73 Amateur Radio Today

SEPTEMBER 1992
ISSUE #384
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International Edition

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Wideband RF Baluns
Everything you need to know

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73 Reviews
Comet CX-224 Triband Mobile Antenna
MAX System's 5 Element Quad

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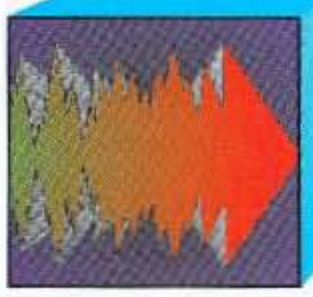

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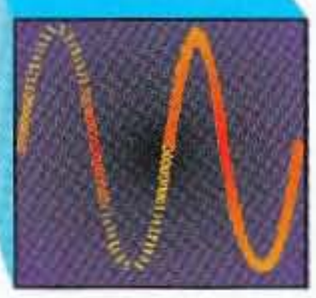

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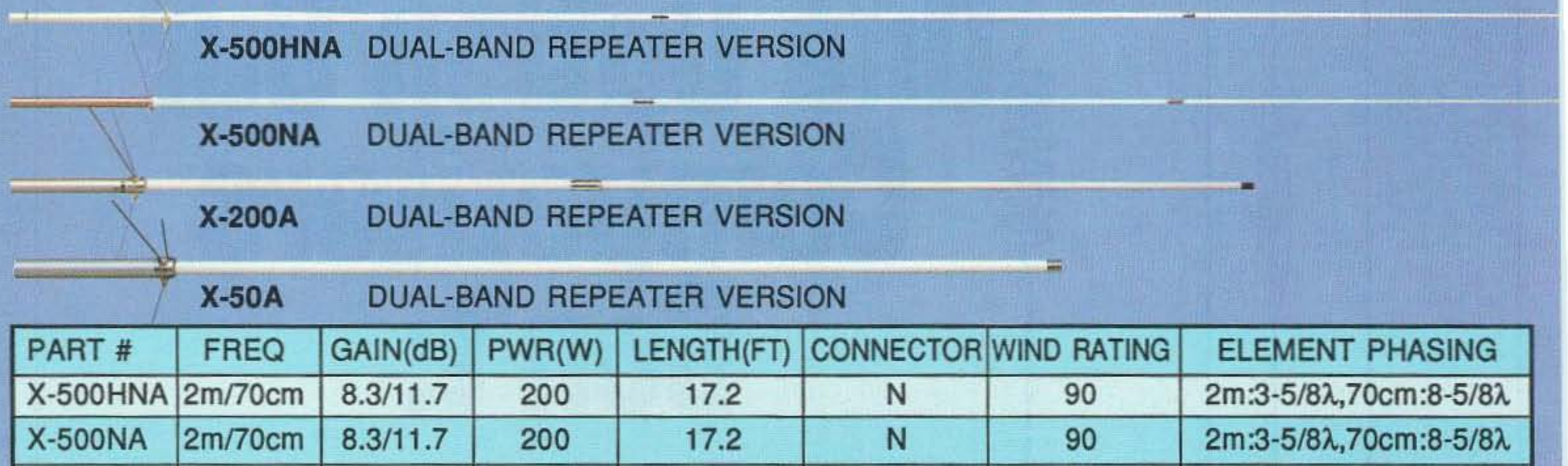


X-500HNA DUAL-BAND REPEATER VERSION

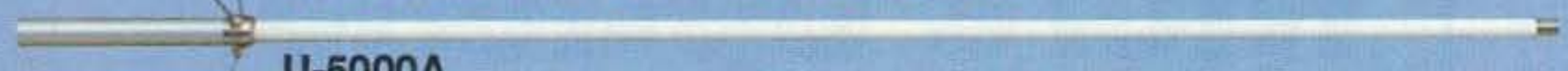
X-500NA DUAL-BAND REPEATER VERSION

X-200A DUAL-BAND REPEATER VERSION

X-50A DUAL-BAND REPEATER VERSION

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
X-500HNA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-500NA	2m/70cm	8.3/11.7	200	17.2	N	90	2m:3-5/8λ,70cm:8-5/8λ
X-200A	2m/70cm	6.0/8.0	200	8.3	UHF	112.5	2m:2-5/8λ,70cm:4-5/8λ
X-50A	2m/70cm	4.5/7.2	200	5.6	UHF	135	2m:6/8λ,70cm:3-5/8λ

U series VHF/UHF MULTIBAND



U-5000A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
U-300A	70cm/23cm	8.6/13.2	150	8.3	N	110	70cm:4-5/8λ, 23cm:10-5/8λ
U-5000A	2m/70cm /23cm	4.5/8.3 /11.7	150	6.0	N	135	2m:6/8λ,70cm:3-5/8λ, 23cm:7-5/8λ

F series VHF/UHF MONOBAND

F-23A

PART #	FREQ	GAIN(dB)	PWR(W)	LENGTH(FT)	CONNECTOR	WIND RATING	ELEMENT PHASING
DP-GH62	6m	6.0	200	21.0	UHF	78	2-5/8λ
F-22A	2m	6.7	200	10.5	UHF	112	2-7/8λ
F-23A	2m	7.8	200	15.0	UHF	90	3-5/8λ
F-142A	1 1/4m	5.5	200	6.0	UHF	110	2-5/8λ
F-718A	70cm	11.5	250	15.0	N	90	18-1/2λ
F-1230A	23cm	13.5	100	10.5	N	90	25-1/2λ

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

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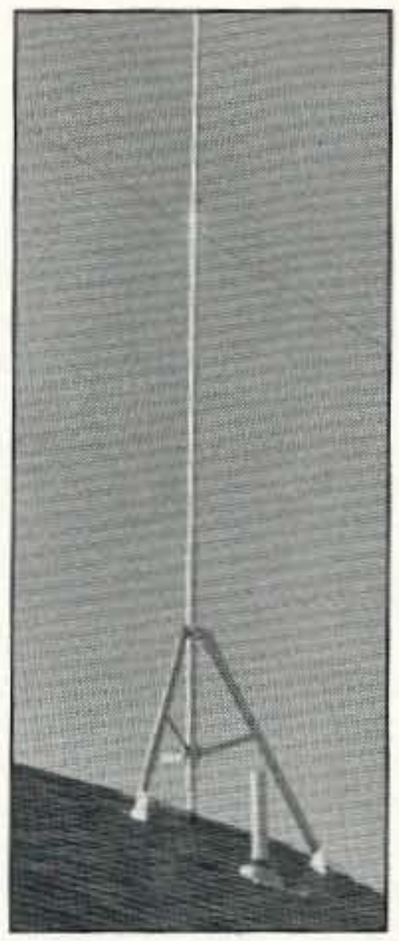

Build a rooftop vertical . . .
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REVIEWS

Cover: The Comet CX-224 Triband mobile antenna. See the review on page 26. Photo by David Cassidy N1GPH.

DEPARTMENTS

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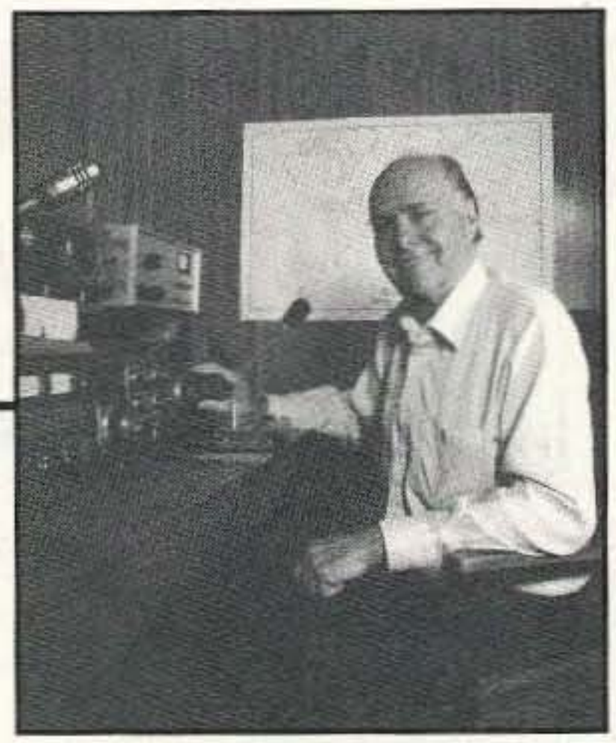

Green For President

When Perot dummied out on the presidency, I got a pile (two) of letters asking why don't I run for the job. Well, there are several good reasons. First, I don't have a hundred million. Second, it's a lousy job. Third, I'm 70 years old and thus very likely to drop dead any day now. Fourth, the media would have a ball interviewing my enemies— and I've got a bunch.

I get to thinking about my enemies every now and then. I don't think you'll find one that I've screwed. The intensity of the hate that I generate seems to be proportional to the depth that I've been screwed. My biggest enemy took me for about $100 million. That's enough to hate anyone for, I suppose. Of course I can look on the bright side—this has kept me from running for the presidency, with all that aggravation. The people who only took me for a few hundred thou are only moderate enemies.

Surely I'm exaggerating, right? I'm laughing, but it's a bitter laugh. I figure as long as I can make more money than people can steal, what the heck. And yes, I'm careless with both money and my things. I'm careless with people too, lending money to almost anyone who asks. One chap borrowed $25,000 to start a tape business . . . another $5,000 to start a computer art gallery . . . another $5,000 to set up a psychological therapy business . . . another $5,000 to help a newspaper grow . . . another $5,000 to keep a small magazine afloat. Then there was about $250,000 to set a chap up in a new software business. And $350,000 for a computer protection system. $250,000 in computer inventory got swiped from my stores and about $300,000 from my warehouse. One chap swiped about $10,000 in CDs to start a CD business. No, I don't think the media would have any problem finding endless testimony against me. How about the employee who sold himself 40 computers from our lab at scrap prices and resold them for around $100,000? He went to work for a competitor and died of a heart attack, so the *Enquirer* will have to get his story via a psychic. I'll bet even the ex-employee who broke into the ham shack recently and cleaned it out hates me now.

People aren't geared to take someone for a bundle without projecting the guilt. They don't want to feel guilty about what they've done to me, so they hate me and then it's okay.

Yes, it's a lot more difficult now to pry money out of me to start new businesses. You know, I've never yet had anyone pay me back. But then I've always just handed them the money without all sorts of contracts. I figured if I got it back I'd be able to help someone else. One chap did repay a little, but that ended after about two small payments. The others stopped calling or writing . . . or answering my letters.

I'm happy doing what I'm doing. I don't need or want the aggravation that comes with public office. And I don't know for sure how I'd react to the temptations. When you're a senator or representative it's easy to threaten one special interest after another and reap tons of money in lobbyist donations to keep you off their backs. Say, I wonder if you noticed that Senator Gore has consistently been one of the top recipients of PAC lobby donations? Talk about special interests having friends in high places, what with him aiming at the veep spot! That's not going to stop the money rolling in, I'll bet. Indeed, that could have been a strong factor in his being selected for the non-job.

I'm having fun helping performers get known via my record companies. Cabo Frio, a jazz group, is now on full rotation on the key radio stations in nine of the top markets and is about to go on a national tour as a result. Marty Balin has had a similar success with his "Better Generation" release on my Green With Envy label. He is also going on tour as a result. "Kukuruza," the Russian bluegrass group's release on my Greener Pastures Records, has been a hit in country circles, so they're coming back for another American tour this year—and will do another CD for us in my studios. And Scott Kirby has been in great demand for ragtime festivals, which is probably the closest there is to a tour in that field.

I'm also having considerable success in helping to get independent music to sell via my Adventures In Music series of CDs. We're up to about 75 of those now and turning out three to five new releases a month.

In the ham field *Radio Fun* has been doing fabulously. I've never seen anything like it in this field. The new subscriptions are coming in by the ton and renewals have set publishing records. The only fly in the ointment is the reluctance of some larger advertisers to change their old habits of doing all their advertising in *QST*. Well, that won't stop us, it just makes the publication a little smaller than I like and gives their competitors a substantial added advantage over them when it comes to selling to this huge newcomer market.

If you're into music you'll want to at least check out my new *Secret Guide to Music*—it's great fun. It's packed with reviews of music I, the editors and readers think you'll want to know about. I have some sneaky plans we're testing which, if they work out as expected, we'll also do with *Radio Fun.*

I'm not getting enough time for skiing or scuba diving. I've got to stop getting off on tangents like the book I've just finished on how to fix America's most serious problems. As I've mentioned, it came about as a result of my reports to the New Hampshire Economic Development Commission. I put 'em all together and am putting the book into New Hampshire bookstores to see how it's received. If it goes well we'll try for national distribution. You've read a lot of it in my *73* editorials over the last 20 years or so, so not much of it will surprise you unless your retention is poor.

Learning The Code

There still seems to be a good deal of confusion about this. Let me explain this as simply as I can. If you go about it the right way you can learn the code in a few days. If you go about it the wrong way it can take you months. Or worse, it can totally frustrate you.

The normal approach (the absolutely wrong approach, naturally) is to start by learning the letters and numbers. Then you start slowly and gradually building up your speed. Wrongo! Bummer! Totally wrong approach right from the start.

A far better way is to get a tape . . . or set up your computer to generate random letters, numbers and punctuation . . . and sit down to listen. You don't have to know the code for the letter B or Q. All you have to do is take pencil in hand, relax and listen for a dit to go by. Write down an E. Pretty soon you'll be able to listen to the tape and write E's down while you are talking with someone. It'll be automatic. Step two, listen for a dash. That's a T. As you listen for T's you'll continue writing down the E's as they go by. Once you get the T's automatically, you start listening for dit-dits and writing I's. And so it goes. You never hear a dah-dit-dit-dit and have to stop and think . . . oh yes, that's a B. By the time you're through the whole alphabet, numbers and punctuation, you'll know what dah-dit-dit-dit is because you've just written it.

About that time you can graduate to words, starting with dah diddle-dit-dit dit (THE) and so on. I suggest you learn the letters in the order of their frequency of use in English . . . E-T-A-I-O-N-S-H-R-D-L-U. That half of the alphabet makes up about 90% of the letters you'll be using, so it pays to give them priority and the most use in your practice.

Ya got that? Learn sounds, not dots and dashes. And start with the sounds, not the letters.

What speed? It takes about the same length of time to learn the code at 13 per as it does 20 per, so if you're going to head for Extra, why not start out at 20 and not waste time on 13? The sound patterns just sound different. Completely different.

Now doesn't that make a lot more sense than starting with the dots and dashes, setting up a lookup table in one side of your brain, listening to the sound with the other, sending the code group over to the lookup table, finding the right combination, and then sending back the letter to be written down? Keep it all on one side of the brain so you won't be stopped dead by the shuttle speed of the brain . . . which bogs you down at about 10 wpm. It just can't go faster, so to hit 13 per you have to start all over anyway. Your brain isn't like a computer where you can plug in a faster microprocessor to speed things up.

If you don't have a good computer program for generating random characters, there's always my Uncle Wayne's tapes. We've been selling a ton of 'em lately . . . and getting wonderful testimonials from happy nocoders who've moved on to higher grade licenses.

We're Homophobes!

The latest Lambda club newsletter accuses *73* of being anti-homosexual. Why? Because *73* didn't publish a news item about their club suing the ARRL because *QST* refused to print an ad for them. So, in addition to being a minority with precious little tolerance by society, now they're busy kicking their biggest ham radio supporter in the . . . er . . . unmentionables.

Well I have a news flash for them. I did editorialize about their incredibly stupid law suit. Apparently even ho-

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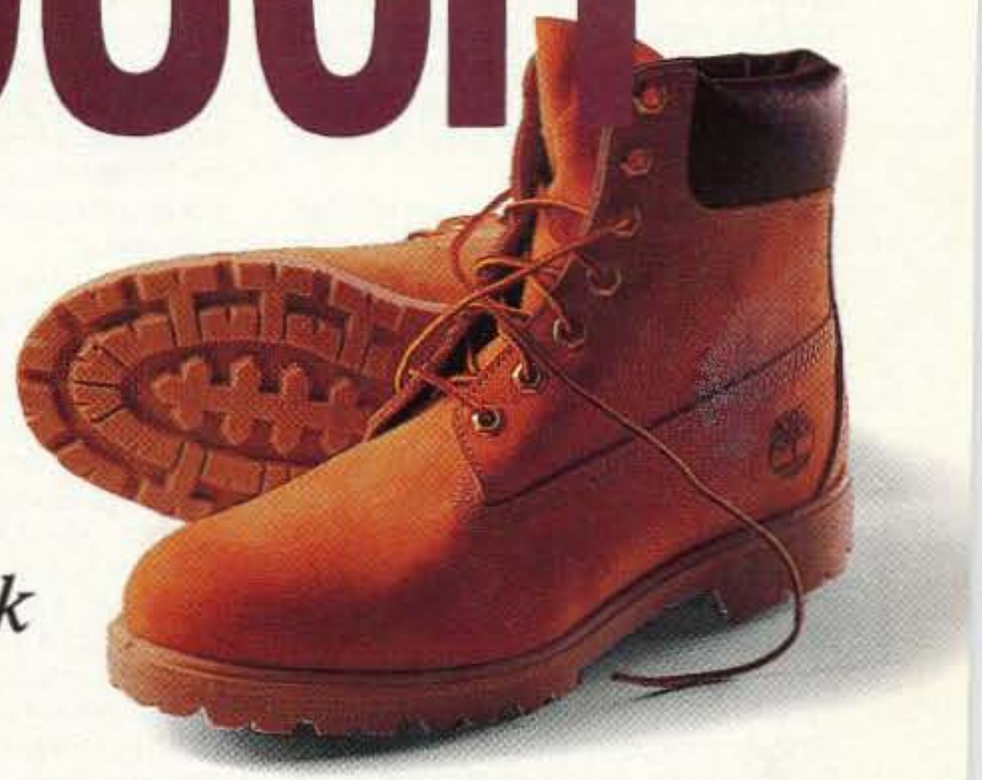
SUPER TOUCH



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LETTERS

Number 2 on your Feedback card

From the Hamshack

Patrick Thomas KG5TK, Corpus Christi TX Wayne, I love your editorials—they keep my faith. I work with kids and ham radio but shy away from clubs as they turn off my guests. Sad but true. Honestly, I have not met with them for a few years but the leaders are the same.

I am a recent (four years) ham and had a great elmer but felt the testing for code was harsh and very uninviting. The volunteers were not helpful nor encouraging in San Antonio or Corpus. I went out of town, to a smaller town, and was treated royally. It spurred me on to Advanced and I now send everyone to them for testing. I feel this is a critical area which is not discussed . . . the attitude of the testing unit is evident and, in most cases, is the only picture of our hobby that the large majority of hams see. I have no desire to associate with negative egos.

Rodney Jackson WA9NZF, Jacksonville IL I have been reading *73 Magazine* since it was 73 cents, so you know I am not a new reader. In addition, I was not a young engineering or mathematical wonder. At the ripe old age of 22 I made the decision to enter into the ranks of amateur radio. My elmer was a 16-year-old boy who thought I might show some promise as a student. I have held every license from Novice through Advanced. Yes, I learned the code, as did everyone. No, I did not "love it" as many profess to today. I never really enjoyed it. And, I rarely used it. After all, what was the most important thing as a ham, anyway? *Talking* to other hams!

Now, you have really begun to get under my skin lately with your editorials. Why? Well, you seem to feel that *all of us over the age of 50* ("Old-Timers"): revere the code, cry about tube days, love AM, never made (or make) anything, don't know anything about the newer communication activities and, worst of all, are incapable of communicating anything meaningful to another person on amateur radio. Well, Wayne, you are wrong. If you would stop listening to 14.313 and K1MAN and "kerchunking vacant repeaters" while your wife plays with Prodigy (QSOs on a commercial land-link computer system . . . really now, Wayne), you might find real communicators. She'd better make more contacts on the Prodigy system than you do with your "kilowatt and full-sized 3-element beam"! I have never owned a kilowatt, yet my walls and files are full of cards from meaningful communications. Yep, you probably won't find too many communicators during contests, nor will you find them on 2m either, unless you try a new no-code ham. They do like to communicate. They haven't learned the bad habits from the other bands yet.

How does one communicate on amateur radio these days? Well, Wayne, I would suggest you take that cute little Macintosh Notebook ("Made in Japan," by the way) away from your wife and unplug it from the telephone. Plug it into a TNC and your 2m handie and switch to the digital modes. Now, before you get up in the air about packet racket, at least someone is there who will be able to communicate with you, and it sure beats kerchunking repeaters for the weekend. Computers . . . for kids? Heck no. I started in computer-driven digital communications about four years ago with a VIC-20. and, I still have it. Do I use an IBM clone? Heck no. Why should I? I use a great little Commodore 64. I have meaningful communications every time I make or answer a CQ, no matter which digital mode, packet, AMTOR or Baudot. We keyboarders *enjoy* communicating. I have had great talks with fellows all over the world. Yes, there are DX stations on digital communications that also enjoy more than the quickie QSO exchange.

Have you tried to learn a new language lately? Why not? Must we American hams continue to be so egotistical to insist everyone use English? There are a number of books available which allow the ham to communicate well with amateurs in almost any foreign language. One of them, *Rose*, is one of your advertisers. Rose Publications now has four books in print covering languages from Spanish to Japanese, from Korean to Chinese and from French to Serbo-Croation. Now, how in the world do you communicate in those languages? Easy. Use digital modes. Type it into the computer. Response from foreign hams? Outstanding. Much more interesting than QTH, WX, RIG, RST, NAME . . . 73!!!

So, good editor, please try to remember that there are those of us who are over 50, do communicate, do use computers, do enjoy the technology of today, and yes, sometimes remember the old days when this was not all possible, and praise the advances of *our day*.

As soon as it was possible to send printed messages I was doin' 'em. I started in 1949 with the Model 12 TTY and my homemade terminal—still have it out in the barn—about a dozen 6SN7GTs—complete with auto-start/stop.

I started out with this on 147.96, when that was the only band where FSK or AFSK was permitted. I helped W2BFD set up the first 2m repeater in NYC on top of the Municipal Building in 1950. I pioneered RTTY on 11m. Worked all around the country on 80m with make/break while we were fighting the ARRL to get FSK allowed on the low bands. You're preaching to the choir.

OK, so there are a few old hams who aren't spending what's left of their lives making things miserable for as many people as possible. A few . . . Wayne

Marshall Welch Jr. W3JBJ, Williamsport PA I thought long and hard before writing this letter. I almost didn't bother but I think I have a valid point which I don't think you can easily argue.

I have been reading your editorials where you constantly bitch, cry, whine, bellyache, complain, etc. about how badly we need more new (preferably younger) hams. We need to double, even triple our numbers, you say.

While at the Dayton Hamvention I found myself in several situations where, had you been nearby, I would have liked to slap your ears off. One situation—standing in a *long* line to use the bathroom—I waited 10 minutes. My bladder ached and felt like it would burst. WE NEED MORE HAMS!, I tell myself (Wayne says so). Heck, with proper bladder control I should be able to wait 20 minutes.

Another situation—a 20-minute wait in line to get a sandwich. WE NEED MORE HAMS!, I tell myself. (I didn't stand in line . . . I guess I really didn't want that sandwich anyway.) So, instead of a burger, I'll go check out the ICOM and Kenwood booths. What a mistake! It was a nightmare. WE NEED MORE HAMS! I finally get somewhere near these two exhibitors and I'm trapped. I can't move forward, backward, left or right. I can't move anywhere, let alone look at any of the new equipment displayed. What if someone had a medical emergency? What if there was some sort of a panic and a stampede? WE NEED MORE HAMS! If the fire marshall had been asleep, he would have woken up in a hot sweat and known why.

I arrive home and figure I'll give the HF rig a workout. I tune across 20 meters; maybe I'll call CQ. The band is *so* crowded I give up even trying to find a clear spot. Oh well, maybe I'll pop open a beer. (Wayne says NO!) Maybe I'll see what's on the boob tube. (Wayne says NO!) WE NEED MORE HAMS!

My point, Wayne, is that sometimes you are extremely biased and often wrong. A good example is this bull about how we gotta get a *lot* more hams. Why don't you loosen up a bit? Sometimes I think some of your ideas are as old as you are. Besides, most youngsters could care less about ham radio. If they want in, GREAT! By all means, elmer, encourage, and welcome them. But maybe they want to play with computers. Or, with girls!

Wayne, ham radio is doing just fine and growing at an acceptable rate. and it will continue to prosper long after you are gone. Take your panic button and disconnect it, OK?

I thought I was wrong once but I made a mistake . . . Wayne

Pete Bartholomey KD4GKQ, Jacksonville FL I just wanted to pass on a note concerning the direct frequency conversion for the Ramsey FX-146 article by Cecil Moore KG7BK in your June 1992 issue.

I bought his EPROM kit for my Ramsey FX-146 and when it arrived it was an improved version with excellent features but lacked the frequency coverage as outlined in the article. Since I was interested also in receiving the NOAA weather broadcasts on 162.550 MHz, I sent him a letter with that request.

Well, I must say he bent over backwards to find a solution. He sent me several sets of EPROMs with different solutions, the last one being the best and simplest to set up. Now I can tune all the NOAA frequencies instead of just one, plus all of the 2 meter frequencies and their offsets. It's apparent to me that he has a sensitivity to a reader's problem and was eager to help. My goal was met and I am very pleased with the article and his service.

As a brand-new Tech my very first amateur project was the Ramsey FX-146 transceiver as described by Rick Littlefield K1BQT in the December 1991 issue. I had a few problems but all were resolved.

73 Magazine is an inspiration, involving me in the inner workings of my gear and promoting the hobby as a whole. I look forward to similar articles in the future.

Ken Getzin, Rancho Palos Verdes CA A few weeks ago, during my once-in-every-decade peak of interest in amateur radio, I wandered into the local bookstore to buy a copy of *QST*. Alas, they had none and the only publication which had any promise of fulfilling my urge for information was your publication, the June issue of *73*. With some reluctance (after all, it was second choice), I made my purchase and retired to my home front to catch up on the past 10 years.

I was surprised! I found a well-written and edited publication, with information of interest to me. But what I really found to be of primary interest was your column, Wayne, "Never Say Die." As I implied earlier, I have a peak of interest in ham radio about every 10 years. This has been going on since I was in grammar school and, as I am approaching retirement, it has been a long time. Something always seemed to get in the way of getting my ticket. This time the breaks seem to be going my way. I had heard about the "no-code" license but had not taken this possibility seriously as I expected that such a license would just relegate me to operation on unpopular bands with low power. But after reading your magazine I found, to my delight, that I could indeed operate over a wide spectrum of useful bands and that equipment has improved to the point where, for a reasonable investment, I could almost immediately participate in the ham fraternity.

A second break I received was in the form of a notice I saw from the amateur radio club at work, W6VPZ/6, which was offering lunch-time classes for prospective codeless Technician licensees. I immediately signed up and by the time you read this letter I should have passed my test and will be awaiting my ticket. You mentioned the unfriendliness of some clubs to the codeless Technicians. I want to hold this club up as an example of the spirit of ham radio, as per part 97, as they want to help bring new hams into the fold, work hard to do it, and will continue to do so. Even though I won't have my license by then I expect to participate in the next Field Day at the end of the month (June), even if I am just a grunt helping to move the big delta they will be using for their QRP work.

This sort of brings me to the next break. Now that my appetite is whetted, I need to move on to the next step: "THE CODE." Here your editorial was also inspiring. For the first time I felt that there was a chance not only to get to 5 wpm but to 20 and beyond. I see an Extra ticket by a year from now. The ideas you recommended in your editorial relative to learning the code are quite interesting and if it works as you say it is a major breakthrough not only in the teaching of code but maybe even foreign languages. I would hope that you will expand upon your proposed teaching method in a future publication. In the meantime, I will take the challenge, and under separate cover I will be ordering your set of tapes and diving into the code.

Angus McLeod 8P6SM, Bridgetown, Barbados I think *73 Amateur Radio Today* is the best of the pack and I enjoy your "Never Say Die" editorial tremendously, but you really should take a leaf from your own book. I have just been rereading your editorial in the June 1992 issue and you finish with the suggestion that articles about digital audio and digital signal processing would be welcome. Why don't you stop skipping "that digital crapola" and give us the articles?

If by digital audio you mean hi-fi, it might be a little out of place in a publication intended for amateur *radio* but I for one would be generally interested. More so if a radio-related application could be devised. And I for one would be *absolutely thrilled* by an in-depth series followed by a regular column on DSP techniques. I own a DSP-12 and would love some tips on how to make it sit up and beg.

So, let's hear less about how the OTs would react. By definition, they will all be dead soon anyway. Give us the goods, Wayne, and let's see what happens next. 73

QRX . . .

Number 3 on your Feedback card

73 Awards Program Scam

A situation has been brought to our attention regarding *73*'s former awards program.

Many years ago, *73 Magazine* ran an extensive awards program, with different awards for working different areas of the world. This program has not been active for many years, yet many people continue to send the administrative fees and applications to the former awards manager (who does not work at the *73* offices in New Hampshire). It appears that this person, who we have been unable to contact, has been receiving applications and keeping the money.

THE ONLY AWARD CURRENTLY AUTHORIZED AND SPONSORED BY *73 AMATEUR RADIO TODAY* IS THE DX DYNASTY AWARD, AND THE MAILING ADDRESS FOR THAT AWARD IS THE SAME AS OUR EDITORIAL OFFICE (PETERBOROUGH, NEW HAMPSHIRE).

If you know of anyone who is active in certificate hunting, please pass along this information.

Text Released on Proposed "No-Business" Rule

The FCC released their *Notice of Proposed Rule Making* to lessen restrictions on permissible communications that amateur stations may transmit. In a nutshell, the Commission proposed to permit greater flexibility for public service and personal communications.

This proposal strikes at the very heart of ham radio since it details new directions in amateur communications. It is the most important proceeding since the codeless Technician matter.

Section 97.113 would be revised as follows:

97.113 Prohibited Transmissions

(a) No amateur station shall transmit:

(1) Communications for hire or for material compensation, direct or indirect, paid or promised except as otherwise provided in these rules;

(2) Communications in which the station licensee or control operator has a pecuniary interest including communications on behalf of an employer. Amateur operators may, however, notify other amateurs of the availability for sale or trade of apparatus normally used in an amateur station provided that such activity is not conducted on a regular basis;

(3) Music; Communication to facilitate a criminal act; Message in codes or ciphers intended to obscure the meaning thereof, except as otherwise provided herein; Obscene, indecent, or profane words or language; or false or deceptive messages, signals or identification;

(4) Communication on a regular basis which could reasonably be furnished alternatively through other radio services.

(b) An amateur shall not engage in any form of broadcasting. Nor may an amateur station transmit one way communications except as specifically provided in these rules; nor shall an amateur station engage in any activity related to program production or newsgathering for broadcasting purposes except that communications directly related to the immediate safety of human life or the protection of property may be provided by amateur stations to broadcasters for dissemination to the public where no other means of communication is reasonably available before or at the time of the event.

(c) A control operator may accept compensation as an incident of a teaching position during periods of time when an amateur station is used by that teacher as a part of classroom instruction at an educational institution.

(d) The control operator of a club station may accept compensation for the periods of time when the station is transmitting telegraphy practice or information bulletins provided that

(1) The station transmits the telegraphy practice and information bulletins for at least 40 hours per week;

(2) The station schedules operations on at least six amateur service MF and HF bands using reasonable measures to maximize coverage;

(3) Where the schedule of normal operating times and frequencies is published at least 30 days in advance of the actual transmissions; and

(4) Where the control operator does not accept any direct or indirect compensation for any other service as a control operator.

(e) No station shall retransmit programs or signals emanating from any type of radio station other than an amateur station, except propagation and weather forecast information originating from United States government stations, and communications originating from United States government stations, and communications originating on United States government frequencies between a space shuttle and its associated Earth stations. Prior approval for such retransmission must be obtained from the National Aeronautics and Space Administration. Such retransmissions must be obtained from the National Aeronautics and Space Administration. Such retransmissions must be for the exclusive use of amateur operators. Propagation, weather forecasts and shuttle retransmissions may not be conducted on a regular basis but only occasionally as an incident of normal amateur radio communications.

(f) No amateur station, except in auxiliary, repeater or space operation may automatically retransmit the radio signals of other amateur stations. *TNX W5YI Report, Vol. 14, Issue #14, July 15, 1992.*

New Radio Technology in Japan

The JARL (Japan Amateur Radio League) reports that Tohoku Electric Power Corp. has developed new radio technology that permits single frequency, two-way simultaneous radio communications. The end result is telephone-like audio because both sides of a voice conversion can be heard at the same time on a single frequency.

Most business radio stations use only one frequency; therefore a dispatcher and the receiver can not talk simultaneously. Each party must press the "push-to-talk" button whenever he or she wishes to speak and release the button to hear the other party.

The newly-developed radio system divides the operator's voice signals into 0.2-second sound segments and compresses them into half the time before transmission. The other half of the time is allocated to receiving similar messages from the other party. This allows both voices to be effectively transmitted at the same time on a single frequency.

JARL says the new technology can be utilized in other radio services—including amateur radio. *TNX W5YI Report, Vol. 14, Issue #14, July 15, 1992.*

"Let's Talk Radio Network" Sold; Now Operating from Los Angeles

Jim Bass has sold his satellite-delivered "Let's Talk Radio Network" to a consortium of media-related hams headed up by Blair Alper KA9SEQ and Frank Collins N6TAF. The LTRN service, which features programs geared toward ham, SWL and satellite dish owners, is delivered over the GTE Spacenet III (S3) communications satellite via Transponder 21, on the 6.2 MHz wideband audio subcarrier.

The new LTRN will be operated by a Board of Directors that includes Alper, Collins, Vern Jackson WAØRCR of the Gateway Net, Walt Garrett NØMAL of *Ham Stuff* and the Ham Radio Business Council, Hap Holly KC9RP of the Radio Amateur Information Network, and Bill Pasternak WA6ITF of Newsline. Other influential hams are being recruited as well.

The Let's Talk Radio Network is currently operating on the following schedule: Friday starting at 5 p.m. Eastern time continuously through 2 a.m. Sunday; Monday through Thursday, every evening from 5 p.m. through 1:30 a.m. Eastern time.

Among the wide array of communications-related programs there are several shows of specific interest to amateur radio operators. Every Tuesday night at 7 p.m. you can tune into the RAIN (Radio Amateur Information Network) Spotlight by Hap Holly KC9RP and at 8 p.m. you can listen to a show called the Elmer Classroom of the the Air that teaches amateur radio via the satellite. The Amateur Radio Weekly show airs every Saturday afternoon at 5 p.m. Eastern time. Hosted by Frank Collins N6TAF, this two-hour live segment offers amateur radio news items along with live interviews.

If you're interested in obtaining satellite air time, contact Frank Collins N6TAF or Blair Alper KA9SEQ at (800) 952-9810. *TNX Steve Coletti, Westlink Report No. 628, June 30, 1992 and Frank Collins N6TAF for the info.*

Three New Astronaut-Hams

Three more NASA astronauts have passed their Technician class examinations. All three took the test at the HamCom Convention in Houston the weekend of June 6th and are scheduled to join Pilot Ken Cameron KB5AWP on a shuttle mission in March of next year.

The three new ham-astronauts are Ellen Ochoa, Mike Foale and Ken Cockrell. Foale is reported to have bought a 2 meter rig at the convention and is gnashing his teeth waiting for his ticket to arrive. Ken Cameron KB5AWP last flew on STS-37 in April 1991. *TNX ARRL, Westlink Report No. 628, June 30, 1992.*

TNX . . .

. . . to all our contributors!

The RASER

A novel wire antenna system.

by James E. Taylor W2OZH

The length of a high-gain antenna for the 75 meter band is often limited by the available space. For example, my lot measures somewhat over 200 feet in the north-south direction and I would like to improve signal strength (gain) in the east-west direction. Conventional wisdom would dictate that I'm stuck with a half-wave dipole (length ~120 feet) because there isn't sufficient space available for a collinear two half-waves in phase (~240 feet). I would like to add length in the center of the dipole (where the radiation is greatest) in increments much less than 120 feet and still have the currents remain in-phase so as to increase the gain in the east-west direction.

Design details will be shown for two such enhanced dipoles. Both are fed with coaxial cable without the need for a separate tuner. One is end-fed and its development is described in some detail. The other is center-fed and it is covered at the end of this article. In each of the antennas the power gain relative to a dipole is a factor of two, with a length of less than 210 feet.

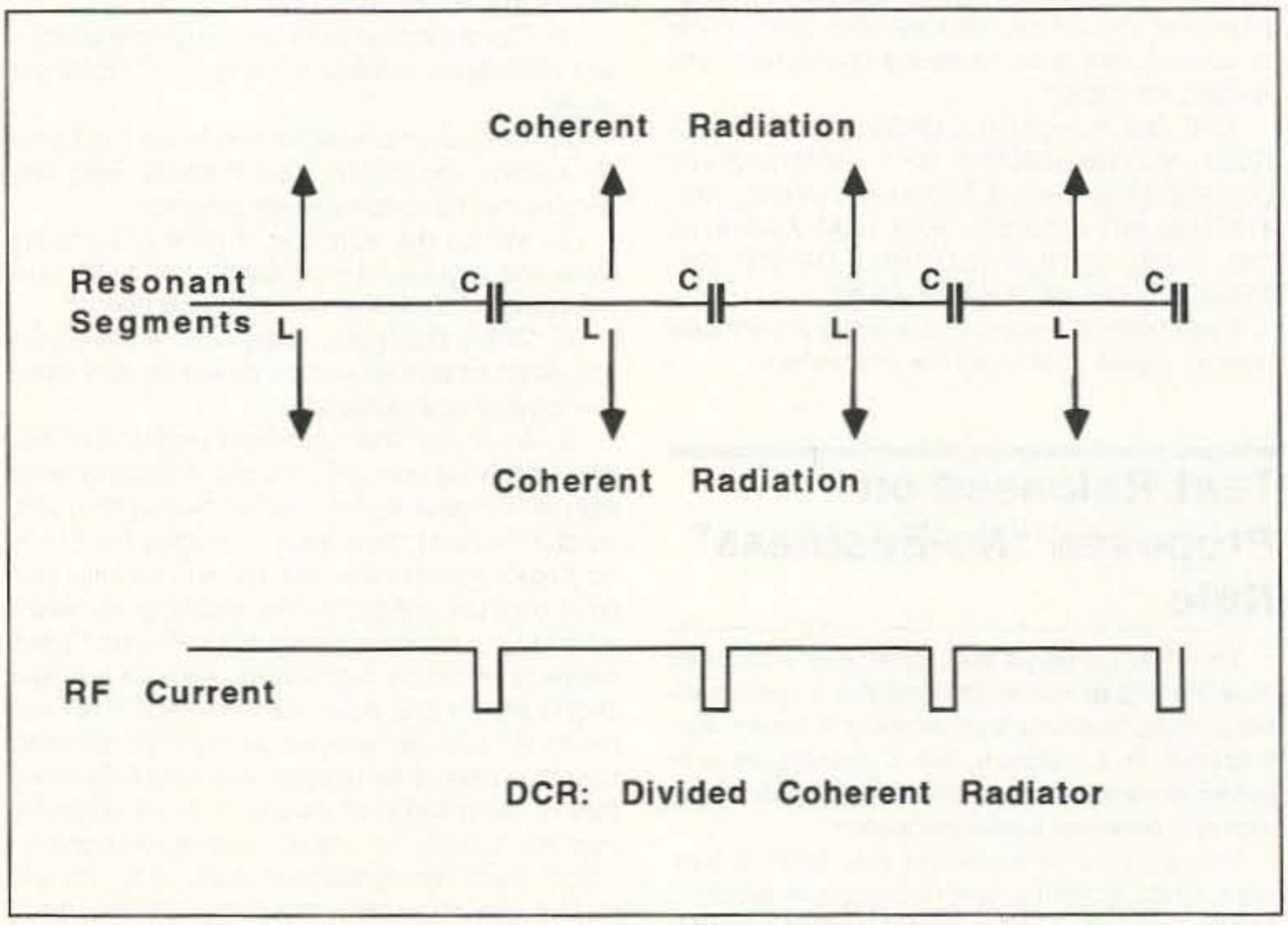

Figure 1. Divided coherent radiator

The Franklin/CCD Antenna Concept

Those who are familiar with the history of radio may know of the Franklin antenna, named after its inventor. This concept involves the modification of current distribution in the elements of an antenna by the introduction of series capacitors. General descriptions of early applications of the concept may be found in H. Jasick's *Antenna Engineering Handbook*, First Edition, pp. 4-35 and 4-36, McGraw-Hill publisher; or F. Terman's *Radio Engineers' Handbook*, First Edition, pp. 773 and 774, McGraw-Hill. Harry Mills W4FD and others have adapted the concept to the ham bands in the form of resonant dipoles or loops fed with high impedance line. Mills developed a resonant radiating system which, for 80 meters, was made up of 48 self-resonant sections, each 70 inches long—a total length of 280 feet. See H. Mills & G. Brizendine, "Antenna Design: Something New!," *73 Magazine*, Oct. 1978, pp. 282-289. Kaplan & Bauer developed calculations for "stretched" resonant radiators made up of multiple tuned sections where the series tuning capacitance is half that needed to resonate the wire in each section, the other half being used to resonate the

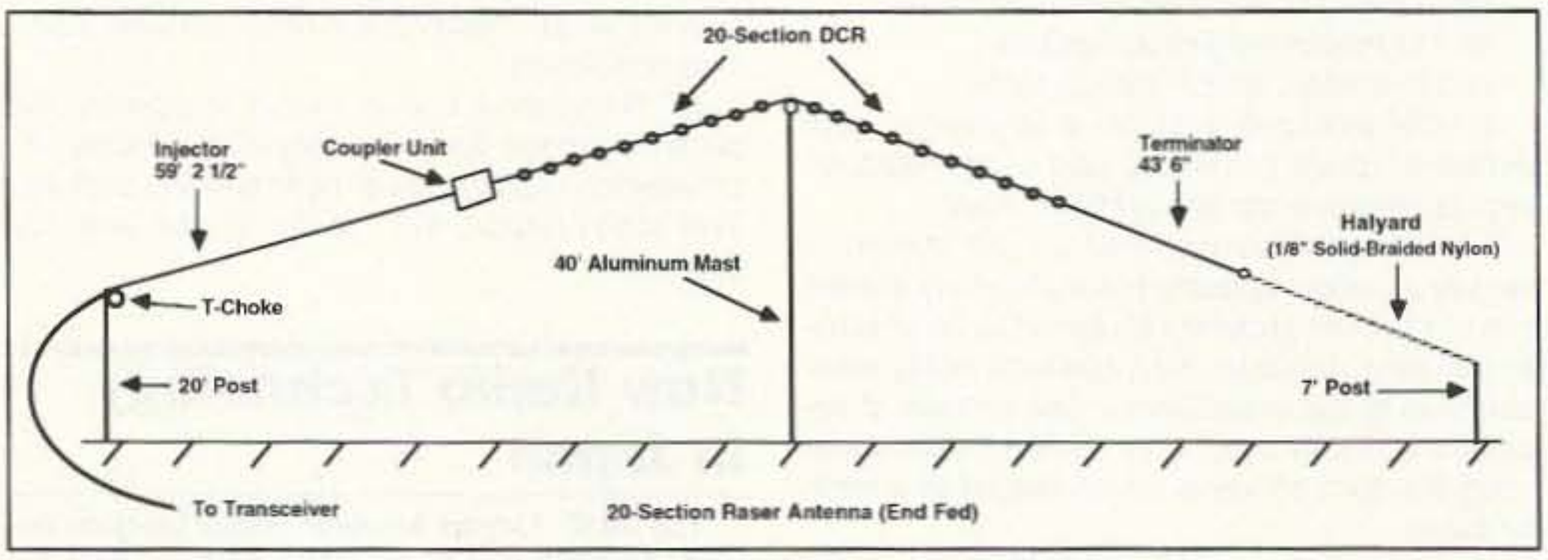

Figure 2. 20-section RASER antenna (end-fed).

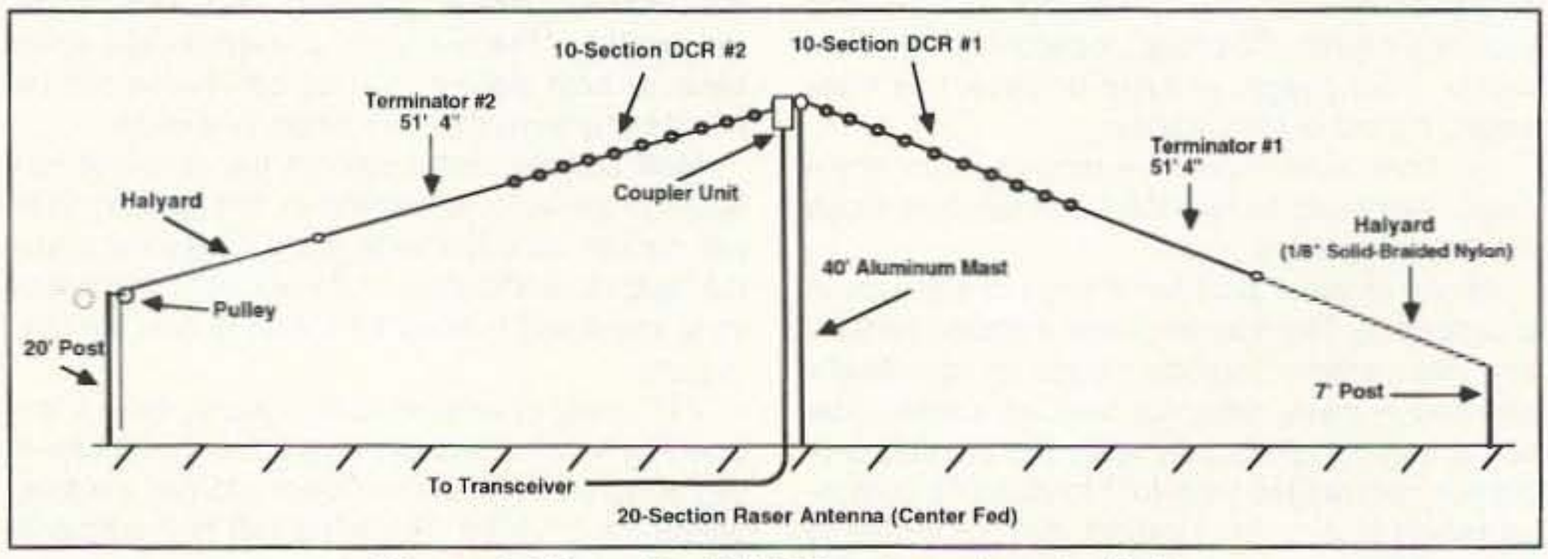

Figure 3. 20-section RASER antenna (center-fed).

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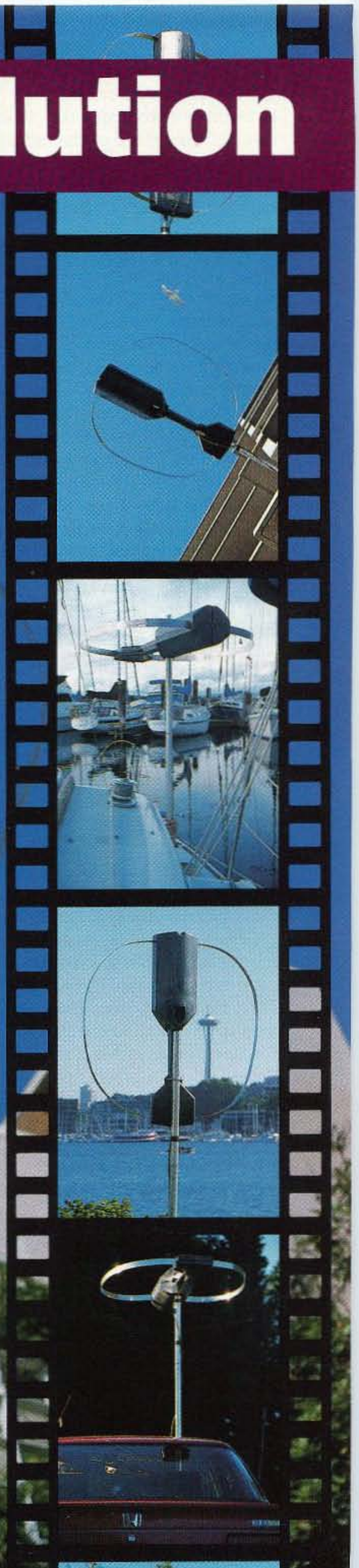

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system. In this case, care must be exercised to avoid compromising the phase and, therefore, the coherence of the radiation from the separate sections (see S. Kaplan & E. Bauer, "The Controlled Current Distribution Antenna," *ARRL Antenna Compendium*, Vol. 2, pp. 132-135).

