abortion forces in this country have escalated their message with intimidation and bullets. Can you believe this war has been going on now for 20 years?

The current ruling party has decided that the fact that Socialism has failed miserably in Eastern Europe shouldn't deter the United States from giving it a try. Clinton Administration policies (and the fear of what's next) have essentially paralyzed an already failing U.S. economy. In the name of "fairness," the American people appear to agree that they should give up some of their hard-won freedoms. There's enough pork in the barrel for both political parties, so the Republicans cannot claim any philosophical high ground, either.

Are there glimmers of hope in all this? Sure. For the first time since Moses came down from Mt. Sinai, Arabs and Israelis have met and agreed to at least try to live together without bashing each other's heads in. This is peacemaking at its most basic level. These two groups have agreed that the other has the right to exist. It ain't much, but it's a start.

"Once again, the good intentions of the United States are being answered with the barrel of a gun."

My mother is the choir director at her church. When I was young, my brothers and I all sang in her choir. One Christmastime, she taught us a song that is based on The Prayer of St. Francis of Assisi. I'd like to offer the words to this song as my holiday gift to you:

Lord, make me an instrument of your peace.
Where there is hatred, let me sow love.
Where there is injury, pardon.
Where there is doubt, faith.
Where there is despair, hope.
Where there is darkness, light.
Where there is sadness, joy.
Oh, Divine Master, grant that I may not so much seek
To be consoled, as to console,
To be understood, as to understand,
To be loved, as to to love.
For it is in giving, that we receive,
And it is in pardoning, that we are pardoned,
And it is in dying, that we are born,
To eternal life.

No matter what your religious beliefs, the truth is still the truth.

I wish you peace. Shalom. 73

Number 29 on your Feedback card

PROPAGATION

Jim Gray W1XU

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In spite of the decline in sunspot activity, December ought to be a Good month for propagation on the HF bands. The daily chart shows only the 12th and 13th and again the 27th to be Poor days. All the rest of the month will be characterized by many days of decent propagation . . . the first month like this in a long time. The P (Poor) days may also be accompanied by severe weather conditions.

Of course, you can't rule out an unexpected and sudden disturbance sometime during the month, but it doesn't seem likely except on the days marked P (Poor) or trending between F (Fair) and P (Poor). Times given below are LOCAL times, but the Band-Time-Country chart uses Coordinated Universal Time (what used to be called GMT).

10 and 12 meter bands: Occasional morning openings to Europe, frequent midday openings to South America and Africa, and late afternoon openings to the South Pacific and Australia. Also, short-skip openings during daylight hours between 1,000 and 2,300 miles possible on Good days.

15 and 17 meter bands: Worldwide DX during daylight hours possible on Good (G) days, with bands peaking toward the EAST after sunrise, toward the SOUTH at midday, and toward the WEST during the afternoon hours. Short skip between 1,000 and 2,300 during daylight hours.

20 meter band: Once again, this will be the top DX band for December between dawn and sunset. The band will close earlier than during summer or equinox months, but you can expect excellent daylight DX. Also, short skip beyond 500 miles will be frequent during daylight hours.

30 and 40 meter bands: These bands are expected to open to the EAST during late afternoon and early evening hours, with excellent propagation for DXers on Good (G) days. The band ought to stay open for DX during nighttime hours and close shortly after sunrise. Short skip up to 1,000 miles during daytime and beyond 1000 miles at night, when the band "goes long."

80 and 160 meter bands: You will find much DX and LOW NOISE on many days of the month, with DX peaking toward the EAST around midnight and peaking in various directions just before sunrise local time. Daytime short skip of around 500 miles on 80 meters and over 500 miles at night should prevail on Good (G) days.

On 160 meters, there will be NO daytime propagation, due to heavy absorption of signals by the ionosphere. Occasional DX between dark and sunrise should be possible on Good (G) days, but as always—QRN will be a limiting factor. Short skip up to about 1,000 miles during nighttime hours can be expected . . . sometimes even when static is heavy.

Grey-line propagation: During the hours surrounding sunrise and sunset (local time) you may be able to take advantage of grey-line skip to the parts of earth in the "fuzzy" areas between total dark and total daylight. Try all the HF bands during these times for unusual signal strength to and from unexpected areas. See you next month, W1XU. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15						20	20A	15			
AGENTINA	20										15	15
AUSTRALIA	20					40	40			20	20	15
CANAL ZONE	40	40					20	15	15	15	15	20
ENGLAND	40	40	40	80	80		20	15	15	15	20	
HAWAII	20					40	20	20			15	15
INDIA							20	20				
JAPAN	15						20	20				15
MEXICO	40	40	40	40	40	40	20	15	15	15	15	20
PHILIPPINES							20	20				
PUERTO RICO	40	40	40	40	40	40	20	15	15	15	15	20
SOUTH AFRICA	40A	40						15	15	20		
U.S.S.R.		40						15	15	20		
WESTCOAST	15	20	40	40	40	40	40A	20A	15	15	15	15

CENTRAL UNITED STATES TO:

ALASKA	20				40	40	20	20				20
ARGENTINA	20	40	40	40						15	15	20A
AUSTRALIA	15					40	20	20	20		15	15
CANAL ZONE	20		40	40	40			20	15	15	15	15
ENGLAND	40	40	80	80				15	15	15	20	
HAWAII	20	20			40	40	20	20	20	15	15A	15A
INDIA								20				
JAPAN	20				40	40	20	20				20
MEXICO	20		40	40	40			20	15	15	15	15
PHILIPPINES	20							20	20			
PUERTO RICO	20		40	40	40			20	15	15	15	15
SOUTH AFRICA	20	40	40						15	15	15	20
U.S.S.R.		40	40					15	15	20		

WESTERN UNITED STATES TO:

ALASKA	15	15	20			40	40	40				20
ARGENTINA	20	20		40	40						15	15
AUSTRALIA	15	15	20				40		20	20	20	15
CANAL ZONE	20	20		40	40	40	40	40	15	15	15	15
ENGLAND			40	40					20A	20A		
HAWAII	15	20	20			40	40	40				15
INDIA		20	20									
JAPAN	15	15	20				40	40	40			20
MEXICO	20	20		40	40	40	40	40				15
PHILIPPINES	20A	20								20		
PUERTO RICO	20	20		40	40	40	40	40				15
SOUTH AFRICA	20	20							15	15	15	20
U.S.S.R.								20	20	20	20	
EAST COAST	15	20	40	40	40	40	20	20A	15	15	15	15

A=Next higher frequency may also be used.

DECEMBER 1993

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 G	3 G	4 G
5 G	6 G-F	7 F	8 F-G	9 G	10 G-F	11 F-P
12 P	13 P	14 P-F	15 F-G	16 G	17 G	18 G
19 G	20 G	21 G	22 G	23 G	24 G	25 G-F
26 F-P	27 P	28 P-F	29 F	30 F	31 F-G	

"Built-in VOX? Right!"

"Dual Decode. Now that's a first!"

"Wow, a real Battery Voltage Readout!"