This project uses a different approach. Here we insert series self-resonant sections into a resonant dipole antenna. This results in a coherent (in-phase) radiator for 75 meters, having extended length with a corresponding increase of gain and aperture. A simple empirical method is given to accomplish this without complicated computations. In the past such an arrangement has been referred to by the acronym CCD: Controlled Current Distribution. However, that acronym is now almost universally accepted to mean Charge-Coupled Device. Thus, I prefer to use the less confusing term "DCR": Divided Coherent Radiator.

The Divided Coherent Radiator Concept

If we consider a short length of wire carrying RF current, it has an inductance which can be readily calculated. If the current is to be essentially constant along the wire, its length must be a small fraction of a wavelength—for example, a fiftieth of a wavelength. For a chosen frequency the value of series capacitance required for resonance can then be calculated. At this frequency the tuned circuit is, of course, non-reactive; that is, essentially, it acts like an element of pure radiation resistance. If we place several of these tuned sections in series, as in Figure 1, their currents will be in-phase and the resulting radiation will be coherent, i.e. mutually reinforcing. Note that we are placing the DCR elements of pure radiation resistance in the center of a dipole which is then trimmed for resonance, rather than demanding that the entire multi-tuned structure be self-resonant.

The RASER Configurations—End-Fed and Center-Fed

This antenna is called a RASER because of its broad functional commonality with the LASER—both utilize multiple coherent radiating elements to achieve gain. Two RASER configurations were developed in response to needs generated by different site restrictions. The first, for end-feed, is derived from the RFD design ("RFD-1 and RFD-2: Resonant Feed-Line Dipoles," by J. Taylor, *QST*, August 1991, pp. 24-27). A second configuration, for center-feed, is reviewed briefly. Both use coaxial feedline. Neither design requires an antenna tuner and each provides an excellent impedance match with adequate bandwidth for normal amateur use. Figure 2 shows the final dimensions of the end-fed RASER and Figure 3 shows the center-fed arrangement. Of course, the heights above ground may vary for other locations.

Increasing the Aperture

Figure 4 is a diagram of the basic RFD-1 antenna system (shown in *QST*, August 1991, pp. 24-27, ref. above). Here I have labeled the input branch of the dipole radiator the "Injector" and the output branch the "Terminator." To develop this antenna, I first resonated the RFD-1 in the normal fashion, then introduced as many DCR sections as desired between the injector and the terminator. Since the RFD-1 is a resonant dipole antenna it continues to function as such even after the essentially non-reactive DCR sections are inserted, but with increased aperture and gain. *[Ed. Note: Due to the sinusoidal distribution of current in the dipole, the principal radiation will be from near its center. For example, the distance between the 6 dB power points (current 1/2 the maximum value) will be λ/3 for 75 meters, about 80 feet. This is a measure of the aperture over which the radiated wavefront is approximately plane. Thus, if we can add a DCR effectively equal to this length we will have doubled the aperture of the antenna.]* Residual mutual inductive and capacitive effects within the radiating system are compensated for by shortening both the DCR sections and the terminator. Simple coupler units (see Figures 5 & 10) assures accurate impedance matching at the desired resonant frequency.

Determination of DCR Design Parameters

The optimum lengths of the tuned sections of the DCR were determined by first calculating the inductance of a λ/50 length, then calculating the capacitance required for resonance (see F. Terman's, *Radio Engineer's Handbook*, First Edition, p. 48ff.). These simple calculations do not take into account mutual inductance and capacitance among the adjacent sections of the DCR. These effects were conveniently compensated for experimentally. The resulting parameters are shown in Table 1. Values for other frequencies can be scaled from these values.

These values are of key importance in the scaling of future RASER antennas for other frequencies. During the development of the design, I used, successively, DCRs having segments of several different numbers of sections which were mechanically separable by coaxial connectors. This was to derive and confirm the parameters of coupling and the optimum lengths of the sections and of the terminator as described above. However, now that the parameters have been determined, these tests need not be repeated in the future. I decided on a 20-section RASER because my lot is only about 220 feet from front to back. However, you can use more or fewer sections, depending on site dimensions—only the terminator dimensions and the coupler constants need be appropriately readjusted (see Table 1) to compensate. Alternatively, the RASER can be bent around the site, but with a less predictable pattern. Nevertheless, the increased aperture will still be beneficial, as will the other advantages cited by Kaplan and Bauer, including: improved directivity, reduced end effects and attendant losses, improved flexibility of scaling its length, broadband characteristics, and better operation close to the earth.

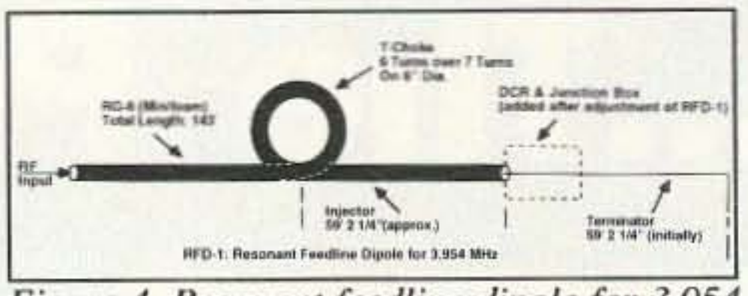

Figure 4. Resonant feedline dipole for 3.954 MHz

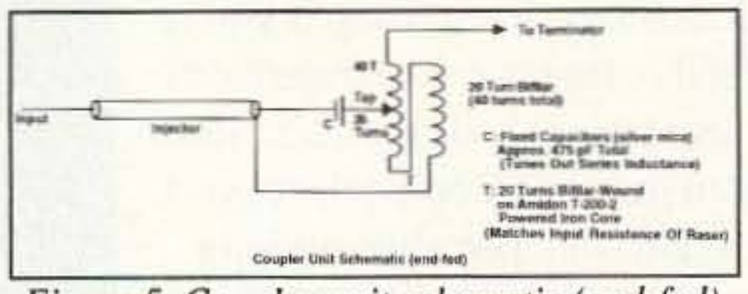

Figure 5. Coupler unit schematic (end-fed).

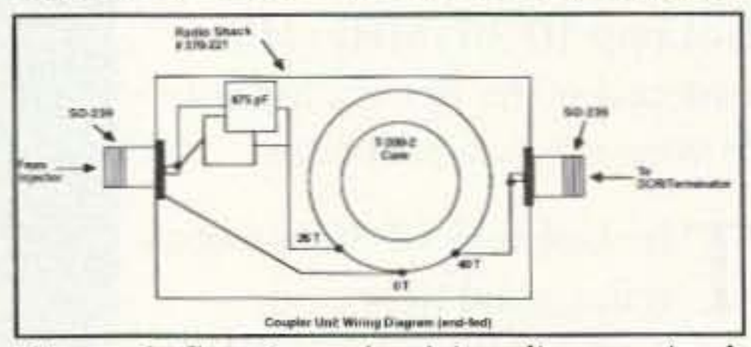

Figure 6. Coupler unit wiring diagram (end-fed).

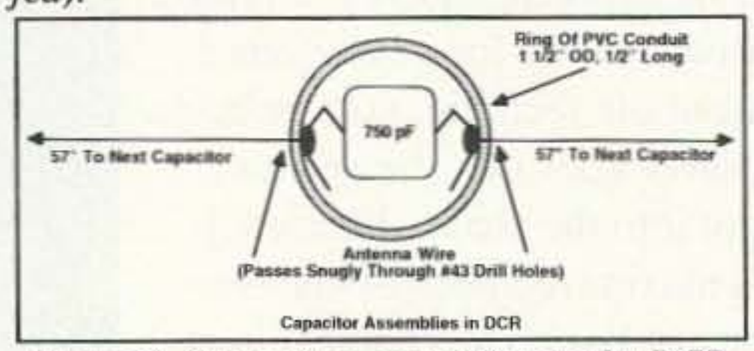

Figure 7. Capacitor assemblies in the DCR.

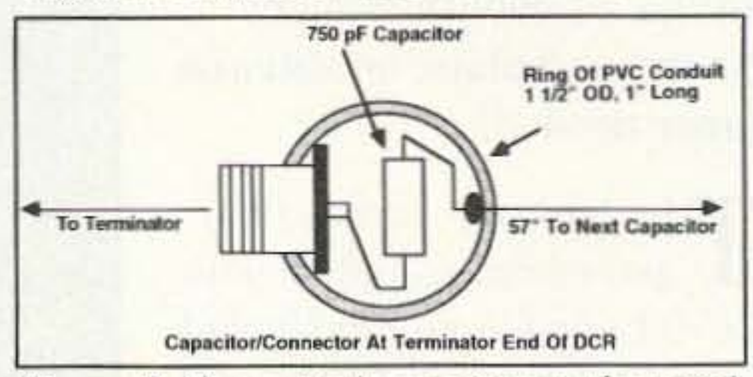

Figure 8. Capacitor/connector at the terminator end of the DCR.

Coupling to the RASER

The addition of the DCR to the RFD-1 antenna increases the input impedance from the 50 ohm resistive value. This is because of the added radiation resistance and also because of any residual mutual reactance introduced. Several approaches were considered but the simplest and most satisfactory involved the use of a powdered iron toroidal autotransformer with a selected, fixed, series capacitor at its input, as shown in Figure 5. The bifilar transformer serves, primarily, to match the impedance to that of the line; the capacitor tunes out residual series inductance. This simple, compact coupler circuit, housed in a convenient plastic housing, (see the Parts List) enables a precise 1:1 SWR.

Referring to the Parts List, the recommended feedline is RG-8/M (Minifoam) having a total length of 143': (~59' Injector + ~22' T-Choke + ~62' λ/4 Lead-in). The minifoam is chosen for its light weight and the 62' (~λ/4) lead-in provides a measure of

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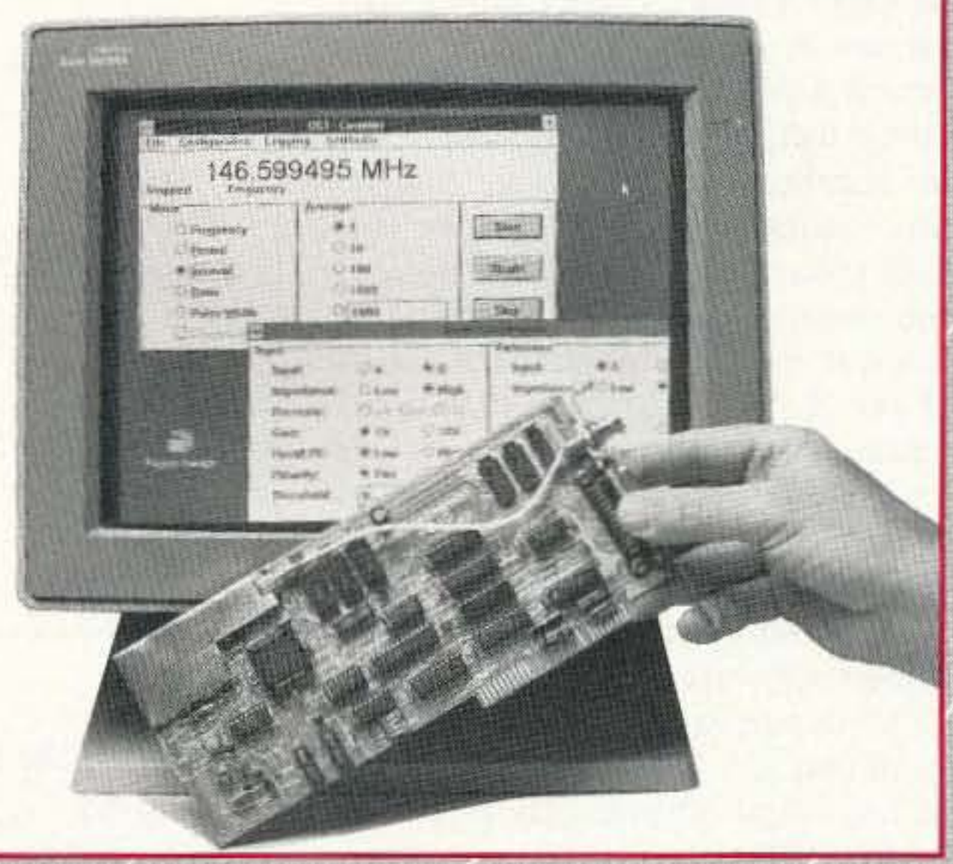

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added isolation. For convenience, I have used coaxial connectors at strategic spots. Two SO-239s are mounted in the two ends of the coupler box which contains the auto-transformer and the fixed capacitor(s), C, as shown in Figures 5 and 6. Final adjustments are described below. The T-choke is wound on a plastic spool. The spools which I used were the red plastic items which wire suppliers have. The winding channel is 6" diameter x 2-1/4" wide. The T-choke comprises seven turns close-wound with six turns wound back in a second layer so that turn #13 is adjacent to turn #1. This coil is adjusted using a noise bridge or an SWR bridge. A supporting rope is tied around the spool and the T-choke is raised for final adjustment of the RFD-1.

Fabrication of the DCR Sections

The DCR sections were designed for strength, lightness of weight and low wind resistance. Cut 20 lengths of the antenna wire to 57" each. The 750 pF capacitors are each contained in 1/2" long rings cut from the PVC tubular conduit. The rings can be neatly cut using a rotary copper tubing cutter. I did it best by supporting the conduit internally using a plastic fitting (available at the plumbing distributor) slipped inside. The cutter was clamped in a bench vice and the tubing was rotated to produce a clean cut. (The DCRs should be tested in the system before the potting compound is applied.) The capacitor assemblies are shown in Figures 7 and 8. The leads of the capacitor and the stranded wire are bent for stress relief. An excess of solder is used here to reinforce these joints as there can be considerable torsion during high winds. The terminator was initially measured to be 59' 2-1/4" long after allowance for the end insulator which is, conveniently, one of the 1/2" long rings of conduit. This terminator length was used for initial adjustments of the T-choke in the RFD-1. After these adjustments, the terminator length was reduced to the final value of 43-1/2' (for the 20-section RASER).

Construction of the Supporting Mast

As with any low frequency antenna system, all parts of the RASER should be mounted as high as possible above ground. At W2OZH I have, for a number of years, used a 2-element phased array (see J. Taylor, "An 80m Phased Array," *73 Magazine*, March 1975, pp. 52-54, 56) with the manifest advantages of switchable directivity. I now use two 20-section RASERs in such an array. The arrangement shown in Figure 9 has proved to be quite practical for the two masts supporting the RASER elements. The 4" diameter aluminum pipe is light, easily erected, and it is sufficiently rigid to permit minimal guying. The pivoted cord-reel at the top acts like a huge pulley so that rope, knots, clamps, insulators, etc. can be easily pulled over the top with no trouble—a great advantage both for installation and experimentation.

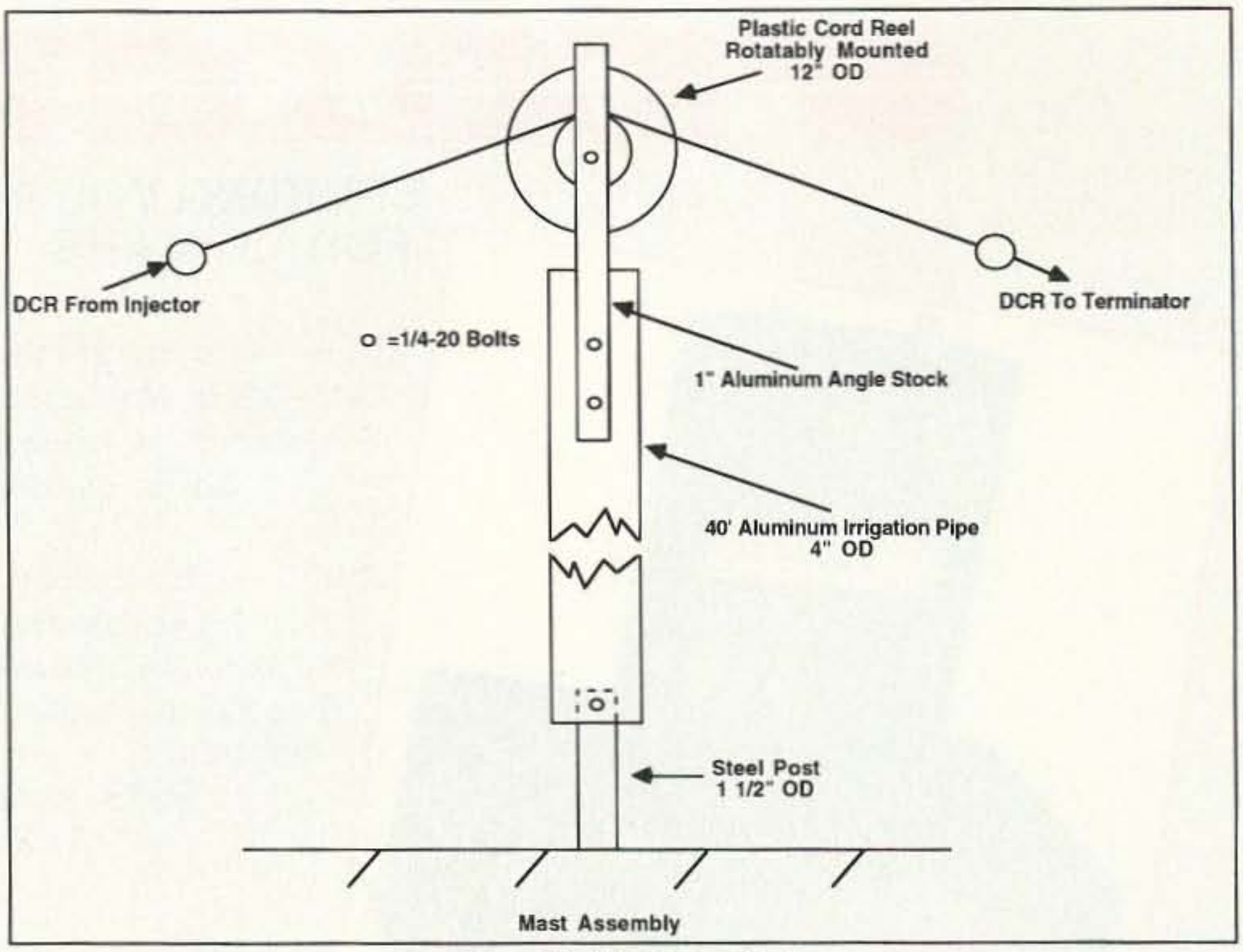

Figure 9. Mast assembly.

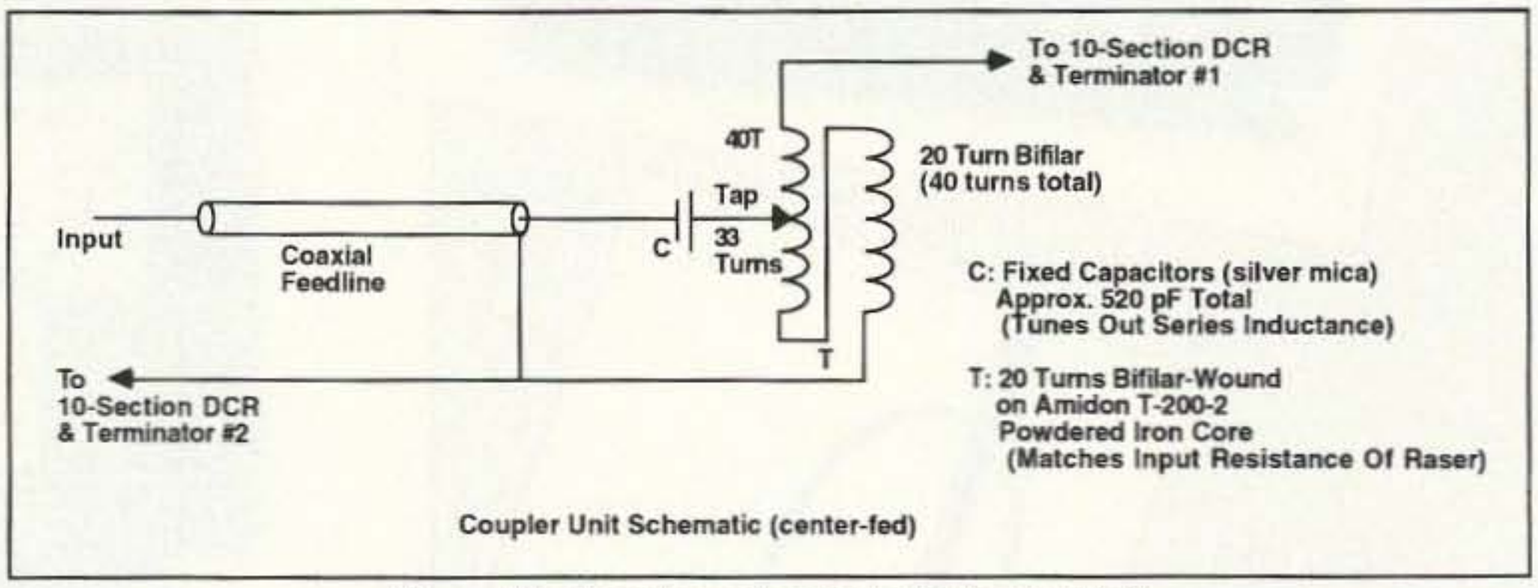

Figure 10. Coupler unit schematic (center-fed).

Resonating the RFD-1

The RFD-1 was assembled as in Figure 4 and adjusted for 50 ohms input resistance as mentioned above (without the DCR and coupler). After the T-choke has been adjusted, the coil is taped in place so that the windings won't shift. We are now ready to adjust the complete RASER.

Adjusting the Coupler

The capacitance and the position of the tap in the coupler are determined after the length of the terminator has been reduced, from Table 1, as appropriate for the number of sections chosen for the DCR. First, the tap and the silver-mica capacitors can be clipped in place and the antenna raised to its normal height before measuring the input impedance, for example, using a noise bridge. From my experience, it should not be necessary to compromise on these values—a precise 1:1 SWR should be attainable. For the two 20-section end-fed RASERS constructed the taps turned out to be at 24 turns and 28 turns and the capacitance 465 pF and 487 pF respectively. Thus, the mean values of 26 turns and about 476 pF should be a good starting point for a specific installation of a 20-section RASER. For another number of sections in the DCR the terminator will be changed appropriately from the initial value from Table 1. The proper tap and capacitor are then determined experimentally. I found a variable capacitor or decade box to be quite valuable for such preliminary measurements, which were first made with the coupler box at stepladder height.

Results

One question which occurs for any antenna is: What is the SWR as a function of frequency? I measured the SWR for two 20-element RASER systems using a Heath SWR bridge at the input to the two-wavelength-long feedline used. For each, the measured value was 1:1 from 3.900 to 4.000 MHz. The value was less than 1.1:1 from 3.850 to 4.050 and under 1.5:1 from 3.750 to 4.200 MHz. Thus, the system has a relatively broad passband. One other experiment was done to confirm the proper operation of the DCR. A 10-section RASER was erected at stepladder height and the RF current in the DCR sections and in the adjacent injector and the terminator were checked, using an

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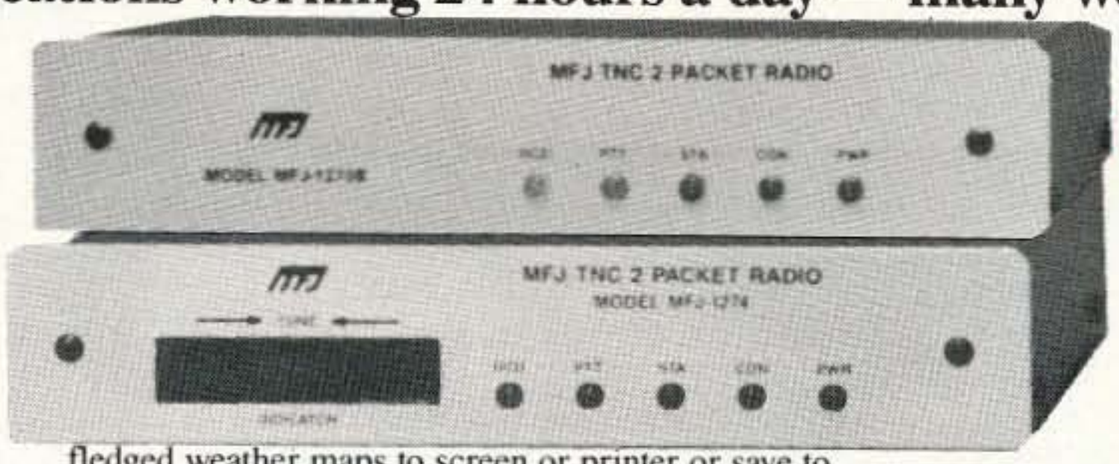

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Yaesu 8 pin radios	MFJ-5080	MFJ-5080X	MFJ-5080Z	MFJ-5080Y[4] MFJ-5080YH[4]
Icom 8 pin radios	MFJ-5084	MFJ-5084X	MFJ-5084Z	MFJ-5084Y[4] MFJ-5084YH[4]
Kenwood/Alinco 8 pin radios	MFJ-5086	MFJ-5086X	MFJ-5086Z	MFJ-5086Y[4] MFJ-5086YH[4]

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Table 1. Raser Parameters—Calculated and Empirical

Assumed frequency: 3.954 MHz
Initial lengths of RFD-1 injector and terminator: 59' 2 1/4"
Wavelength: 249'
1/50 wavelength: ~5'
Capacitance for resonance: ~750 pF
Calculated self-inductance: 2.15 µH
Empirically determined optimum values:
DCR Length: 57" per section
Reduction of terminator per DCR section added: 9.425"
Calculated terminator length for 20-section RASER: 43-1/2'

RASER Parts List (For convenience, optional suppliers are indicated)

#200'	Antenna wire	7 x #22, stranded, copper-clad (W1JC)	
143'	Coaxial cable	RG-8 (minifoam) (Radio Shack)	
1	Plastic box	4" x 2-7/16" x 1-1/16" (Radio Shack)	
Assorted	Silver-mica capacitors	50 pF to 500 pF	(Fertik's Electronics, 5400 Ella St., Philadelphia PA 19120)
20	Silver mica capacitors	750 pF	(Fertik's)
#5'	Thin-walled PVC conduit	1-1/2" o.d.	(MPT db4PVC1120 at plumbing distributor)
Foam epoxy potting compound for electronic assemblies			(Spray-can insulating foam for plumbing sealing should work.)
#1	Type T-200-2 powdered iron core		(Amidon Associates, 12033 Otsego St., N. Hollywood CA 91607)
10'	Parallel bell wire	2 x #20 in plastic sheath	(Servistar Hardware Store)
4	Type SO-239 coaxial sockets	(Radio Shack)	

MFJ H-Field probe. The meter measured essentially the same reading throughout, indicating the desired constant-current operation of the DCR sections.

The RASER system produces a readily discernible gain over a non-enhanced dipole. Two RASERs used in a switchable phased-array (see J. Taylor, "An 80m Phased Array," referenced above) gave front-to-back ratios as high as 35 decibels. The directivity of each RASER is quite pronounced. Reported signal strengths are outstanding with output power of 100 watts or less. Stations in the preferred E-W direction are worked with uniform superiority, whereas those in the N-S direction are seldom worked—there is no free lunch! The RASER phased array has been in operation at W2OZH for a year now and it has shown clear improvement over the dipole-based array previously used.

Addendum: The Center-Fed RASER (A Double-Edged RASER)

The RASER described, shown in Figure 2, is most suitable for sites which favor an end-fed antenna. For sites which favor **center-feed**, the version shown in Figure 3 was constructed using the principles already developed. Briefly, it was only necessary to split the 20-section DCR into two equal parts and connect a coaxial feedline into a coupler unit at this point. The injector of the RASER was replaced by a second terminator. Each of the two terminators is 51' 4". The diagrams, Figures 3 and 10, indicate the changes in geometry and coupler constants. The center-fed RASER is currently in daily use in the phased-array at W2OZH, with results which are essentially the same as those experienced for the end-fed RASER.

Conclusion

This development project was initiated to satisfy the need for an end-fed dipole antenna system having enhanced gain while retaining the efficiency and simplicity of feed which is characteristic of the RFD approach. The RASER system described above provides the desired enhancement. It offers an excellent match to the transceiver, without a separate antenna tuner, and without a dangling feedline to contend with. The concept is applicable to other bands and, because of its broadband characteristics, all-band operation, using an external tuner, should be possible. For locations where center feed is desired, suitable changes in design values were developed and tested.

Acknowledgments

I wish to acknowledge encouraging telephone conversations with Harry Mills W4FD, and with Gene Brizendine W4ATE, whose joint paper originally triggered my interest. Thanks are also due the numerous 75 meter hams who showed interest and who gave me comparative signal strength reports.

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My Longwire Antenna

Cheap, no-fuss and it's got gain!

by Dean Frazier NH6XK

There are instances when a ham wants propagation in several general directions, with gain, on more than two or three bands, to take advantage of different propagation conditions at different times of day. Living in Hawaii, almost all of my HF work is off-island DX, across water, for very long hauls. It is very enjoyable to be able to operate all bands through the day and into the night as each band "comes in" and subsequently "goes dead"—early morning 20 meters to Africa/Europe; 10 meters in the day to the U.S. mainland, VK-land, and Asia; 12, 15, and 17 to Oceania; 20 again to South America, as well as 15 meters, in the afternoon; 30 meter CW in the evening to almost anywhere; 40 meters in the evening to VK, ZL, and the U.S. mainland; and 80 meters also to the big "Big Island."

My longwire puts signals on all of these bands, just about centered in each of the directions I wish to propagate. It's a cheap, no-fuss antenna (it's a piece of wire!), and it's got gain.

The Longwire

My end-fed longwire runs 414 feet east-west, and averages 20 or so feet above the ground, a modest setup indeed. But, contrary to what all the books say, I don't experience RF in the shack, as would be expected from an unbalanced antenna, but this is probably because of the way I feed it.

The radio output, either direct or through my linear (after low-pass filtering), runs through a simple random wire tuner (L/C "Box"), and then out the window for about 100 feet on RG8 coax. The antenna, covered with #12 wire PVC, takes off from the center conductor of the coax, and terminates in an insulator which is tied off to a bush, with nylon line. The antenna starts at the rear peak of the house, crosses the backyard in the clear, and then disappears into a forest to the east. Fully three-quarters of the antenna is literally "buried" in the forest, which slopes down into a rather deep gulch. I consistently receive amazing signal reports from the U.S. mainland and South America.

The coax itself is air RF choked at both ends, just past the random wire tuner and just before the feed point, with six turns of the coax wrapped tightly to a diameter of six inches, taped together. I clamp quarter-wave counterpoise wires for all of the bands to the braid side of the coax at the feedpoint, and fan the wires out on the roof.

In the directions of the primary lobes of the antenna, it beats my dipoles, my R5, and horizontal-half-wave inductively-loaded "baby" loops. And it's inconspicuous—towers/beams etc. are not allowed in the planned community on Oahu where I live. On 10 meters, for example, when the background noise level is very high, as it is now as Cycle 22 takes a swan dive and few stations are heard, I have been told by hams on the mainland that my S9+ signal is a "real crusher."

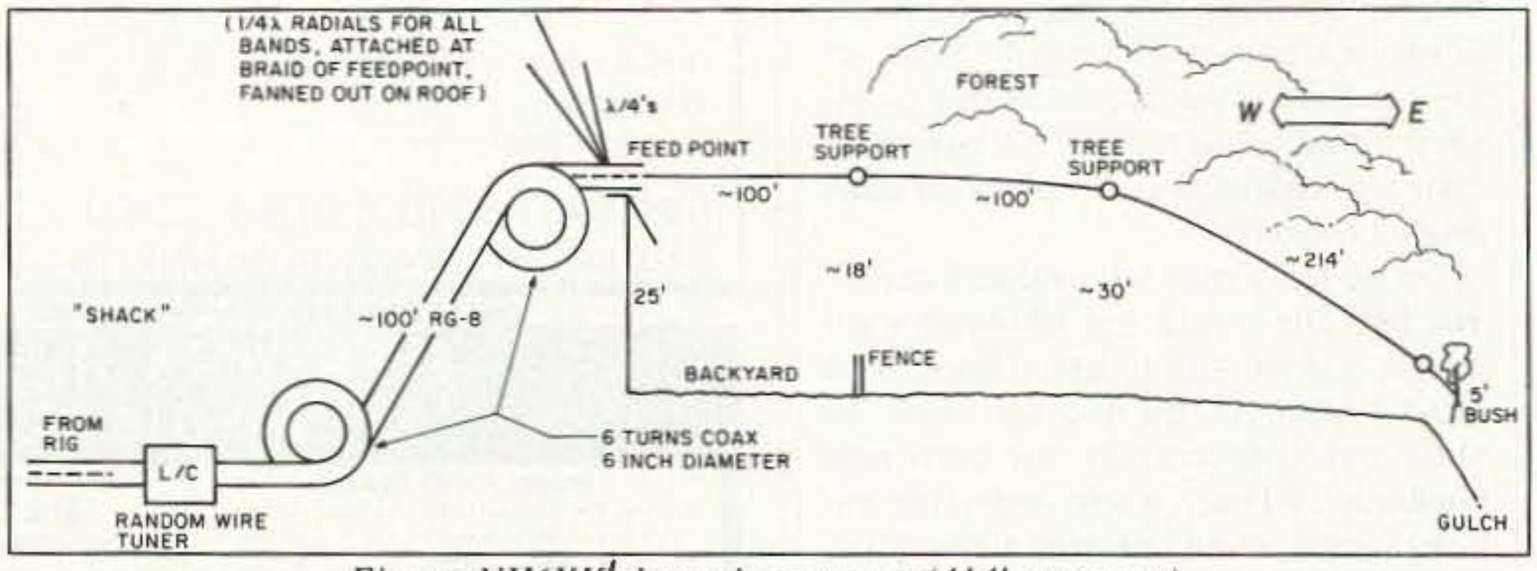

Figure. NH6XK's longwire antenna (414' east-west).

With a wire this long, the antenna impedance will be on the order of 500 to 600 ohms at average heights above ground. This presents a mismatch of about 10- or 12-to-one at the radio. But via the tuner in my TS-440S (balun about 3 or 4 to 1) and the L/C box itself (another 3 or 4 to 1), the mismatch is easily compensated for, e.g., 3:1 x 4:1 = 12:1.

Pertinent data concerning my antenna is given in the sidebar.

Recall that a gain of 3 dB is equivalent to doubling your power; 6 dB gain is a double-double, i.e., 100 watts becomes 400 watts; and a 9 dB gain is a double-triple, or 800 watts equivalent for 100 watts.

You don't need this much wire (414 feet) to realize gains; I just happen to be fortunate enough to be able to put out this much. Even a modest 68 feet will give you some gain over a dipole, and access to four bands.

Here are longwire lengths which I have tried, with their expected performance:

Length (Feet)	Bands Covered (Meters)	Gain (dBd) on 20 Meters
68	10, 15, 20, 40	1/2
137	10, 12, 15, 17, 20, 30, 40, 80	1-1/2
206	10, 12, 15, 17, 20, 30, 40, 80	2
275	10, 12, 15, 17, 20, 30, 40, 80, 160	3
372	10, 12, 15, 17, 20, 30, 40, 80, 160	4-1/2
414	10, 12, 15, 17, 20, 30, 40, 80, 160	5

NOTE: Gains will be in excess of these figures on higher frequency bands—as you have more waves on the wire, the shorter the wavelength. The converse is true of lower frequency bands.

The Figure shows how I have set up my longwire.

The bottom line is that if you are looking for a simple antenna which will cover all the bands, costs next to nothing to make, and has gain and directionability, a simple longwire may be hard to match, except by two of them (called a rhombic), of course. And there's no need to be put off by admonishments that you'll get "RF in the shack"—just choke off antenna currents as described.

If you've never tried a longwire, you have missed an opportunity to discover how simple and inexpensive an antenna can be, and still be very, very effective. 73

NH6XK's Longwire Antenna

Band Meters	Number of Full Waves on Wire	Horizontal Angle Of Major Lobes, From Wire Axis, Degrees	Radiation Angle, Degrees	Gain dBd
10	12	15	18	9
12	10-1/2	16	23	8
15	9	17	27	7
17	7-1/2	18	30	6
20	6	20	30	5
30	4-1/2	22	30	4
40	3	28	30	3
80	1-1/2	42	30	2
160	7/8	57	30	1

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Wideband RF Baluns

A practical guide to the perfect match.

by Carl Markle K8IHQ

Amateurs who have been in the hobby for a few years know that many articles have appeared in various magazines and publications describing balun RF transformers. Much of this material has been written with very little practical applications information. Most articles either contain just enough information to allow the reader to construct (monkey see, monkey do), or go to the other extreme and include involved mathematical and theoretical explanations. Most readers want middle-of-the-road information with appropriate references to answer the more technical or application-type questions.

This article will answer some of the basic questions: What is a balun transformer? When does an application require a balun? How do you construct an efficient balun transformer? Where can you purchase component parts? I will also provide cost, performance, and technical information.

What is a Balun?

The word balun is an acronym describing a transformer. The letters "bal-un" stand for *bal*anced-to-*un*balanced impedance matching. This is to say that either the balanced or unbalanced windings may be used for input or output; the device will match unbalanced-to-balanced or balanced-to-unbalanced devices. Applications might include coax-to-ladder line, antenna arrays, and multiband antenna systems. The ratio required for a given application can be from 1:1 up to 1:16.

When to Use Baluns

The most obvious use is in matching a 50 or 75 ohm coax transmission line to an antenna system. This is especially true if it is a multiband antenna system.

One example is when connecting to a center-fed dipole antenna with a 1:1 ratio balun. Both sides of the dipole will provide equal half-power RF lobes, thus providing an undistorted figure-eight pattern. The second advantage of the unbalanced-to-balanced match in this situation is minimization of the TVI interference caused by the radiation of the coax shield instead of the dipole antenna. You will also notice that the SWR meter will start telling the truth about the actual standing waves present on the coax. Regardless of what is said, a low SWR is desirable because it ensures against high RF voltage breakdown on the coax line. It also gets all the RF power to the radiating antenna system, not allowing the feedline to radiate. In the chapter listing coax cable losses, *The ARRL Antenna Handbook* explains that the foam-type coax cable has very low breakdown voltages, which is not the case with the solid types. Some of these values are as low as 600 volts.

When using baluns at low frequencies, from 1.8 through 7.0 MHz, it is obvious that a coax-type balun would be physically very large and heavy and not practical. The second type of balun to be considered is the air-wound type. Because of the large number of turns required, it too would be a very poor choice. The most practical choice to cover this frequency spectrum is a ferrite or iron core wideband RF transformer. This core could be either a rod or the toroidal type. These types of baluns are the most practical type of matching device for transmitting uses to match the antenna to the transmission line. This is particularly true when multiband, i.e. 160, 80, 40 meter operation, is anticipated. It would be quite difficult, if not impossible, to mount an antenna tuner between the transmission line and the antenna. The remote tuning system would be expensive and very difficult to use because it would require retuning on each band before using. The wideband RF balun transformer is the most practical solution to this problem.

When selecting an appropriate core, consider its A_L factor (the inductance index) since the higher the A_L, the less the number of turns that are required to provide the inductance necessary at 1.8 MHz. Again, the use of a rod or toroidal core is a matter of the builder's choice. I chose the iron toroidal cores over the ferrite rod and toroidal types. The T-200-2 (2" o.d.) type of iron core is a good choice because it has an inductance index (A_L) of 49 and a permeability (μ) of 10.. With 14 turns of AWG14 magnet wire, the center resonant point falls into approximately 3.5 MHz, where 10 turns falls in at about 15 MHz.

The difference between iron and ferrite is usually only two turns, and certainly not a good trade-off in favor of ferrite. I discourage using ferrite because tests have proved that if high SWR occurs, heating of the core will also occur. High power core saturation can also cause heating of the core. If heating

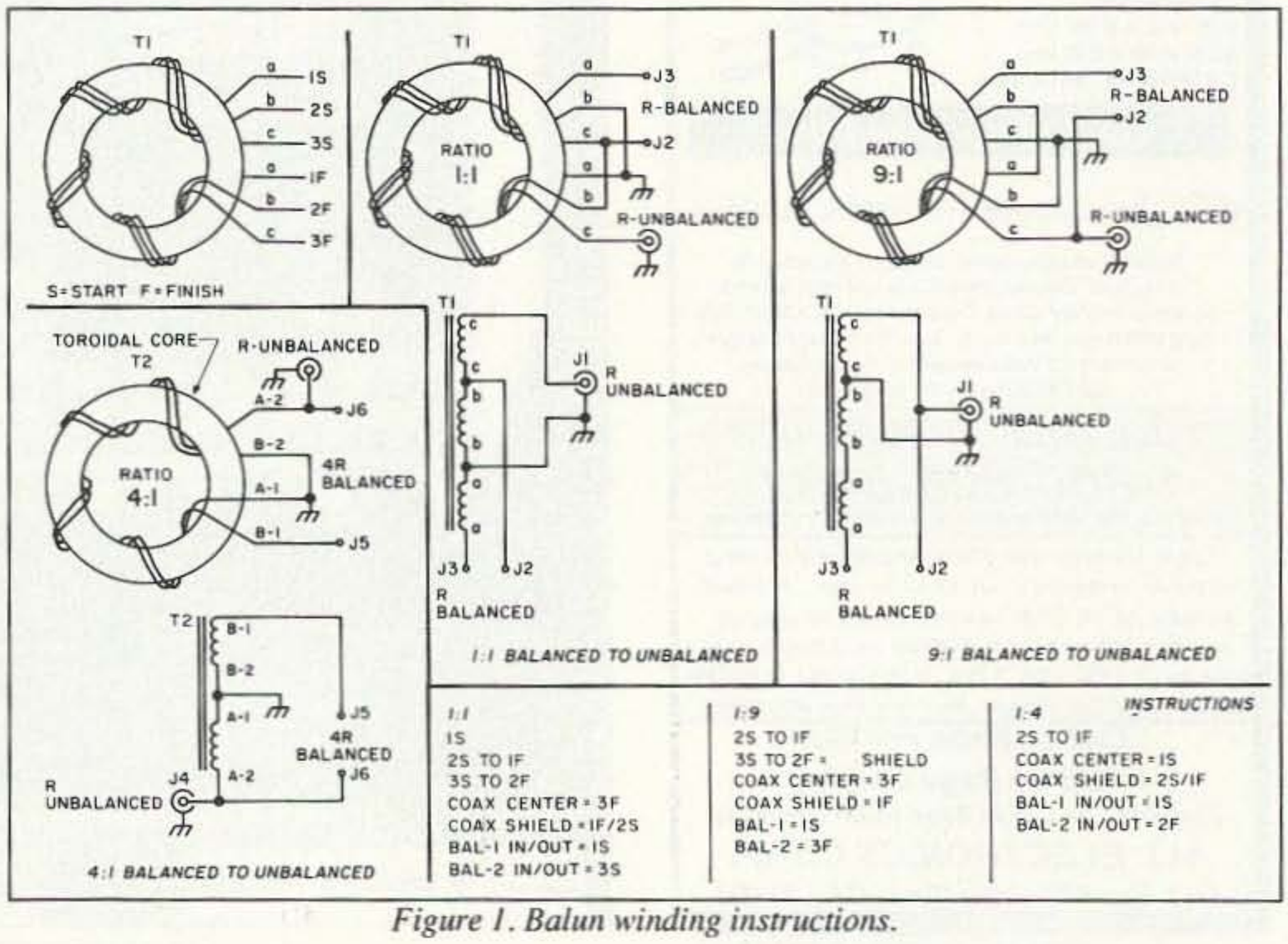

Figure 1. Balun winding instructions.

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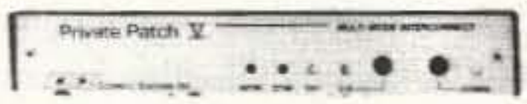

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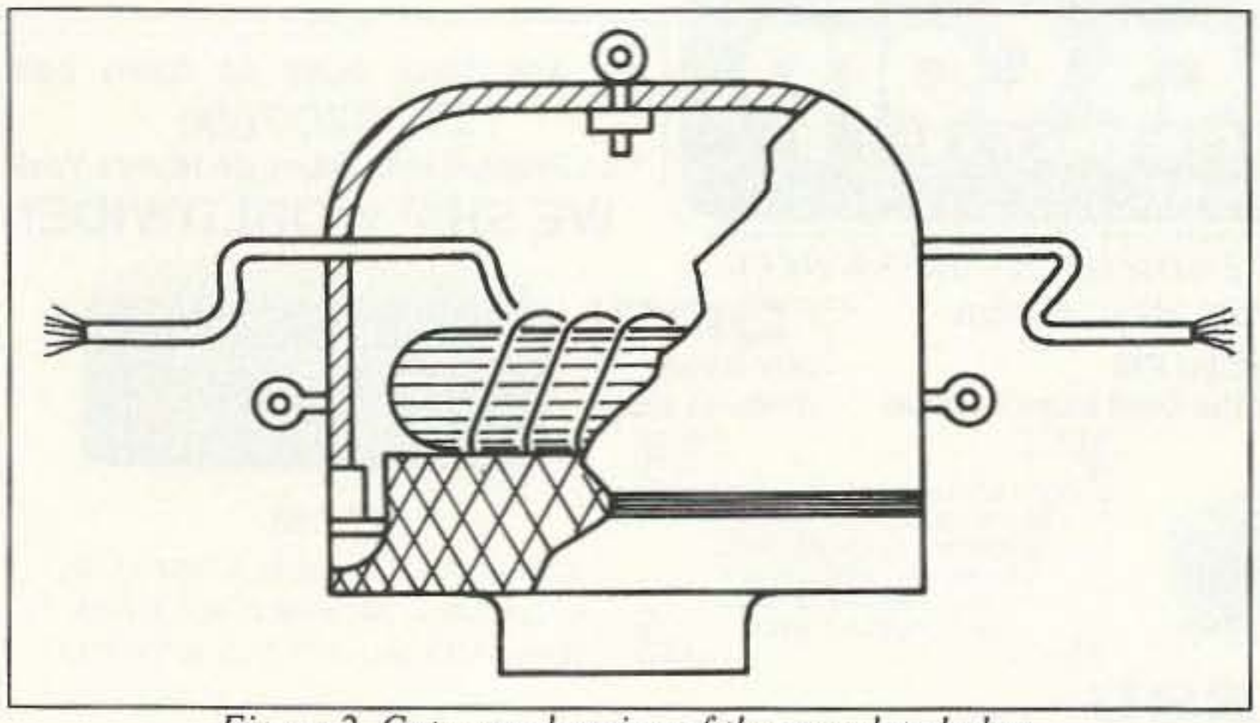

Figure 2. Cutaway drawing of the complete balun.

occurs on an iron powder core, the core will recover after cooling, whereas the ferrite will change $A_L(\mu)$ and not ever recover. Another consideration is that ferrite is very fragile and is prone to break if physically stressed (dropped to the ground during installation or damaged by a storm). Even water build-up can damage or fracture the core if it freezes in cold weather. Hairline cracks, visually hard to detect, can cause considerable performance problems. Also, note that ferrite is electrically a nonlinear material, very unlike the linear powdered iron cores. In general, I feel that ferrite should not be used for outdoor or transmitting applications.

Again, when to use baluns depends on the application. Practical winding ratios are 1:1, 1:2, 1:4, 1:6 and 1:9. If a ratio of 1:16 is needed, two 1:4 devices should be used. Table 1 lists some situations where baluns are necessary.

I highly recommend using these balun transformers to match line-to-load impedance differences (high SWR) over the 1:1 through 1:9 range if you expect maximum efficiency and power transfer. The second consideration is that unbalanced lines/loads can be matched to balanced lines/loads over a broad frequency range without tuning out the impedance differences which usually exist over a broad frequency range in a high Q situation. Since the balun is a low Q broadband device, there will be no large impedance differences caused by the change of frequency. This subject has been covered in many ham magazine articles.

In comparing the use of toroidal baluns from 14—50 MHz, the only construction difference is that 10 turns of AWG14 are required, although 14 turns would not be objectionable up to 30 MHz. The 10 turns of AWG14 enameled magnet wire on a T-200-2 (μ=10) core provides a center frequency of approximately 15 MHz. Of course, this is what is desired for 80 through 10 meters, the bands of most interest. This is the ideal balun to be used to match 50/75 coax to a 136' off-center-fed multiband Windom antenna. Complete coverage on 80, 40, 20, and 10 meters can be used without an antenna tuner. Multiband quad-driven elements can be driven from one balun, thus making only one coax cable necessary to feed the system.

Don't forget that 50-ohm coax is usually fed through a short Q-section of 75-ohm coax to form a single frequency 1:2 balun for quad and delta loop antenna designs. Use of a 1:4 balun to feed all driven loop elements at once will result in no coax balun and a single coax feedline.

Multiband verticals can be made that don't require tuning when using a toroidal balun. Windings can be made to make unbal-unbal configurations useful in feeding verticals with multiband capability built in.

How to Build It

How is always the place where the true amateurs and the appliance operators separate. Most appliance operators will become ham operators sooner or later. The idea is that practical, easy-to-follow instructions, reasonable cost, and readily available materials must be used to encourage construction attempts by inexperienced hams. They must have the fear of failure reduced to a minimum. That is the objective of this article. This project should not take the novice more than a weekend to complete, so it will encourage the amateur to take on more difficult projects.

Schematics and pictorials of the three most popular baluns are provided. There are no critical or tricky items involved. If you just plain follow the instructions, success will follow. Decide on one of the projects and wind the proper ratio for the application.

Parts Sources and Prices

Where to purchase parts? I am sure that there are as many sources of materials as there are varied prices. There are handling/shipping charges, taxes, etc. This type of aggravation has caused many a do-it-yourselfer to just put his hands in the air and give up. I have been tempted many times myself. But, as a very determined person, as well as a ham from the vacuum tube days, I take great pride in displaying home-brew items which perform as well as those expensive imported items.

Costs? The bill for the materials will be the same regardless of what ratio or configuration you choose. It is important to use one of the sources listed below, since all manufacturers do not produce the item in the same physical size. Bargain store or hamfest parts could take all the fun out of the project. A list of sources and relative costs are included in the Parts List.

Testing can be done by connecting a 100W electric light bulb to the balanced output. Connect the transmitter to the balun coax input. Apply less than 100W of RF power at 7.0 MHz and observe the light bulb lighting up. Ensure that the SWR indicates less than 2:1 using 17 feet of coax feedline or less. Two or more of the baluns, regardless of winding ratios, can be connected back-to-back in conjunction with a standard 50 ohm dummy load to check SWR and performance at the 1 kW power level. SWR should read 1.3:1 or less during this test. Always test the feedline connected to the dummy load or 100W light bulb to insure that the line is good and there is an SWR of 1.0:1.

Construction

Always consider the high RF voltages which might occur if the SWR gets greater than about 3:1. This high voltage can break down between windings or short out to the iron core. Follow these steps:

1. Wind the T200-2 core with glass tape. Make sure that all the surface is covered. Overlap the tape slightly to insure that adequate coverage is present.

2. Even though it's not necessary, I always spray the core at this point with polyurethane. Any brand, such as Varathane, may be used.

3. Take all two or three (3 feet each) lengths of #14 AWG magnet wire and simultaneously wind all three wires: 10 turns for a 15 MHz center frequency or 12 turns for a 3.5 MHz center frequency.

4. Configure the windings for the desired ratio as outlined in Figure 1.

5. It's not necessary, but I always spread a little RTV insulating gel between the winding connections. This insures against high voltage breakdown between windings. Additional glass tape could be used instead of the RTV compound.

6. Prepare the S0239 receptacle by soldering two 6" wires to the center and shell of the connector. Place RTV compound freely around the back side of the connector. Place the connector into the 1-1/4" bushing. Allow about one hour for the RTV to set up.

7. Place the S0239 connector/bushing assembly in the 2" reducer. Coat the surface with PVC cement or other adhesive. A thin coat of RTV may also be used for this purpose, although the cure time is quite long.

8. Place this assembly face down and level. Pour the rest of the epoxy into the rear of the assembly. Bring the level up to the lip of the 2" reducer. Now take the prepared balun transformer and place it into the epoxy on top of the 2" reducer assembly. When the epoxy cures the balun will become permanently attached, thus forming an assembly.

9. When the assembly has cured (approximately two hours) you will be able to handle it. Strip and attach the SO239 wires to the correct windings by soldering.

10. Attach the other two 12" #14 insulated wires to the proper windings again with solder.

11. Drill 1/8" holes at the top of the cap to

Table 1. When to Use Baluns

1:1	Unbal-Bal	Matches 50 or 75 ohm coax to center-fed dipoles and 2-element quads.
1:2	Unbal-Bal	Matches 50 or 75 ohm coax to multi-element quad and yagi antenna systems.
1:4	Unbal-Bal	Matches 75 ohm coax to 300 ohm twin-lead and off-center-fed multiband Windom antennas. Also, they can be used in low frequency antenna stacking arrays.
1:6	Unbal-Bal	As in (3), except for 50 ohm coax.
1:9	Unbal-Bal	Matches 50 ohm coax to 450 ohm open ladder line. Provides an extremely low-loss transmission line for antenna arrays from 15 to 50 MHz. (See Figure 2.)
1:1.5	Unbal-Unbal	Matches 50 ohm coax to vertical antennas.

allow the 12" balanced wire connections to exit the housing.

12. Cut a piece of the #14 AWG insulated wire to fit around the edge of the 2" reducer. This will form a gasket seal when the cap is placed over the balun assembly.

13. After electrically testing the balun for correct operation, place the assembly together. Bring the insulated wires through the cap exit holes. Force the assembly into the cap. Place the insulated wire gasket between the cap and assembly. I recommend using PVC cement to help provide mechanical strength.

14. Place the assembly in a vice, carefully squeezing it together. Finish drilling the 1/8" holes into the assembly, being careful not to drill into the connector. Only epoxy and PVC is removed.

15. Drill one hole at a time, screwing the eye hooks into the housing. This provides a weatherproof assembly. Suspension is generally by way of the antenna system, i.e. dipole wire. The balun acts as a center insulator in this case. The coax (RG58A/RG59A, etc.) will make the assembly hang properly when suspended. The coax connection will then be protected from the weather.

Note: In the case of 1:9 baluns used as 450 ohm ladder line transformers, the ladder line connects to the eye bolts and the coax will provide the required in-line mechanical support.

I recommend that the unit be sprayed with polyurethane to protect it from ultraviolet ray deterioration. This is not necessary, but it is desirable. Unprotected, the housing will last in excess of seven years.

Refer often to the figures and instructions to keep from making a mistake. Mistakes in winding connections can be corrected with less difficulty before final assembly. An ohmmeter should be helpful in determining the beginning and ending of the various windings.

Again, the effort here is on practical construction and not on design information. Pick a project and build a balun or two. Applications include delta loops, quad loops, dipoles, slopers, G5RV(Zep), multiband windom dipoles, low-loss coax to ladder line transformation, etc. 73

Contact Carl Markle K8IHQ at 8385 Locust Dr., Kirtland OH 44094. Please enclose an SASE.

Parts List

Item	Description	Part No.	Qty.	Cost	Source
Toroid core, 2" o.d.	iron powder (μ=10)	T200-2 (1 kW) T200A-2 (2 kW)	1	$3.60 $4.25	Amidon, Palomar
5"-wide electrical tape	glass cloth	Scotch (3M) #27	2'	$4.50	Amidon—66' roll
AWG-14 magnet wire	9' (2kV)				
	thermoleze	wire	9'	$0.90	Amidon
Coax conn.	receptacle	SO239 (flange)	1	$1.29	Radio Shack, Hosfelt, hamfests
Eye hooks	NI-CAD 3/16	none	2	$0.26	local hardware store
AWG-14	PVC strand	insulated			
	stranded	machine wire	3'	$2.00	local auto store ($2.00 per spool)
Epoxy	epoxy resin	FHR4	1	$4.95	local auto store Permatex 1-pt.
1.25" x 1.5" bushing	white PVC plastic	Univ. No. 437-167	1	$0.65	local plumbing store; NIBCO or Colonal only
2.0" x 1.5" DWV reducer	white PVC plastic	Univ. No. 4801-2F	1	$0.69	local plumbing store; NIBCO or Colonal only
2" DWV domed cap	white PVC plastic	Colonal 447-020	1	$0.86	local plumbing store; Colonal only

Sources:

Amidon Associates, 12033 Otsego St., Hollywood CA 91607.

Palomar Engineers, P.O. Box 462222, Escondido CA 92046.

Radio Shack/Tandy: Local stores; Part No. 278-201.

Hosfelt Electronics, 2700 Sunset Blvd., Steubenville OH 43952.

NiCd Restorer/Charger

Don't throw old NiCds away!

by Ed C. Miller N7APE

Amateurs have about the same battery-powered devices around the home as most other people. But we also have numerous pieces of ham equipment, test equipment, and other electronic gear that use rechargeable NiCd batteries. Around my shack, most of them are either C or AA cells.

Recently, I rounded up all the NiCd batteries I had that wouldn't take a charge. Seven of them were C's. It was time to build a NiCd restorer/charger. The circuit in Figure 1 restored all but one of the batteries (it had an internal open condition). Most of them were restored in an hour or less, except for one with an internal short, which required four hours.

Why NiCds Won't Charge

NiCd batteries stop recharging because small bits of metal slough off inside the cell and become lodged between the battery's plates. This causes the cell to short. To restore the battery, the short must be removed.

The restorer/charger does just that: It breaks down the internal short by briefly applying high current pulses to the defective battery. When the short is removed by this action, the unit becomes a standard charger. Since it becomes a charger at the right time, all you have to do is insert a C or AA battery and come back 24 hours later. In most cases, you will come back to a fully charged and restored battery.

A Straightforward Circuit

Twelve VDC is applied through a 47 ohm resistor to the parallel 2200 µF capacitors. U1a monitors the rising voltage on the capacitors. At a prescribed level of charge, U1a fires the SCR, discharging the capacitors through the power transistor into the defective battery.

When the discharge is complete, the procedure is repeated. U1b monitors the average voltage at the battery terminals, and when it exceeds about 0.3 volt, the SCR is switched on continuously to produce about 150 mA of steady charging current.

Although the restorer was intended primarily for C size cells, you can also use it for the AA size. The charge current is suitable for a standard charge of the C size and a quick charge of the AA size. Charge time for AAs should be about five hours. For C's, charge time is 24 hours, as noted above.

PC layout is generally not critical, but it's important to keep the charging current path resistance low. Using wide traces on the board and reasonably thick wire to the battery terminals helps accomplish this. Although the current pulses applied during restoration are of very short duration, they may exceed 20 amps.

Photo A. The home-brew NiCd restorer /recharger can save you money.

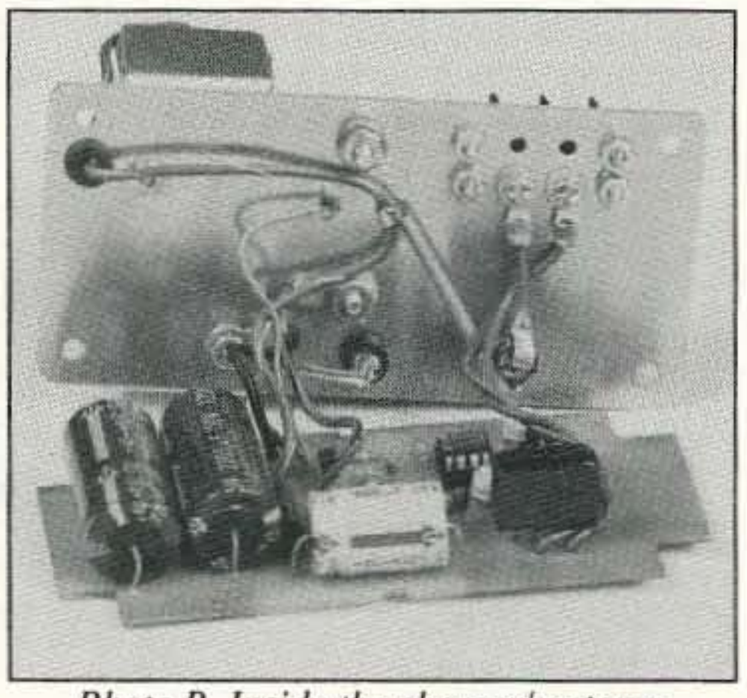

Photo B. Inside the charger/restorer.

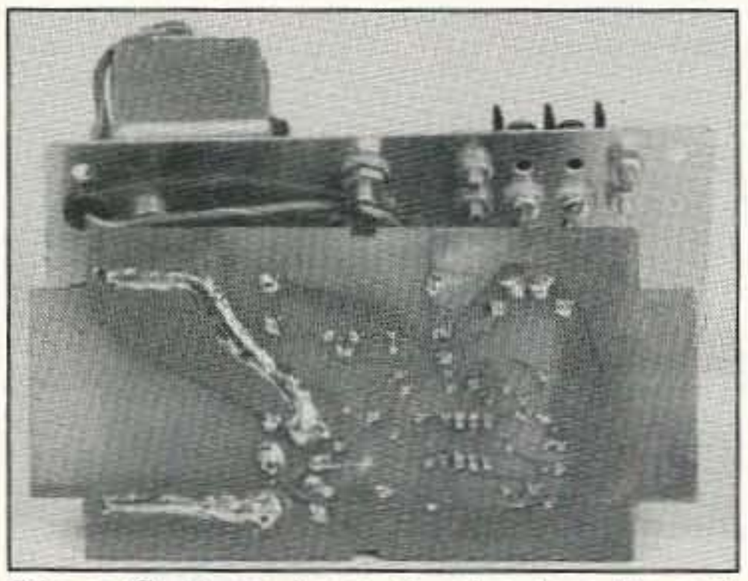

Photo C. From beneath, showing the soldered PC board.

Components and Parts

Easily obtained components are used throughout, and none of them are particularly critical. An LM358 is used as a dual comparator: The output of U1a goes positive when C1 and C2 are nearing full charge, enabling the SCR, and in turn the pass transistor, which discharges C1 and C2 through the battery.

Section U1b compares the average battery voltage with the reference set by R13. When this voltage exceeds about 0.3 volts, the output of U1b goes positive, locking U1a ON, and lighting the LED. In this condition, the battery is on a steady charge. The charging current is determined primarily by R1 and the supply voltage under load.

Almost any high current NPN power transistor may be used for Q1. Although an ECG-181 provided slightly more burst current, the circuit worked very well with a 2N2055 and an RCA 40411. The SCR should be a sensitive gate type, and have characteristics similar to the GE 103 series.

I used a standard 1.75VA, Class 2 utility transformer rated at 6—8 VAC, but the unit may also be powered by a DC supply of 10—15 volts with a current rating of at least 100 mA. It is best that the voltage across C1 exceed 8 volts under load (i.e., with C1 and C2 shorted). Of course, somewhat higher AC or DC voltages may be used if only C and D

Continued on page 28

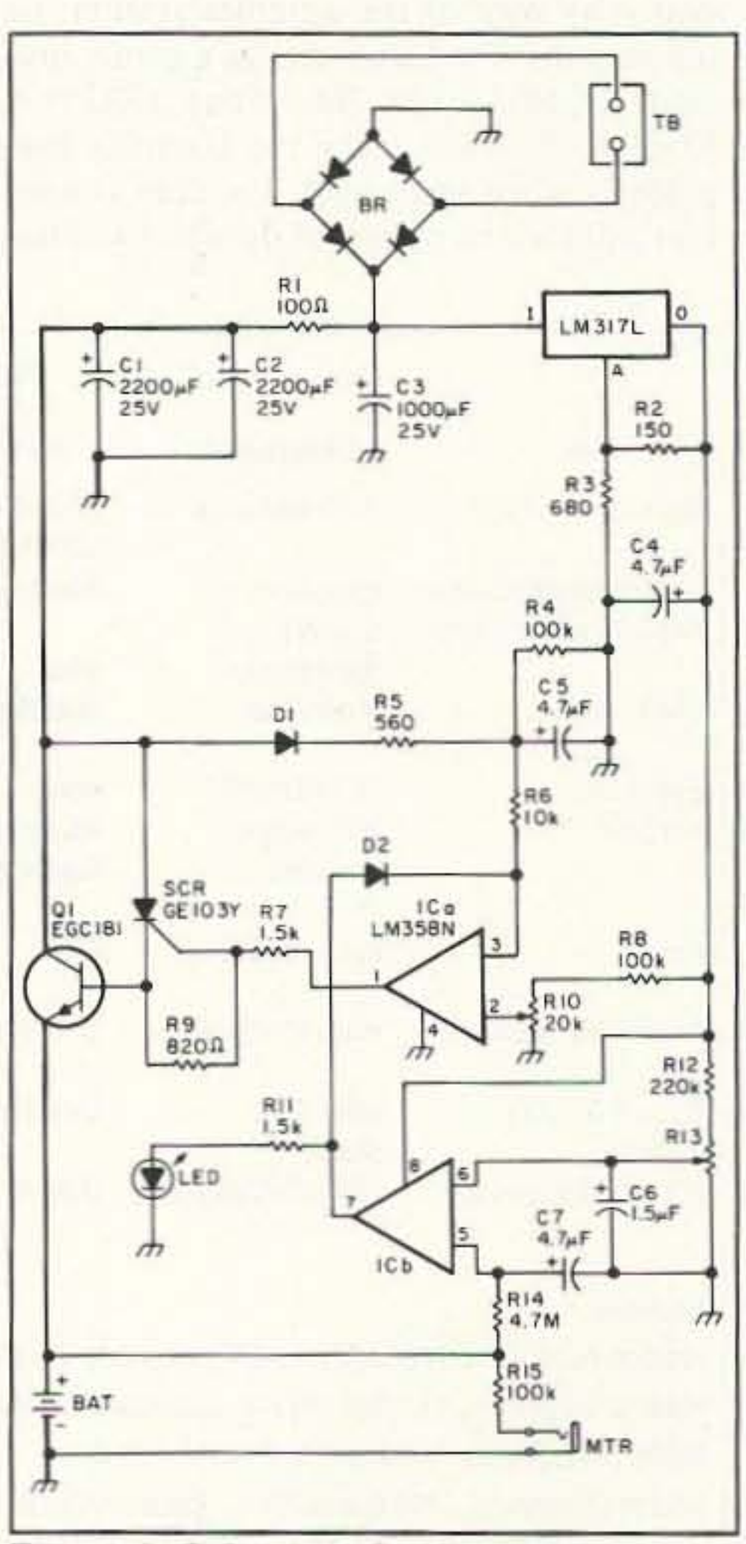

Figure 1. Schematic for the NiCd restorer/ charger.

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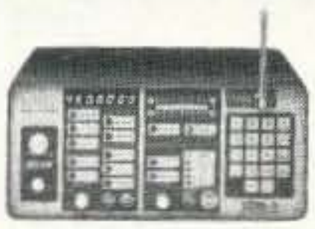

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FX-440 kit (3/4 Meters)	$169.95
CFX matching case set	$ 24.95

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz

CT-90 9 DIGIT 600 MHz

CT-125 9 DIGIT 1.2 GHz

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one-year warranty on parts and labor. We take great pride in being the largest manufacturer of low-cost counters in the entire U.S.A. Compare specifications. Our counters are full-featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry, and durable high quality epoxy glass plated-thru PC board construction. All units are 100% manufactured in the U.S.A. All counters feature 1.0 ppm accuracy.

NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

Telescopic ship antenna—BNC plug, WA-10	$11.95
High impedance probe, light loading, HP-1	$16.95
Low-pass probe, audio use, LP-1	$16.95
Direct probe, general purpose use, DC-1	$16.95
Tilt bail, elevates counter for easy viewing, TB-70	$ 9.95
Rechargeable internal battery pack, BP-4	$ 8.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
CT-50	20 Hz–600 MHz	<25 mV to 500 MHz	8	1 Hz, 10 Hz	$189.95
CT-70	20 Hz–550 MHz	<50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	<10 mV to 150 MHz <150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	<25 mV to 50 MHz <10 mV to 1 GHz <50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$249.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	<50 mV	Convert your existing counter to 1.5 GHz		$89.95

2 MTR & 220 BOOSTER AMP

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

PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $89.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $89.95

QRP TRANSMITTERS HAM RECEIVERS

20, 30, 40, 80M CW TRANSMITTERS

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

Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
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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.

Your choice of bands $29.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

E-Z KEY CMOS KEYER

Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.

CW-7 kit $24.95
Matching case knob set, CCW $12.95

ACTIVE ANTENNA

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

AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.

SS-7 kit $29.95
Matching case & knob set, CSS $12.95

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, SRI $29.95
Shortwave converter kit, SCI $27.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.

FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

FM STEREO TRANSMITTER

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FM-10 kit $29.95
Matching case set, CFM $12.95

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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

SPEED RADAR $89.95 complete kit SG-7

ew low-cost microwave Doppler dar kit "clocks" cars, planes, boats, rses, bikes or any large moving obct. Operates at 2.6 GHz with up to 4 mile range. LED digital readout splays speed in miles per hour, kiloeters per hour or feet per second! arphone output allows for listening to ctual doppler shift. Uses two 1-lb cofe cans for antenna (not included) id runs on 12 VDC. Easy to build—l microwave circuitry is PC stripline. BS plastic case with speedy graphs for a professional look. A very usel and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.

PR-2, wired, includes AC adapter $59.95

2M POWER AMP

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

PA-1, 40W pwr amp kit $34.95
TR-1, RF sensed T-R relay kit $11.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88-108 MHz FM band up to 300' except for hi power FM-4 that goes up to 1/2 mile.

FM-1, basic unit $5.95
FM-2, as above but with added mike preamp $7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
MC-1, miniature sensitive mike cartridge for FM-1,2,4 ..... $2.95

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real microwave Doppler nsor that will detect a huan as far as 10 feet away. perates on 1.3 GHz, and is t affected by heat, light, or brations. Drives up to 100 A output, normally open or osed, runs on 12 VDC. omplete kit MD-3 ... $19.95

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Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.

Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 ... $12.95

PACKET RADIO

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

KIT P-64A $59.95
P-IBM $59.95
CASE CPK $12.95

LO NOISE PREAMPS

Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.

Each kit $17.95

ONE DECODER

complete tone decoder a single PC board. Feares: 400–5000 Hz adtable range via 20-turn t, voltage regulation, 567 . Useful for touch-tone rst detection, FSK, etc. n also be used as a sta tone encoder. Runs on o 12 volts.
mplete kit, TD-1 $6.95

VOICE ACTIVATED SWITCH

Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.

VS-1 kit $6.95

TELEPHONE TRANSMITTER

Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!

PB-1 kit $14.95

NEW

SPEAKER PHONE

Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.

SP-1 ..... $29.95 Case-CSP $12.95

CKLE STIK

shocking kit! Blinkg LED attracts vicns to pick up innont-looking can—u watch the fun! eal for office desks, rties, nosey knowalls!
-4 kit $9.95

LIGHT BEAM COMMUNICATORS

Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug." Transmitter + receiver set, LB56 .. $19.95

FM RADIO

Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!

FR-1 kit $19.95

SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.

BN-9 kit $6.95

BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.

SA-7 kit $14.95

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. •Add $3.75 for shipping, handling and insurance. •For foreign orders add 20% for surface mail. •COD (U.S. only), add $5.00. • Orders under $20, add $3.00. •NY residents add 7% sales tax. •90-day parts warranty on kit parts. •1-year parts & labor warranty on wired units.

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CIRCLE 34 ON READER SERVICE CARD

73 Review

by C. L. Houghton WB6IGP

The Comet CX-224 Triband Mobile Antenna

Operate 144, 222 and 440 MHz with one antenna.

Number 8 on your Feedback card

NCG
1275 N. Grove St.
Anaheim CA 92806
Telephone: (714) 630-4541;
(800) 962-2611
Price Class: CX-224 Triband Antenna: $80
CFX-324A Triplexer
(with leads: $100;
w/o leads, CFX-324B: $95)
RS-21 Mobile Mount: $30
3D4M; 13.5 feet of low-loss coax w/ connectors: $23

I have tried several different types of antennas over the years and have at times been quite pleased with their operation. I was not aware of a triband VHF/UHF antenna on the market until I heard about Comet's new triband mobile antenna, the first on the market as far as I can tell.

I set several goals for evaluating the Comet triband mobile whip antenna. First, what improvements were made by Comet in comparison to the basic mobile antenna in use today? Second, what advantages or disadvantages were noted during the evaluation test period? Third, how sturdy is the construction and what is the longevity of the product? Will it hold up to the weather and to mobile operation? With those main questions in place I set out with an open mind to evaluate Comet's new three-band antenna.

Installation

My installation consisted of the CX-224 Comet antenna, along with their RS-21 Prestige trunk and hatchback mount, and their CFX-324 Triplexer (Model CFX-324A has coax UHF connectors with leads, and Model CFX-324B is terminated in UHF connectors). In actual use the triplexer is not necessary if you intend to use only one band at a time. In a single radio mode all you have to do is switch the coax cable to the other transceiver.

With the triplexer the coax cable can be attached to each individual radio or to each input/output of a three-band radio. It worked superbly on all bands with the triplexer and triband antenna. My three single-band HTs were used singly and in concert with each other when I switched to the triplexer for mobile operation. It was quite something having the triplexer and operating on all three bands at the same time: 144, 222, and 440 MHz.

To those not familiar with a triplexer, it's a passive bandpass filter with individual coaxial ports for each band and one combined output to connect to your antenna system, in this case to the three-band antenna. There are three frequency ranges for the Comet CFX-324 triplexer: Input 1 is rated for 1.3 to 150 MHz; Input 2 for 200 to 320 MHz, and Input 3 for 390 to 500 MHz. Power handling capability for the unit is 600 watts PEP, and the VSWR was less than 1.5 on all bands. Loss through the triplexer was also very low.

Since the Comet antenna is a single antenna resonant on all three bands (144 MHz, 222 MHz and 440 MHz) the triplexer and antenna are a natural pair. Operation can be carried out with three different radios, each connected to and operating on the same antenna at the same time. Transmit or receive, it does not matter how you use it. That's the concept.

Road Test

I decided to try this out in actual operation. In my test I used my normal mobile radios, all single-band handie-talkies on the 144 (2 meters), 222 (1-1/4 meters) and 440 MHz (3/4 meter) bands. See the Figure for details.

The antenna mount was positioned on the luggage rack of my station wagon. A comparison antenna (quarter-wave) was mounted on the other side of the car for each band, one at a time. In test comparisons on 2 meters (146 MHz) the antenna showed about 2 dB gain over the test antenna. On 1-1/4 meters (222 MHz) gain was slightly higher, just over 3 dB, and on 3/4 meters (440 MHz) gain was noted at just over 5 dB. The gains may have actually been slightly higher, considering connector wobble during the test, switching and timing between measurements. Also, I did not have attenuators in fractional values to exactly duplicate results, so I had to settle for 1 dB increments. In any case, performance was as advertised in this portion of the test.

On transmit I measured the system SWR which was quite flat (1.5 to 1 SWR) over each band. I have seen dual-band antennas before and tried to construct one (which, by the way, is quite tricky to get working right.) But for a three-band antenna to perform so well and be matched throughout the band, to say I was pleasantly surprised is quite mild! I was very impressed with Comet's antenna and their attention to detail. I was skeptical at first, trying to keep an open mind, but after lots of mobile operation it proved to be a real joy to use.

The setup is nothing—there are NO adjustments to make. There's no element to change length—just screw the base of the antenna onto its coax feeder/mount and you are ready to go right out of the box. Quite impressive! Comet really did their homework for us in making the antenna "goof proof." In extended operation with the triplexer no degradation in signal performance was noted, with three different frequency radios connected all at the same time (my HTs), and the large triband rig.

Photo. The Comet CX-224 triband mobile antenna.

I suppose, in the case of my HTs, you could give a different radio to two other amateurs in your car and all operate at the same time. Normally you would operate on one frequency and monitor or scan the other bands. This mode worked very well in practice and allowed me to keep up with several frequency-hopping friends. I did test two radios at one time and did not notice any interaction or degradation ever, even between the 2 meter and its harmonic-related 3/4 meter radio (simultaneous transmit and receive). There was no apparent loss of sensitivity on one band while transmitting on another band.

Lots of Good Points

There are so many applications, advantages and improvements it's hard to know where to start desribing them. First, the ready-out-of-the-box aspect makes a vast difference. Operation with the triplexer is so easy it requires no intervention to start operation—you just connect the coax cable.

How sturdy is the system? Well, the mechanical construction of the antenna is quite durable and has handled its brushes with low-hanging tree limbs quite well. The antenna is well made and should have a long life, even with some harsh treatment, and should survive even bad weather for a long time. All elements to tune the antenna are sealed in a plastic/epoxy molded enclosure around the main element, also very strong.

All exposed metal used in the antenna is stainless steel. The mount only was covered with a hard black enamel finish. The hardware is very substantial, making it a rigid mount.

The trunk hatchback mount was adaptable and easy to apply to many different surfaces of my station wagon. All you need is a thin metal strip, like the top of your auto door or trunk lid, to fasten the

Continued on page 28

Comet Three-Band Antenna

Continued from page 26

mount. It has four Allen screws to fix it securely. The big advantage to this type of mount is that it's a real wife-pleaser, a no-hole installation on your car. I managed a no-scratch mounting demonstration for my wife! The mount is provided with a pad to prevent scratches on the car's finish when mounting or removing it.

The bottom surface is where the four Allen-head screws fix the mount to your trunk or door. For a trunk application, the mount is normally positioned straight up in all adjustments. If you took the mount off the trunk and mounted it on the door the antenna would be horizontal. However, by a simple adjustment on the multi-angle mount you can right the antenna to vertical in moments. As I said, very versatile.

The antenna can be removed quickly with a few twists from the mount for theft prevention when parking your car. I usually place external antennas inside the car's trunk to keep them out of sight. For all-day parking, a mobile antenna on display is a red flag for someone on a "shopping spree." Placing it in the trunk and out of sight took only a few seconds.

Another feature that took me by surprise was the base-to-antenna-mount portion of the antenna itself. It is connected to an internal spring-type mechanism that permits the antenna to be folded over in a hinging action. It does not disconnect at this joint but can be folded over in one section so you don't have to drag it through your open garage door. Fold it over and then just park in your garage—a nice additional feature from Comet.

My overall rating for this antenna from Comet is one of high marks in all categories. They have done an excellent job making three-band mobile operation on one antenna quite easy and cost effective. What seems to be a complex antenna system is actually very simple to put into operation. I feel this product was engineered and delivered to fill a real void, especially when you consider that you are getting one complete ready-to-use antenna system for the three prime VHF/UHF amateur bands in use today: 144 MHz (2 meters), 222 MHz (1-1/4 meters), and 440 MHz (3/4 meters). I highly recommend this antenna to anyone searching for a good system for these bands. 73

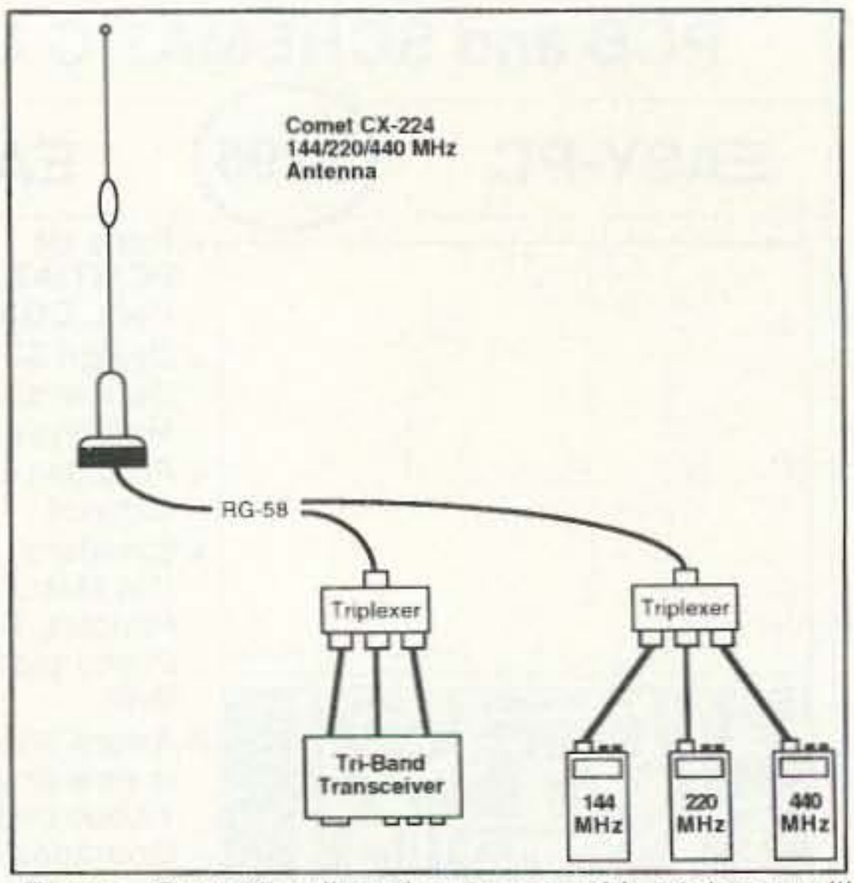

Figure. Comet's triband antenna with triplexer will feed one three-band radio or three individual radios, with one radio per band. All may transmit or receive at the same time.

NiCad Restorer Charger

Continued from page 24

size cells are to be restored or charged. It's important to limit the charging current to the maximum recommended for the cell size.

The battery compartment was made from aluminum, with a small aluminum insert for use with AA size batteries. If the builder wishes, a commercial holder for a C, and one for an AA (wired in parallel), can be used instead.

The LM317L low current voltage regulator powers the op amp, as the supply voltage fluctuates considerably while C1 and C2 are being charged. Without the regulator, the op amps might lose some of their stability.

The two mini-pots may be replaced with 18k ohm resistors if the power transformer is equivalent to the Western Electric 2012A.

Any case will do. I used a stock Radio Shack item.

Adjustments

There are only two of these, and they are interrelated. R10 sets the bias on U1a so that its output will go positive just before C1 and C2 reach full charge. R13 is set to enable U1b positive output when the voltage across the battery being restored reaches about 200 or 300 mV. A battery sustaining that voltage between restoration pulses is usually free of internal shorts. 73

Parts List

1	1 amp	bridge rectifier
C1,2	2200 uF, 25V	electrolytic
C3	1000 uF, 25V	electrolytic
C4,5,7	4.7 uF, 15V	tantalum
C6	1.5 uF, 15V	tantalum
U1	LM358N	IC
1	standard	LED
Q1	ECG-181	or 2N2055 or 40411
U2	LM317L	regulator
R1	100 ohm, 2W	carbon
R2	150 ohm, 1/4W	carbon
R3	680 ohm, 1/4W	carbon
R4,8,15	100k, 1/4W	carbon
R5	560k, 1/4W	carbon
R6	10k,1/4W	carbon
R7,11	1.5k, 1/4W	carbon
R9	820 ohm, 1/4W	carbon
R10,13	20k	trimpots
R12	220k, 1/4W	carbon
R14	4.7 megohm, 1/4W	carbon
1	GE-103Y Triac	SCR

Misc.: Case, PC board, mini-jack (for meter), terminal strip, battery holder(s).

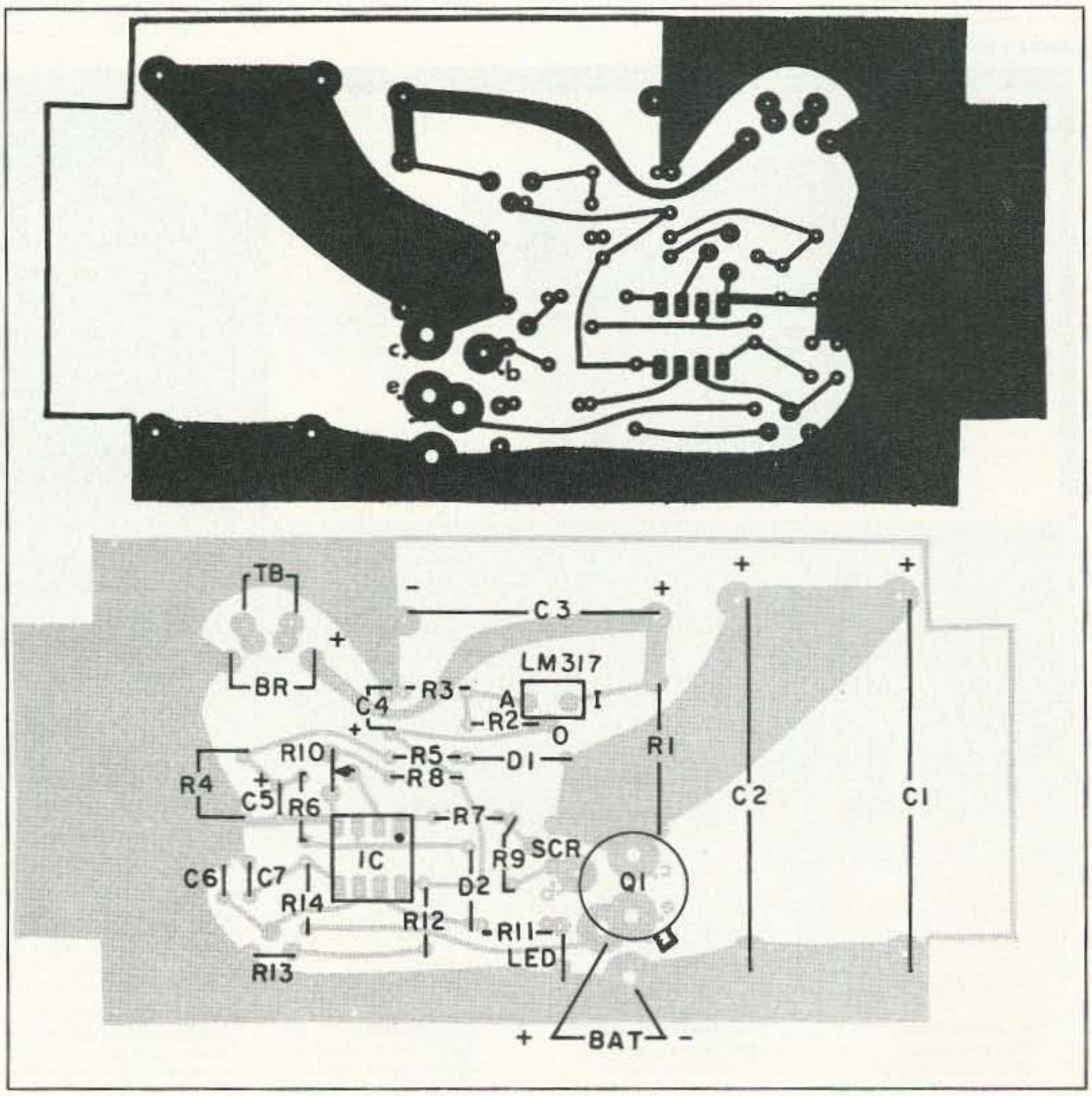

Figure 2. (a) The PC board and (b) parts layout.

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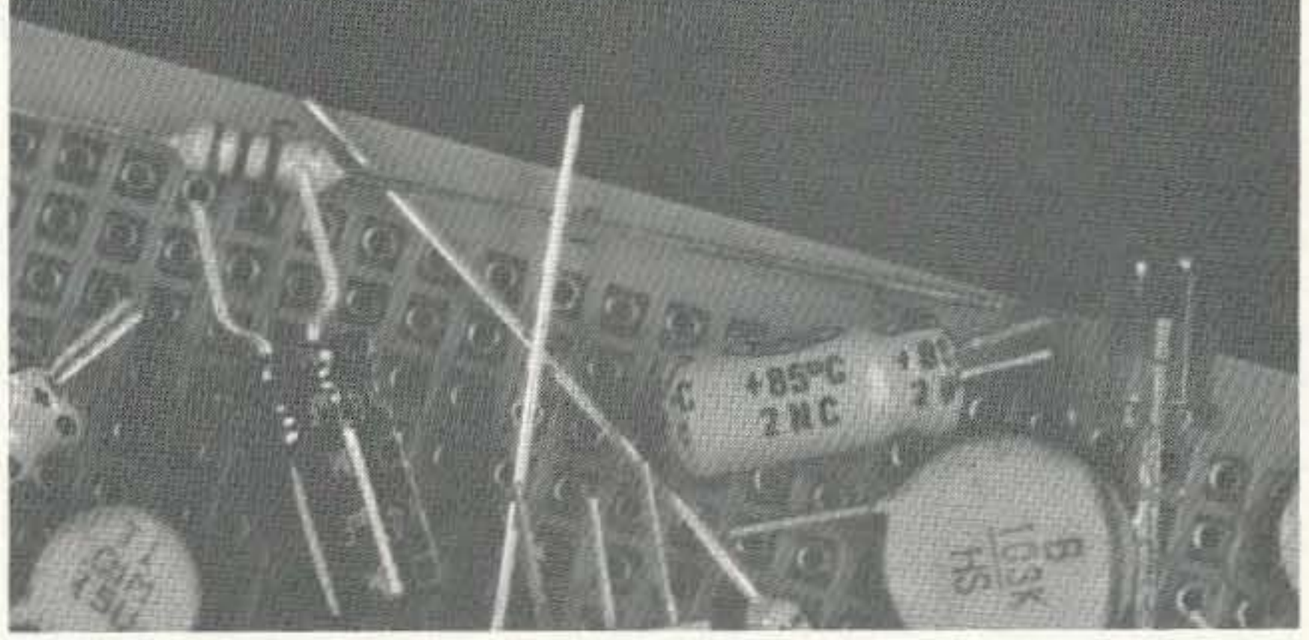

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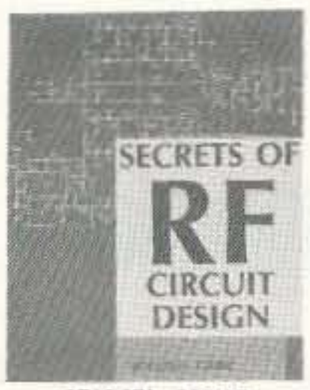

3710-XX $32.95
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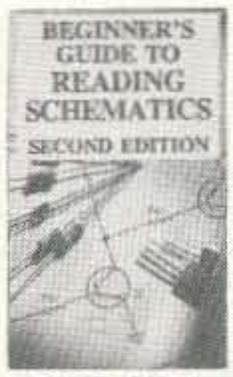

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3365P-XX $24.95
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2653P $13.95
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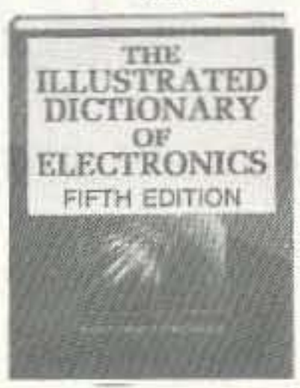

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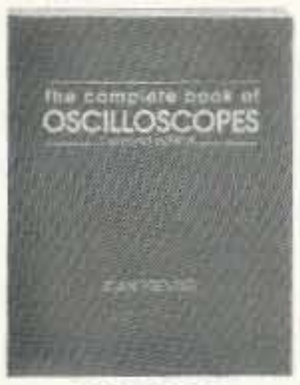

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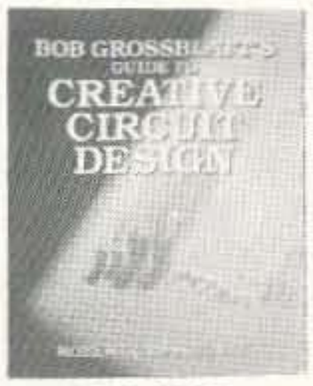

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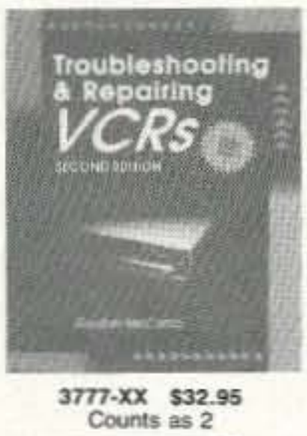

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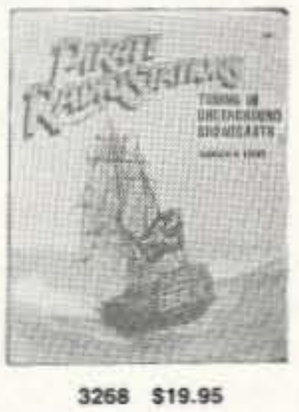

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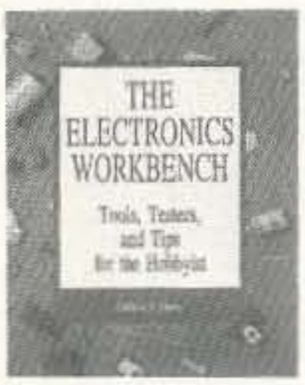

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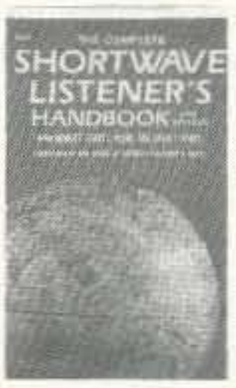

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High Performance 2 Meter Yagi

Improve your signal with this compact design.

by Bill Robertson W3HMI

It never ceases to amaze me that with 40 milliwatts of RF power into a yagi antenna, I could bring up a 2 meter repeater 30 miles away. But it happened. The report I got was of a ". . . raspy background but clear copy." Another incident that proves there is no substitute for a good antenna.

2 Meter Yagi Design

The antenna shown in Figure 1 has the characteristics listed in Table 1, which were taken from my old engineering notebook.

It is interesting to note that on the hand-drawn pattern of Figure 3, the E-plane pattern is skewed about 5 degrees off center. This skew is caused by the gamma matching element. The side of the radiator with the gamma element tends to be the side of the positive skew. Reversing the gamma element reverses the skew. When mounting the yagi vertically, it is best to have the gamma element on the upward side so the pattern will tend to point 5 degrees upward.

Super Portability

Transmitter hunters will find this antenna an asset because of its size, weight, mounting and operation ease. It can be mounted either horizontally or vertically.

After a look at Figure 1, it is evident that this yagi appears to be a little different from run-of-the-mill yagi antennas. The driven element is close to the reflector, and the reflector itself looks considerably longer than normal. The full size boom length is just under one wavelength.

The gain measured in the lab on a 20 to 1 model using a standard gain horn was 13.8 to 14.1 dBi over a 3 percent bandwidth. The beamwidth at the half power point is about 37 degrees in the E-plane (vertical plane, with the antenna mounted vertically), and about 42 degrees in the H-plane (horizontal plane). The VSWR (Voltage Standing Wave Ratio) with the gamma set as shown in Figure 2 is 1.5:1 or less at 145—148 MHz. You can get a larger bandwidth by changing some components in the gamma matching element. I have found that the combination shown fits my needs.

I always refer to this antenna as the "Stu Henderson Yagi," after the guru who developed all of its basic parameters, which he based on his original design for a folded dipole TV antenna. Stu spent many hours experimenting with this antenna design. My part in the design consists of the matching device and the construction technique.

Even though the antenna described here is for 2 meters, the same parameters work just as well for any frequency. See Table 2.

Wood or Metal?

The antenna and supporting mast are all metal with the tolerances held as close to within 1/16 of an inch as possible. Using metal for all the antenna parts does *not* affect the performance.

In several articles I have read lately, the beam antennas have wooden booms and masts. However, in most cases, the added protection of all-metal mast elements is worth more than the minor benefits of insulated booms and masts.

One of the things I measured in the lab on the models was the effect of metal with the antenna, vertically or horizontally polarized, mounted on the supporting mast. No measurable difference could be detected on the patterns or gain when comparing wood versus metal mast and boom element.

Making the Boom

The first and most important task is to correctly drill all the holes in the boom. See Figure 1. Getting this right is very important because it affects the accuracy as well as the appearance of the antenna. The boom requires 72-1/4 inches center-to-center from the reflector element to director number 3. Therefore, I had to purchase two booms because they only came in 72-inch lengths. See Table 3.

At the same store, I purchased a 1-inch diameter wooden dowel. A 3-inch long section of the dowel was wrapped with one layer of aluminum foil, and forced 1-1/2 inches in-

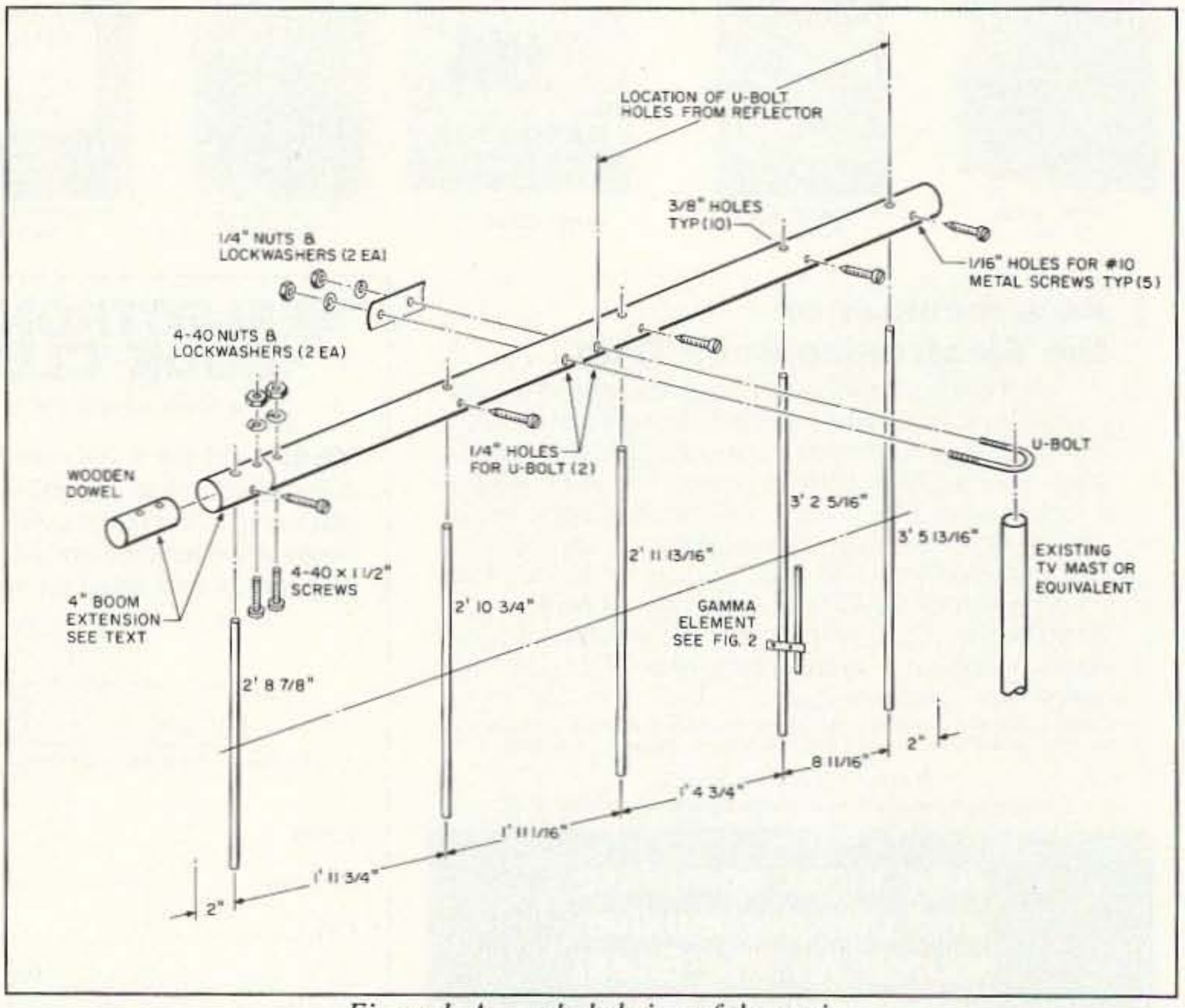

Figure 1. An exploded view of the yagi.