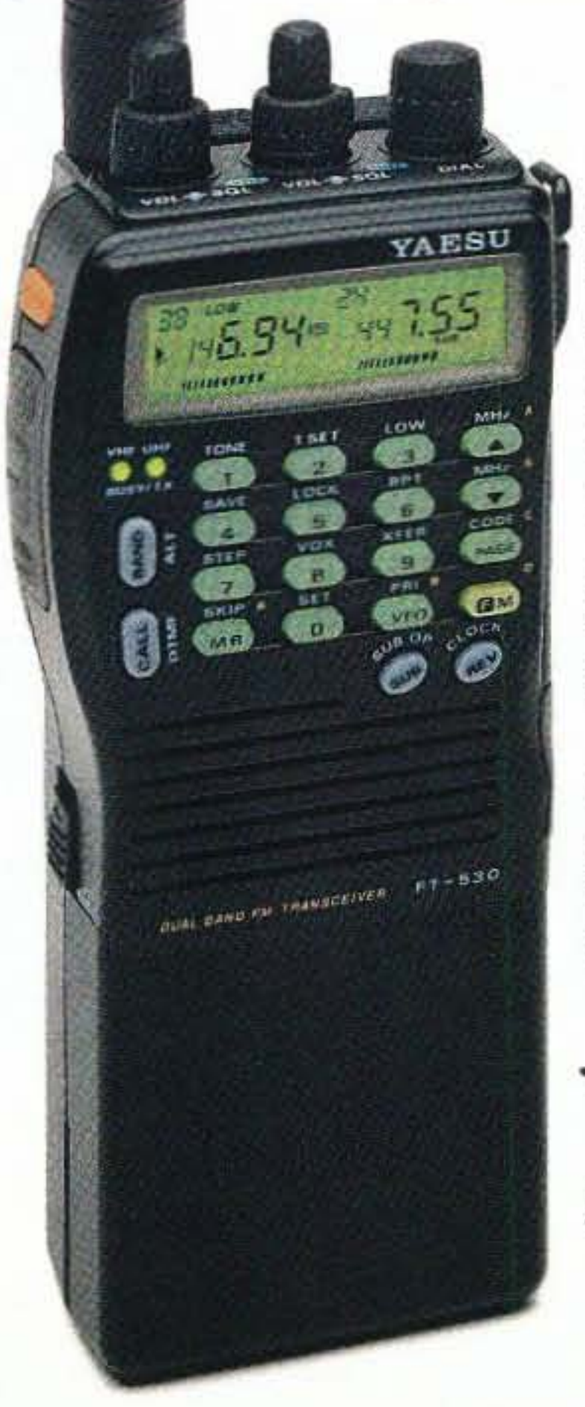
"Yaesu did it again!"

FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W-21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest".

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-26 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B 12 VDC Adaptor
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 Mobile Mounting Hanger



No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠

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.

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TS-950SDX: An industry first! 50-volt, MOS FET final amplifier and DSP for superior linearity. 150 watts output•All-band HF transceiver with general coverage receiver•Switchable AGC, selectable IF filters with memory, dual-mode noise blankers, IF notch filter, CW reverse mode, CW pitch, SSB slope tuning, IF and AF variable bandwidth tuning•Built-in CW memory keyer (DRU-2 voice keyer optional)

SAVE $ 50

TS-850S: All-band HF transceiver with general coverage receiver, 100 watts• SSB slope tuning, CW variable pitch and reverse control, IF notch, 1-Hz fine tuning function•Superb receiver sensitivity and extremely quiet noise floor•SSB HIGH BOOST function to bust through the pile-ups•Filter options for both first and second IF sections•Built-in CW memory keyer (DRU-2 voice keyer optional)

SAVE $ 50

TS-450S: **All-band** HF transceiver with general coverage receiver,100 watts •Wonderfully easy to use, yet high-performance package•Filter options for superb receiver performance

SAVE $ 30

TS-50S: An exceptional compact, all-band HF transceiver, with 500 kHz to 30 MHz receiver. 100 watts. DDS with "fuzzy logic" control. Kenwood's Advanced Intercept Point (AIP) ensures top performance with reduced noise floor

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TM-241A: Wide band receiver coverage•CTCSS encode built-in•Three power settings: 5, 10, and 50 W•20 full-functior memory channels store everything you need•Multiple scanning functions

SAVE $ 30

TM-732A: 50 watts on 2m, 35 watts on 70cm•Wide coverage receiver•CTCSS encode built-in, decode optional•50 memory channels•Unique S-meter squelch•Remote controllable via DTMF

SAVE $ 30

TM-742A: 2m, 50 watt/70cm,35 watt modular FM transceiver•101 memory channels for each band•CTCSS encode built-in•Wide band receiver•Optional modules for 28, 50, 220, or 1200 MHz•Remote-mountable front panel

SAVE $ 20

TH-28A: •2m pocket HT, 2.5 watts outpu •Sub-receiver for 70cm band•Alpha numeric displ and message paging•CTCSS encode/decode built-in•Wide band receiver•40 memory channels

SAVE $ 20

TH-78A: Full duplex cross-band operation•CTCSS encode/decode built-in•Alpha numeric display and message paging•Wide band receiver •50 memory channels • Sliding keyboard cover and illuminated keypad

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