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

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• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

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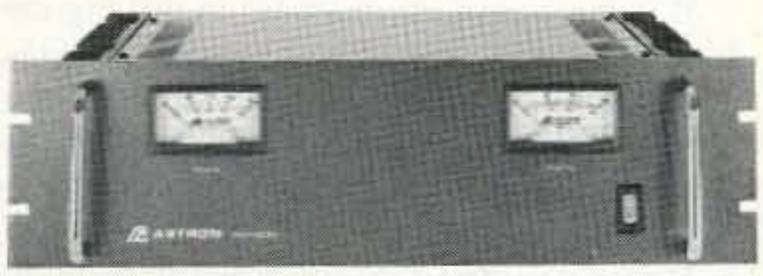
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



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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-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

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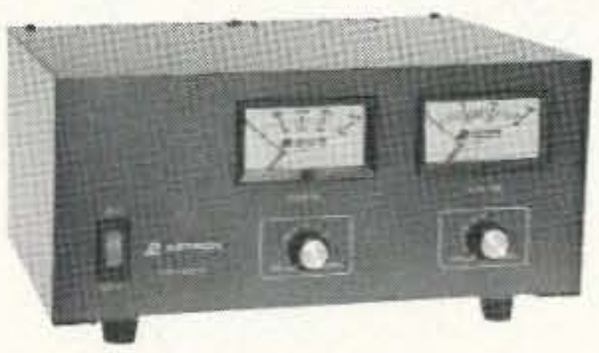

MODEL VS-35M

• 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

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

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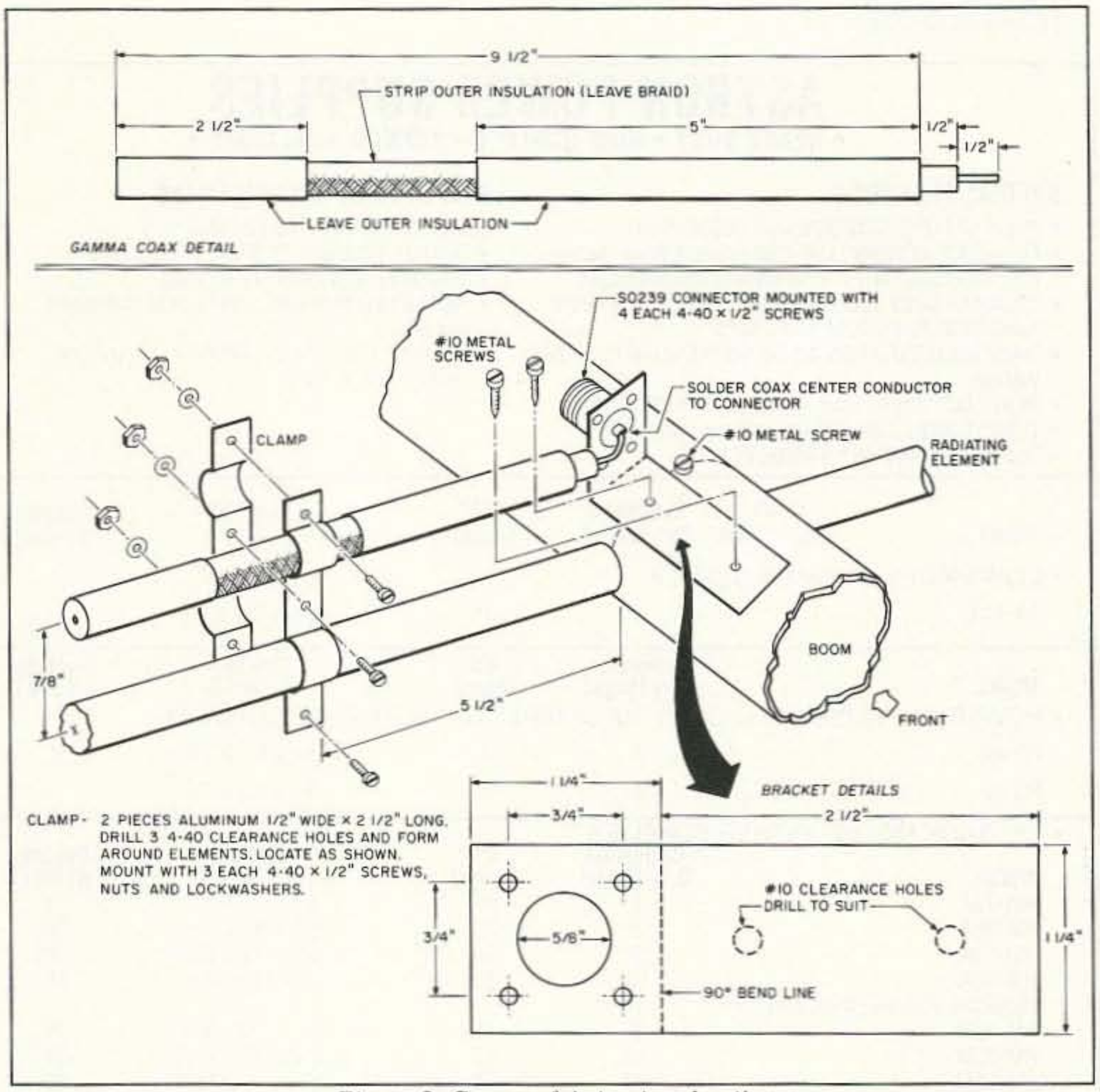

Figure 2. Gamma fabrication details.

side the 1-1/4-inch outside diameter aluminum tubing. This allows an extension to be made to the boom. I added a 4-inch piece, making the total length 76-1/4 inches. Two holes were then drilled through the metal and the wood for the two #4-40 x 1-1/2-inch screws. (Aluminum pipe in longer lengths is available at some stores.)

A bench vice was used to hold the boom in a fixed horizontal position. I used a plumb line to find the top point on both ends of the boom. Then I scribed a line running the length of the boom. Along this line I measured out the element spacing, and center-punched each one. Before punching, however, I double-checked each element spacing for an accuracy of as close to 1/16 of an inch as possible.

At each element measurement, I scribed a line around the boom diameter. If you use a drill press to make the holes, all this will be unnecessary. I used an electric hand drill, so I wanted to find the bottom hole as accurately as possible, and drill from both sides, rather than taking a chance on holding the hand drill straight.

To accomplish this, I cut a strip of paper and wrapped it around the diameter. With this strip of paper marked properly, I could accurately find each 180 degree point for every element measurement.

After marking the paper strip for one boom diameter, you just lay it out flat and measure and mark the halfway point. Then wrap it around the diameter, and the halfway mark will be the 180 degree point. After center-punching them, you can drill the holes. Using a 3/8-inch drill bit on the hand drill, I drilled each element from both sides of the diameter towards the center of the boom.

Next, I drilled the 1/16-inch holes at 90 degrees to the large holes for the #10 metal screws. These holes are for securing the elements once they have been installed. I located the proper 90 degree point with the same paper technique as before.

Now you can locate the U-bolt holes and use the same technique with the paper to center the 1/4-inch clearance holes. Drill from opposite sides again to get the holes straight.

Assemble the elements by cutting them to the correct length, as listed in the design parameters. I found it was easier to center the elements during installation by first measuring each element and marking the center point, then second, measuring from the center point in either direction 5/8 of an inch, and third, scribing a circle around the diameter of the element. Then you can push the elements into the 3/8-inch diameter holes, as shown in Figure 1, until the scribed circle is flush with the boom.

If enough care has been taken drilling the holes, you may be able to drive the elements in and not have to use the #10 screws to hold them in place. If the fit is sloppy, use the screws and tighten them until they touch the elements. (Flatten the screws on the tip with a file before insertion—this makes them fit against the elements a little better than a

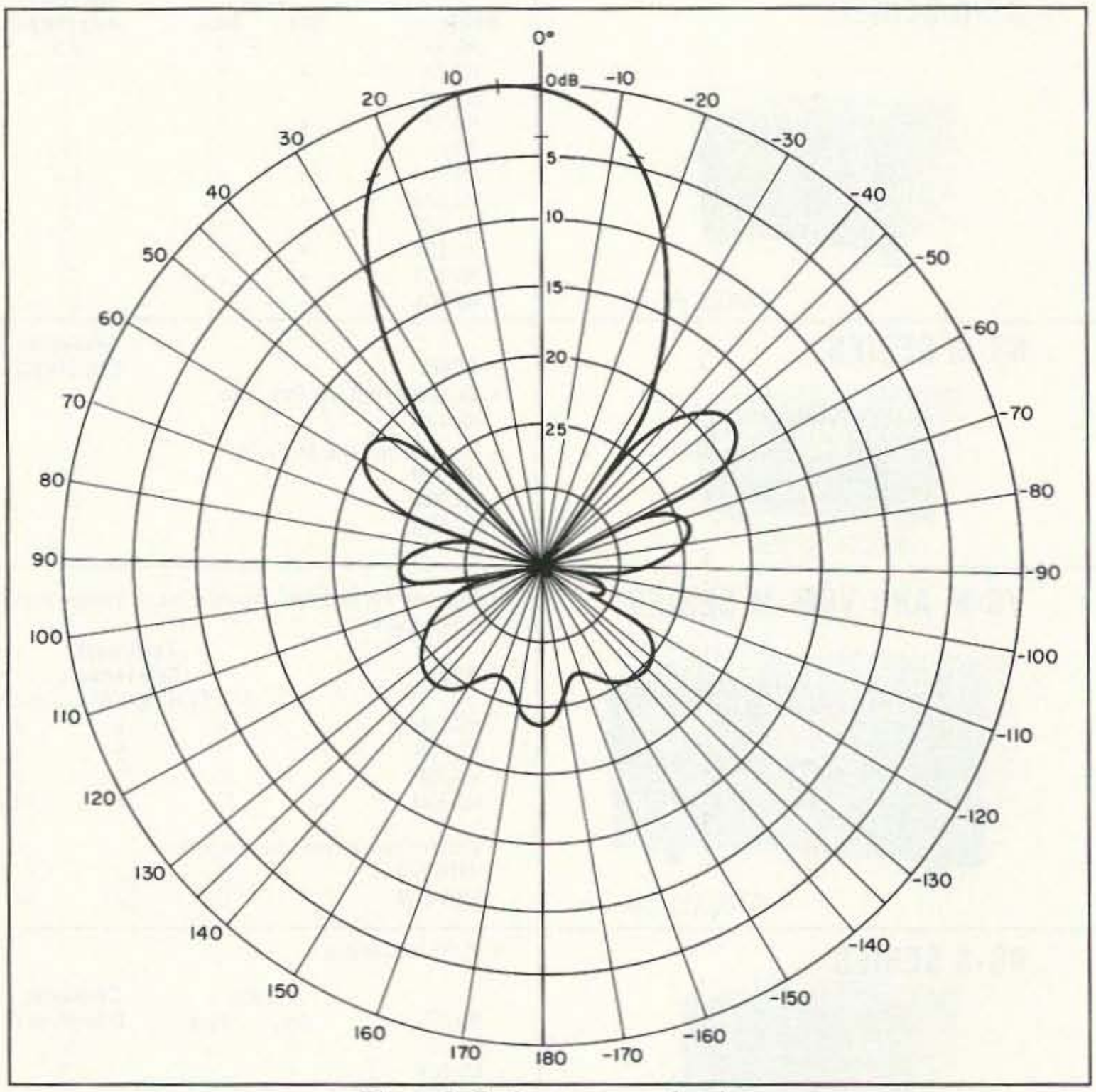

Figure 3. E-plane pattern sketch.

Table 1. Center Design Yagi on 146 MHz

Gain:	14 dBi
Bandwidth for 1.5 to 1 VSWR:	3 MHz
Beamwidth E-plane	37 degrees
Beamwidth H-plane	42 degrees
Front-to-Back Ratio:	Greater than 20 dB
Sidelobes:	Greater than 15 dB down
Length	76-1/4 inches
Weight	Less than 2 pounds

sharp point.) Double-check the fit by pulling and pushing on the elements. Tighten as necessary, but do not over-tighten, as this will distort the element and could tear the thin skin of the boom.

Gamma Construction

Fabricate the gamma parts as shown in Figure 2. The gamma is simple and very effective. The length of coax provides the series capacitance, and the slider provides the inductive adjustment. The combination provides the resistive component. Cut a 10-1/2-inch length of RG-8, RG-9, RG-213, or RG-14 cable. All will work because they naturally have a capacitance of about 29 pF per foot.

Trim two 1/2-inch segments at one end as shown in Figure 2, one all the way down to the center conductor, and the other through the outer insulation and braid. Cut the outer insulation only from a 2-inch section that will be in contact with the gamma slider. The total braid left on the coax piece should be 9-1/2 inches for about 23 pF series capacitance.

Table 2. The "Stu Henderson Yagi" for 146 MHz

Reflector length	= 509/*f*	3' 5-13/16"
Space #1	= 106/*f*	8-11/16"
Radiator length	= 466/*f*	3' 2-5/16"
Space #2	= 204/*f*	1' 4-3/4"
Director #1 length	= 436/*f*	2' 11-13/16"
Space #3	= 280/*f*	1' 11-1/16"
Director #2 length	= 423/*f*	2' 10-3/4"
Space #4	= 289/*f*	1' 11-3/4"
Director #3 length	= 400/*f*	2' 8-7/8"

Where *f* is in megahertz.

Fabricate the connector bracket and mount the SO-239 connector. Align the bracket on the boom at 45 degrees from the elements, and drill the mounting holes for the #10 metal screws. Solder the coax piece to the connector and mount the remainder of components.

Final Adjustments

Fabricating the antenna to the dimensions specified, and holding the tolerance to 1/16 of an inch, should get you very close to the design parameters. I moved the gamma slider in about 1/4 of an inch, and that is the only adjustment I had to make on the first try.

For the VSWR adjustments, I mounted the yagi on a 10-foot section of TV mast and leaned it against a 4-foot chain link fence. This allowed me to make changes easily. I then mounted the yagi on an existing TV mast and measured the VSWR again. One adjustment of about 1/8 inch was all I needed, and I was close enough on the second try.

Table 3. Materials List for the 2 Meter Yagi

2	booms	1-1/4" dia., 76" long, 0.05" wall thickness
3	elements	3/8" dia., 6-foot long solid or thin wall
1	piece scrap	3" x 4", 1/16" thick

I think the yagi is an easy antenna to build. I have built at least 10 antennas for different frequencies, plus all the models during the design phase in the antenna lab.

The total cost for the antenna, including the connector, U-bolt, and all hardware, is less than $30. If you also buy a 20-foot mast, a roof support bracket, and 50 feet of coax with two connectors, the cost is still less than $70. You can buy the necessary materials, hardware, and connectors at most hardware stores and Radio Shack.

Less expensive methods for mounting the antenna are available. One economical approach is to use two chain link fence rails as masting, and a roof bracket. The rails are 10 feet long, interlock with each other, and are about $6.00 each. The roof bracket can be installed to hold the rails at the roof level. On most houses there will still be adequate antenna space on the mast above roof level.

The yagi described here will work well if fabricated to the specified guidelines. Many variations can be applied, and the results would be just as good or better. Don't hesitate to experiment! 73

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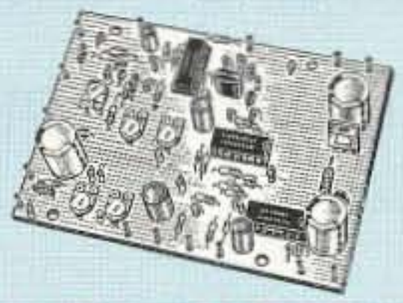

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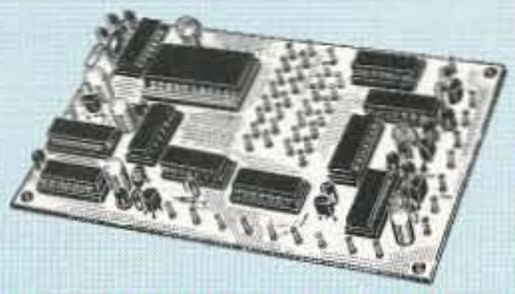

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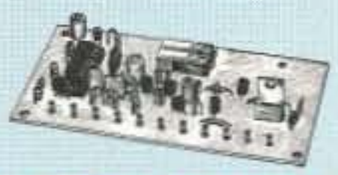

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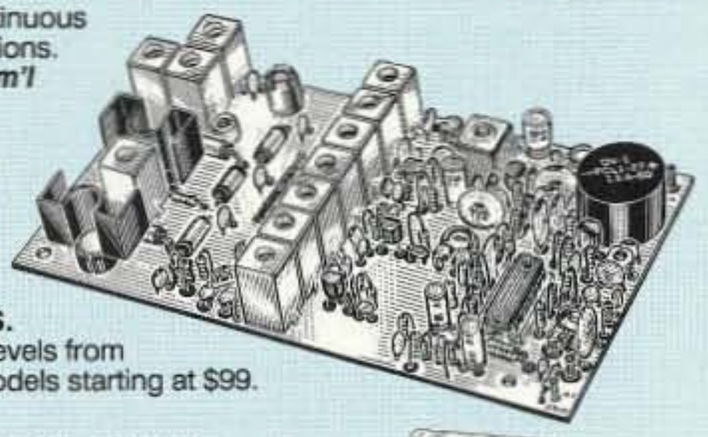

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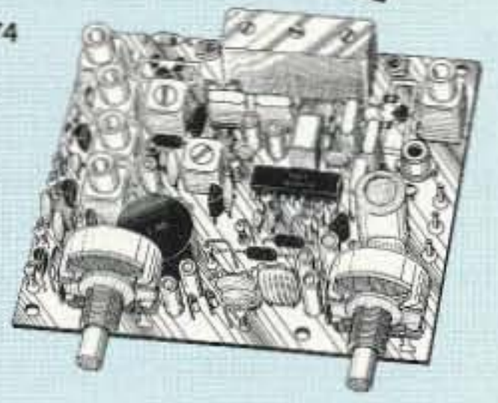

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CIRCLE 57 ON READER SERVICE CARD

Common Audio and Speaker Bus

Control noise pollution chaos.

by Hugh Wells W6WTU

If your ham shack is like mine, you have accumulated a number of receivers to monitor all of the frequencies and local activities you're interested in. This can cause a couple of problems, beginning with noise pollution. Also, after becoming addicted to listening to these frequencies, you want to be able to monitor them when you're in a different part of the house. I've solved both problems by installing a common audio bus around the shack and remote speakers throughout the house.

With each receiver blaring away, it was next to impossible to hold a conversation with someone, either in person or on the air, without turning down the volume control on each receiver. I wanted to have a common volume control for all of them, and an audio bus system as shown in Figure 1 was the solution to this problem.

Later, I wanted to monitor the receivers, using remote speakers at several locations in the house. Each remote speaker needed an independent volume control that wouldn't affect the bus volume. Figure 2 shows my solution for this. Although I've used both circuits in my audio bus system, the two could be combined into one system by using the circuit shown in Figure 2. One speaker and its volume control could be placed in the shack, and the remote speakers placed at convenient locations in the house.

In my application, the solution to the common bus system required two independent bus impedance values. Also, one receiver and the remote amplifier had to be powered up and down by remote control along with the receiver's audio being distributed by the bus.

Common Audio Bus

The common audio bus (Figure 1) from all of the receivers had to be high impedance in order to isolate, to a degree, each receiver's output from the bus. Without isolation, bus audio would be driven back into each receiver's output circuit. Assuming a common audio bus of any relatively high impedance, each receiver would inject a small audio signal voltage into the bus. Current/power into the bus was of little concern, and I preferred to keep it at a low value. Because the output from each receiver was taken from the 8 ohm headphone/speaker jack, a nearly correct load impedance was needed for each receiver to maintain performance. I found that a 10-ohm, 1/2-watt carbon resistor worked well as a load since it was not necessary to develop very much audio power in order to drive the bus.

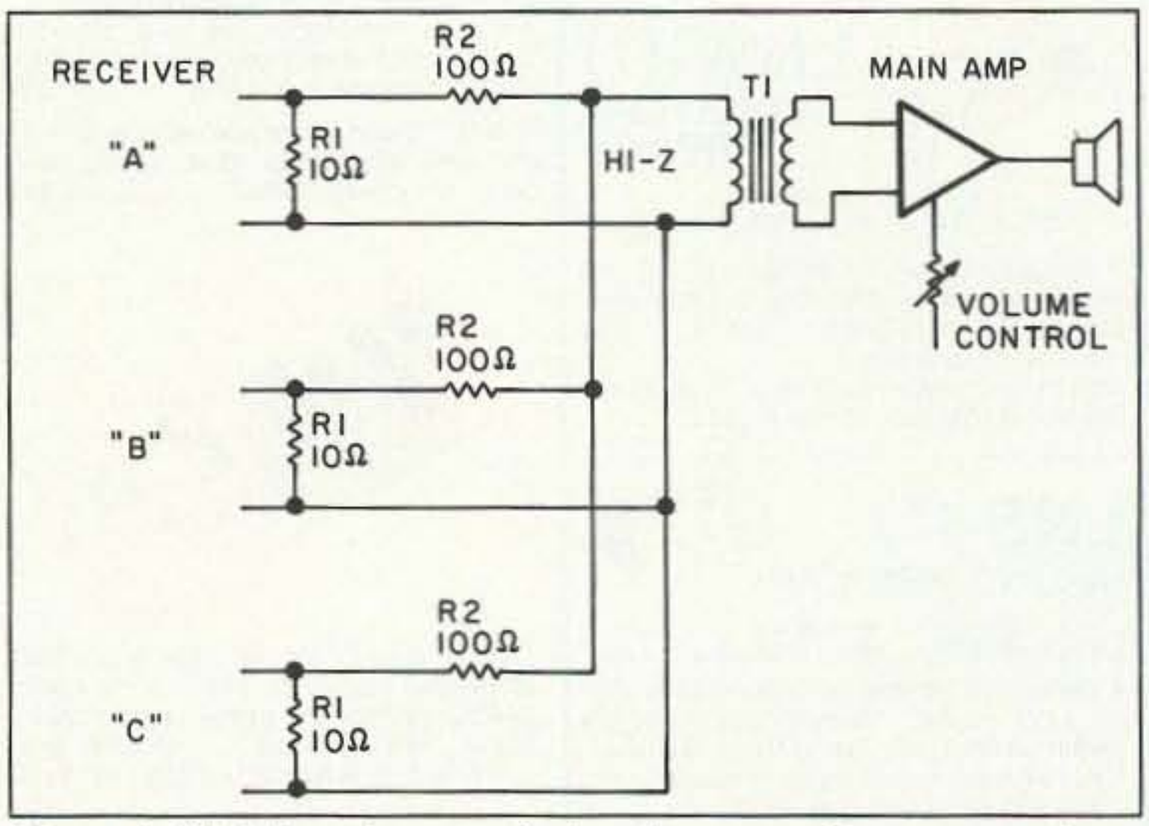


Figure 1. High impedance audio bus for connecting many receivers to a single amplifier.

I used a high input impedance amplifier to receive the bus audio voltage and provide speaker audio for the shack. The amplifier was capable of producing about four watts of audio power, which was more than adequate. I've not specified here any particular amplifier circuit for use with the bus as almost any tubed or solid-state amplifier would work in the system. However, I have a preference for the LM383 IC, which is capable of providing up to 8 watts of audio.

Some attention was required in matching the bus-to-amplifier impedance. I found it desirable to use a coupling transformer between the amplifier and the bus to provide DC isolation, as a hum problem developed through a ground loop between one receiver and the amplifier. The hum problem was easily solved by installing a 600/600-ohm line transformer at the input of the amplifier. It could just as easily have

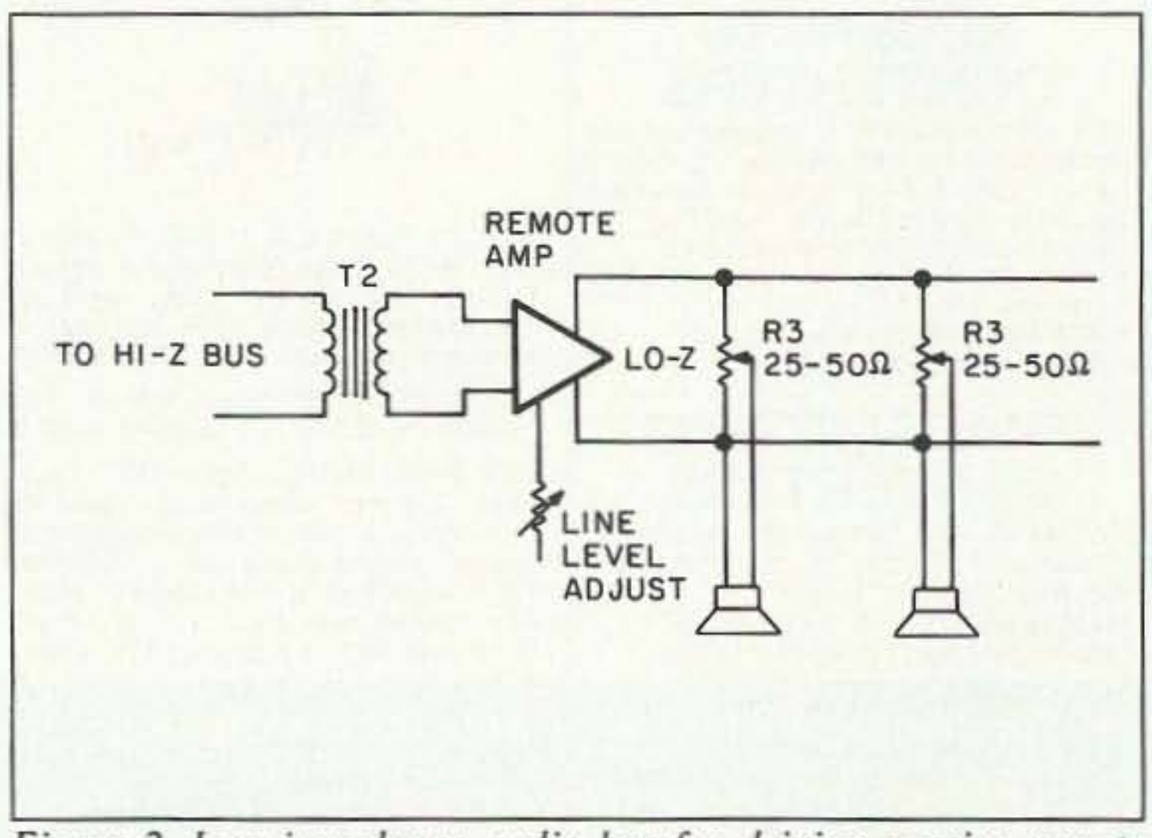
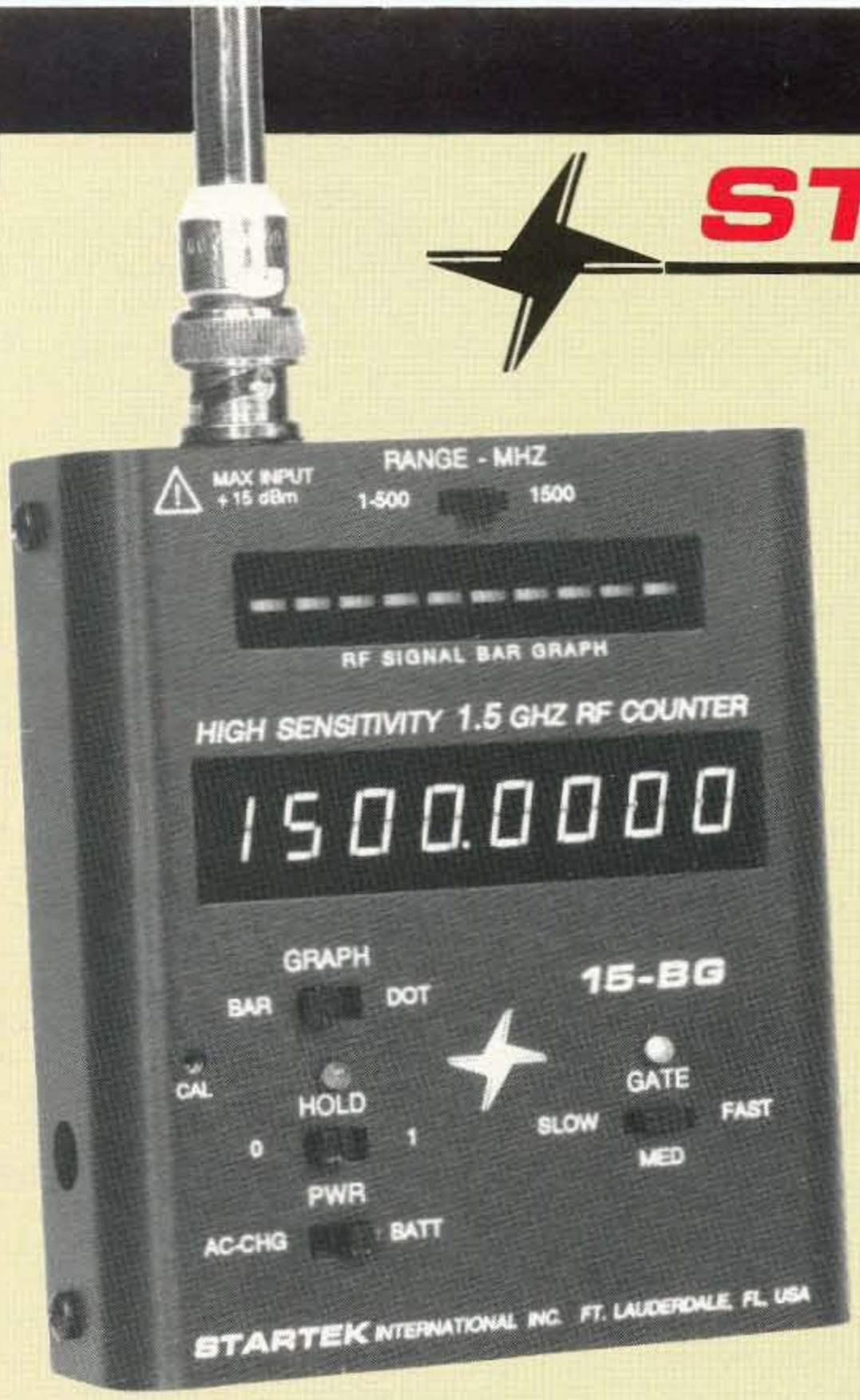


Figure 2. Low impedance audio bus for driving passive remote speakers.



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CIRCLE 247 ON READER SERVICE CARD

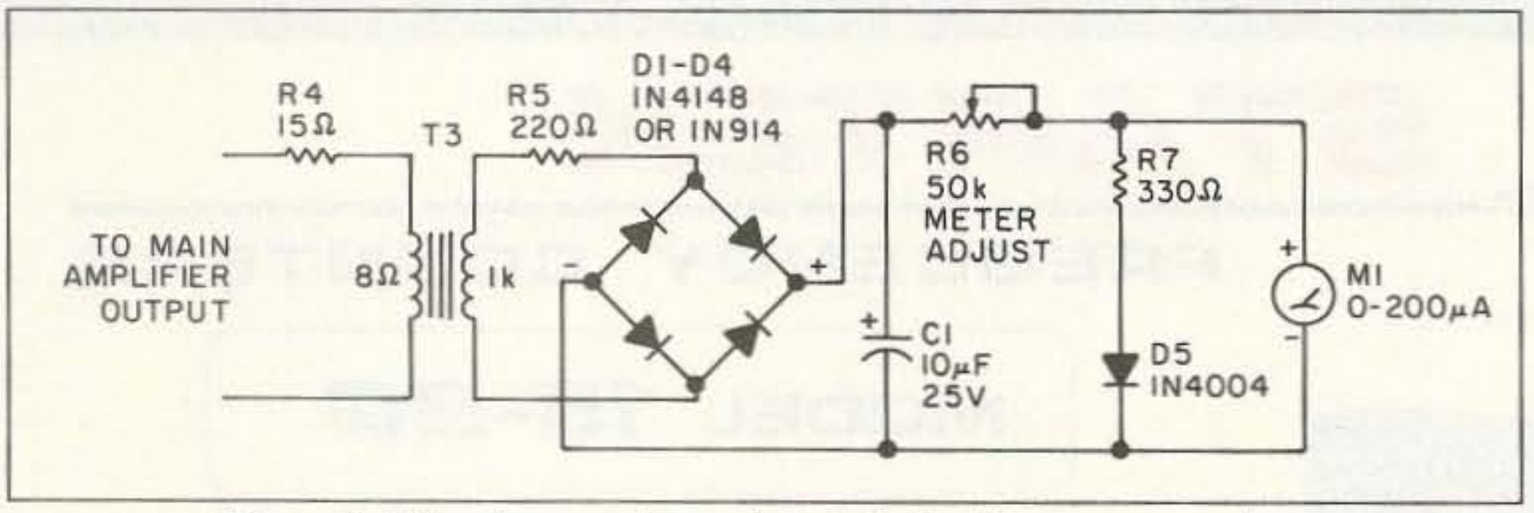

Figure 3. VU-style meter for setting audio levels on a common bus.

been installed at the output of the receiver. Further, the bus system is unshielded, unbalanced and works well as long as noise doesn't develop through ground loops, etc. The bus was made using #24 (paired) speaker wire strung along the shelves in the shack with terminal blocks attached periodically to accept receiver output.

I also tried an 8/500-ohm transistor radio output transformer for matching the bus to the amplifier input. It worked well, but the voltage step-up ratio required more amplifier input attenuation than I wanted for my application.

As an aside, I did notice some frequency response changes, though, while experimenting with different transformer input impedance values. Specifically, when using a 4/10k-ohm impedance ratio followed by a resistor attenuator to reduce the signal voltage, I observed a loss of low frequencies. It was necessary to bypass the attenuator with a capacitor to regain some low frequency response. Of course, the attenuation ratio changed, too. The use of a 1:1 ratio transformer solved the response and signal voltage problems.

Once the audio bus was operating to my satisfaction, I soon wanted to extend the system into the house for remote monitoring. Rather than modifying the first system, I developed a low impedance bus for remote speakers, as indicated in Figure 2. I wanted a single amplifier to drive all of the remote speakers rather than having an amplifier installed at each speaker, which would have required an added power bus. Again, a 4-watt amplifier was transformer-coupled to the high impedance audio bus and the output of the amplifier wired to the remote speakers. Each remote speaker consisted of a 2-inch/16-ohm transistor radio speaker mounted into a box, along with a 20-50-ohm pot used as a volume control. The actual pot resistance value was not found to be critical and values from 15 to 150 ohms worked well. Note that the pot wiper was connected to the speaker, not the bus. The object was to vary the audio power in the speaker without affecting the audio level on the bus. Rarely was it necessary to use more than about 250 mW at a remote speaker, therefore the pot usually stayed below the midpoint.

Frequency response and intermodulation distortion on the audio bus was not a problem. It seems that most amplifiers have a fairly linear sine wave response in the audio spectrum, preventing noticeable mixing products from being created when several audio signals are simultaneously present.

VU Meter

When setting the audio level at each receiver, I found it convenient to have a meter (VU-style) connected to the bus to observe the average signal level from each receiver. (See Figure 3.) I connected the meter circuit to the output of the "main" amplifier, adjusted the output of one receiver to a comfortable level and adjusted pot R6 to provide a mid-scale pointer swing. The output level of each receiver was adjusted to provide the same amount of pointer swing. Because the meter worked so well, it remains connected to my system to provide a continuous VU-style indication for received signals.

The VU-style meter obtains its power directly from the audio output of the "main" amplifier. To obtain sufficient voltage to swing the meter, I used a step-up transformer and rectified the output to provide DC. Because of pointer ballistics, a 10 μF capacitor was used to provide a long time constant to dampen the otherwise rapid pointer movement. I attached a series-connected diode and resistor across the meter to create a square-law non-linear pointer movement. The purpose was to reduce the pointer velocity as it approached the upper mechanical pointer stop, but yet provide an adequate swing below mid-scale. In theory, as the voltage across the meter rises to 0.7 volts, the 330-ohm resistor is shunted across the meter coil, reducing the meter sensitivity and slowing upward pointer movement. Almost any meter having a sensitivity from 50 μA to 200 μA works well in the circuit. A 0-1 mA could also be used, but cir-cuit values would have to be adjusted to accommodate the higher meter current value.

Since installing the common audio bus in my shack, I've been able to free up several independent speaker enclosures for use elsewhere in addition to combining the audio output of several receivers into a common speaker. I've also met my objective of having a single volume control for all of the sounds emanating from the receivers. If your shack needs some audio organization, consider trying a common audio bus system. 73

Parts List

C1	10 uF 25V electrolytic cap	Radio Shack	272-1013,1025
D1,4	1N4148 or 1N914 diode	Radio Shack	276-1122
D5	1N4001-1N4004 diode	Radio Shack	276-1101, 1102, 1103
R1	10 ohm 1/2 watt		
R2	100 ohm 1/2 watt		
R3	25-50 ohm pot	Radio Shack	271-265
		All Electronics	#POTS-50
R4	15 ohm 1/2 watt		
R5	220 ohm 1/2 watt		
R6	50k ohm pot	Radio Shack	271-1716
		All Electronics	LTP-50K
R7	330 ohm 1/2 watt		
T1, 2	1:1 turns ratio transformer	Radio Shack	273-1374
		All Electronics	600/600 ohm #TCTXS
			600/600 ohm #TCTX-1
			300/300 ohm #CPTX-2
T3	8/1k ohm audio output trans	Radio Shack	273-1380
M1	Any 50-200 μA panel meter		

Reference: All Electronics Corp., P.O. Box 567, Van Nuys CA 91408.
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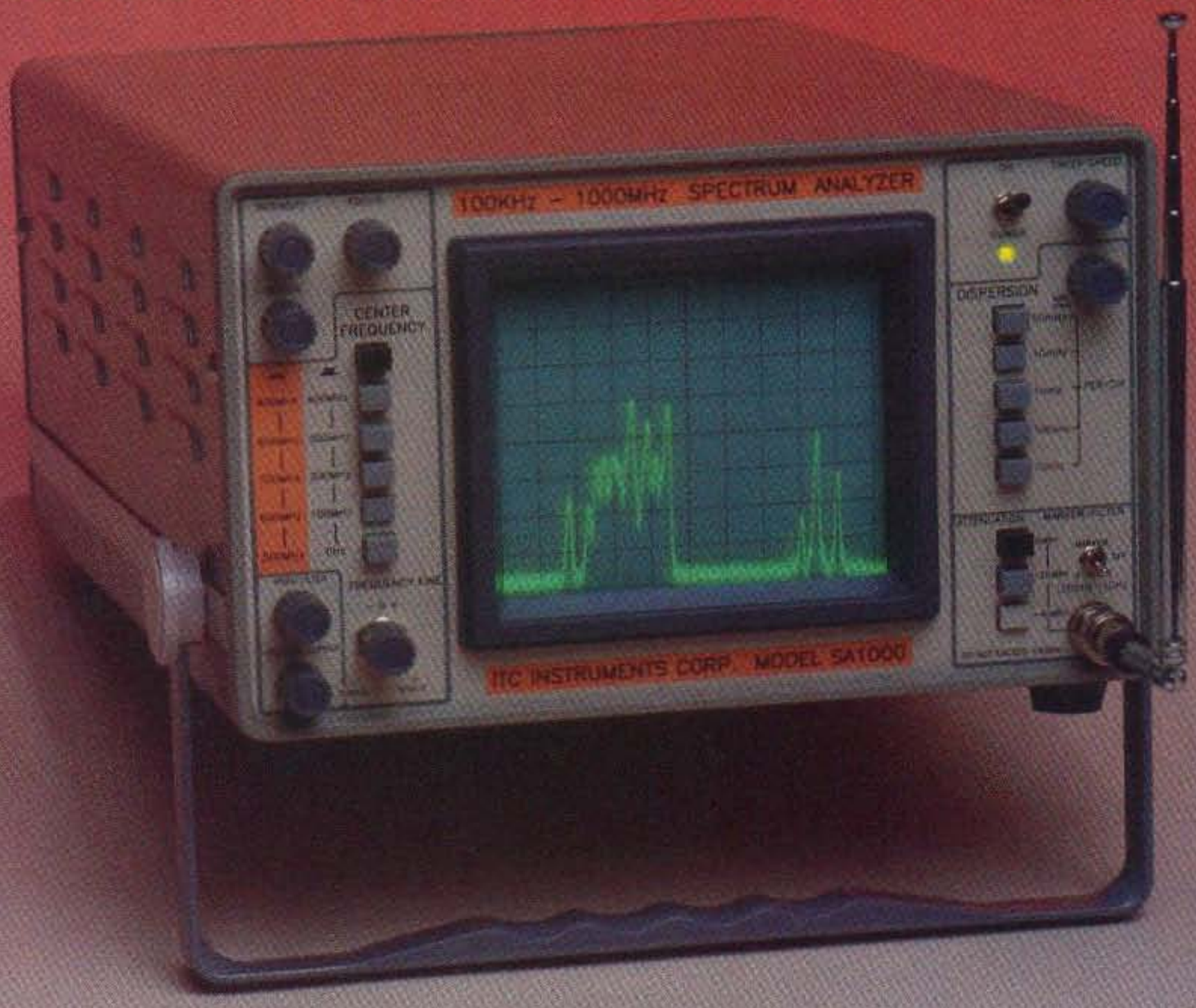

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CIRCLE 159 ON READER SERVICE CARD

73 Review

by Gordon West WB6NOA

The MAX System 5-Element Quad

Easy to assemble and very portable.

Number 11 on your Feedback card

Cellular Security Group
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(800) 487-7539
Price: $59.95, plus $4 S & H

Some unique and interesting antennas are available from the Cellular Security Group. Now, I realize that this name may seem a little strange for a company that builds antennas, but their PVC-based antennas are distinctly unique. I have their little telescopic PVC ground plane, and it works super for class demonstrations and portable work. With all the little ground plane elements pushed in you can get up as high as 450 MHz. Fully extended, you are down around 130 MHz. I can't think of anyone else with a collapsible VHF/UHF ground plane!

Quad antennas for 2 meters VHF have the distinct advantage of *portability* and quick assembly. The 5-element quad from this manufacturer uses sturdy white PVC tubing pre-drilled for the boom and the Fiberglas spreaders, and an extra PVC tube for a push-on attachment to support the boom.

Photo A. The Cellular Security Group's 5-element quad comes complete with a PVC mast.

Assembly

The 2 meter quad is great for newcomers because everything is pre-assembled. The stranded copper wire elements are clearly marked for the three directors: one driven, and one reflector placement. The wire has soldered-on spreader caps that simply pop on to each spreader assembly. The wire element is one total wavelength long, with each side a quarter wavelength. Directors are about five percent smaller than the driven element, and the reflector is approximately five percent larger.

The quad takes about five minutes to assemble. The spreader simply pushes into the holes on the boom. Red-tip spreaders are for the reflector, blue for the director, and black for the driven elements. Cellular Security Group's new improved version of their original 5-element quad also features cotter pins for the exact placement of each Fiberglas rod. The rods behave just like Fiberglas should, and are quite flexible.

As you attach the copper caps with the wire element pre-soldered on, there is gentle pressure that bows the elements either forward or backward. It makes no difference which way you bow the elements—just make sure that each set of spreaders is bowed in the same direction.

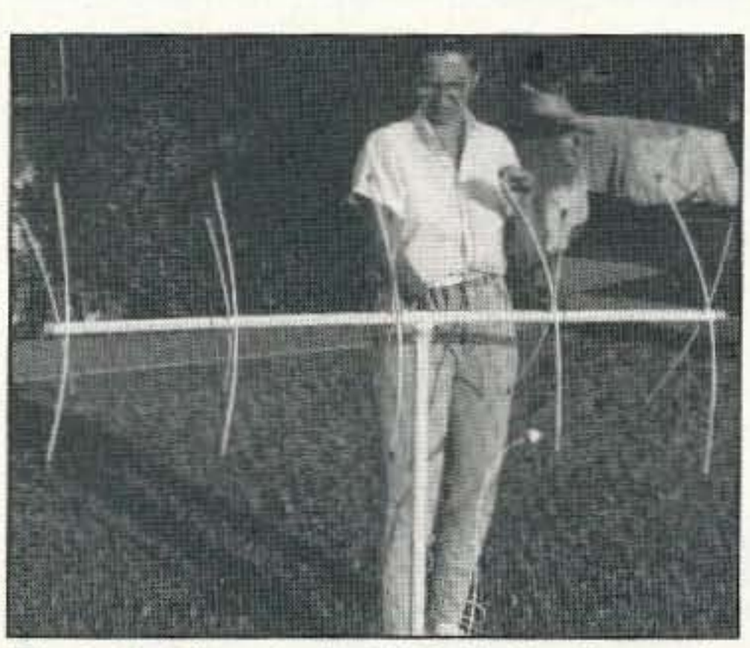

Photo B. The sturdy PVC design keeps the boom from sagging. Be sure to bow all of the spreaders in the same direction.

The driven element features a matching network which is mounted on the horizontal wire element for long-range, 2 meter, SSB horizontal polarization, or on the vertical side for 2 meter repeater communications. And for fox hunting, you can quickly add in attenuation when you get close to the hidden transmitter by simply going from one polarization to the other by swinging the quad on its side.

Performance

Once the quad was assembled we looked at its resonant bandwidth on the handy MFJ SWR analyzer. We backed up our findings with a Bird Model 43 wattmeter. With the antenna held safely above our heads, the SWR was a perfect 1:1.1 at 145 MHz, and at band edges 1:1.4 to 1. This makes it plenty broadband for use just outside the 2 meter ham band by Coast Guard auxiliarists, Civil Air Patrol operators, and MARS operation.

When we elevated the antenna to rooftop level of a single story house, the SWR minimum shifted down slightly 1 MHz. We were still well below 1:1.4 to 1 at the top of the band.

Since this lightweight portable quad makes a handy transmitter-hunting antenna, we were curious to examine what effect hand-holding the boom might have on the directivity of incoming signals, as well as on the overall performance of the antenna. As

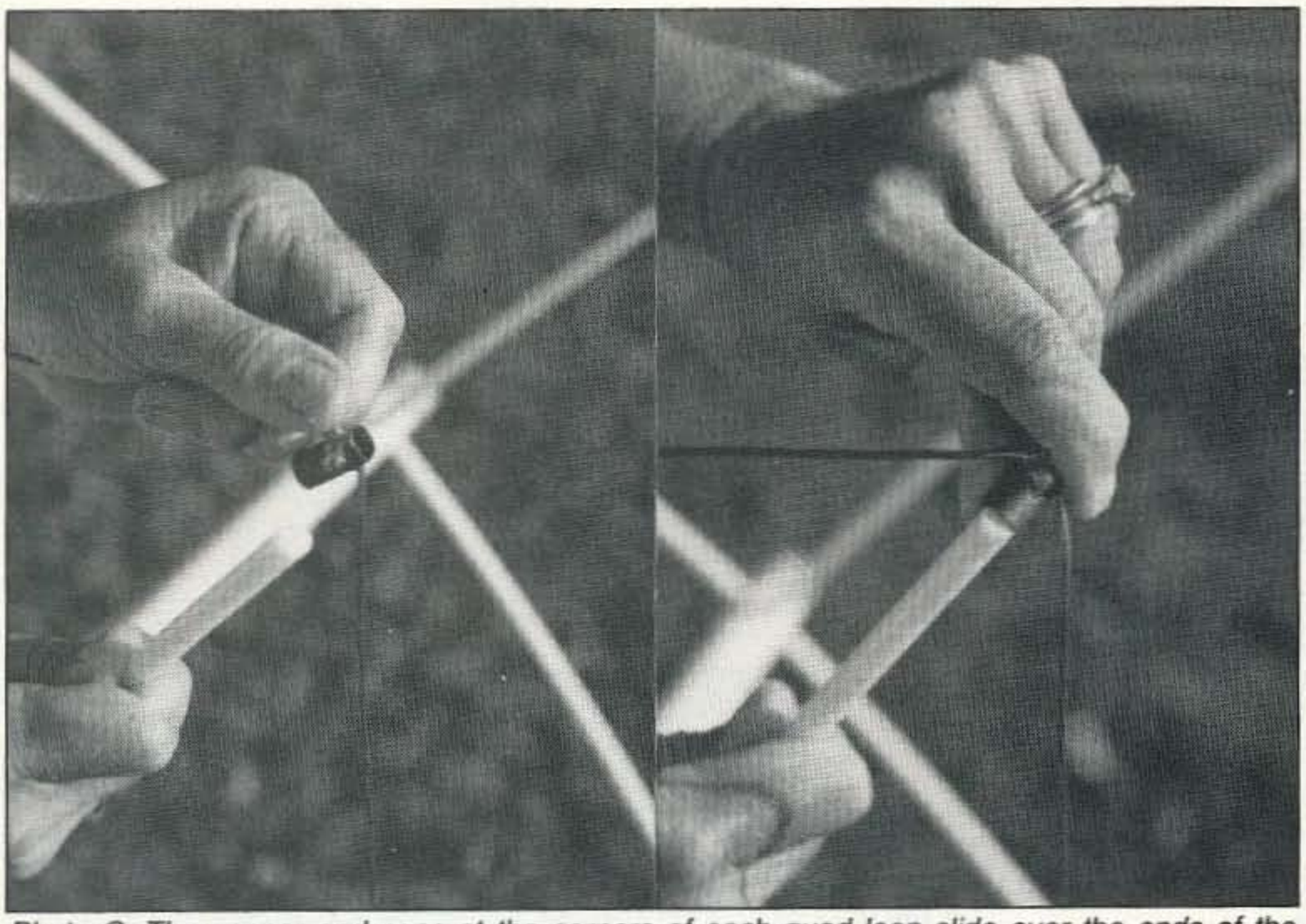

Photo C. The copper end caps at the corners of each quad loop slide over the ends of the spreader arms allowing you to quickly and accurately assemble the quad.

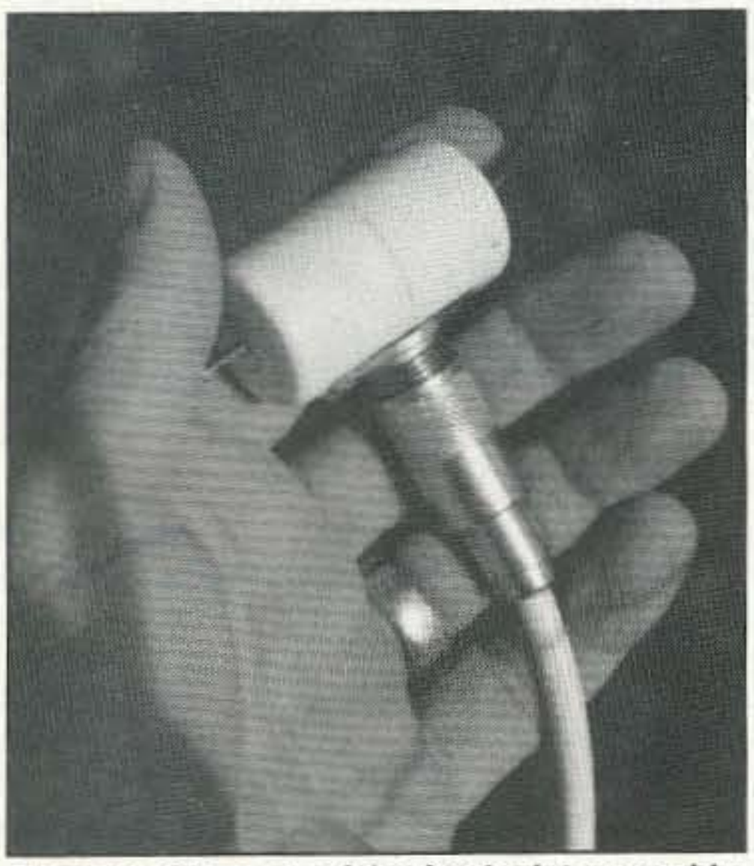

Photo D. Close-up of the feedpoint assembly.

long as you keep your fingers off of the antenna wires you can't tell the difference. However, we would never suggest holding the antenna by the boom when transmitting—even with flea-powered hand-held transceivers. Rather, use the supplied vertical PVC mast, and you will be assured of low SWR and a good clean forward lobe. It is advertised as an 11 dB forward gain antenna, probably 11 dBi. This is a pretty healthy figure for a boom length of only 5 feet, so I would simply go on record in saying that the quad is very directional, with very noticeable signal attenuation off the sides and off the back. Its front-to-back ratio is listed as 25 dB, but again, the testing we were doing was only with observed incoming and outgoing signal strengths.

Because the unit is so lightweight, it's ideal to take along on a VHF 2 meter mountaintop expedition. You can pack the spreaders and the wire elements inside the PVC tubes for safekeeping. Some little end caps keep everything in place, and a couple of extra pounds in your backpack is next to nothing on a local hiking trip. You supply your own coaxial cable harness, and we recommend RG8X so as not to distort the wire element attached to the matching network. If you're going to leave this unit out in the open air for some time you would want to seal up the PL259 connection with Coax Seal™ available from Universal Radio, Reynoldsburg, Ohio.

I did work some fantastic DX on this little antenna during the June VHF/UHF contest. An SSB station 400 miles away down in Mexico was able to hear our tropo signals just about as well as nearby operators running long boom yagis with plenty more gain. This proves the point that once a 2 meter path is open, a good directional antenna may really pick up signal strengths at both ends of the circuit.

The MAX System Quad will give you a terrific-performing setup for under $60. Best of all, everything is color-coded. So, even if you immediately lose the instructions, it would be tough to put this thing together wrong. And since the spreaders are made of Fiberglas-like materials, there's not that age-old problem of pulling down on the wire elements and having a wood dowel suddenly snapping in half. The element end caps are also smoothed out for safety protection, so with a little care this antenna should be safe around everyone on a mountaintop expedition. For added safety at moderate power use you could even coat the bare-stranded wires with a non-conductive, flexible compound available at most hardware stores.

And while assembling this little antenna in less than two minutes isn't much of a chore, it is sort of a kick to let the kids put it together, and to communicate from an antenna akin to a home-brew array. 73

Number 12 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

NYE ENGINEERING

Nye Engineering has announced a new and unique digital field strength meter for amateur and commercial use. The FS73 "Signal Cube" is a heavy duty model, 2.5" square and 2" deep, with a splash-proof cast aluminum case and has a large 3-1/2 digit LCD display indicating RF amplitude. It is broadband (0.1 to 450 MHz) and can be used for absolute or relative readings. A calibration chart on the back of the unit can be used to determine actual volts per meter, up to 150 MHz. The unit uses a standard 9V transistor battery and will operate for two months if the battery switch is left on (a low battery message shows on the display).

The FS73 Signal Cube has many uses, including checking radiation patterns of antennas at relatively great distances, and checking RF levels and detecting sources. It is priced at $159. For more information, contact *Nye Engineering Co., Inc., 4020 Galt Ocean Dr. #606, Fort Lauderdale FL 33308; (305) 566-8560, Fax: (305) 537-4711.* Or circle Reader Service No. 201.

CONNECT SYSTEMS

The new Model CD-1 from Connect Systems Inc. decodes and displays 104 DCS codes, 50 CTCSS codes and all 16 DTMF digits. The CD-1 is intended to be used with service monitors to provide important additional capabilities. However, it can also be connected to any receiver or scanner to check radios or to monitor shared repeaters and display the current user's DCS/CTCSS code. The CD-1 also displays DTMF codes such as ANI, access codes, phone numbers, etc. DTMF sequences are automatically replayed just in case you missed it in real time or the sequence was too fast to observe.

For prices and more information, contact *Connect Systems Inc., 2064 Eastman Ave., Suite 113, Ventura CA 93003; (805) 642-7184, Fax: (805) 642-7271.* Or circle Reader Service No. 205.

RABUN LABS

Rabun Labs, Inc. has announced a new product line that is a revolutionary new concept in electrical and electronic equipment protection technology. The Incipient Lightening Detection and Protection System (ILD/P Series) detects the presence of lightning when a storm is typically 5 to 10 miles away and protects equipment by automatically disconnecting power sources, telephone lines and coax cables. The system automatically restores all power and other connections after the storm is out of the area. Various models are available for amateur radio and two-way communications equipment, satellite receiving systems, computer and data processing equipment, well pump motors and air conditioning compressors.

For prices and more information, contact *Rabun Labs, Inc., P.O. Box 790, Clayton GA 30525; (800) 788-1824.* Or circle Reader Service No. 202.

JAPAN RADIO

Japan Radio Company, Ltd. has announced their newest product, the JRL-2000F HF linear amplifier, the world's first MOSFET linear amplifier for the ham radio market. JRC has developed several MOSFET transmitters for commercial HF applications up to 10 kW, all using the same single-ended push-pull circuit design found in the JRL-2000F. The JRL-2000F's 48-MOSFET power amplifier offers lower IMD and harmonic distortion than convention bipolar-type transistor amplifiers, a higher output power margin, higher efficiency, greater final device durability, and better linearity across wide frequency ranges. It features a built-in automatic antenna tuner and four antenna output connectors. Any exciter can be used; the unit senses the input RF and automatically tunes the amp to the operating frequency. The internal CPU stores band, tuner and antenna settings to one of 1,820 memory channels for fast recall. A built-in switching power supply utilizes a unique power factor correction (CFC) circuit to improve efficiency and reduce power consumption.

The suggested retail price for this amplifier is $4,899. For more information, contact *Japan Radio Co., Ltd., 430 Park Avenue, New York NY 10022; (212) 355-1180, Fax: (212) 319-5227.* Or circle Reader Service No. 204.

ANTENNAS WEST

The Pico-J from Antennas West is a sleek, tough end-fed half-wave antenna ready to hang anywhere. It can be attached to window glass or curtain rods, or suspended in an apartment closet, in a patio doorway, in a motel window, or from a light fixture. When not in use it rolls up and fits into a 4 oz. pocket-sized holder.

The Pico-J doesn't need radials for broadband low-angle omidirectional half-wave gain. It improves received signals, stretches simplex range, reaches far-away repeaters, and saves your pack. Priced at $19.95 ppd., it comes ready for work with 72" isolated coaxial feedline and a gold pin BNC. For more information, contact *Antennas West, 1500 N. 150 W., Provo UT 84604; (801) 375-4664, (800) 926-7373, Fax: (801) 373-8425.* Or circle Reader Service No. 203.

New Model DJ-580T

RATED # 1 IN JAPAN, NOW AVAILABLE IN THE U.S.

A super-compact handheld, the tiny DJ-580T is a powerful, feature-packed twin bander. This super-compact HT is the smallest you'll find, and literally fits in the palm of your hand.

Ergonomic design, combined with excellent sensitivity and unbelievable great sound, sets a new standard for miniature HT's.

New MCF function allows you to set the 40 memory channels regardless of which channels you want for VHF or UHF. Any combination is possible.

Alinco's DJ-580T has Full-Duplex Cross Band Operation and Cross Band Repeater Functions with real world power and excellent sensitivity. Airband receive with simple modification.

If the battery is depleted to less than 5 volts, Alinco's Patented Super Low Battery Consumption Function is automatically activated. You can continue to operate the radio all the way down to 3.5 volts. This feature is effective with dry cell batteries only.

This unit has built in DSQ for paging, CTCSS encode and decode standard, various scanning functions, 3 power level selections for each band, bell function, and an illuminated keypad.

Check out the affordable technology of the 90's.
Check out ALINCO.

ALINCO ELECTRONICS INC.

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Two Year Limited Warranty.
Specifications and features are subject to change without notice or obligation.

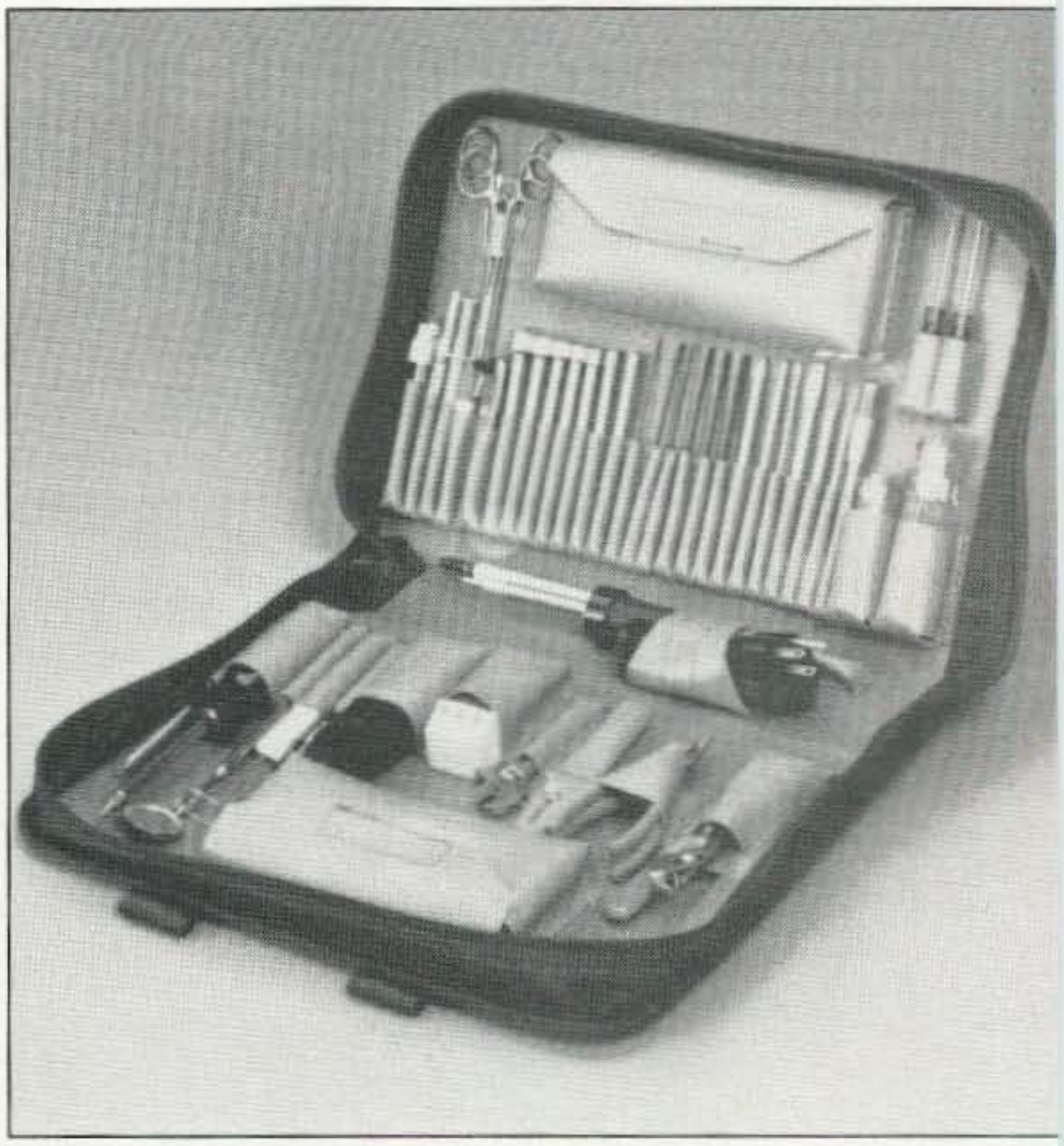
CIRCLE 67 ON READER SERVICE CARD

NEW PRODUCTS

CONTACT EAST

The 68-piece Workstation Specialist Kit from Contact East is designed for specialists servicing PCs, file servers, workstations and I/O devices. It contains commonly needed tools plus special tamper-proof fastener tools needed to access computers and monitors. Included are testers for duplex power outlets and telephone jacks and extractors. Three case styles are available: Model 68-TCD2 with a single compartment, brown Cordura case; Model 68-CDS2 with two compartments (one for documents), in a khaki Cordura Plus case with leather-like trim and a detachable shoulder strap; and Model 68-CDS3, 100% ESD-safe, with static-conductive foam, grounded through a common point grounding snap, made of specially treated static-dissipative gray Cordura Plus fabric, with a 5-foot ground cord and 5-foot coiled cord and adjustable wrist strap. All cases have three outside pockets.

Prices range from $235 to $323. For more information, contact *Contact East, 335 Willow Street, N. Andover MA 01845; (508) 682-2000.* Or circle Reader Service No. 206.

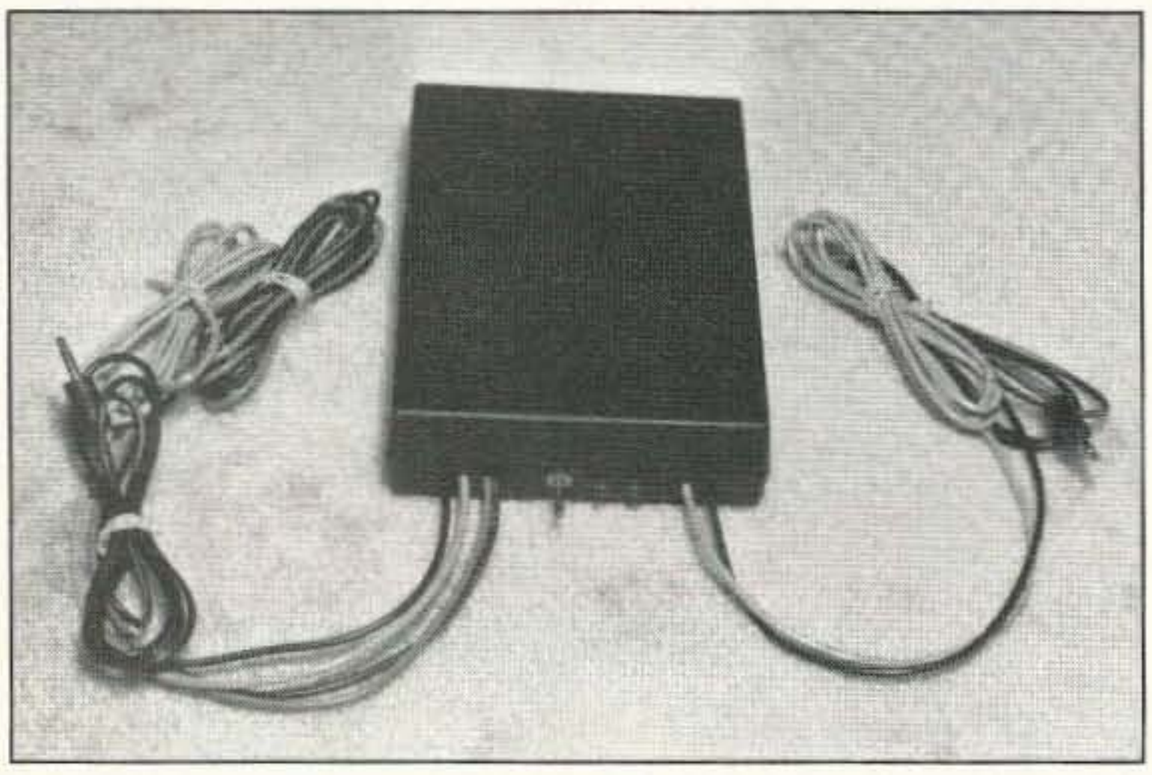


ELECTRON PROCESSING

Electron Processing has introduced a simple means to put a linked repeater or bi-directional link on the air quickly and without excessive expense. Ease of use and low cost make the BRI-2-DUAL and BRI-2-RB ideal for HT range extension, mobile/portable repeaters or dual frequency linking operation. The BRI-2-DUAL provides a bi-directional link configuration when connected to two transceivers. In this configuration, all signals received by one radio are transmitted on the other and vice versa. The BRI-2-RB is configured to provide a standard duplex repeater operation with connection to another transceiver in "remote base" type operation. The repeater is then linked to whatever repeater or frequency the second transceiver is tuned to.

No internal modification of your equipment is needed as it connects to the external speaker output of your receivers and the mike jack of your transmitters. All the basic necessities of repeater or relay operation are provided. Audio Isolation and PTT transmitter keying using a VOX circuit makes connection to your equipment simple—just wire your microphone plug! A five-second "hang" time and a three-minute "timeout" timer are both provided (and can be disabled). Both units are powered by 12 VDC.

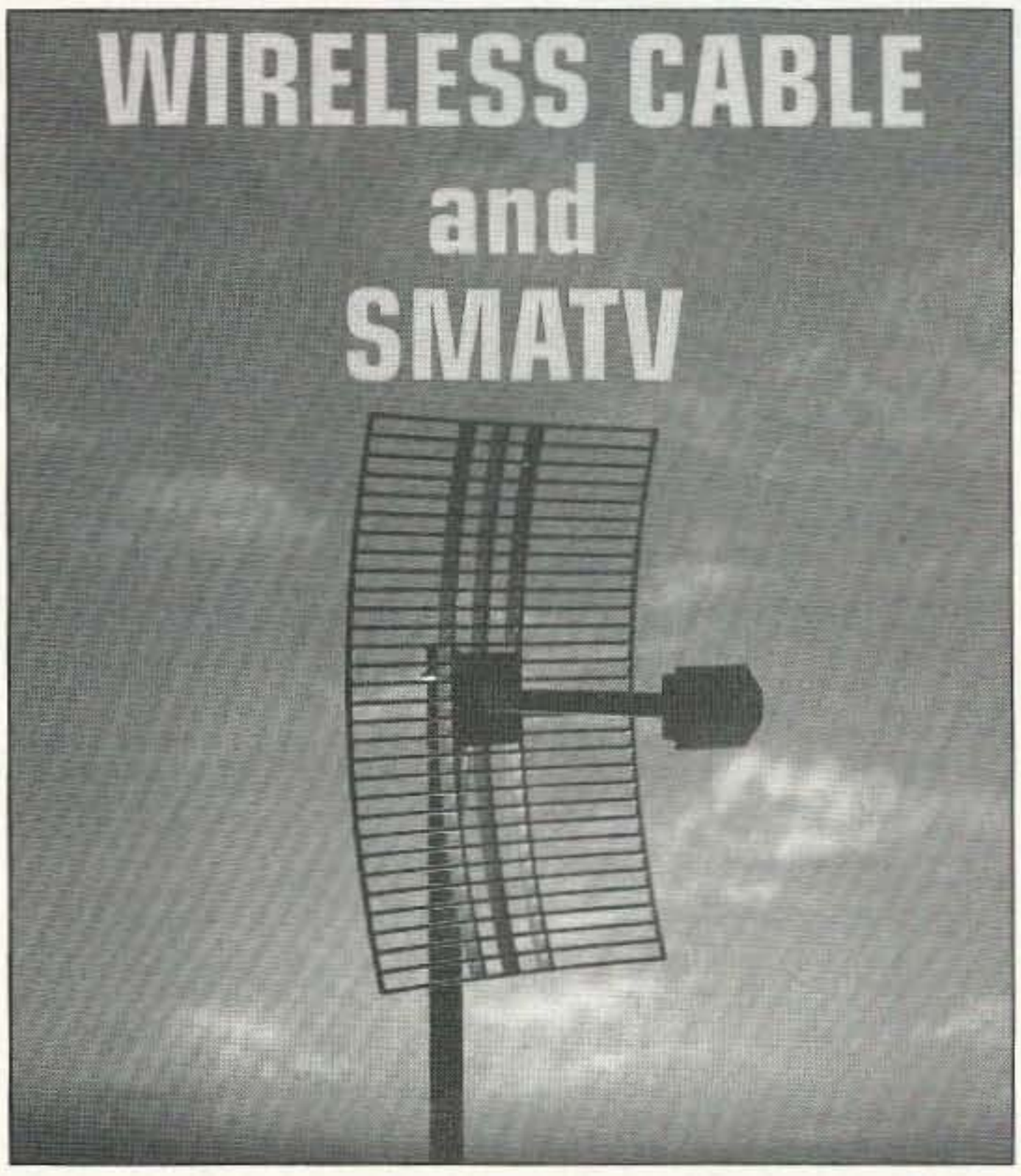
The BRI-2-DUAL and the BRI-2-RB each sell for $85, plus a $5 shipping/handling charge. For more information, contact *Electron Processing, Inc., P.O. Box 68, Cedar MI 49621; (616) 228-7020.*



BAYLIN PUBLICATIONS

Baylin Publications has announced a new book, *Wireless Cable and SMATV*. This 400-page, 8-1/2" x 11" publication expands upon an earlier work, *Satellite, Off-Air and SMATV* and includes a completely new 170-page section on wireless cable/MMDS systems, as well as a chapter on private cable security systems. It has over 200 photos and illustrations that support the goal of allowing even a non-technical person to develop a comprehensive understanding of wireless cable and SMATV.

Wireless Cable and SMATV is priced at $50, plus $4 shipping and handling. Contact Baylin Publications, 1905 Mariposa, Boulder CO 80302. *Or circle Reader Service No. 207.*



Handy POWER™

POWERFUL

- 12 Volt 6.5 AH PowerPack.
- Boosts H-T to 5/7 watts output.
- 15 times H-T nicad pack.

MODULAR

- Modular mounts for accessories.
- Carries H-T & adapters in one.
- Standard cigarette socket.

PORTABLE

- Built-in handle & strap.
- Always ready, no overcharge.
- For emergency, field day, etc.

"Communications coverage for 10 hours without coming ashore for recharge!"
NQ4K Robert Walters LakeRidge, VA

"The PowerPack was flawless and was still working when our (emergency) drill ended."
W6VKF/7 CE "Jim" Ware Concrete, WA

DC POWER PACK

12 VOLT · DC · CORDLESS · RECHARGEABLE

DC PowerPack—Sealed lead acid cell rechargeable up to 1,000 times.
Wt. 6.8 lbs., size 7" X 3" X 10".
Powers other DC products too.

DC Charger—Recharges in vehicle in 1 to 3 hours.

AC Charger—Recharges at home in 8 to 10 hours.

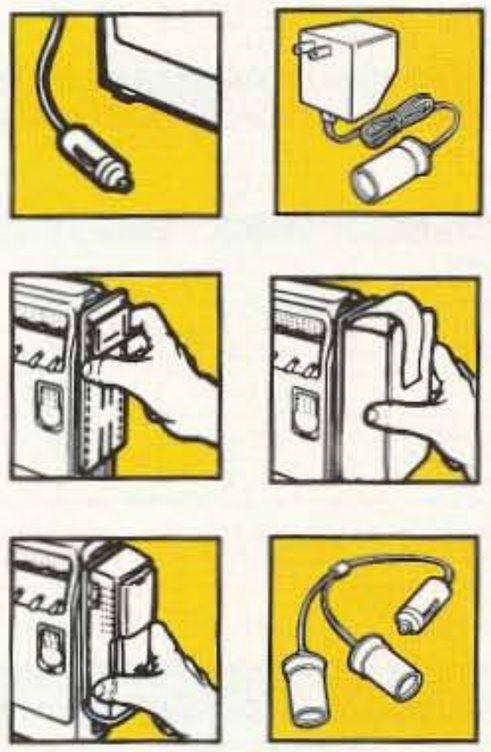
Modular Clip Holder—Holds H-T, or anything with a belt clip.

Modular Storage Pouch—Carries accessories & adapters.

Modular Light—Constant/flashing light for night or emergency. Powers 8 watts up to 8 hours.

Double Socket—Powers two 12 volt products.

HAM KIT INCLUDES



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MODULAR SYSTEM ACCESSORY

Optional Solar Charger Kit

Recharges in remote areas in 8 to 10 hours (sunny day).
Powers H-T in emergency (sunny day).
15 volt, 6.8 watts, wt.4.5lb., size 12"X18"X1/4".

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17291 Mt. Herrmann Street, Fountain Valley, CA 92708

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List Price $142.70 **Your Price** **$99.95**
$9.95 S&H*

Optional Solar Charger Kit #06-8191
List Price $151.40 **Your Price** **$99.95**
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*S & H in continental USA. Extra cost for others. CA residents add tax $7.75/Kit. Allow 2-4 weeks for delivery. Extra charge for 2nd day express.

MODERN, MULTI-BAND ANTENNA SYSTEMS

COMET

For COMET Customer Service: Call NCG Company

714/630-4541

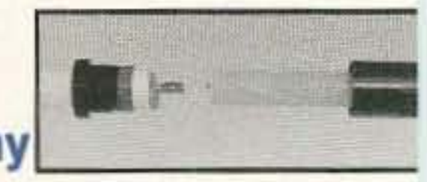


PHOTO A

PHOTO B

COMET developed the Super Linear Converter (SLC) System to increase the actual gain of Dual/Triband antennas.

- A completely pre-formed phasing coil and phosphorus copper element eliminates additional components and gain loss. (Photo B)
- The SLC is electrically very efficient, providing a low angle of radiation directly to the horizon, for maximum performance. (Photo B)
- COMET sectional antennas use ABS (Transparent to RF) connecting joints for the finest pattern and easiest assembly. (Photo A)

CFX-4310

CFX-431

CF-4160

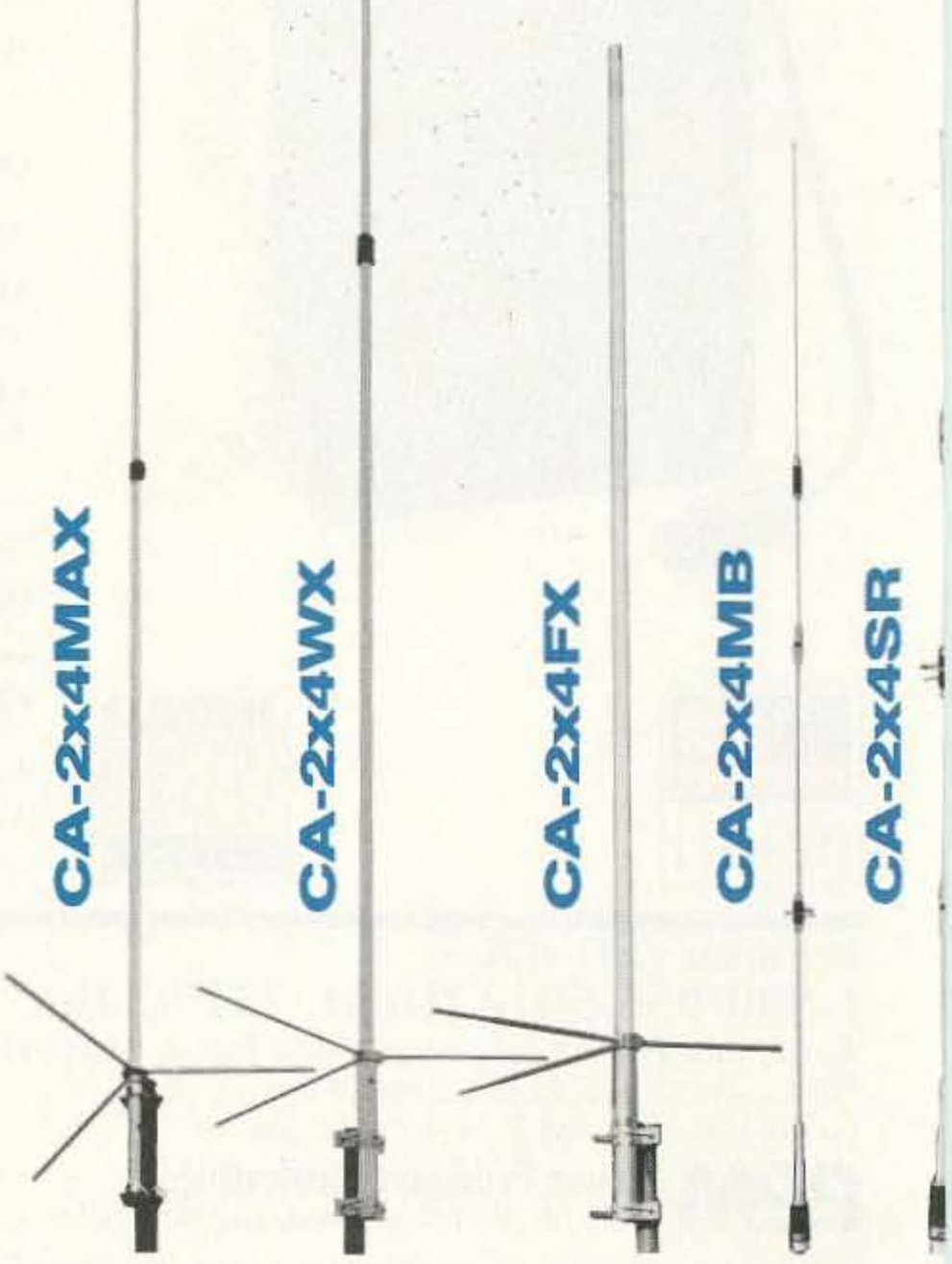
CF-416

COMET DUALBAND ANTENNAS

MODEL #	BANDS	GAIN	MAX PWR Watts	CONN	WEIGHT Lbs' oz"	LENGTH Ft' In"	MAX WIND SPEED MPH
DualBand Base Station/Repeater Antennas							
GPX-2010 SLC	2M/70cm	9.5/13.2	200	SO-239	7'14"	23'4"	65 w/o guys 90 w/guys
Nylon Guys Included. Highest Gain Dualbander in the World!							
CA-2x4MAX SLC	2M/70cm	8.5/11.9	200	SO-239	5'11"	17'8"	90
CA-2x4WX SLC	2M/70cm	6.5/9.0	200	SO-239	3'8"	10'5"	90
CA-2x4FX SLC	2M/70cm	4.5/7.2	200	SO-239	2'12"	5'11"	112
NCG-1422B	2M/220MHz	2.15/3.4	200	SO-239	2'8"	3'8"	112
CA-350DB	10M/6M	2.15/6.5	100 FM	SO-239	7'8"	22'7"	65
CA-1243Z	70cm/23cm	9.4/12.8	150/50	N-Female	3'8"	7'5"	90
CA-1243E	70cm/23cm	6.0/8.4	150/50	N-Female	1'13"	3'4"	112
DualBand Mobile Antennas NEW B-Series BLACK ANODIZED Cellular Appearance							
B-10	2M/70cm	–/2.15	50	PL-259	–	12"	–
B10NMO	2M/70cm	–/2.15	50	NMO	–	12"	–
B-20	2M/70cm	2.15/5.0	50	PL-259	–	30"	–
B20NMO	2M/70cm	2.15/5.0	50	NMO	–	30"	–
NEW F Series: The Highest Quality DualBand Antenna You Can Buy!							
FL-62S	2M/70cm	3.6/6.0	150	PL-259	–	3'5"	–
FL-67S	2M/70cm	4.5/7.2	150	PL-259	–	4'11"	–
CA-2x4MB	2M/70cm	4.5/7.0	150	PL-259	–	4'11"	–
CA-2x4SR	2M/70cm	3.8/6.2	150	PL-259	–	3'4"	–
CHL-23J	2M/70cm	2.15/3.8	100	PL-259	–	20"	–
CHL-21J	2M/70cm	–/2.15	100	PL-259	–	12"	–
NCG-1422M	2M/220MHz	2.15/3.4	100	PL-259	–	3'0"	–
CHL-350	10M/6M	–/2.15	200	PL-259	–	7'0"	–

COMET TRIBAND ANTENNAS

MODEL #	BANDS	GAIN	MAX PWR Watts	CONN	WEIGHT Lbs' oz"	LENGTH Ft' In"	MAX WIND SPEED MPH
TriBand Base Station/Repeater Antennas							
CX-725	6M/2M/70cm	2.15/6.2/8.4	200	SO-239	2'15"	7'11"	90
CX-902 SLC	2M/70cm/23cm	6.5/9.0/9.0	200	N-Female	3'3"	10'0"	90
CX-903	2M/70cm/23cm	6.5/9.0/13.5	100	N-Female	3'6"	9'8"	90+
TriBand Mobile Antennas							
CX-702	6M/2M/70cm	2.15/6.0/8.4	120	PL-259	–	6'10"	–
CX-801	2M/70cm/23cm	3.0/6.8/9.6	100	N-Male	–	3'3"	–
FL-95SN	2M/70cm/23cm	2.8/6.0/8.4	80	N-Male	–	2'7"	–
NEW! The Highest Gain 2M/220/440MHz Mobile In The World! Available from COMET, Of Course!							
CX-224	2M/220/70cm	2.15/3.6/6.0	150	PL-259	–	3'1"	–
CX-224NMO	2M/220/70cm	2.15/3.6/6.0	150	NMO	–	3'1"	–
NEW! QUAD-BAND Mobile Antenna. Simultaneous TX On 4 Bands. 6M And 2M Bands Are Constant. By Adding HF Coils, The CA-HV Can Be Used For 3 Or 4 Bands Easily!							
CA-HV	40/(20)/15/ 10/6/2Meters	HF –/2.15/3.4	120SSB	PL-259	MAX 1'3"	MAX 6'3"	– –
L-14	Optional 20M loading coil for the CA-HV.						



RS-80

RS-81

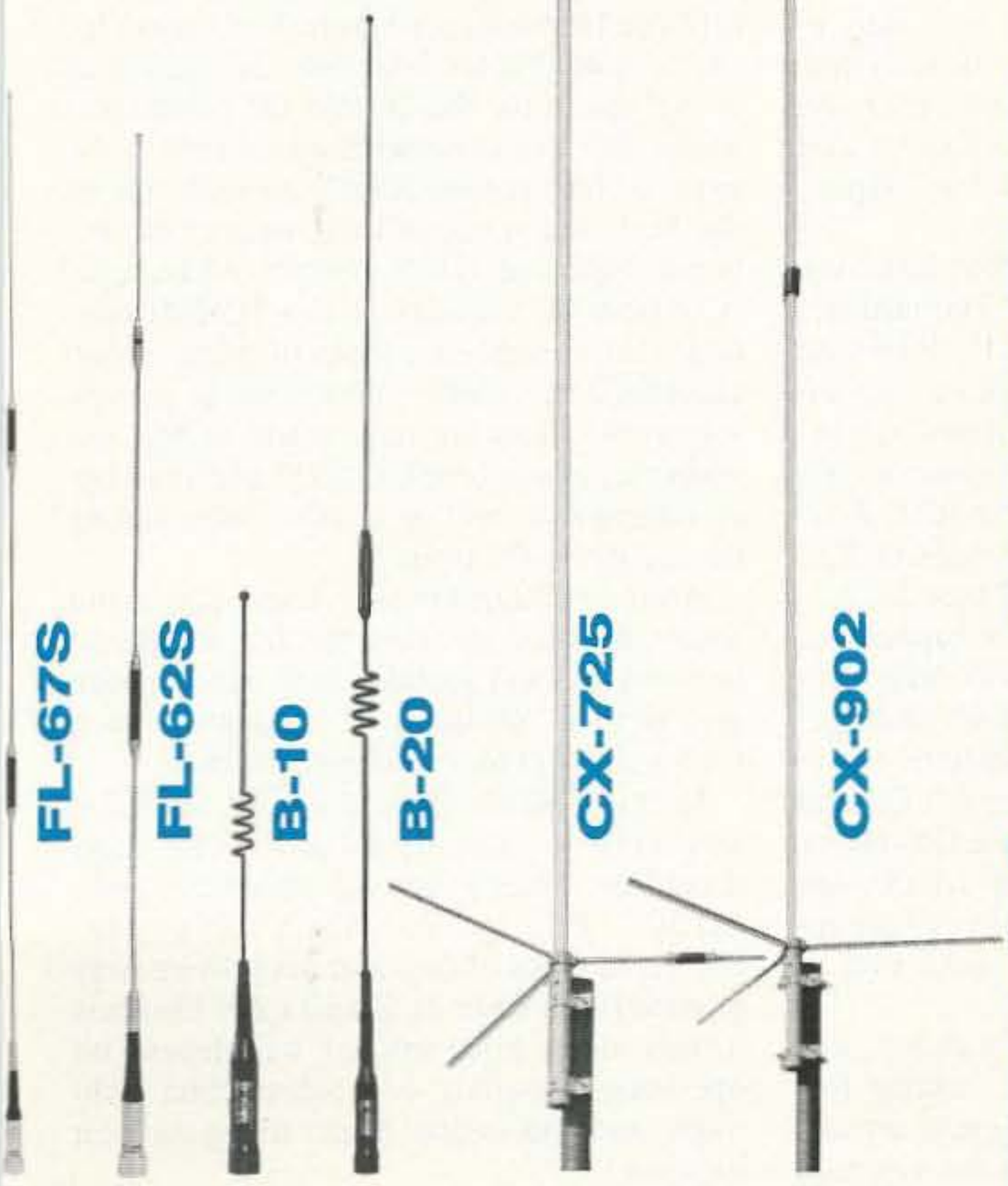
RS-21

RS-9

CA-HV FL-95SN CX-801 CX-224

04M Standard ble assembly.

CK-5M Deluxe cable assembly.



FL-67S FL-62S B-10 B-20 CX-725 CX-902

COMET HIGH-POWER DUPLEXERS AND TRIPLEXERS

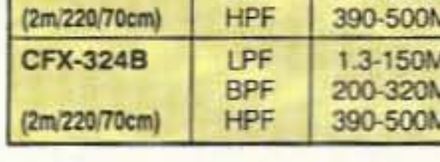
Zinc-Alloy, Die-Cast, Twin-Cavity. Low Input-Loss, High-Isolation, and HIGH-POWER. Modernize Your Station with COMET Antenna Products.

MODEL #	PORT	Freq MHz	CW Watts	PEP Watts	Loss dB	Isol dB	Mix Conn	Port Conn
CF-416A (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.15 0.25	60dB 60dB	SO-239	PL-259 w/leads PL-259 w/leads
CF-416C (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.15 0.25	60dB 60dB	N-Female	PL-259 w/leads N-Male w/leads
CF-4160I (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.1 0.2	60dB 60dB	SO-239	PL-259 w/o leads N-Male w/o leads
CF-4160K (2M/70cm)	LPF HPF	1.3-150MHz 400-540MHz	450 300	800 500	0.1 0.2	60dB 60dB	SO-239	PL-259 w/o leads PL-259 w/o leads
CF-413A (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.25 0.25 0.4	55dB 55dB 55dB	N-Female	N-Male w/leads N-Male w/leads
CF-413B (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.25 0.25 0.4	55dB 55dB 55dB	N-Female	PL-259 w/leads N-Male w/leads
CF-413O (70cm/1.2GHz)	LPF HPF	1.3-150MHz 350-500MHz 840-1.4GHz	450 300 100	800 500 200	0.2 0.2 0.3	55dB 55dB 55dB	N-Female	N-Male w/o leads N-Male w/o leads
CF-350 (10m/6m)	LPF HPF	1.3-30MHz 50-240MHz	350 350	600 600	0.2 0.2	40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads
NCG-1422D (2m/220MHz)	LPF HPF	144-148MHz 220-225MHz	50 50	100 100	0.5 0.5	40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads
CFX-431A (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.2 0.2 0.3 0.4	50dB 50dB 50dB 50dB	N-Female	PL-259 w/leads N-Male w/leads N-Male w/leads
CFX-4310B (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.15 0.25 0.25 0.3	50dB 50dB 50dB 50dB	N-Female	PL-259 w/o leads N-Male w/o leads N-Male w/o leads
CFX-4310C (2m/70cm/1.2)	LPF BPF HPF	1.6-60MHz 100-150MHz 350-500MHz 840-1.4GHz	600 450 300 100	1KW 800 500 200	0.15 0.25 0.25 0.3	50dB 50dB 50dB 50dB	N-Female	PL-259 w/o leads PL-259 w/o leads N-Male w/o leads
CFX-514 (6m/2m/70cm)	LPF BPF HPF	1.3-90MHz 130-200MHz 380-500MHz	450 450 300	800 800 500	0.2 0.25 0.3	55dB 55dB 55dB	SO-239	PL-259 w/leads PL-259 w/leads PL-259 w/leads
CFX-514J (6m/2m/70cm)	LPF BPF HPF	1.3-90MHz 130-200MHz 380-500MHz	450 450 300	800 800 500	0.15 0.2 0.25	55dB 55dB 55dB	SO-239	SO-239 w/o leads SO-239 w/o leads SO-239 w/o leads
CFX-324A (2m/220/70cm)	LPF BPF HPF	1.3-150MHz 200-320MHz 390-500MHz	350 350 350	600 600 600	0.2 0.25 0.3	40dB 40dB 40dB	SO-239	PL-259 w/leads PL-259 w/leads PL-259 w/leads
CFX-324B (2m/220/70cm)	LPF BPF HPF	1.3-150MHz 200-320MHz 390-500MHz	350 350 350	600 600 600	0.2 0.25 0.3	40dB 40dB 40dB	SO-239	PL-259 w/o leads PL-259 w/o leads PL-259 w/o leads

COMET MOBILE MOUNTING SYSTEMS

COMET has a wide selection of mobile mounts, choose the mount and Coax Cable Assembly that best fits your personal needs. All COMET cables have detachable connectors.

MODEL #	DESCRIPTION
3D4M 3D4N	Standard coax assy. 13ft low loss coax w/UHF Connectors. Standard coax assembly with N-Conns. 13ft low loss coax.
CK-5M CK-5N	13ft VERY low loss cable + RG-188. Avoids cable damage upon vehicle entry. UHF Conns. 13ft VERY low loss cable + RG-188. Avoids cable damage upon vehicle entry. N-Conns.
5D4N	13ft VERY low loss cable assy. For 1.2GHz N-Connectors
The Following Mounts are w/o Coax. Choose from the Cable Assemblies Above.	
RS-80 RS-81 RS-21 RS-9	Heavy-Duty Gutter Mount, Black w/Dial lock. Heavy-Duty Trunk Lip Mount, Black w/Dial lock. Multi-Purpose Mount, Trunk-Lip/Hatch-Back, Black, Adj. to any position. Trunk Lip Mount, Black. For small antennas. (B-10, B-20, CHL-23J, etc.)
MS-3FVMM	Mag Mount, 13ft low-loss cable. 12 pole magnet. UHF Connectors
MS-5LXMM MS-5LXNN	Mag Mount, 13ft low loss cable + 10" RG-188 to avoid water leak/cable damage. Mag Mount, 13ft low loss cable + 10" RG-188, N-Connectors
TS-103MM TS-106NN	16.5ft low loss cable and trunk Lip mount, UHF Conns 16.5 VERY low loss coax + 10" RG-188, N-Connectors.



Detachable Connector
All Comet assemblies use this connector for easy installation.

COMET SWR/POWER METERS

MODEL #	DESCRIPTION
CD-270	Bench Meter, illuminated. 140-525MHz Pwr Range: 15/60/200W Low Inser. loss UHF Connectors, 50 Ohm impedance. Measure and Monitor, SWR Fwd AND Ref Power.
COMET Minimeters: Measure SWR 1.0-5:1 Imped: 50 Ohm Weight: 5 oz.	
CM-200	140-150MHz PWR Range: 15/50 Watts
CM-300	220-240MHz PWR Range: 15/50 Watts
CM-400	430-450MHz PWR Range: 15/50 Watts
CM-420	140-440MHz PWR Range: 15/60 Watts
CM-1200	1240-1300MHz PWR Range: 10/60 Watts

ATV Transmitter, Part II

Get on ATV easily and quickly.

by Rudolf F. Graf KA2CWL and William Sheets K2MQJ

[Last month we looked at the theory of operation and the circuitry involved to build a compact 1-watt ATV transmitter for the 70cm band that operates with a 9-volt supply. In this final segment, we'll show you how to complete the assembly and test the circuit. Keep in mind that you will need the appropriate amateur license to operate ATV on 70cm (Technician or higher) and you must stay within the amateur band frequency limits.—Ed.]

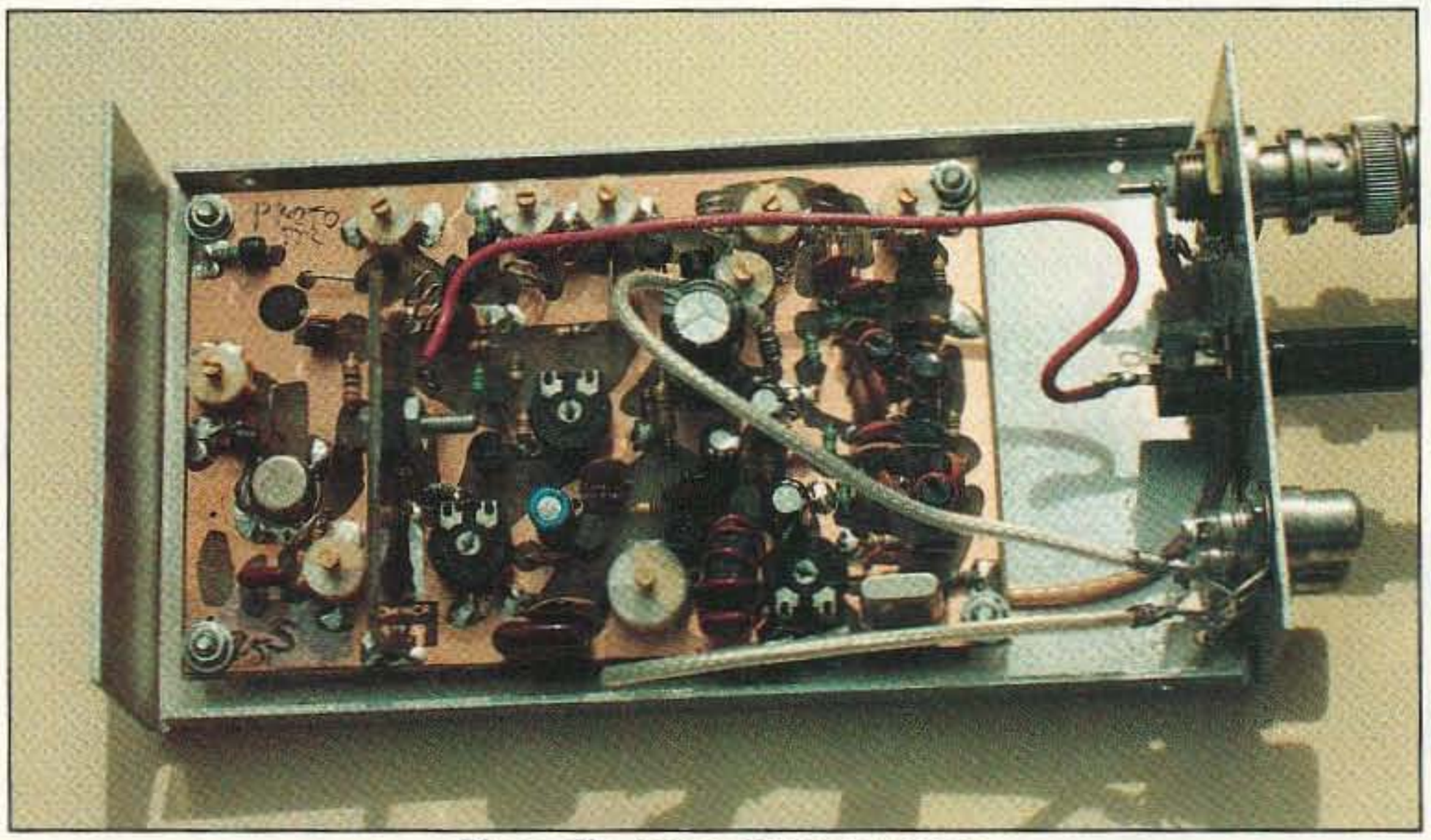


Photo. The 1-watt ATV transmitter.

Remember that this transmitter is basically an AM transmitter with very wide modulator frequency response. Construction of the transmitter board should pose no special problems as long as you take care to duplicate the prototype as closely as possible.

Assembly Hints

Some precautions to take are:

1. Use only G10 0.062" thick epoxy Fiberglas board material. Other materials and thicknesses could be used, but may result in different tuning conditions and stray capacitances. However, do not use paper-base phenolic material—it is too lossy at the high frequencies present in this transmitter.

2. Q12 must be heat-sinked. A possible 3-watt dissipation makes some form of heat-sinking mandatory. The method shown in Figure 7 has proved adequate if at least one-ounce copper is used. If possible, use 0.040 copper or brass, but this is not absolutely necessary. Q7 is adequately heat-sinked, if the metal case is soldered to the PC board ground plane, for a normal transmit-receive duty cycle (one minute on, one minute off). For continuous operation use a clip-on heat sink that encircles the can of Q7 (use the type that has spring fingers) and, if possible, add a few fins to this, or bolt this clip-on heat sink to a larger piece of aluminum or copper (preferred), or even the mounting case, if possible.

3. Solder as many component leads as possible, on top of the board, that pass through the ground plane to both the top and the bottom of the board. In particular, the ground lugs on all trimmer capacitors should be soldered on both sides. The same is true for most of the resistors that have one side connected to ground. The idea is to ground as much of the ground plane (shield top side) to the ground foil on the component side, in as many places as possible. This is especially important around Q4 through Q7.

4. Use chip capacitors where specified. Do not substitute ordinary leaded capacitors. Use only those components specified, no substitutions.

5. *Keep all components as close to the PC board as possible, and the leads as short as possible.*

6. Take care to make coils as accurately as possible. While some error can be tolerated, accurate work will make tune-up easier and assure duplication of results. Expect that some coils (L1, L2, L3, L14) may require addition or subtraction of a turn.

Construction is started by first installing all resistors and then D1 and D3. (Do not forget ferrite beads on R15, R17, R19, and R21.) Next, install all disc ceramics 0.01 µF and 470 pF. The NPO capacitors are installed next. After the NPO capacitors are installed, install potentiometers R22, R32, and R33. Solder the grounded sides of R22 and R33 to both sides of the PC board.

Next, install all the trimmer capacitors. Note that C18 and C40 are different from the rest. Solder ground tabs of all the trimmers to both the top and the bottom of the PC board. Next, install Q1 through Q5 and Q8 through Q11. Do not install Q6, Q7 or Q12 yet. Now, wind and install L1 through L9, and L14. Last, install chip capacitors C22, C24, C44, and C20 and make sure to omit C22.

Check all of the PC board for shorts, solder bridges, and trim away any excess foil with a sharp knife (X-acto™ type or equal). Make sure any excess foil on the top side isn't touching any component leads not intended to be grounded. Slight misregistration of the top foil may cause this. Simply trim excess foil away with an X-acto knife. Note that Q6 and Q7 and associated circuitry is best installed after the remainder of the board is completed and tested. Now install Q12 and heat-sink per Figure 7 and also Figure 3. Note that the heat sink also serves as an RF shield for the Q6 and Q7 power amplifier. Be sure to solder the heat sink to the top foil side (ground plane), on each side of the heat sink where it butts against the PC board. Note that Q12's case should be insulated from the heat sink. Use a TO-220 insulator (cut to size) or a scrap of mica, mylar, polyethylene, or teflon tape (used in plumbing work). You are now ready to test the main part of the board. Q6, Q7 and associated components will be installed after testing the rest of the PC board.

After checking for shorts and opens and solder bridges, measure the DC resistance between B+ and ground. It should measure greater than 100 ohms. If it's lower, check for the cause before proceeding further.

Next, install the slugs in L1, L2, and L3 if you have not already done so. The slugs should be initially set fully inside the coils. Set R22, R32 and R33 about halfway between extremes of rotation. Set C40 halfway meshed (see Figure 3). Set all other trimmers to half mesh. Final settings will depend on operating frequency, coil construction technique, and application. (Refer to Figure 3 for location.)

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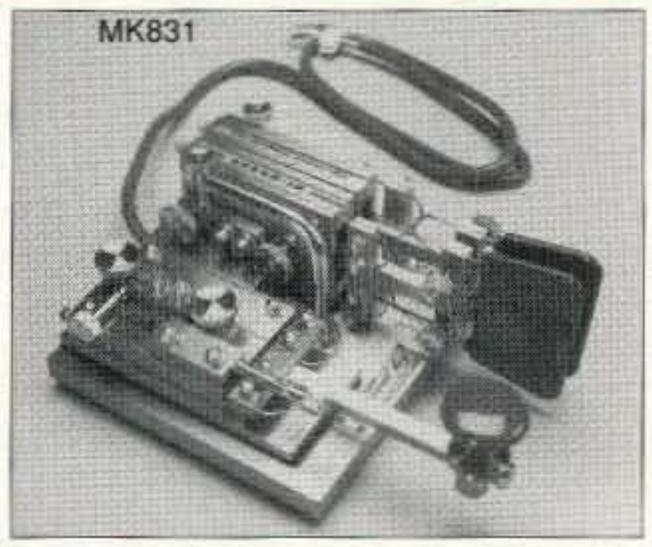
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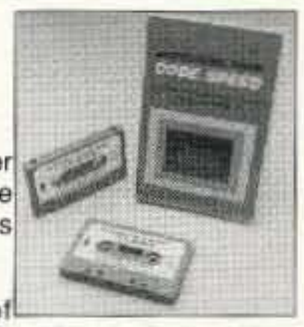

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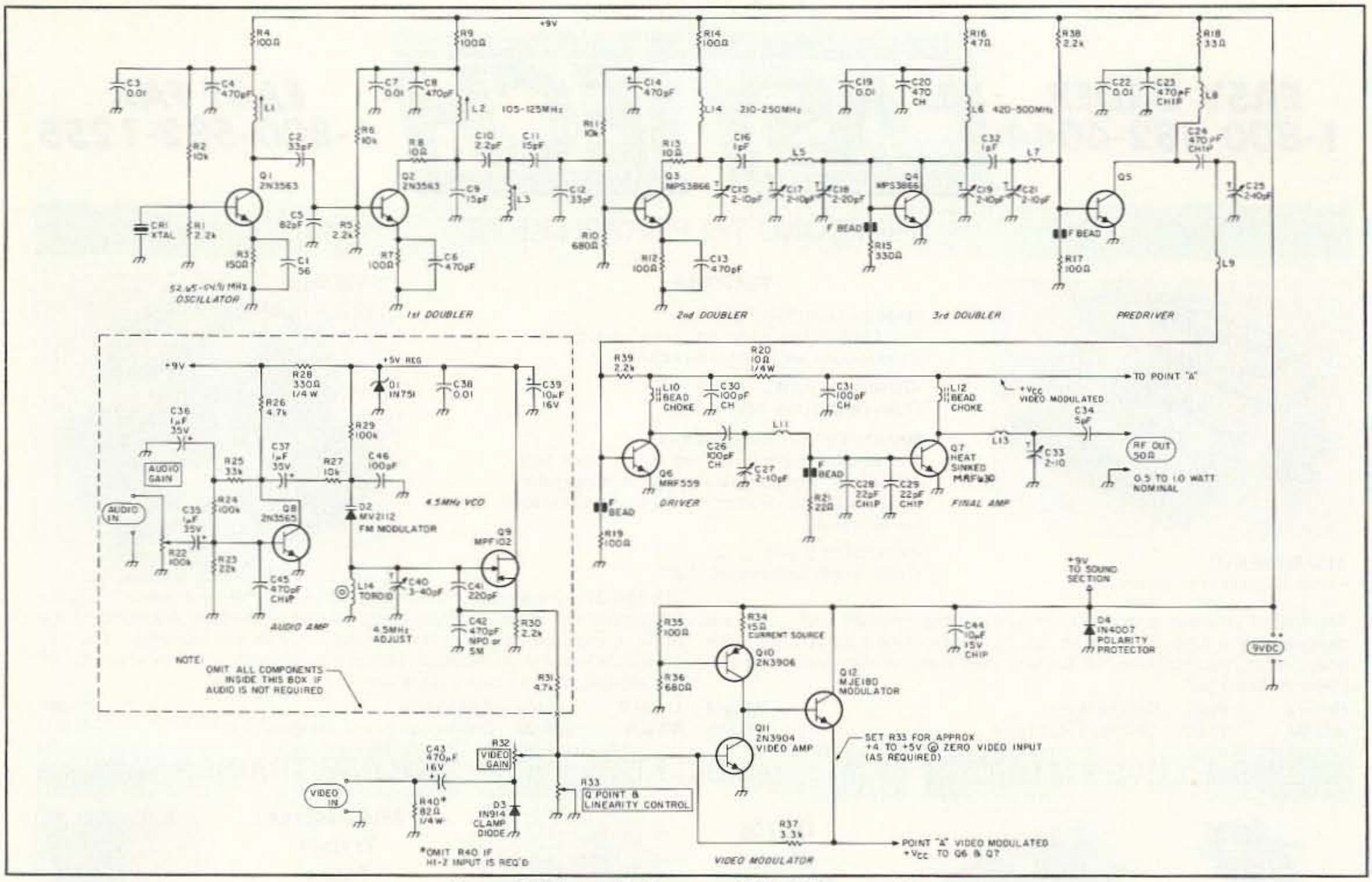

Figure 1. Schematic diagram of the ATV transmitter.

Final Test

Next, apply +9 volts to the B+ line after connecting the negative supply lead to the ground plane of the PC board. Immediately observe the power supply current. If it's over about 150 mA there may be a problem. If anything smokes or gets hot, immediately remove the power and find the problem before proceeding.

If all seems OK, connect a VOM (analog meters are easier to use for this test, but a DVM is OK) across R3 and then R7. You should read about 2 volts DC (1.5 to 3VDC is OK). Next, connect the VOM to Q3's emitter. You will probably read 1 volt or less. Now, connect the VOM to point A (Q12's emitter) and ground. Verify that adjusting R33 through its full range can vary the voltage at point A between less than 3 volts to greater than 8 volts. Set R3 for full voltage (>8V) at point A for now. Next, measure the voltage at Q8's collector. About 3 volts is OK. Next, measure voltage across D1 (1N757A). It should be between 5 and 5.2 volts DC. Significantly more or less indicates a problem in Q8, Q9, or associated circuitry. Check for 5 to 5.5 volts across D2. If it reads less than 1 volt, D2 is either installed backwards or is shorted. Make sure C37 has the (+) lead connected to R27.

If it is OK, install crystal CR1. Connect the VOM across R7. Apply +9 volts. Now slowly back the slug of L1 out of the winding. You will find that the voltage across R7 will suddenly increase, then slowly decrease as the slug in L1 is tuned. Adjust the slug for maximum voltage (2 to 4 volts is typical) and then back out the slug for about a 10% drop. This will ensure stable oscillation. As a check, a frequency counter connected to the junction of C2 and C5 should indicate the crystal frequency. An unstable reading indicates possible problems in that the crystal is not controlling the frequency. If this is the

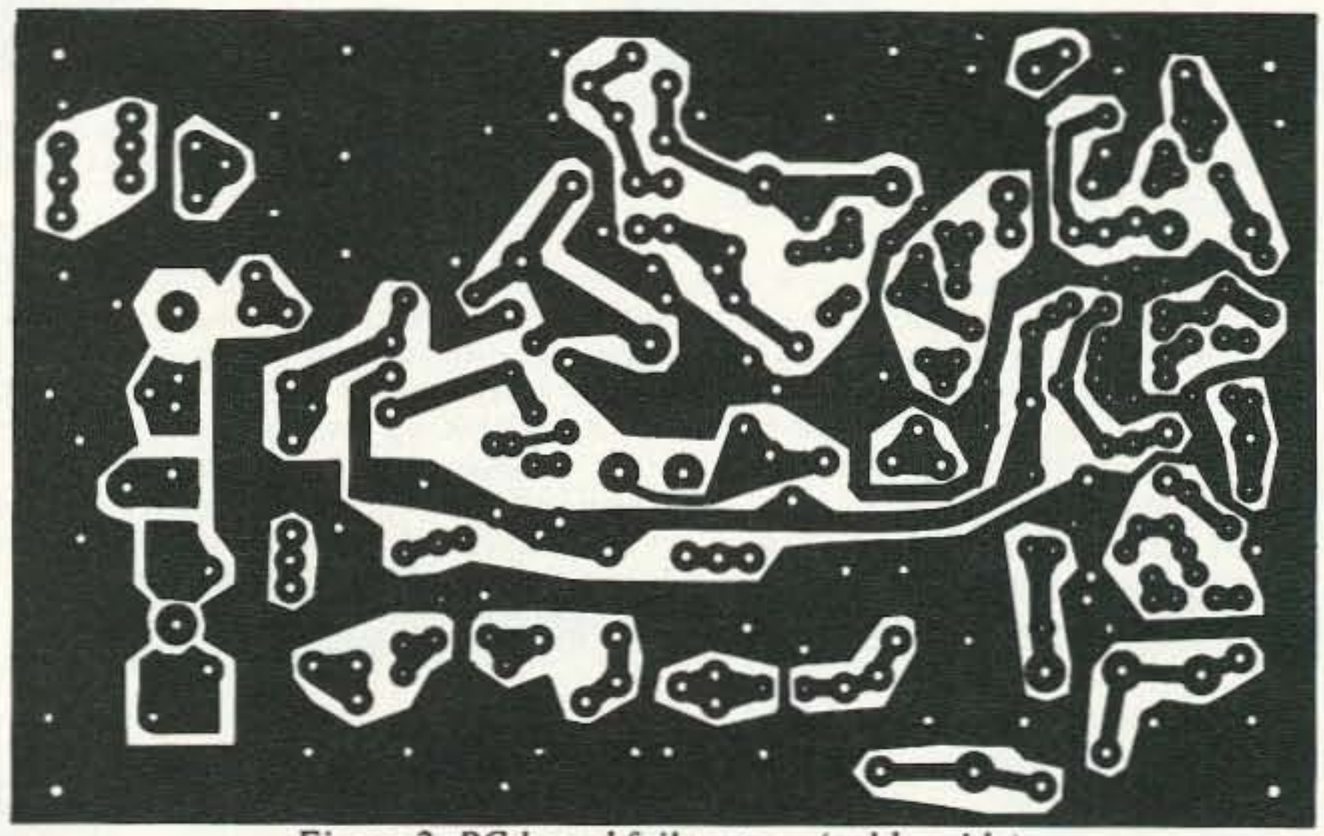

Figure 2. PC board foil pattern (solder side).

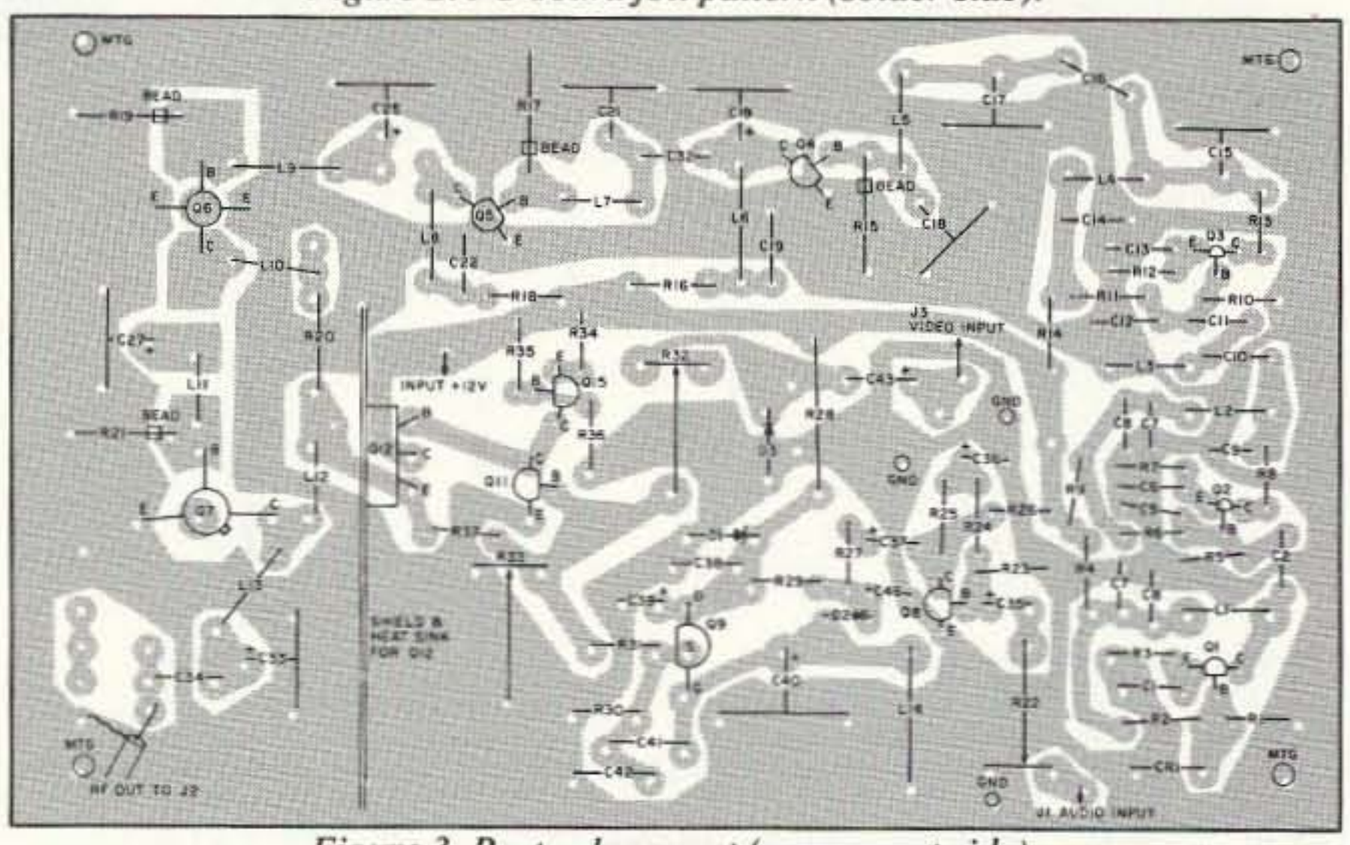

Figure 3. Parts placement (component side).

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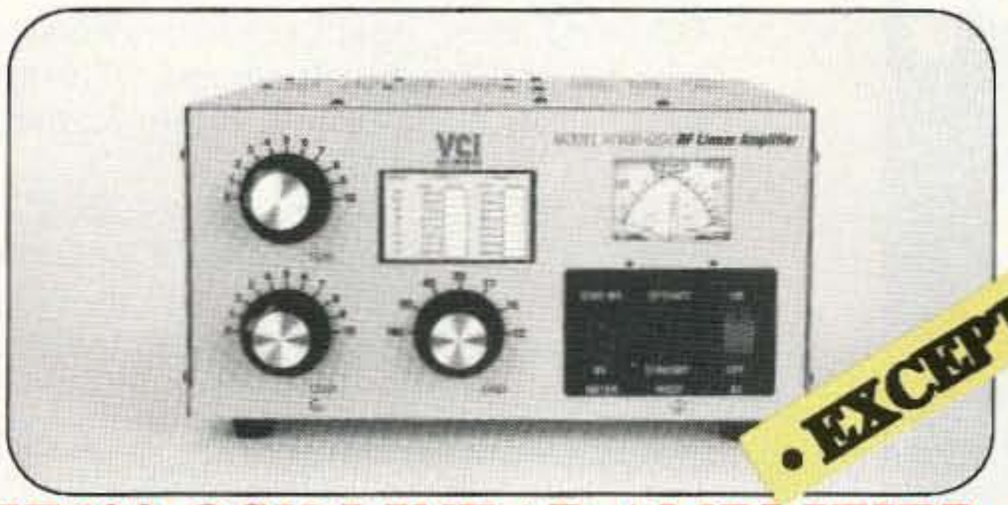

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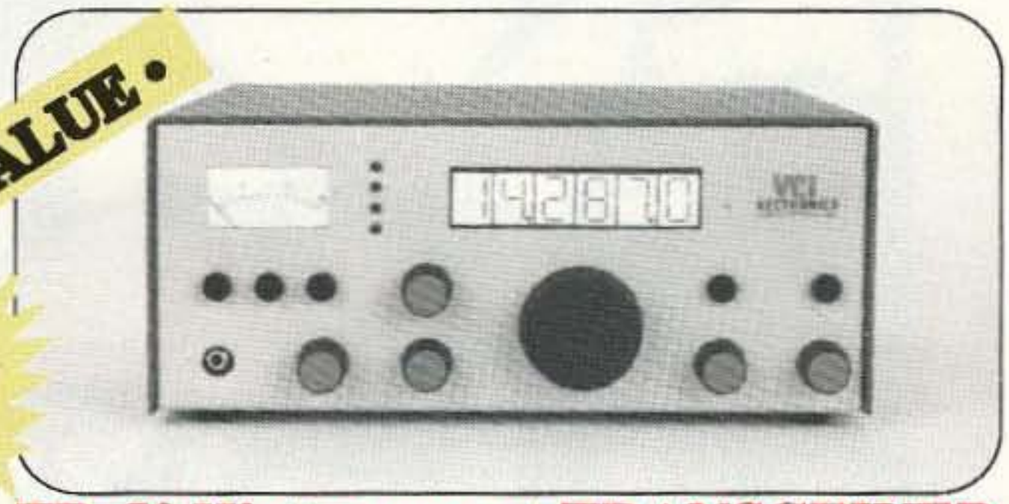

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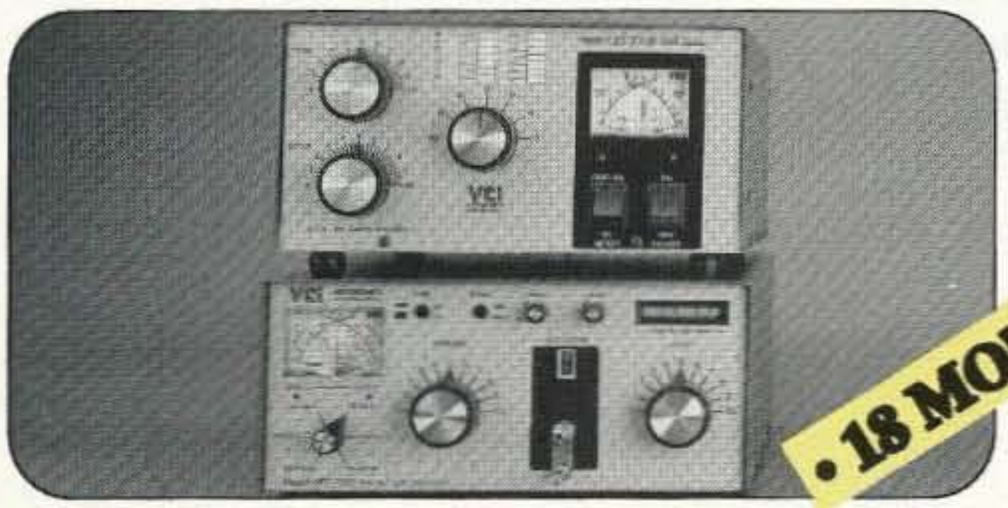

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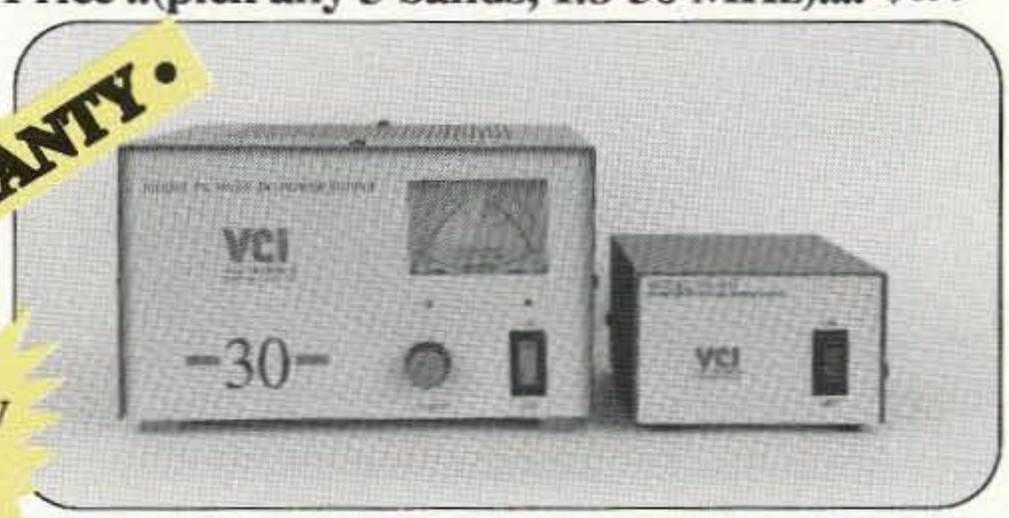

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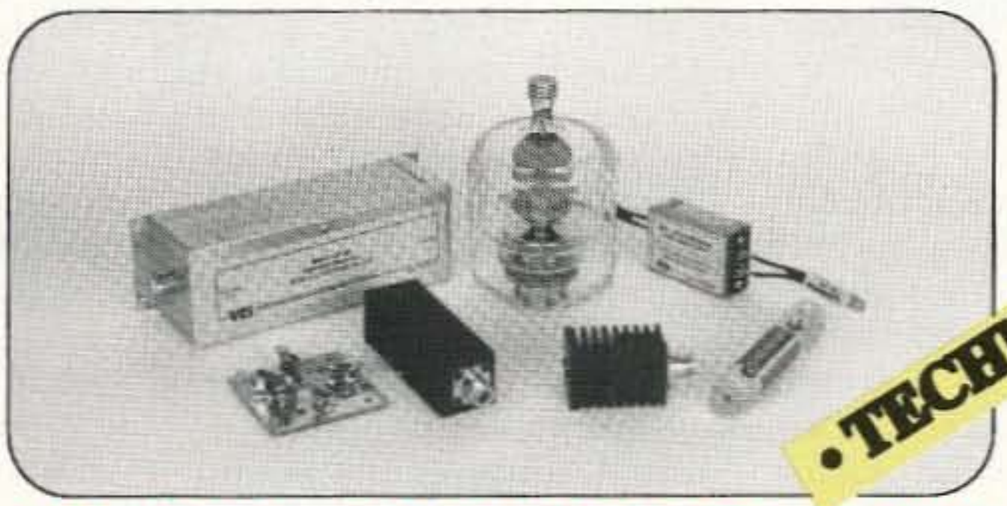

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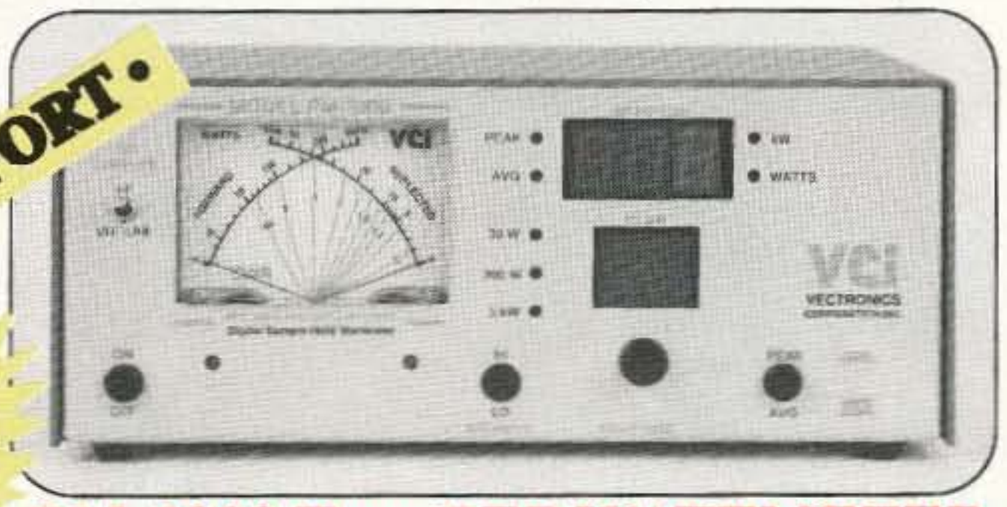

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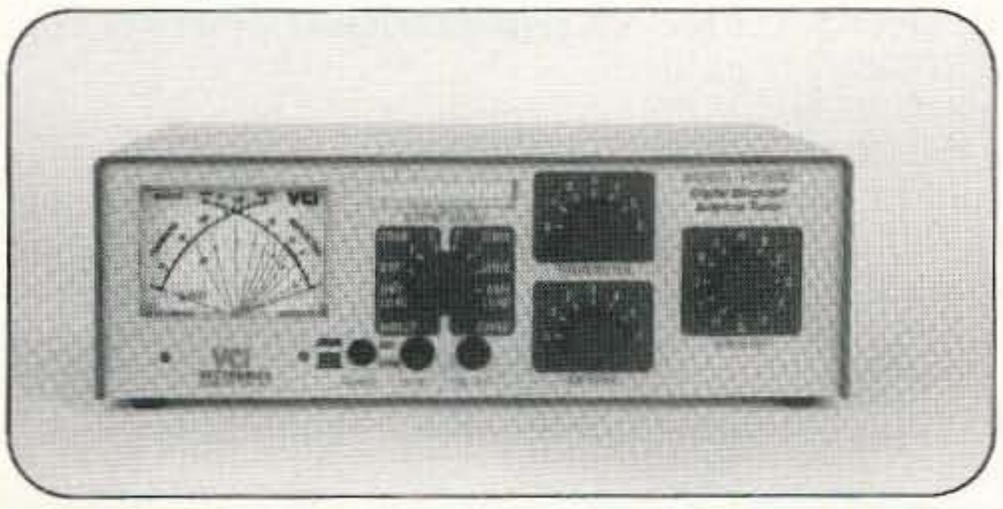

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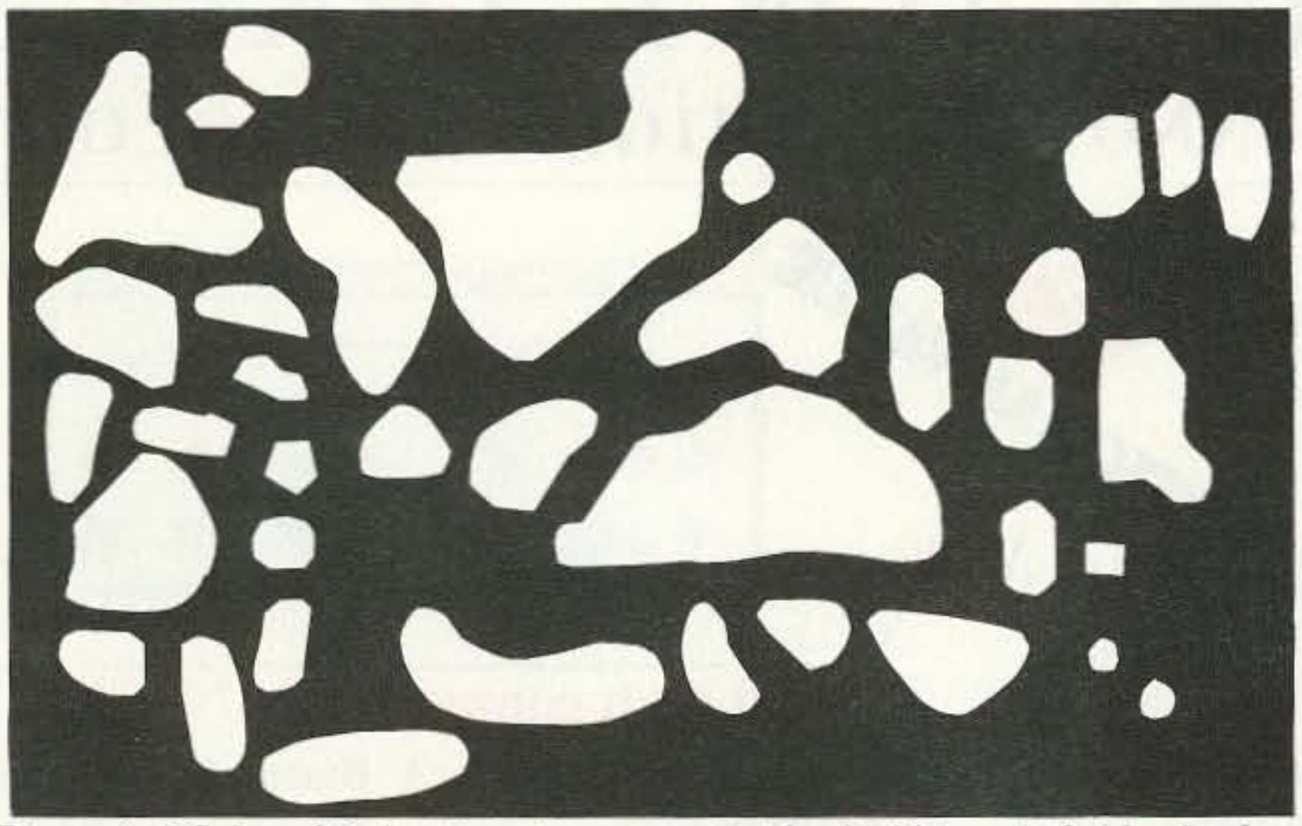

Figure 4. PC board foil pattern (component side shield layer). Solder leads on both side of the PC board where necessary.

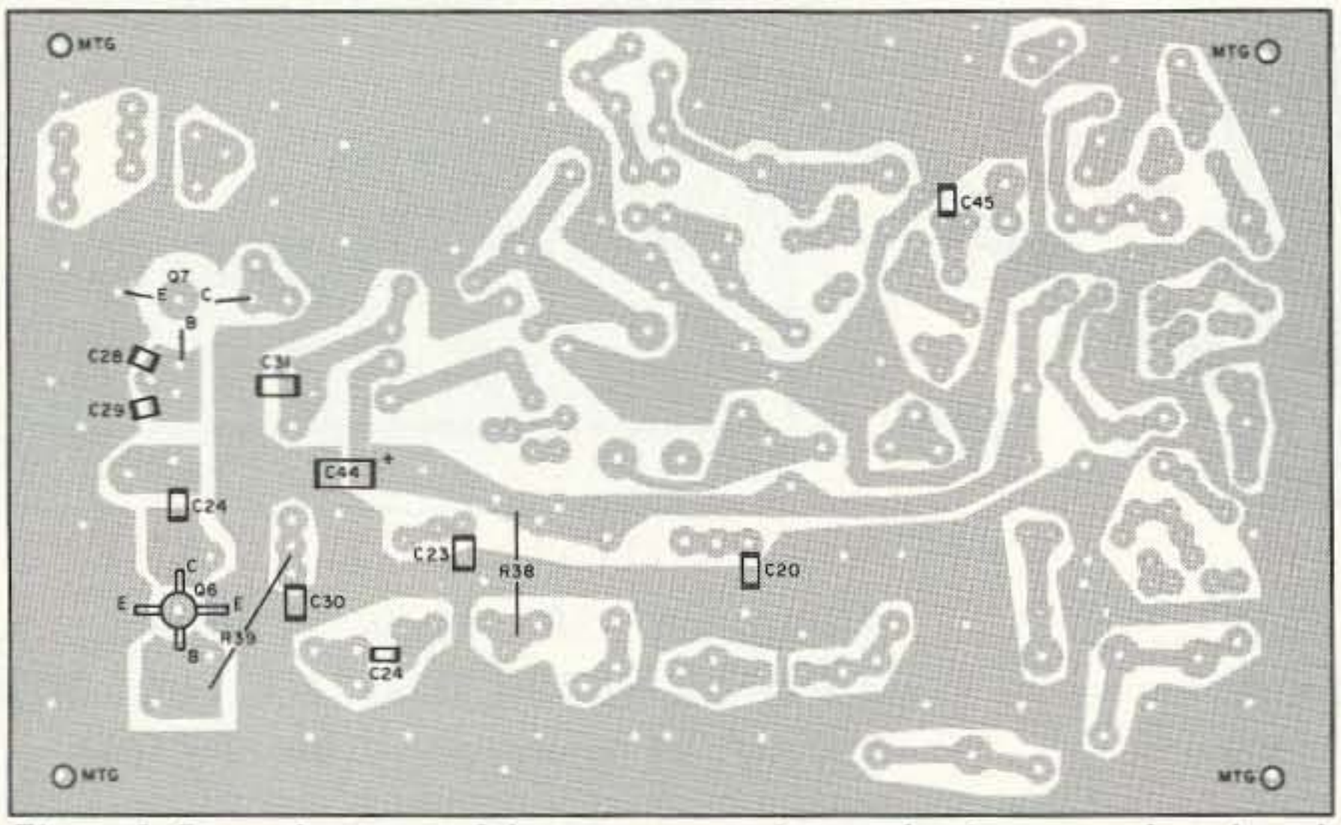

Figure 5. Parts placement of the components that need to be mounted on the solder side of the PC board (the opposite of the component side).

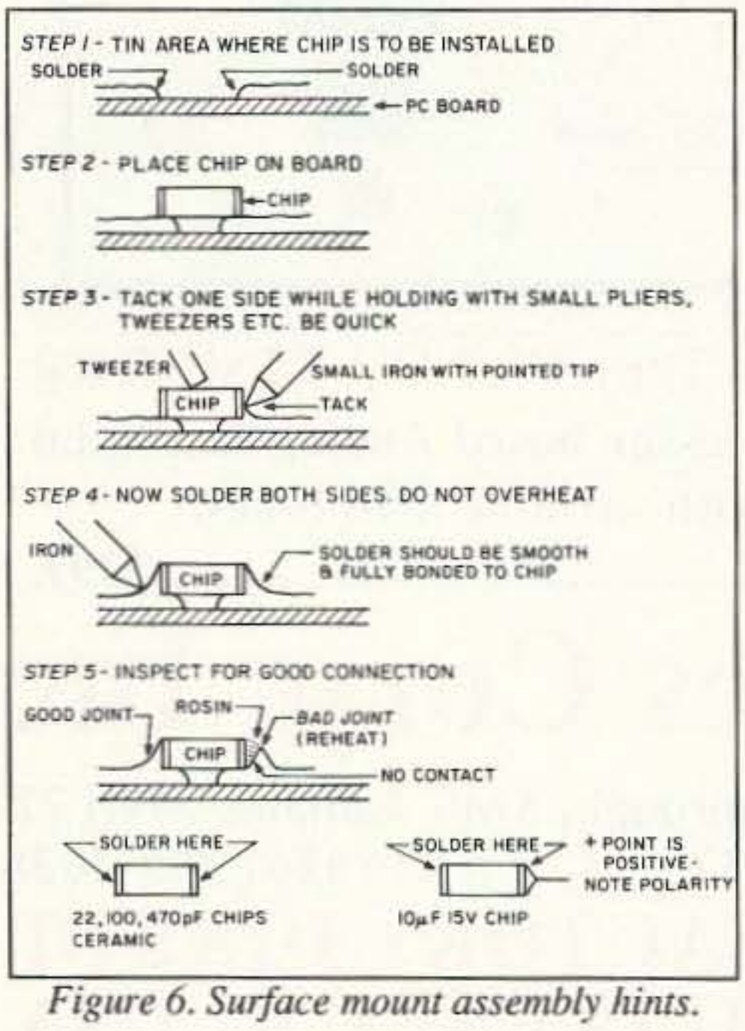

Figure 6. Surface mount assembly hints.

case, try readjusting L1. If you have installed more than one crystal and a switch, adjust for the higher frequency crystal. Next, connect the VOM across R12. Adjust L2 and L3 for maximum voltage. This will be 1 to 2 volts. If the slugs in either L2 or L3 have no definite peak, add or subtract a turn from that coil as required, after first checking C9, C10, C11 and C12 for the correct value. Adjust for all crystals if applicable. A compromise may be needed. In this and any following, tuning adjustments of crystal frequencies are such that >5 MHz of output frequency spacing is required.

If less than 1.5V is obtained, check dimensions L2 and L3 (often L2 wants to be one turn less than L3). Usually, L2=3-1/2T and L3=4-1/2T.

If you cannot get these results, go back and find the problem. *DO NOT PROCEED FURTHER.*

If everything is OK, connect the VOM across the junction of R16 and C20. (+LEAD) and GND (-). Tune C15, C17, and C18 for *minimum* voltage (this will initially be around 9V and should drop below 6 volts or so). If this is OK, next connect the VOM across the R18 positive lead to a 9V supply, the negative lead to JCT C23 and R18, then tune C19 and C21 for maximum voltage drop across R18 (typically ≥ 2V DC). Readjust C15, C17, and C18 until no further drop is seen across R18. Check with all crystals, if applicable. If the drop is small, try readjusting C18. It may help to go back and repeak all stages Q3 and Q4 for best results.

Next, if all the previous tests are successful, you can install the components in the power amplifier sections of the transmitter PC board. First, install resistors associated with Q6 and Q7. Install Q6 and Q7 (watch the orientation and refer to Figure 3), install L10, L11, L12, and L13.

Last, install chip capacitors C26, C28, C29, C30, and C31. See Figure 3 for correct chip placement. Do not overheat the chips. Make sure the PC board is tinned in the areas where chips are installed. The best way to install them is to first tack-solder one side of the chip capacitor. Then, solder the other side. Now, resolder the first (tack-soldered) side. See Figure 5. Do not overheat. Use a 25-watt iron with a pointed tip. Small fine-point needle-nose pliers or tweezers should be used to manipulate the chip capacitors. C44 is somewhat large, but C28 and C29 are tiny. Finally, install C34 and a suitable length of small 50-ohm coax cable to J2. Check all joints for solder bridges. Make sure that the metal case of Q7 is soldered to the top ground plane (top side). Q7 has a reverse pinout—the emitter is internally connected to the case. Install Q7 and connect leads to the underside of the PC board using as short lead lengths as possible. Q7 must be flush with the ground plane. Check all connections, and then connect the PC board to a 50-ohm load or, ideally, a 50-ohm wattmeter reading 0-5 watts if you have one good at 450 MHz. Connect the power supply and apply 9V. Adjust R33 for maximum voltage (≥ 8 volts) at point A (Q12's emitter). Now watch the power supply current (now at about 100-150 mA). Adjust C25 for maximum current draw, then adjust C27 for further current increase—this will go to 300-600 mA.

Now, adjust C25, C27, and C33 for maximum RF output from Q7 at J2. You should be able to get about 1 watt of RF out. Adjust R33 to bring RF output down to 0.2 to 0.3 watt. Connect a counter between emitter Q12 and ground. Adjust C40 for a 4.500 MHz frequency. (5.500 MHz for PAL use. Skip this step if you omitted audio circuitry.) Do not apply any video or audio. Verify the transmitter output frequency with a counter. Adjust L1 as required. Readjust all tuning adjustments for optimum performance. Check all crystal frequencies for proper operation.

Battery Operation

This transmitter is intended to operate from a nominal 9V source. A maximum of +10V is recommended and a minimum of 7.5 volts. The appropriate "end point" of performance is about 6.5 volts, below which output drops very rapidly. A seven-cell NiCd pack of 8.4V (actually about 9.8V full-charge) will allow efficient utilization. Also, six alkaline batteries (your typical AA cell is good for about 1.5 ampere-hours) makes a good supply. Remember that, in general, batteries tend to lose effective "ampere-hour" ratings at very high or very low

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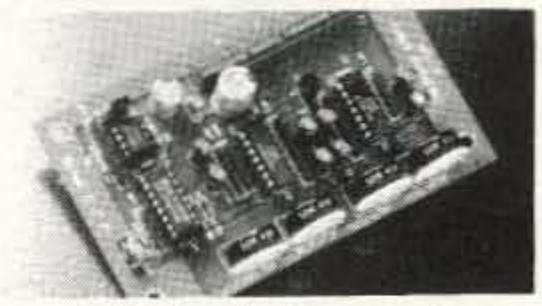

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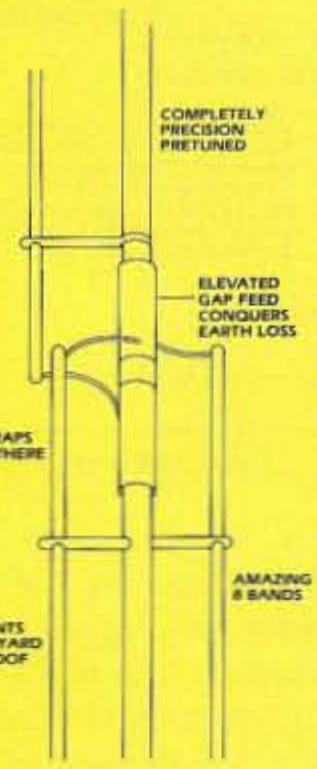

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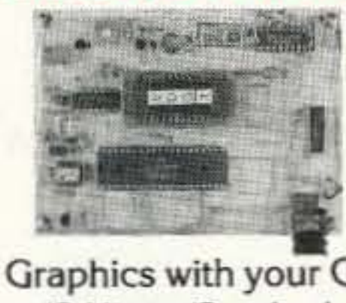

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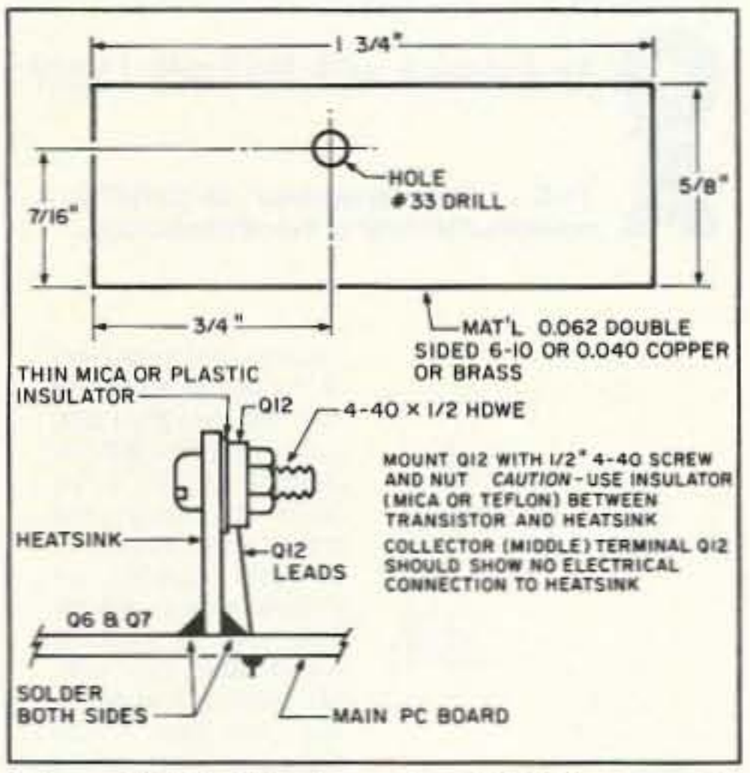


Figure 7. Fashioning a heatsink for transistor Q12.

discharge rates. A 100 mA-hour 9V NiCd of the type used in transistor radio applications will last 10 to 20 minutes. This is OK for R/C model airplanes where a short duration flight is contemplated. A 9V alkaline battery will go about one half hour. AA NiCds (six) will run this transmitter 45 minutes to an hour on a charge. Large "D" size 4Ah NiCds should run the transmitter eight to 12 hours. The choice of battery is a compromise between the size and weight allowable and the expected longevity expected in a particular application.

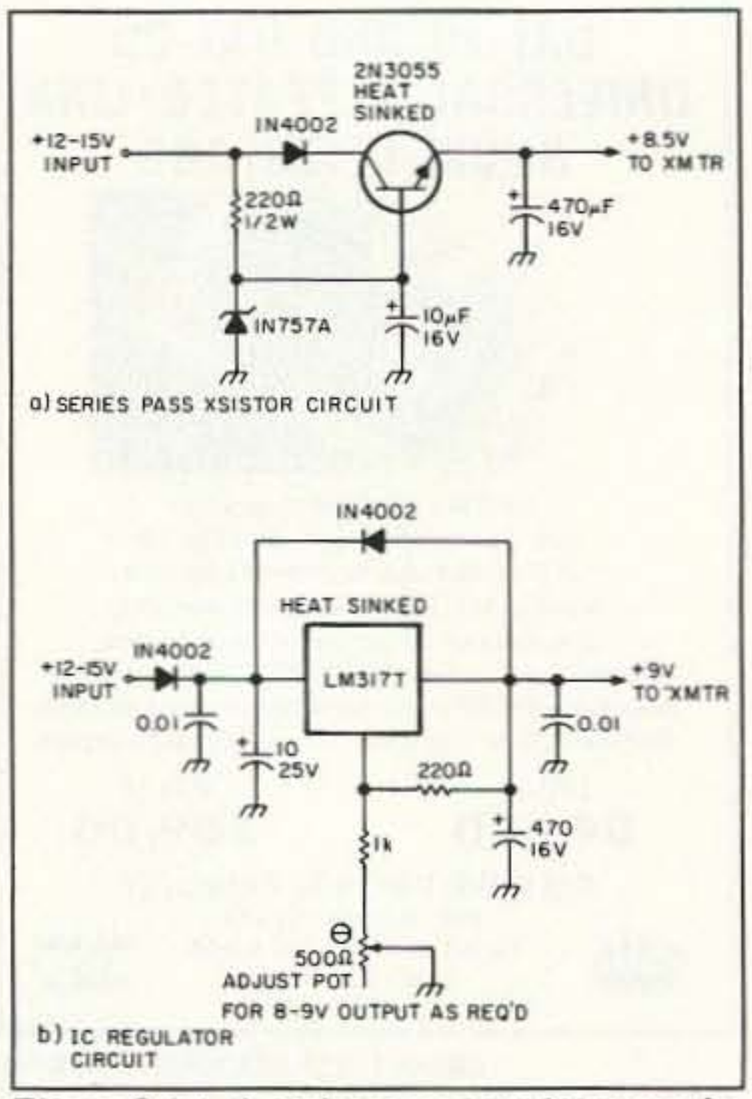


Figure 8 (a). A series pass transistor regulator circuit for use with power supplies between 12 to 15 volts. (b). An alternative IC voltage regulator circuit.

Operating From a +12 VDC Source

Often, a 12V DC source for the main station, such as an auto or boat battery, a power pack, or a 12V supply, is available. The 9V transmitter can be operated from these sources using a regulator circuit. Two approaches are shown. One uses a simple pass transistor and zener diode regulator. The other uses an IC regulator circuit. While the pass transistor and zener should prove adequate, purists will probably prefer the IC regulator. Both circuits require the regulator element (2N3055 or LM317T) to be heat-sinked, since a possible 5-watt dissipation could occur with a +15V maximum input voltage. This would produce a 6V drop with a 0.5A drain. Figure 8 shows two such circuits that would be applicable. Do *not* use 9V "wall transformers;" they have poor regulation and may damage the transmitter or produce video hum at 60 to 120 Hz.

The World of ATV

Whether you use the ATV transmitter for mobile, portable or home station operation, you will find it to be a stable and reliable performer. Hopefully it will provide you with a glimpse into the fascinating world of Amateur Television. 73

Parts List

Resistors: 1/8 or 1/10W

P/N	Value
R1,R5,R38,R39,R30	2.2k ohm
R2,R6,R11,R27	10k ohm
R3	150 ohm
R4,R7,R9,R12,R14, R17,R19,R35	100 ohm
R8,R13	10 ohm
R10,R36	680 ohm
R15	330 ohm
R16	47 ohm
R18	33 ohm
R20	10ohm 1/4W
R21	22 ohm
R22	100k pot
R23	22k ohm
R24,R29	100k ohm
R26,R31	4.7k ohm
R27	10k ohm
R28	330 ohm 1/4W
R32,R33	1k ohm pot
R34	15 ohm
R37	3.3k ohm
R40	82 ohm 1/4W

Inductors:

L1 - L14 See the Coil Table in Part I of the Article.

Capacitors:

Capacitor	Type
C1	56 pF NPO
C2,C12	33 pF NPO
C3,C7,C19,C22,C38	0.01 disc
C4,C6,C8,C13,C14	470 disc
C5	82 pF
C9,C11	15 pF
C10	2.2 pF
C15,C17,C19,C21, C25,C27,C33	2-10 trimmer
C16,C32	1 pF NPO
C18	2-18 trimmer
C20,C23,C24,C45	470 pF chip
C26,C30,C31	100 pF chip
C28,C29	2.2 pF chip
C34	5 pF mica
C35,C36,C37	1 μF/(35 or 50V) electrolytic
C39	10 μF/16V electrolytic
C40	3-40 trimmer
C41	220 pF NPO
C42	470 pF NPO
C43	470 μF/16V electrolytic
C44	10 μF/15V chip tantalum
C46	100 pF NPO

Semiconductors:

Q1,Q2 2N3563	transistor
Q3,Q4,Q5 MPS3866	transistor
Q6 MRF559	transistor
Q7 MRF630	transistor
Q8 2N3563	transistor
Q9 MPF102	transistor
Q10 2N3906	transistor
Q11 2N3904	transistor
Q12 MJE180	transistor
D1 1N757	diode
D2 MV2112	varactor diode
D3 1N914	diode
D4 1N4007	diode

Miscellaneous

1 toroid 76T188
6 ferrite beads
3 blue slugs (Cambion)
1 PC board
1 T0220 insulator
1 4-40 screw, nut, lockwasher
1 8-32 screw 1" (for winding of coils)
2 ft. #22 enameled wire
2 ft. #22 tinned wire
2 ft. #32 enameled wire
1 crystal 52.5 - 55 MHz

NOTE 1: Kits consisting of the PC board and *all* parts that mount on the board are available from North Country Radio P.O. Box 53H, Wykagyl Station, New Rochelle NY 10804.

The 1-watt ATV transmitter kit + crystal for 439.25 MHz is available for $112 + $3.50 postage/handling. Crystals for 434.0, 426.25 or 421.25* MHz are an additional $7.50 each.

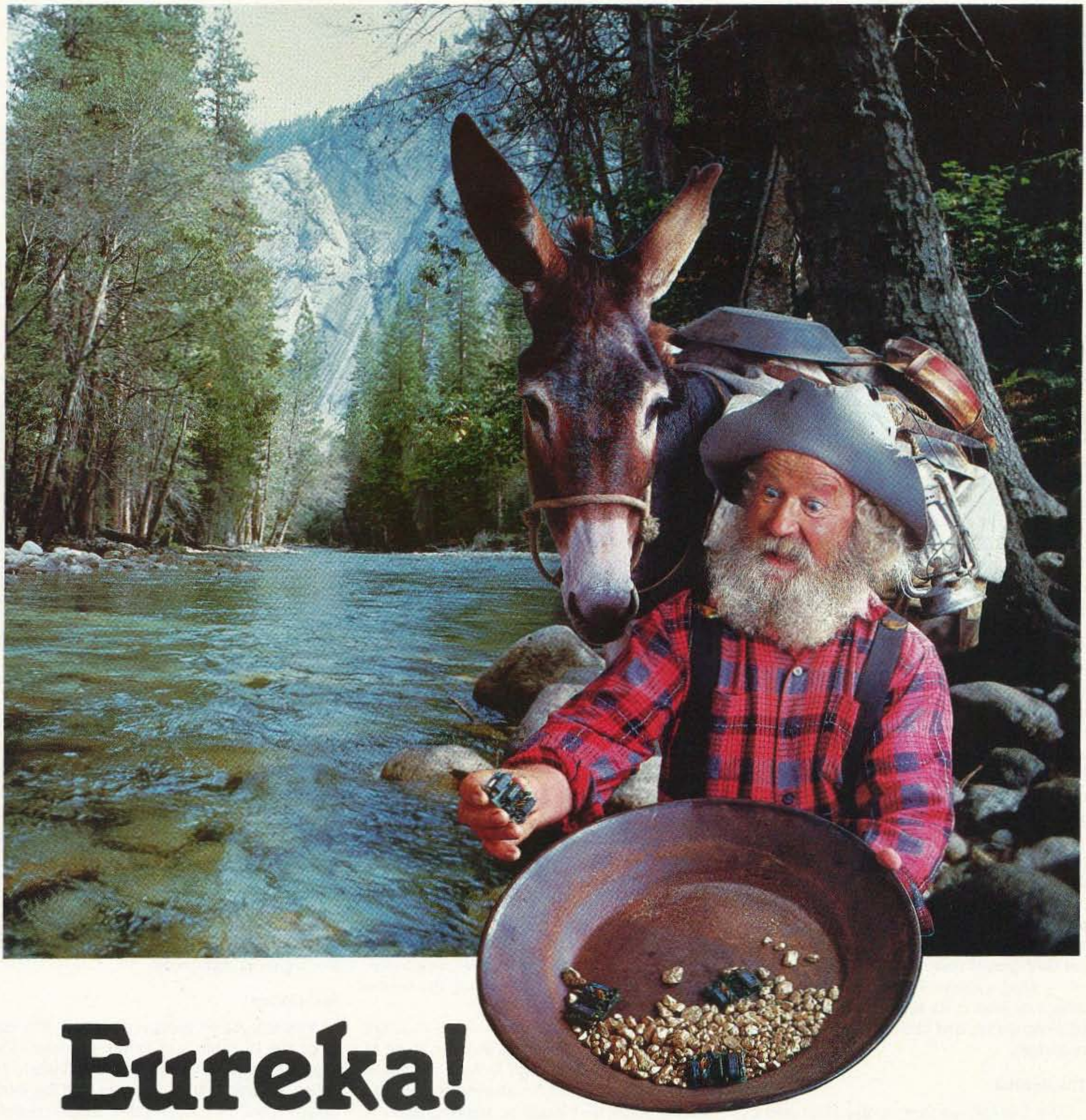
A 12-volt version of the ATV transmitter capable of a 2 watt output (similar in design to the 9-volt version - see the June/July '89 issues of Radio Electronics for details) is available for $110 + $3.50 p/h with ATV crystal.

A metal case (5-1/2" x 3" x 1-1/4") suitable for the 9-volt or 12-volt versions of the transmitter complete with one power, one BNC and two RCA connectors is also available for an additional $15.

To help you assemble a complete ATV station, two other items are also available: an ATV linear amplifier to boost your output power for $79.50 + $3.50 p/h and a low noise (1.5 dB typical) ATV downconverter kit to enable reception of ATV signals using a standard TV set for $59.50 + $3.50 p/h.

A complete catalog of all products is available. Please send an SASE (with 52 cents postage).

***NOTE 2**:Operation on 421.25 MHz requires use of a VSB (Vestigial Sideband) filter (not available from North Country Radio but supplied by others) to prevent LSB components from being radiated outside of the band limits.



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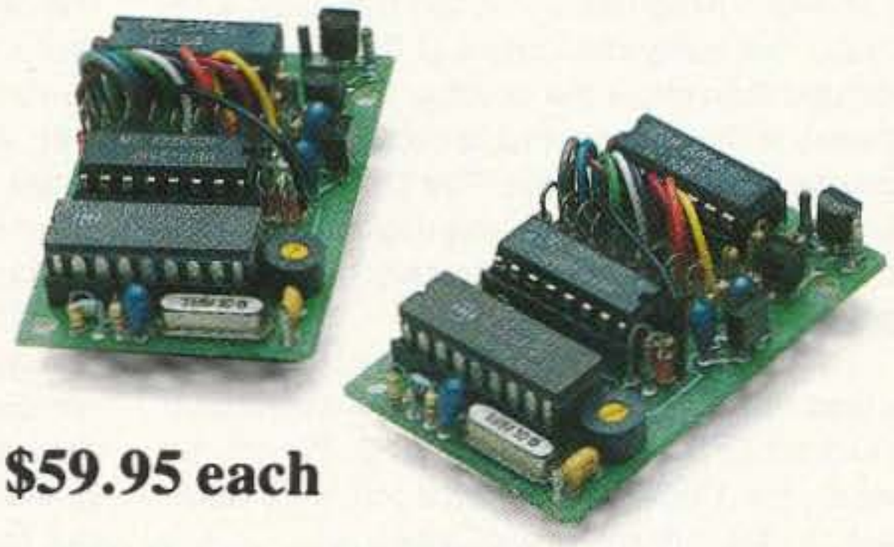

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73 Review

by Ed Karsin W3BMW

The "Super Guy" Tower Guy

A simple method for tower support.

Foresight Products, Inc.
6430 East 49th Dr.
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Information: (800) 325-5360
Price Class: $10 each

Many of us have tried to use an earth screw anchor to guy our towers. It's reasonably priced and simple enough to install. I attempted to install one but, after penetrating two feet of soil, I struck shale and became disheartened. I realize that the earth screw anchor has its place. Unfortunately, its place and my property have little in common. I had to find an answer somewhere or my two beams would be spending the stormy weather on the rear patio, rather than up on the 40-foot tower.

An obvious alternative at this point would have been to dig three holes distanced from the tower at the appropriate 120 degree locations, pour in the concrete, and install guy wire holding rods. The concrete could then be covered with the loosened soil and compacted for strength. But the thought of that much digging made me search for an easier method of guying.

With luck and a little research I found the answer, and just possibly your answer to the ground guy wire attach point problem. It's called a Duckbill® anchor. This simple, inexpensive, easy-to-install device is one of the best-kept secrets in hamdom. It really is a "Super Guy" ground level attach point for your tower's guying system. The photographs give a clear indication of its simplicity. Yet, the Duckbill's capabilities and strength approach the unbelievable.

The Duckbill

The Duckbill anchor is manufactured by Foresight Products of Commerce City, Colorado, but many distributors of the product are located throughout the country. One need only glance at the photographs to recognize how the device received its name. The Duckbill is used in numerous ways by nurseries and building contractors as it offers tremendous holding power for its size and small cost.

Feeling quite pleased with my "find," I ordered six Duckbills, along with an installation Duckbill Drive Rod, Model DR-3. Within the week, the Duckbills and drive rod were delivered by the famous "Black Truck."

The model I selected was the 88DB-1 Duckbill Anchor/3000, priced at $9.98 each. Basically, the 3000 indicates the approximate amount of pound pull the device will withstand. Under certain circumstances, one can easily assume that guying the tower at the triangular top will offer a 9,000-pound resistance to the wind forces at that point, given a correct guy wire tension on each guy, and of course, soil consistency. Surprisingly enough, the greater the soil's sand content, the greater the holding power of the Duckbill.

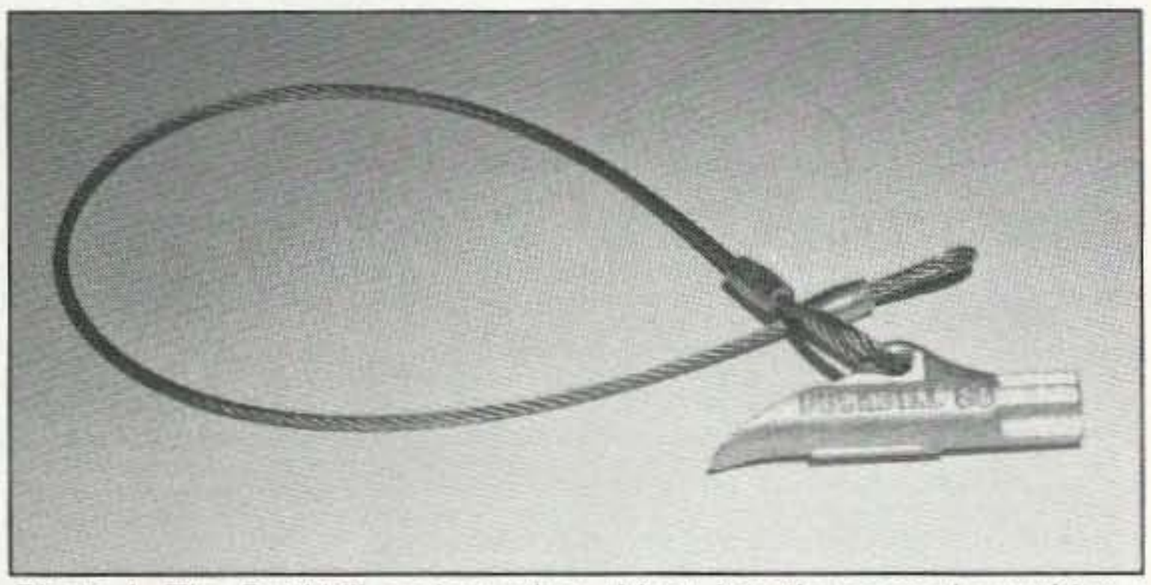

Photo A. The Duckbill anchor, when driven into the ground, provides a heavy-duty attachment point for your tower's guy wire.

Note, however, that the actual calculations of how much pull or force is exerted in your particular case should be determined by using one of the many computer programs that are available on the computer market today. They are fairly accurate and will give you the actual forces, pulls, etc. for the wind surface area of your particular installation at a given wind factor. Knowing this information is vital in determining the distance to place your Duckbills and guy wires from the tower base to insure the greatest holding power. You could also engage the talents of a physics major who just happens to be a friend, and talk him or her into performing the necessary calculations. I did both.

Foresight Products also offers a 5,000 pound Duckbill (Model 138-DB-1) for those of you who are lucky enough to have the space for a "Monster Quad." Needless to say, the holding power here would be 15,000 pounds. A few computer calculations indicated three of these 5,000 pounders would easily handle a 25-square-foot wind surface area antenna at 70 feet, with about a 3,000 pound safety factor. Again, your particular soil conditions must be taken into account.

Some might question the need for a 9,000- or 15,000-pound hold-down anchoring or guying system. I ran some figures through a few computer programs I had available. Unbelievably, a 40-foot-high tubular tower offers a projected 60-square-foot wind surface area, without the beam, rotor, or masting installed! Adding a beam five feet above the tower, or a total antenna system possessing a wind loading factor of only 15 square feet, causes some fairly heavy forces to be exerted upon the system. We are talking about thousands of pounds, not hundreds, of forces both horizontal and downward in direction, with an 80-mile-per-hour wind blowing.

These thousands-of-pounds figures can be quite unnerving, especially when that beam system is bouncing around during those 85 to 90 mph "hurricane" winds we're not supposed to have in Pennsylvania, or the "tropical storms" you do have in Florida, that we Pennsylvanians call hurricanes. Therefore, you can rest easily if you give yourself at least a 30% safety factor above whatever you calculate or the computer digitizes out.

Installation

Now that you've become a believer, let's discuss the Duckbill installation process. The Duckbill has an arrow forged into its body to indicate the side that is placed toward the earth (which is not the pointed side). Simple enough. The Drive Rod, Model DR-3 for use with only the Anchor/3000, and priced at $22.79 (only one drive rod is needed and will suffice for numerous installations), is inserted into the bill's body. The rod is then positioned to allow the bill to be angled toward the tower. You then use a sledgehammer to drive the 88-DB-1, Anchor/3000 into the ground at the proper spacing from the tower base. Foresight Products states that this is easily accomplished, even through shale.

However, if you decide upon the Model 5000, Foresight recommends that you rent a jackhammer for the installation of the Duckbills. Electrically-operated jackhammers are available at most retail rental outlets for a few dollars a day, and a small deposit. (Now you know how I really installed my smaller Model 3000 anchors.) Additionally, a heavier model drive

Photo B. The Duckbill can be driven into place with a sledgehammer and the DR-3 drive rod.

rod, GR-2 is required when installing the Model 5000 Duckbills.

In either case, the anchor is driven into the earth as shown until the loop is just a few inches above ground. An automobile jack can then be used to exert the necessary force to pull upon the bill's cable, making the bill rotate underground into its proper, horizontal holding position.

During the final rotation process, I used an automobile jack as the 3000's loop fit directly onto my jack safely and I was certain it wouldn't slip off. The object here is to exercise extreme care to prevent the cable from slipping and causing bodily harm. The jack is pulling upward upon the anchor cable with a tremendous force—probably over 3,000 pounds!—but it is necessary to insure the bill's proper installation.

Once the Duckbill is in place, and it will be when you've pulled the cable three to four inches out of the earth, you're all set to install the first guy wire, turnbuckle, non-conducting cable, etc. The choice is yours from here on. Fortunately, you are now free from worrying about whether or not your tower installation is going to weather the next severe wind.

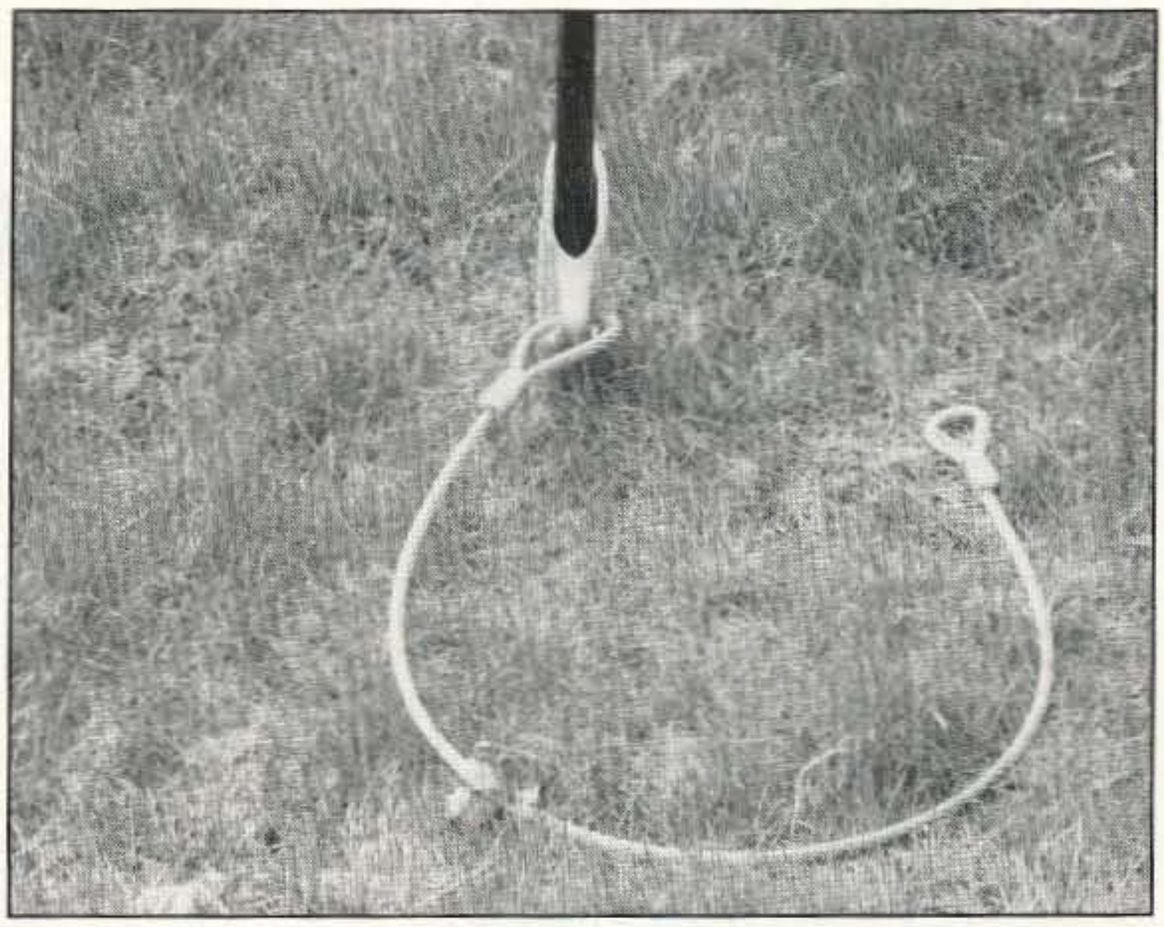

Photo C. The Duckbill is driven into the ground until the guy wire attachment loop (on the end) is just a few inches above the ground.

For more information, or to find your closest distributor, contact Foresight Products Incorporated, 6430 East 49th Drive, Commerce City CO 80022. They also have a toll free number: 1-800-325-5360

Happy "Super Guying"! 73

Number 15 on your Feedback card

UPDATES

Letters

Refer to the July 1992 ``Letters" column, p. 2. The callsign for Joseph P. Esposito (the second letter) should read N2NEO instead of N2NSO. *TNX to William E. Woolverton N2NSO for the correction.*

A Simple Rooftop Vertical

An inexpensive and easy-to-build 40 to 10 meter antenna.

by Paul Stump NØLRF

If you don't have the real estate for wire antennas, or if you want to try vertical polarization for DX contacts, give this project a try. The only drawback is that it requires an antenna tuner to resonate on all HF bands, 40 through 10 meters. This is really an advantage, however, since the antenna can be band-tuned from the shack—instead of at the base of the vertical like some antenna designs. There are many tuners on the market and many more home-brew circuits in numerous publications. If you plan to experiment with antennas, sooner or later, you'll be glad you've got one.

The design criteria were:

- Reasonable cost: less than $60
- Visually unobtrusive: no guy wires or large supports
- Made from readily available components: hardware store
- Ease of construction: no special tools or talent required
- Maximum height above ground: rooftop
- Lightweight for safe installation

This antenna is best described as a vertical dipole. It is centerfed at the base of the rooftop vertical element with a ground wire running to a ground rod below it. This looks electrically similar to a conventional horizontal dipole.

All materials were purchased from the local hardware store except for the tripod, which came from a Radio Shack store. Some hardware stores carry these tripods, too. If your local hardware store does not stock the aluminum tubing, they should be able to order it. I know that ACE hardware stores can get it.

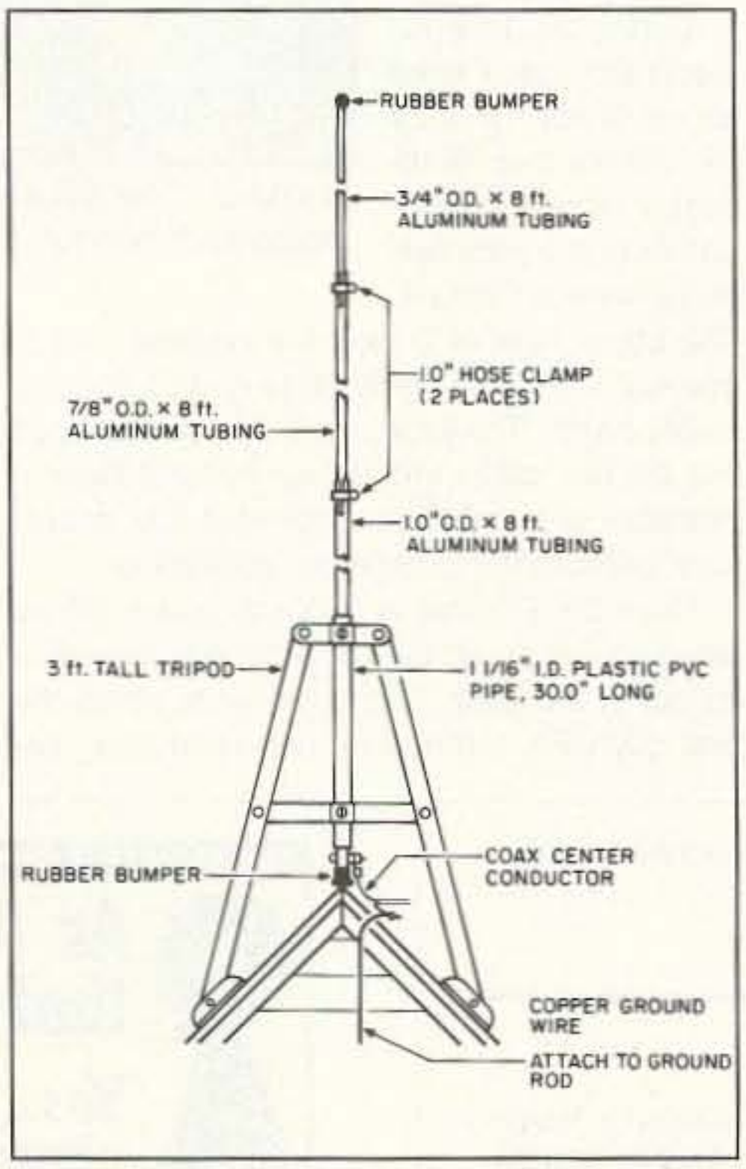

Figure 1. Overall diagram of the rooftop vertical.

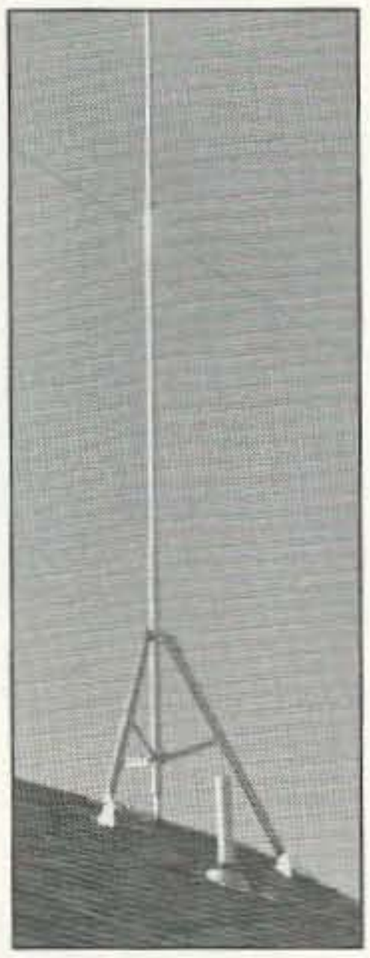

Photo A. The simple rooftop vertical.

Construction

It is important that the three aluminum tubes fit closely within one another. This provides the rigidity necessary for the tubing to be one self-supporting unit and unlikely to kink under side loads. By close fit, I mean a diametrical difference (larger tube i.d. minus smaller tube o.d.) of approximately 0.020 to 0.030 inches. They should clamp easily using the stainless steel hose clamps and one hacksaw cut down the end of the larger tube.

Refer to the tube clamping detail and slot the medium and largest aluminum tubes down two inches from their upper ends using a standard hacksaw. With a pencil, mark the small and medium tubes twelve inches from their lower ends. Insert these into the medium and the largest tube to the pencil mark. Be sure to use hose clamps with hex-head adjusting screws. Clamp the three tubes together very securely using a ratchet and socket or a nut driver. Don't use a screwdriver to tighten the clamps because it will inevitably slip out of the screw slot and impale your other hand.

Now drill a hole in the lower end of the largest tube, about two inches above the bottom. This hole should be just slightly larger than your brass screw. The coax center conductor will attach here later, but don't install

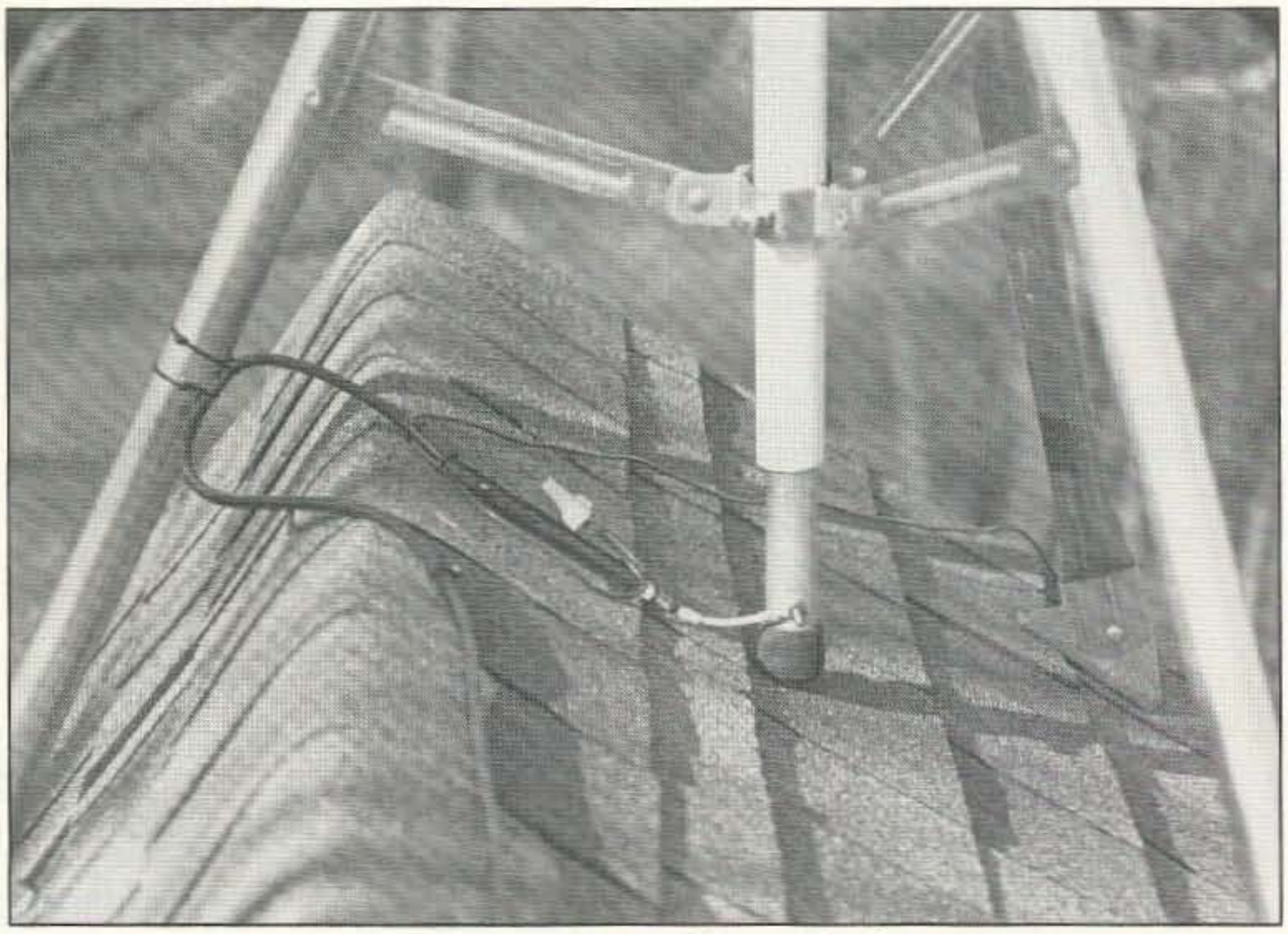

Photo B. Close-up view of the coax feedpoint.

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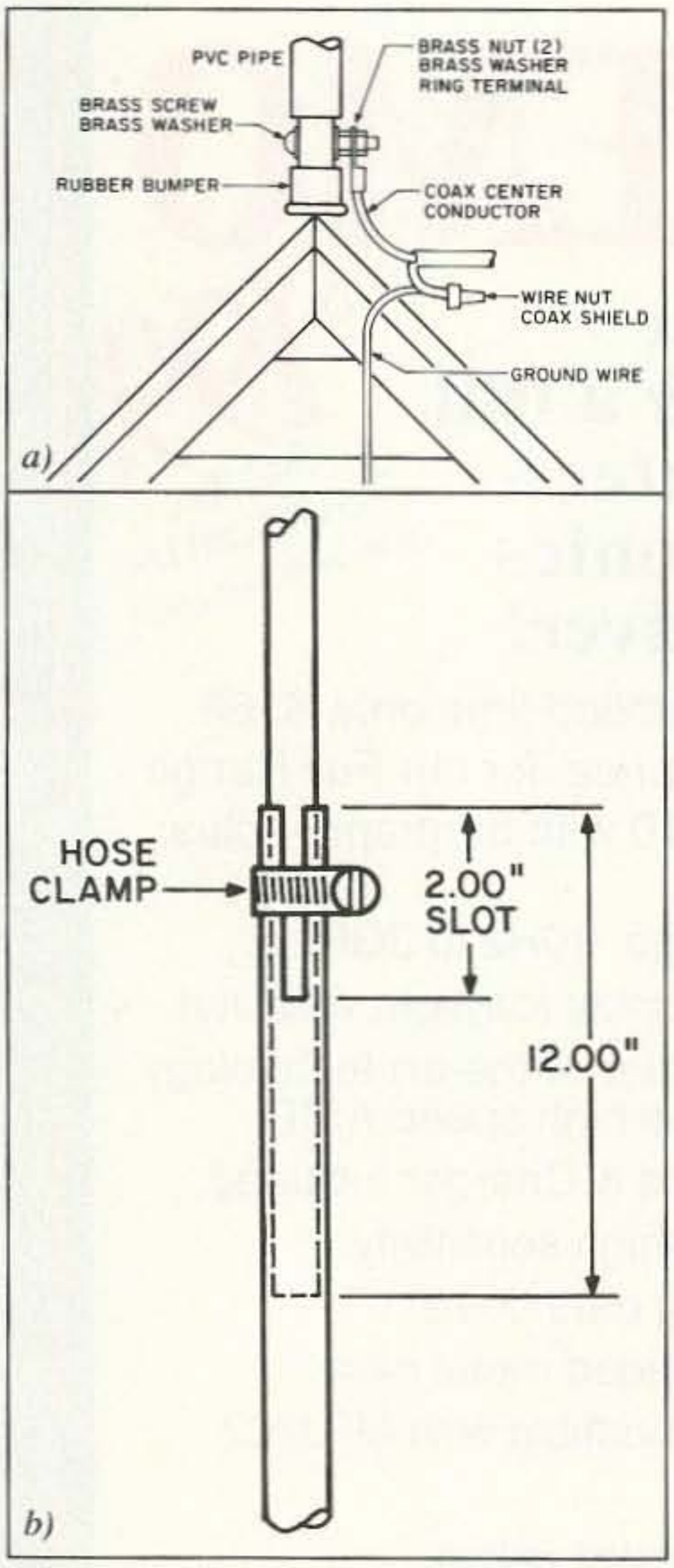

Figure 2.(a) Coax connection detail. (b) Tube clamping detail.

the screw yet. Install the rubber bumpers on both ends of the completed assembly. Be sure to drill a moisture drainage hole in the bottom bumper. This hole can be the same diameter as the screw hole you just drilled. You should now have a combined length of tubing (the driven element) 22 feet long.

Refer to the antenna assembly drawing. The assembled three tubes will float inside the plastic PVC pipe which is clamped into the tripod. This allows the driven element to flex enough to withstand the 50 to 70 mph winds we often experience here in Kansas. (Who says Chicago is the windy city?) With the PVC pipe clamped in the tripod and using a level to check for vertically plumb conditions, secure the tripod to the roof using galvanized or brass three-inch screws, two per leg. Adjust the height of the PVC pipe in the tripod so that it is about three inches above the roof to allow coax connection below.

Insert the aluminum tubing assembly in the PVC/tripod assembly from above. Remember, the aluminum tubing does not fasten to anything structurally—gravity holds it down. The lower rubber bumper rests against the roof. Insert the brass screw and one brass washer through the hole you drilled in the lower end of the antenna. Tighten the other brass washer and one brass nut on it.

I have found that you get what you pay for in many purchases. This is especially true when buying coax. Use only enough high-quality, 50-ohm coax (RG-8 or RG-8X) to reach inside the house and to your rig (maybe six feet extra inside). If this runs over three feet outside the house, somehow attach it to the house at three-foot intervals so that the wind does not whip it and damage it. Use coax staples or nails and ty-wraps. If you don't, the XYL will be greatly disturbed by the noise it creates in windy weather.

Meanwhile, back at the antenna, strip back three inches of the coax and crimp a ring terminal on the center conductor. Coat the coax with RTV or silicone bathtub caulk around the area where you have separated the center conductor and shield. Then cover this area with electrical tape or heat-shrink tubing. This is to prevent moisture from wicking into the coax. Attach the ring terminal to the brass screw with the remaining brass nut. Refer to any *ARRL Handbook* for proper coax connections and care.

Using a common household variety wire nut, attach the coax shield to a length of 12- or 14-gauge wire (solid or stranded), long enough to drop straight down the side of the house. Connect the ground end to a good ground rod (eight feet in the ground, if possible). Ty-wrap the the antenna end of the coax and the ground wire to a leg of the tripod to provide strain relief. As with the coax feeder run, attach the ground wire to the house every three feet or so. Install a PL-259 coax plug at the rig end of the coax and connect it to your antenna tuner antenna jack.

Safety

Now, let's jump start your common sense. Stay away from electrical services to your house—this thing is 22 feet long. Although the aluminum assembly is lightweight (less than 6 pounds), it is a bit awkward to manipulate on top of the roof. Therefore, practice on the ground lifting it up three feet as if you were inserting it into the tripod on the roof. Determine the best places to hold it and get a feel for its balance. Make sure your ladder is in good shape and be sure of your footing at all times.

Final Notes

I have not had much luck using the built-in antenna tuner in my rig with this antenna. However, I suspect one could adjust the length of the elements to find a compromise which would play with the limited capabilities of an automatic tuner. I have had great signal reports on 40 through 10 meters using an MFJ-989C tuner. This tuner will even resonate the vertical on 80 meters.

Although I haven't tried it yet, this might make a good portable antenna for Field Day, as the elements telescope into one another for transport. You might try using long gutter nails to fasten the tripod to the ground. Another application could be to mount it to the bed of a pickup truck and use the bed as a ground plane. 73

Parts List

Qty.	Description
1	3-foot-tall rooftop tripod
30"	1.063" i.d. PVC pipe
8'	1.000" o.d./0.900" i.d. (18-gauge) aluminum tubing
8'	0.875" o.d./0.775" i.d. (18-gauge) aluminum tubing
8'	0.750" o.d./0.650" i.d. (18-gauge) aluminum tubing
2	0.75" to 1.00" stainless steel hose clamp with hex head adjustment screw
1	0.75" i.d. rubber bumper
1	1.00" i.d. rubber bumper
1	10-24 x 1.50" brass screw
2	10-24 brass nut
2	#10 brass washer
1	8' ground rod
1	14 AWG/#10 ring terminal
6	3.00" galvanized or brass screw
1	12-gauge wire nut
1	PL-259 coax connector
AR	12 or 14-gauge ground wire
AR	RG-8 or RG-8X coax
AR	RTV or silicone caulk
3"	electrical tape or heat-shrink tubing
AR	coax staples
AR	ty-wraps
(AR = As Required)	
Required tools:	
	Hacksaw
	Pencil
	Measuring tape
	Electric drill
	0.201 diameter drill bit for brass screw
	Wrenches for tripod bolts & brass nuts
	Ratchet & socket or nutdriver for hose clamps
	Screwdriver for brass screw
	Level with 90-degree plumb bubble
	Crimp tool for crimp terminal

HF Equipment

	Regular	SALE
IC-781 Xcvr/ps/tuner/scope ●	$6395.00	4899

IC-765 Xcvr/ps/keyer/tuner ●	$2800.00	2239

IC-751A 9-band xcvr/SW rx ●	$1440.00	1159
PS-35 Internal power supply	228.00	209.95
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)	115.00	109.95
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic ●	1064.00	859.95
PS-55 External power supply	228.00	209.95
AT-150 Automatic antenna tuner	446.67	389.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.67	
UT-30 Tone encoder	18.67	

IC-725 HF xcvr/SW rcvr/mic D●	$893.00	719.95
AH-3 Automatic antenna tuner	488.33	429.95
IC-726 10-band xcvr w/6m. D●	1283.00	1058

HF Accessories:

	Regular	SALE
IC-2KL HF solid state amp w/ps ●	$2079.00	1679
IC-4KL HF 1 kw amp w/ps ●	7275.00	5599
EX-627 Automatic antenna selector	314.67	279.95
PS-15 20A external power supply	183.00	169.95
PS-30 Systems p/s w/cord, 6 pin plug	363.00	299.95
SP-3 External speaker	65.00	
SP-7 Small external speaker	52.00	
CR-64 High stab. ref. xtal; 751A, etc	79.00	
SM-6 Desk microphone	47.93	
SM-8 Desk mic; two cables, scan	89.00	
AT-500 500w 9 band auto ant tuner	589.00	529.95
AH-2 8-band tuner w/mount & whip	780.00	689.95

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IC-575A 25w 6/10m xcvr/ps D●	1455.00	1158
IC-575H 25w 100w 6/10m xcvr ●	1564.00	1289
IC-1275A 10w 1.2GHz FM/SSB/CW ●	1923.00	1559

VHF/UHF FM Transceivers

	Regular	SALE
IC-229A 25w 2m FM/TTP mic ●	$392.00	319.95
IC-229H 50w 2m FM/TTP mic ●	425.00	349.95
IC-38A 25w 220 MHz FM xcvr ●	409.00	339.95
IC-449A 35w 440FM xcvr/TTP ●	473.00	389.95
IC-1201 10w 1.2GHz FM/SSB/CW ●	831.00	709.95

Dual band FM Transceivers

	Regular	SALE
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IC-2410H 45w 2m/35w 440 FM/TTP ●	932.00	769.95
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IC-2500A 35w 440/10w 1.2GHz FM D●	1039.00	829.95

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UX-19A 10w 10m unit	311.00	269.95
UX-59A 10w 6m unit.	363.00	329.95
UX-S92A 2m SSB/CW module.	623.00	549.95
UX-39A 25w 220MHz unit	363.00	329.95
UX-129A 10w 1.2GHz unit	571.00	499.95
UX-49A 440MHz module for IC-900	363.00	319.95
IC-970A 25w 2m/430MHz xcvr/ps ●	2409.00	1939
IC-970H 45w 2m/430 MHz xcvr ●	2567.00	2099
UX-R96 50-905 MHz receive unit	405.00	349.95
UX-97 1.2GHz band unit	1039.00	869.95

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	Regular	SALE
AH-32 2m/440 Dual Band mobile ant	$39.33	
Larsen PO-K Roof mount	23.00	
Larsen PO-MM Magnetic mount	28.75	

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	Regular	SALE
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RP-2210 220MHz 25w repeater ●	1715.00	1409
RP-4020 440MHz 25w repeater. ●	2392.00	1959
RP-4020/50W 440MHz 50w repeater. ●	2599.00	2149
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IC-03AT 2.5w 220 HT/TTP ●	319.00	259.95
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IC-4SAT 440MHz HT/TTP ●	351.00	289.95
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IC-4GAT 440MHz/TTP ●	372.00	309.95
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IC-W2A 2m/440 HT	588.00	499.95

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	Regular	SALE
A-2 5W PEP synth aircraft HT	$525.00	429.95
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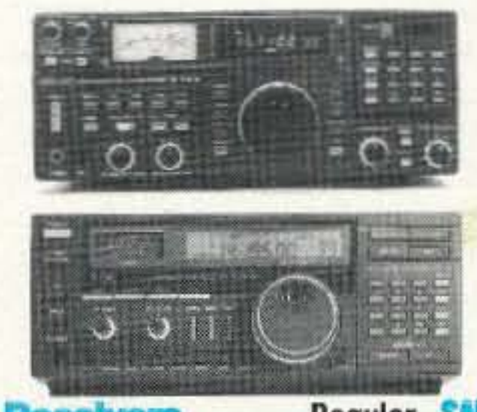

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RC-11 Infrared remote controller	71.00	
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FL-44A SSB filter (2nd IF)	178.00	169.95
EX-257 FM unit	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stablity oscillator xtal	79.00	
R-72 30kHz-30MHz SW receiver ●	972.00	769.00

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R-7000 25MHz-2GHz receiver ●	1221.00	969.00
RC-12 Infrared remote controller	71.00	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit	139.00	129.95
SP-3 External speaker	65.00	
CK-70 (EX-299) 12V DC option	13.00	
R-7100 25MHz-2GHz receiver	1383.00	1169
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Pick A Rig

So, those flashy magazine ads have finally gotten to you, huh? Now you're itchy to replace that 1974 HF rig with its drifty VFO and weak receiver. Well, today's rigs certainly are a whole lot better! And, despite their higher prices, they're a lot cheaper, too.

What? Sounds pretty contradictory, right? Well, consider this: In real dollars, you are getting *far* more radio for your bucks than you did when you bought that old one. Sure, the new ones cost from $700 to $3,000, but the old ones cost from $300 to $800 and that money was worth a great deal more back then. And did your old radio have the stability of digital synthesis, a speech processor, automatic antenna tuner, memories, built-in dual VFOs, split frequency operation and all those other nifty features we've come to take for granted? Of course not!

OK, today's rigs are pretty neat. And they do cost lots of money. So, before you plunk down your precious cash, it pays to do some research, in order to be sure you get the radio you really want at a price you can afford. Let's take a look at what features and specs are typical of today's rigs, and how they differ among the various price levels.

Gimme Power

Most rigs produced today put out 100 watts of power. There are some expensive ones which can produce 150 watts and one or two which put out more than 200 watts. Does it matter?

Usually not. The difference between 100 and 200 watts is 3 dB, or one-half of an S-unit! And the difference between 100 and 150 watts isn't enough to notice at the receiving end. Far more important is the ability to control the amount of power. Some rigs have power output controls that work in all modes, while others let you adjust the output power only in CW, AM and FM, relying on the mike gain control to control it in SSB. Unfortunately, that method makes it very hard to keep the power below the level you want, because voice peaks can still drive the output quite high. But why do you care?

Gimme More Power

You care because you might want to add a linear amplifier one of these days, and most require maximum drive power to be less than 100 watts. Especially if you want to run the amp at less than its maximum power (to prolong the life of the amp or reduce TVI), you need to be able to control the output of your rig. If you think you might ever buy an amp, be sure to get a radio with an all-mode RF power output control. Yes, you can control maximum output using the ALC line which runs from the amp back to the radio but, unless the amp has *adjustable* ALC, you may not be able to set it where you need it. Also, ALC voltage and polarity are not standardized, and some amps don't control some radios very well. Some combinations don't work at all. In fact, many hams don't even connect the ALC line, although you should if you can, because it really helps avoid flattopping distortion and all the woes that brings.

Tuner Up

Nearly all new rigs have solid-state RF power amps. The convenience of being able to change operating frequencies without retuning the finals has made the tube final obsolete. Transistor finals have many advantages, but just one drawback: They cannot match a wide range of antenna impedances. If you have a great antenna system with a low SWR across all the bands you want to use, then it's no problem. If, however, you live in the real ham world and have a 3:1 SWR on 75m and want to use your 20m dipole on 17, then you need some method of matching the rig to the antenna. Today's solution is the automatic antenna tuner.

Sure, you can buy a manual tuner for under $100. You can even build one for much less. But now you're back to the old annoyance of retuning every time you move more than a few kHz. Heck, you might as well have stuck with tube finals! A much better approach is to buy a rig with an internal automatic tuner. With such a setup, you need only press one button and your rig will be matched in a second or two. Although you can purchase external autotuners, it is far nicer to have the unit built into the rig. While some radios come with the tuner as a standard feature, most offer it as an option. Buy it installed when you get the rig; it'll cost you a great deal more if you want it later. Typically, a rig costs about $200 more with the tuner, but the tuner alone costs $300 or more, and you still have to install it or pay someone else to do it.

The lowest-priced radios don't offer autotuners at all, leaving you with the necessity of getting some kind of external tuner. If you really need to save money, you can buy or build a small tuner and just live with the required knob twiddling. Heck, some hams, especially those raised on tubes, actually *enjoy* doing the adjustments. For me, it's just an annoyance. And I've seen more than a few tube diehards converted after five minutes of playing with an autotuned rig.

Can I Hear You?

Perhaps the single most important characteristic of any transceiver is the quality of its receiver. All of today's receivers have more sensitivity than you need on the ham bands, so don't quibble over the difference between 0.2 and 0.16 microvolts! But sensitivity is just one aspect of a receiver's quality. Far more important are selectivity, AGC smoothness, resistance to overload, and phase noise. All of these things contribute to the overall sound you'll be listening to. Is there really a noticeable difference between modern receivers?

You bet your sweet dipole there is. Even among similarly priced radios, you'll find tremendous differences. Some rigs are smooth-sounding and lovely to listen to, while others may distort voice peaks because of lousy AGC. Still others sound muddy and can literally give you a headache, thanks to phase-noisy synthesizer designs. Unfortunately, there's no easy way to tell from the published specs whether or not you'll like any particular receiver. The very best way to find out is to actually try the rig before you decide to buy it. Ham radio stores are a great way to do this, because often you can perform A/B comparisons, since the radios are lined up right next to each other. If you don't live near a store, though, you may still be able to try a radio out simply by asking around on your local repeater. If it's new, you can bet some local ham has one and can't wait to show it off.

Beware

Take brand advice with two grains of salt. Nearly every ham loves the brand of rig he or she owns and thinks it is better than the other brands. One ham will tell you that ICOM is the greatest, while another will swear by his Ten-Tec. The truth is, the satisfaction you will get from your radio can vary, not only by brand, but by various models within a given brand. In other words, you may love one Kenwood or Yaesu and hate another one. The only time it really pays to listen to anecdotal advice is when it concerns repair problems. If several hams tell you that their model XJ-1200 has had lots of PLL problems, it pays to avoid that rig, even if you get a good deal on one.

General vs. Specific

Most new radios have general coverage receivers. If you like shortwave listening, the wide coverage (typically 150 kHz to 30 MHz) will give you countless hours of pleasure. Having been a shortwave listener most of my life, I can heartily recommend that you give it a try. Some of the best news coverage in the world comes from the BBC. And if you have a multimode digital controller, you can copy news photos, weather maps, RTTY traffic and lots more.

There's a small price, however, to having a general coverage receiver: The overload rejection and some other receiver characteristics are not quite as good as they can be on a good receiver designed *only* for the ham bands. In my experience, though, general coverage receivers perform more than well enough; I've never had a problem. I suppose if I were a contester I might feel differently.

Bells and Whistles

Today's rigs have lots of knobs and buttons on them, with each new model attempting to outdo the last. If you're used to an old Swan, you're in for quite a shock! Looking at my TS-940, I count 47 switches and 19 knobs. Yikes! Do we really need all this stuff? Perhaps not, but a lot of it is really nice to have, even if you use it only once in awhile. Some of it is just pure marketing: "They've got it so we'd better have it too." The ease with which a new radio can be learned and used, however, does not directly depend on the number of controls it has. Far more important is the philosophy behind its "user interface." In other words, the locations of the various controls and the sequences you must perform in order to carry out the operations. The user interface varies *tremendously* from manufacturer to manufacturer. The only way to know if you like it (and believe me, you will like some and hate others) is to try it. If you don't live near a radio store, try out a friend's rig. Even if it isn't the same model, its interface probably will be similar as long as it was made by the same company. Let's take a look at some of the available features and how much you need them:

RIT: Nearly all rigs have it. Some have a separate control, while others use the main tuning knob in conjunction with a button. The separate control is preferable.

XIT: Many rigs have it, although some low-priced ones don't. For normal, non-contest use, you really don't need it.

Notch Filter: Very useful. Lets you take out tuner-uppers and other heterodynes. If you really like a rig, though, and it doesn't offer a notch filter, don't pass the radio up on that account. You don't use the filter that often.

Attenuator: Lets you knock down the receiver's front-end gain. Sometimes useful on 75m in high-QRN conditions. You can live without it.

RF Gain: Lets you adjust the IF gain. Works somewhat differently than an attenuator. Some folks use 'em, but I never do; I just leave it all the way up.

Adjustable AGC: Handy. Most offer Fast/Slow selection, while a few also offer a medium setting or are continuously adjustable. Usually, you leave it in the slow position, turning it to fast only for CW and digital modes. Some

Continued on page 68

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IC-229A 2		Call $
IC-		Call $
IC-228H 2m, 4		Call $
IC-W2A 2m 4		Call $
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The Flight of SPECTRA III

On March 21, 1992 at 7 a.m., the Franklin Community High School (Franklin, Indiana) Aerospace class launched their third high altitude balloon experiment. These experiments were part of a continuing school sponsored program aimed at teaching weather and communication satellite techniques. The students actually got a chance to design and build their own "satellites" and launch them to the edge of space with balloons to simulate the real thing.

Two Separate Flight Experiments

Two separate balloon payloads were launched from the baseball field at the school. The first balloon package carried aloft an actual aircraft transponder (donated by TERRA transponders of Albuquerque, New Mexico) and a 2 meter 300 milliwatt FM beacon (built by Dan N9KZH) with a tone-modulated CW ID. The second balloon package consisted of a Wyman Research ATV transmitter on 439.25 MHz with on-carrier sound, a 2 meter FM receiver, a 10 meter FM transmitter on 29.6 MHz, and a 100 milliwatt CW transmitter on 28.322 MHz. Anyone heard coming in on the 2 meter uplink would be repeated out on the ATV on-carrier sound frequency as well as the 10m FM output. The idea was to link up a number of classrooms across the midwest using the balloon as a crossband repeater. In addition to the amateur radio payload, a separate Samsung AF-SLIM camera was attached loaded with special infrared film. The camera was set up to take a picture automatically every 10 minutes. Thanks to the special film, a series of very detailed and spectacular photographs were obtained throughout the flight.

Liftoff

The first balloon (with the transponder) was filled with just enough helium to lift the payload and barely left the ground when it was released. It finally headed leasurely up towards the edge of space. The second balloon was filled with an abundance of helium and had plenty of excess lift. At liftoff, it zipped up at over 1500 feet/minute, almost as if it were helped along by a rocket.

Since the second balloon carrying the ATV gear and the crossband repeater was zipping along much faster than the transponder balloon, it reached its maximum altitude (about 90,000 feet) in about 1.5 hours. Along with spectacular aerial views of Indiana and the Ohio River, the crossband voice repeater saw a good deal of activity. Since the ATV transmitter operated with on-carrier sound (FM voice modulation of the center carrier) anyone with a 440 MHz HT could tune into the voice activity just by tuning into the center carrier of the ATV signal. At least three schools were able to work through the repeater and over 50 individual stations in a several state area were able to establish contact with the student-operated communications center at Franklin High School.

Recovery

The ATV balloon burst over extreme southeastern Indiana and the package plummeted back to earth when the parachute fouled up. Fortunately, the payload managed to just make it over the Ohio River to land near Warsaw, Kentucky. The payload was found just over an hour after the landing in reasonably good shape considering its rapid descent. Good ATV reception was reported in several Midwestern states and one school in Olds, Alberta, Canada, reported receiving not only the 10 meter transmissions but the 70 cm on-carrier output of the balloon repeater as well (a remarkable distance of 1500+ miles on UHF). The 10 meter CW ID was heard by Bill WA6YPE in Glendora, California, even after the landing (the 10m dipole was draped over two bushes).

Long after the ATV package had landed, stations from across the Midwest reported hearing the very strong 2 meter FM output from the first balloon. Since the balloon was filled with very little positive list, it took over 3-1/2 hours to complete the flight.

Due to the increased flight time, the payload drifted across most of Kentucky and landed near the town of Isonville, Kentucky (over 180 miles from the launch site). The intrepid Indianapolis foxhunters finally located the payload hanging 70 feet up in a tree around 11 p.m. After numerous theories of the proper method for payload removal from the tops of trees, a local resident, Mr. Julian Fyffe, came up with the solution. He said, "If I were you, I'd chop that tree down!" Julian disappeared for a couple of minutes and reappeared with a chainsaw. He chopped down the balloon-eating tree in no time at all. All the chase crew had to do was walk up to the top of the tree and pluck the package from the formerly lofty branches. I understand that chainsaws are now standard equipment on any balloon chase.

A special thanks go out to the following flight sponsors: Wyman Research, Avex Portable Battery, Samsung Cameras, Terra Transponders, Milo & Associates, Inc.

Thanks to Chuck Crist WB9IHS for the information in this month's column. His continuing support and advice to the Aerospace class at FCHS (as well as the many area hams who pitch in to launch and recover the payloads) has made this a very exciting program for the students. In fact, the design and launch of payloads is now part of the class curriculum. If you have any questions about starting a similar venture with your local school, feel free to contact Chuck at 6455 Madison Ave., Indianapolis IN 46227 (please enclose an SASE). 73

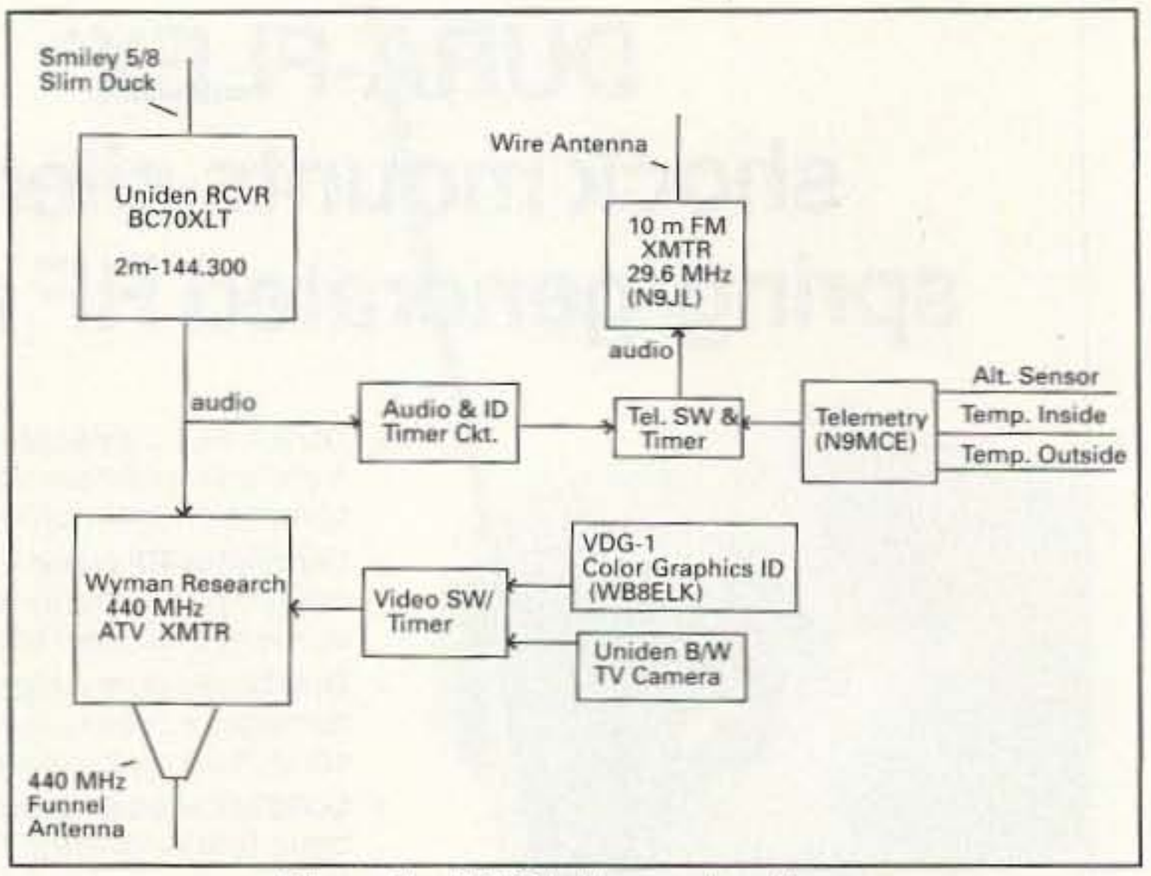

Figure. The FCHS balloon system diagram.

Photo A. The Spectra III ATV payload.

Photo B. The launch team inflates the first balloon. (l to r): Chuck WB9IHS, Pat WB9IQI, Seth KB4BGV and Darren Rasmussen.

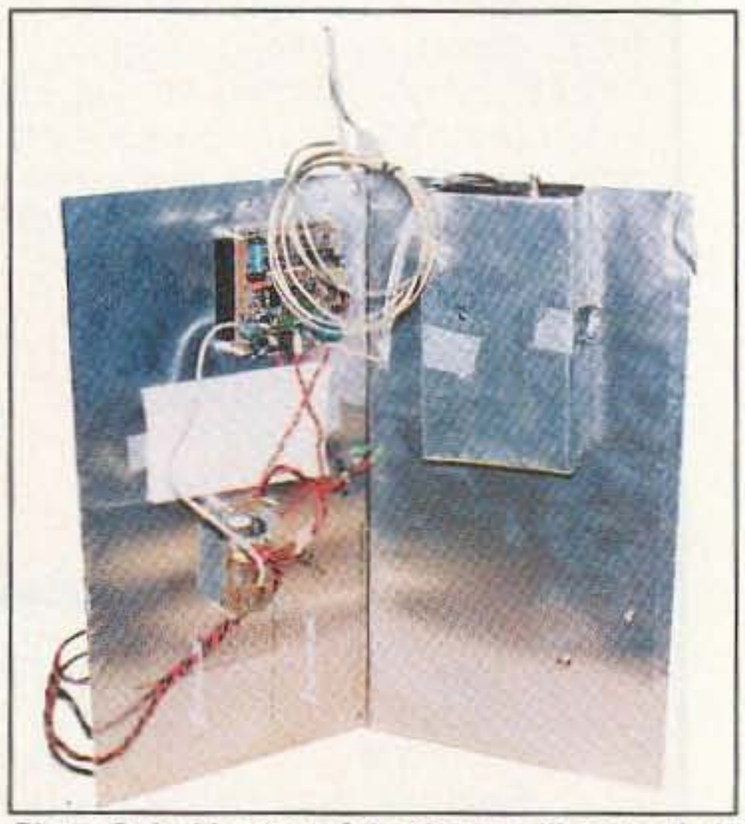

Photo C. Inside view of the Spectra III payload. All components were mounted on a triangular-shaped inner core which fit inside the styrofoam package.

Photo D. (l to r): FCHS students Andreas Sohmlein and David Smithers ready the Spectra III ATV package for liftoff.

The FCHS Balloon Team

Doug Craig	Project Manager
Chuck Crist WB9IHS	Project Director
Pat Crowe WB9IQI	Asst. Project Director
Ron Hamilton KA9VWR	Flight Communications
Dave Distler KN9E	Launch Program Director
Steve Smith WA4VWV	40 meter net coordination
John Goolby WJ9U	10 meter net coordination
Bob Rogers	FAA tracking/communications
Rick Tyre N9HLL	ATV downlink director
Mike Sercer WA9FDO	Video records
Seth Rossman KB9BGV	Launch team coordinator
John Lutz N9JL	Technical advisor (10 meter payload)
Darrell Sego KM9S	Technical advisor (2 meter payload)
Dave Latsch N9MCE	Telemetry coordinator
Mike Crist	Balloon fill/launch coordinator
Mike Rosemark KA9VMR	Weather coordinator
Ron Pogue KD9QB	Chase plane
Ken Jessup	Pilot of chase plane
Dan Trogglin N9KZH	2 meter transmitter beacon

Chase Team:

440 MHz

Tom Curran N9DZJ
Cliff Vaught N9FHF
Bernie Hefferman KB9AWS
Larry Oaks WB9YAJ

2 meters

Dan Trogglin N9KZH
Malcolm Mallette WA9BVS
Paul Bohrer W9DUU
J.R. Denney N9GWD

Students:
Darren Rasmussen
Sandi Winter
Tim Smock
Randy Miller
Kelly Puckett
David Smithers
David Young
Brian Ferris
Heather Kuntz
Jenny Reed
Chris Williams
Andy Bayliss
Lorrie Whisler
Bob Bufton
Andreas Sohmlein
Chad Lamasters

RTTY LOOP

Number 19 on your Feedback card

Amateur Radio Teletype

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

As fall falls, and Labor Day lumbers by, let's take a dip in the "RTTY Loop" mailbag and see what we come up with.

The Rev. James Barton WØKNJ, of Colome, South Dakota, writes in response to the column last December regarding interfaces for VIC-20 and C-64 computers. Jim relates that for most of his 40 years in ham radio he was concerned with building gear that did not always function according to plan; or, if it did, may have not been the most presentable!

Just getting into computers, Jim picked up a VIC-20, and trotted down to his local Radio Shack to ask about computers and ham radio. Their recent push into ham equipment notwithstanding, Jim says that the look he received made him feel as though he were "some present-day Rip Van Winkle."

Well, Jim, we remain happy to be an alert and awake source of RTTY information. As you suggested in your letter, the G & G line of interfaces featured in the December column may be just the ticket for someone such as yourself who wants to put a VIC-20 or C-64 onto RTTY. I would not suggest you trash the VIC-20 for a C-64 just yet, though. Go ahead and put the VIC-20 online first, and see if it meets your needs. With a suitable interface and software you may well be perfectly happy. After getting on the air, let your interest level and desires dictate whether or not you want to move into the more complex equipment.

For those who may have missed the December 1991 issue, G & G Electronics offers the old Microlog line of interfaces for the VIC-20 and C-64 computers. Contact them here in Maryland at (301) 258-7373. Be sure to relate the source of your knowledge, OK?

Another puzzler is supplied by Bill Barbee AA5ZR of Grenada, Mississippi. Bill states that he has "been running RTTY for a few months now and have a problem with my set-up. I am using a Heath SB-1400 transceiver, MFJ-1224 interface for RTTY and CW, the MFJ-1265 software 9.1 April 1984, a C-64 computer, and a Commodore MPS-801 matrix printer. I have been using the C-64 and the MFJ-1224 interface to send and receive RTTY with my monitor. I have just purchased the Commodore MPS-801 matrix printer.

"My problem: I can't get the printer to print online when the RTTY signal is being received. I can get the print on my monitor, but the printer will not print simultaneously. After the buffer fills up, the buffer will dump the print on the printer. When this happens, the RTTY online information is lost. It will not receive and print at the same time.

"Is there something I can do to get the printer to copy online a RTTY signal? I love RTTY and I like to copy ARRL bulletins, but my printer will not print instantaneously."

Well, Bill, I have no current information, but seem to recall a similar problem with the C-64 and an earlier setup years ago. Could this be a design flaw of the system? I turn it open to the readership, and look forward to passing along whatever information I receive.

Speaking of information, a letter received from Lance Miller, Ph.D., AB4LP addresses the needs of quite a few of you. He writes, "I see by your column, in the August issue of *73*, that there is renewed interest in the old ASR-33. I have fond memories of this noisy, smelly, electro-mechanical marvel, and not-so-fond memories of attempting to discover information—any information—that would help me get the damn thing hooked up and functioning. I have empathy for anyone, especially neophytes, in the position of owning one of these gadgets, and attempting to use and maintain it. I'm convinced that more 33s have hit the garbage dump for lack of information than any other reason.

"There is a point. I have, on my bookshelf, the complete Teletype Corporation service manuals for the ASR/KSR-33, resplendent in their original blue binders. I will make these available to all who reimburse me for copying and shipping costs. One potential drawback—there are about 400 pages of material, and one never knows where the answer will be found in the manuals. In my case, I simply found the proper page and followed instructions. I'm not an expert on the 33, quite the contrary, so I can't answer specific questions; but the books are available, and they are complete.

"I haven't investigated copying costs yet. If anyone's interested, I'll shop around and get the best deal. This is a not-for-profit enterprise, but it's not a loss-leader either. I just hope that I can make life easier for some poor soul who is flailing around trying to get a 33 online."

This is a generous offer, Lance, and I am quite certain from the letters I have received in the past that there will be several folks willing to take you up on your offer. Drop Lance a line at 3123 Baird Avenue, Lakeland, Florida 33805-2118. Lance, thanks for you proposition, and please let us know further details as they become available.

While IBM compatibles and older Commodore computers take up much of our interest, one cannot forget that there are other systems out there. Dave Ventura KEØNA of Burnsville, Minnesota, has one of them. He writes, "I have been trying to find references or articles that would help me interface an AEA CP-1 to my Apple IIc computer. The CP-1 manual mentions that Apple II computers were once supported. I called AEA with the hope that the software and interface cable are still available, but they are not. A call to Kantronics and requests in local BBS systems also proved fruitless.

"I was hoping that you would be able to point me to any resources or references that may be helpful in my quest to get on RTTY with my Apple IIc and Yaesu FTDX560."

Well, Dave, I will throw the question out to the readers of this column. My experience has been that they often have the answer when conventional sources fail. Stick with us for a few months, and let's see if someone comes up with it.

Last month, Rick Arzadon posed a question about DesqView and running packet. Via CompuServe, Doug Stracener KA5YSY of Baton Rouge, Louisiana, relates that "DesqView is great, and runs much better than the Windows environment; i.e., it is faster and does not consume the memory or processor time. As to the question of what can handle simultaneous multimode contacts, I can highly recommend the Kantronics KAM and the Hostmaster II software. The Hostmaster II has a logging system and many other nice goodies, not the least of which is the ability to watch a DX cluster-spotting net and also be running RTTY, AMTOR or any other mode on HF port too. Since he asked the question about configuration, mine is as follows: 386/20 MHz IBM clone, 4 mB RAM, 105 Mb hard disk. My software is MS-DOS 5.0, DesqView with QEMM 386; the usual logger for me is Aries 2, which is a great terminal program with logging built in and is crashproof during contests. I also run Instant Track for the satellites, the Bearing program (which is an option with the Aries-2), and several other programs simultaneously. If Rick really wanted to get crazy, two KAMs into two COM ports would give the ability to run four different QSOs at one time on four different frequencies. Of interest to all is the fact that one of the built-in features of DesqView is the ability to cut and paste information between programs. This is a great feature if you need it."

Doug, I appreciate the information, and I am sure Rick does as well. Once again, the readers of this column come through.

Is there any interest in putting an old Flesher terminal unit to use with one of the popular RTTY programs? One scheme has showed up here, and I would be inclined to pass it along, if there is any curiosity.

I look forward to your input, as always, via mail, at the above address, or electronically via various services. Doug used CompuServe, my ppn is 75036,2501; others have used Delphi or America Online, my identifier on either is Marc WA3AJR. I look forward to hearing from each and every one of you this month. 73

Ask Kaboom

Continued from page 64

rigs do it automatically, some don't. Some even let you turn the AGC off. Now and then that can be nice with a weak CW station, but most of the time it isn't useful.

IF Shift, Variable Bandwidth Tuning, Slope Tuning: These all are methods for narrowing your IF passband to eliminate QRM from adjacent stations. An absolute must. VBT and slope tuning are better than IF shift, but that's OK too. I own a radio with no shift control, and it drives me nuts. For a while, there was a patent dispute in Japan which prevented some new radios from having the feature, but it has since been resolved, so newer models should have it.

All-Mode Power Output Control: As I discussed above, this is very useful if you are planning to get an amplifier. You can live without it, though, especially if you intend to keep your station "barefoot."

All-Mode Squelch: Occasionally handy, but not very often. Not worth worrying about.

Memories: They all have 'em. The more the better if you're an SWL. Otherwise, just a few will do fine.

Memory or Band Scanning: Absolutely pointless on HF. Don't waste your time.

Noise Blanker: Very useful in mobile situations or high-static base station locations. Some are better than others. Some offer an extra blanker for the "woodpecker" noise which used to emanate from Soviet over-the-horizon radar. The woodpecker no longer exists, but I suppose it could be used again in the future. An adjustable noise blanker is best, but some fixed ones work pretty well.

Speech Processor: Very useful. This can make your transmitter seem much stronger than it is. The RF or IF type of processor is best, but some audio processors are quite effective. Like noise blankers, adjustable processors are best, but fixed ones are OK too.

Monitor: This lets you hear your own signal after it has passed through the RF chain. Very nice for adjusting your speech processor. Otherwise not too handy unless your station develops a problem of some kind. Then it's a godsend.

Audio Peak Filter: This is the opposite of a notch filter—it peaks up a desired audio pitch while rejecting everything else. Great for CW, useless for anything else. Some peak filters "ring" and sound muddy, while others don't.

Full Break-In: If you're a big CW op, you may want it. Otherwise, probably not worth worrying about.

VOX: Some people love it. I hate it. I think it sounds annoying on the air. Are we really too lazy to press the TX switch?

Split-Frequency Operation: Needed for 10m FM, nice for some DX work. Most rigs have it, a few don't.

FM Capability: By law, only used on 10m. Since 10 is going "thataway" with the reduced sunspots, you'll have very little opportunity to use FM for a number of years. By the time the sunspots come around again, you may not even still own the radio! But, when the band is open, FM is a blast! Decide for yourself.

Whew, that was a long one! See you all next month. 73

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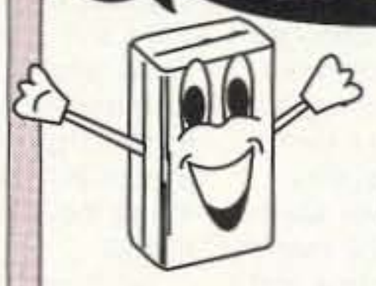

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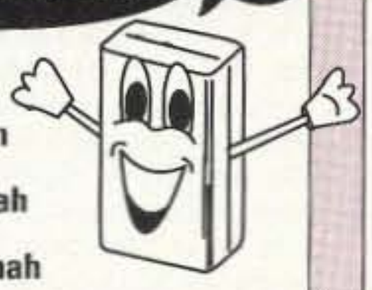

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T-Hunting in the Beef State

For many hams, weekends mean uninterrupted hours in the ham shack working DX, contesting, packeting, or building new gadgets. But for many of my ham friends, weekends mean taking to the open road in a vehicle full of radio direction finding (RDF) equipment. Whether it's called hidden transmitter hunting, foxhunting, or T-hunting, the idea is the same: Find the hidden ham station with minimum time or mileage, to be the champion competitor of the weekend.

Mobile T-hunting started decades ago, but it's more popular now than ever, partly because of regular coverage in *73 Amateur Radio Today*. I hear from RDF enthusiasts all over the country, and it isn't hard to find hunters and hunt opportunities wherever I go. Such was the case in May when my wife April and I visited family and friends in eastern Nebraska.

One important stop was Lincoln, home of our alma mater (the University of Nebraska) and one of the most active ham clubs in the state. We had been invited by huntmaster Roger Hansen NØLIA to compete in the monthly Sunday afternoon transmitter hunt.

Times Change, for the Better

When I was a member of the Lincoln Amateur Radio Club (LARC) 25 years ago, there were no pocket handhelds or VHF repeaters. Nebraska hams kept in touch with each other on 75 meter single sideband, mobile and base. Statewide nets were held morning, noon, and night. That band was also where hidden transmitter hunts were held, but they were rare events.

A few of us college students, wanting to be "high-tech," tried out 2 meter FM using surplus RCA CarFones and GE "Pre-Progs." (This was before Wayne discovered it.) Their low-sensitivity 6AK5 front ends and battery-hogging vibrator power supplies made these sets as awkward as our 75 meter rigs, so no one dreamed of T-hunting on 2 meters back then.

New technologies have made great changes in ham radio life in Nebraska since then, but one LARC attribute remains constant—its members still show Midwestern friendliness and hospitality. As we got on repeaters and chatted with Lincoln hams, it was hard to believe over two decades had passed since we had moved to California. These folks have a way of making newcomers and visitors feel right at home.

Monthly 2 meter RDF contests have been going on in Lincoln for only a couple of years, so many hunters are still learning the ropes. I saw no dopplers or dual-whip RDF sets during my visit. Everyone used a yagi or quad. Simple through-the-window mast mounts (Photo A) were most common.

The most elaborate setup of the day belonged to Scott McCullough NØNID (Photo B). His home-brew quad uses a wooden boom and spreaders. The element spacing is adjustable to eke out the absolute best gain and pattern. It's too long for window mounting, so he built a wooden platform and pulley drive system to put it above the center of the roof (Photo B). Nice work!

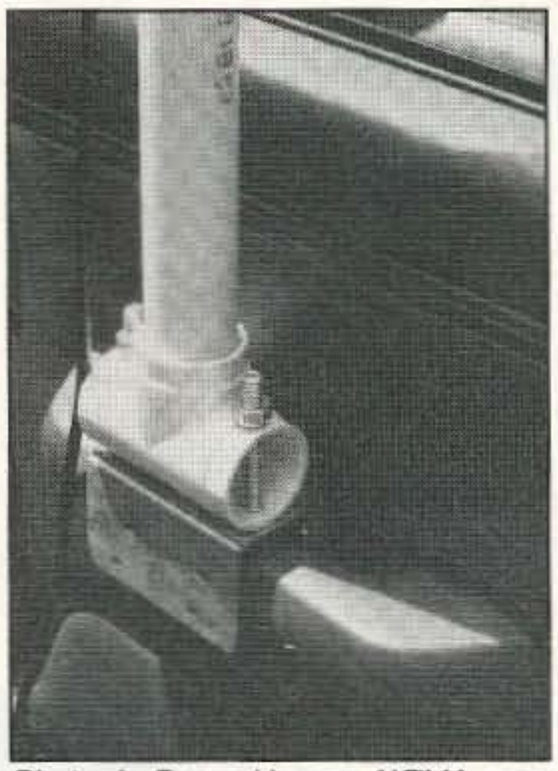

Photo A. Roger Hansen NØLIA came up with this novel idea for an armrest mount. The mast turns freely, but it took some filing to keep the fittings from sticking.

There is no requirement that the hidden T be in a vehicle, so contestants must be prepared for on-foot "sniffing." Most brought some sort of sniffing gear, such as KØGND's special yagi (Photo D).

Novel Rules

To win the LARC hunt, you must be the first to arrive at the hidden site. That's a common requirement for hunts everywhere, of course, but the Cornhusker hams have added a few interesting twists to the rules. For example, you are not considered to have found the T until you touch its microphone.

All members of the hunting team must touch the mike at the same time. Why all the togetherness? It prevents large teams from having an advantage over a single hunter in a sniffing situation. A car full of hams could be more efficient by scattering and doing a visual search. This rule encourages them to stay together and follow the RDF set's indications.

Another unusual provision in the rules helps hunters with inadequate means of attenuating strong signals. The hider must begin using reduced power when requested by one hunter. From then on, each two minute transmission is full power for the first minute, then low power for the remainder.

To keep interest high throughout the year, LARC invented a special scoring system. Fifteen points are awarded to the winners of each hunt, ten points for second, seven for third, five for fourth, three for fifth, and one for sixth and later.

If there are several hams on a team, each one gets the points. The club newsletter (called "The Lincoln Log," of course) regularly prints a running total of points for the year. This encourages everyone to keep participating and raise their standings.

The points are allocated to the hiding team at the start of the hunt, then awarded by the hiders to the hunters as they come in. For instance, if four teams are hunting, the hider starts with 37 points (15 + 10 + 7 + 5).

If any teams do not find the T, they get zero points. Their points are kept by the hiders. Continuing the example, if two of the four teams are skunked, the hiders keep the 12 third/fourth place points. If all teams find the T, the hider gets only one point for his efforts—a consolation prize.

To get the most points, hiders work hard to keep from being found by anyone. Time is on their side because the hunt lasts only 60 minutes, maximum. Each transmission is two minutes long, then there is silence for three minutes. As RDFers know, you can make a lot of mistakes in those three-minute off periods.

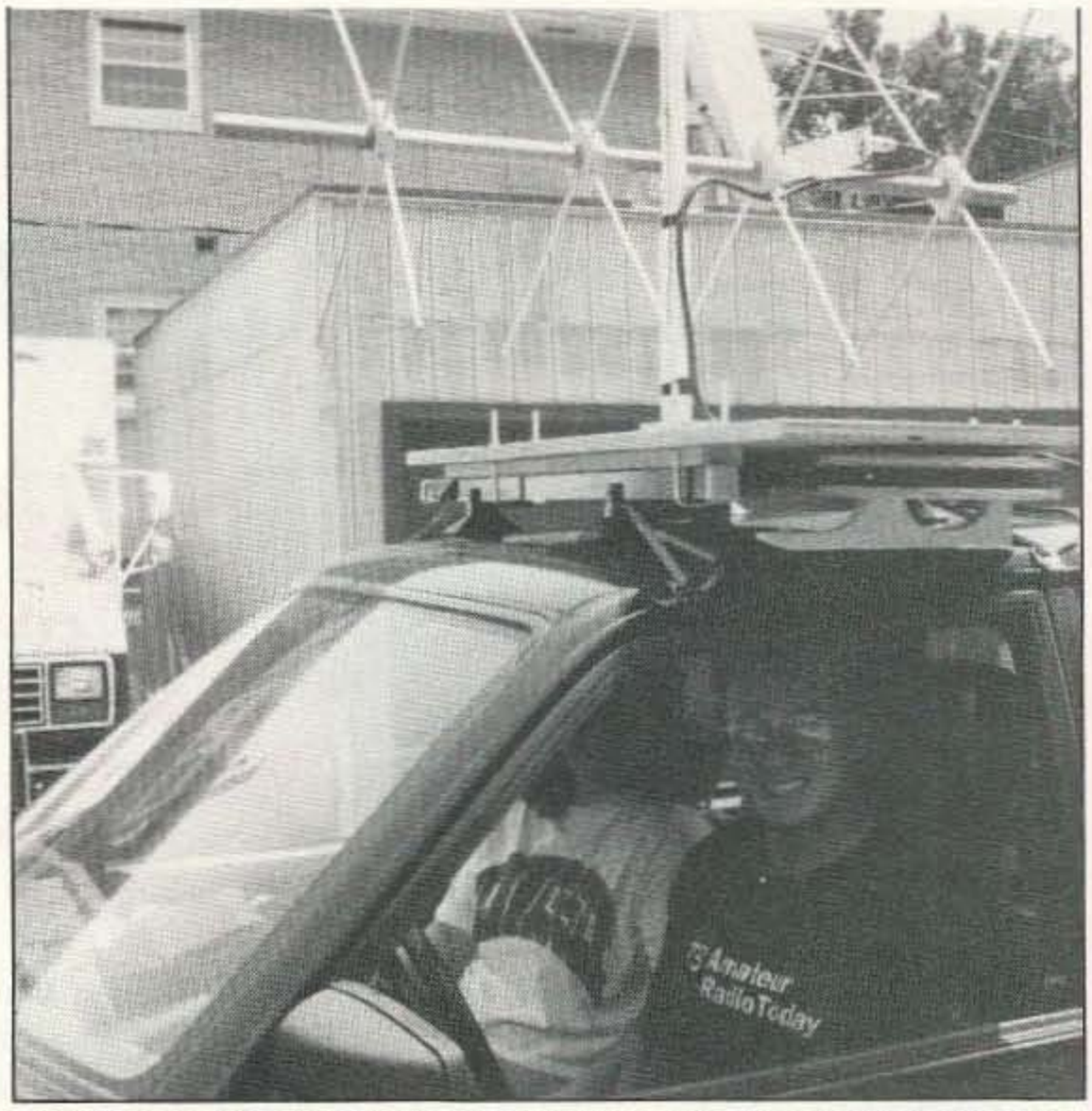

Photo B. Scott McCullough NØNID shamelessly sought recognition in this column by proudly wearing his 73 tee shirt. (It worked!) His RDF setup is a real eye-catcher.

Stealthy Signals

Another advantage for the hiding team is the unusual hearability rules. In the LARC hunt, there is no requirement that the fox's signal be copied at the parking lot of the Red Cross building, where hunters gather to start.

First contact is made on a repeater located two miles northeast of the start point. The T must be copyable through that repeater. Hiders get the names and calls of the hunting teams via the repeater, then they give the "go" signal. Hunters take off for their favorite nearby listening posts and listen on 146.52, awaiting the fox's first official transmission, which occurs five minutes later.

The fox can't make any changes to his setup when he QSYs to 146.52. But if the hidden signal can hit the sensitive repeater receiver without being heard near the Red Cross building, the hunters will face a serious dilemma. Running flea power and hiding close to the repeater will do it. But that's an obvious ploy—hiders will usually head for the repeater site right away if they don't get a direct signal at the start.

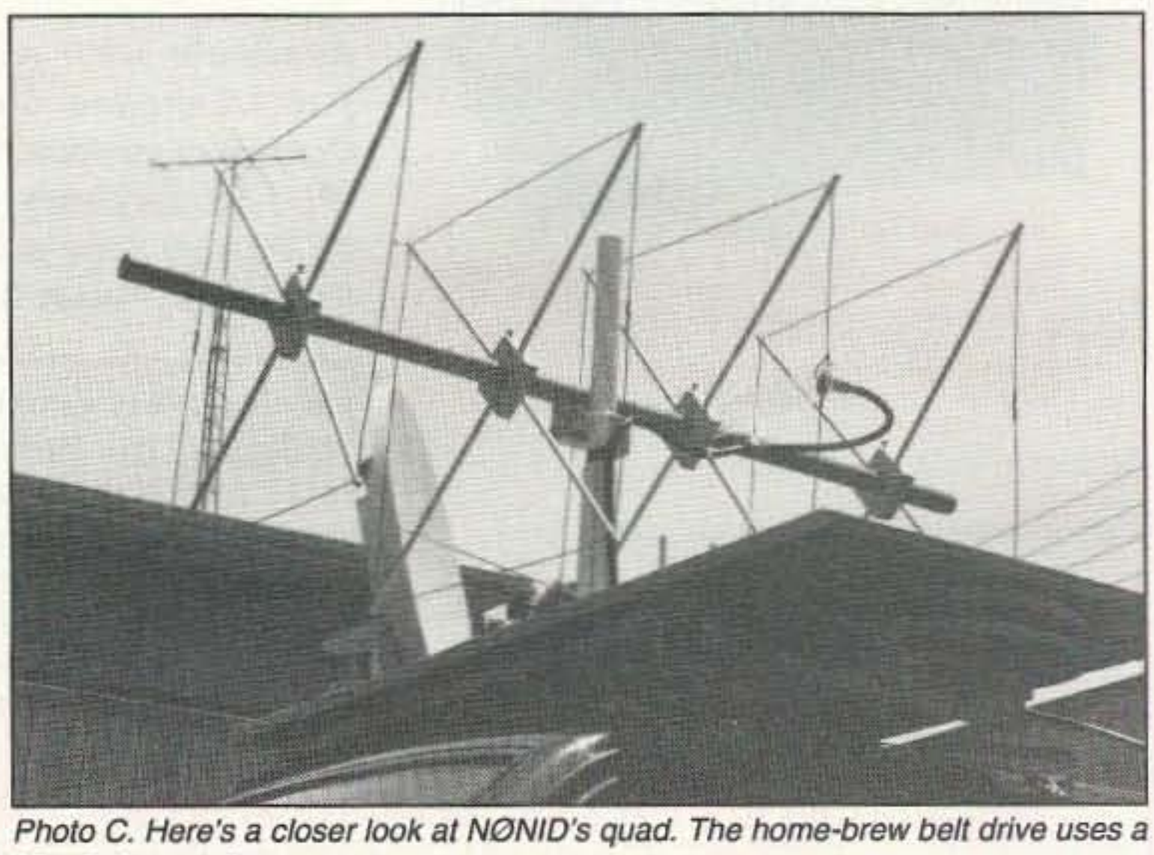

Photo C. Here's a closer look at NØNID's quad. The home-brew belt drive uses a bicycle inner tube.

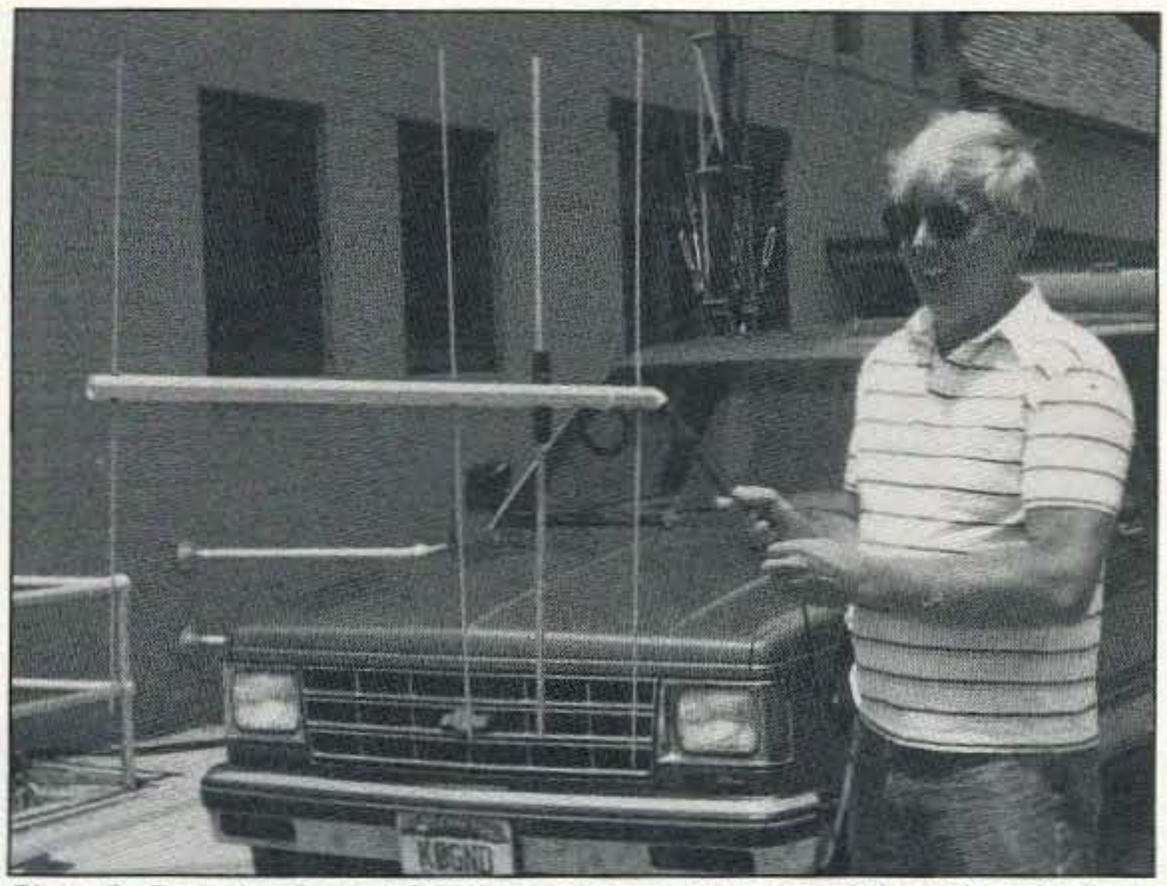

Photo D. Reynolds Davis KØGND says this yagi was carefully designed to have the perfect pattern for sniffing out the fox.

In Southern California, where there are 5,000-foot mountains within the boundaries of many hunts, hiders can use the terrain for shielding. But there is barely a hundred feet of elevation change within the 80-square-mile boundary of the LARC hunt, so terrain shielding is hard to do.

On the day of our visit, the hiders tried a different scheme. KBØEK and NØQEC hid near the southeast boundary corner. They used a very low power T feeding a long quagi antenna, pointed at the repeater (Photo E). They elevated the beam, hoping to hit the high repeater receiving antenna with the lower part of the beam's forward lobe, without giving any signal to the mobiles at ground level.

The trick was a partial success Teams with sensitive gear such as long beams and GaAsFET preamps were able to get a smidgen of signal near the Red Cross building. On the other hand, one team with only a two-element quad drove for the duration of the hunt without ever hearing the T.

TBOX Update

TBOX, the multi-featured fox controller, was described in "Homing In" for October 1991. Judging by the mail, it has been one of the most popular projects to appear in this column. An improved PROM BIOS code (version 0.8) is available on the *73* landline BBS. It has additional tone sequence modes and improved keyboard interrupting. The new BBS phone number is (603) 924-9343. Look in File Area 1 for TBOX08.ZIP.

As with all microprocessor-based devices, hardware and software upgrades can make a good thing even better. Designer Ron Seese N6MBR has developed a number of improvements and enhancements. You can add a Dallas Semiconductor SmartWatch socket to program TBOX to turn on at a future time and date.

On/off timing and tone sequences can be changed remotely by a control link receiver and DTMF tones. There is a new mode to allow you to talk through the hidden T via the control link. A new version (revision B) of the printed circuit board is available from N6MBR.

Ron's mini-kit includes the board, a programmed PROM (v1.4), and the hard-to-find EEPROM. I just got it and I'm headed to the local jobber for the rest of the parts. For more information on TBOX enhancements and kit prices, send an SASE to Ron Seese N6MBR, 6136 Landino Drive, Westlake Village CA 91362. 73

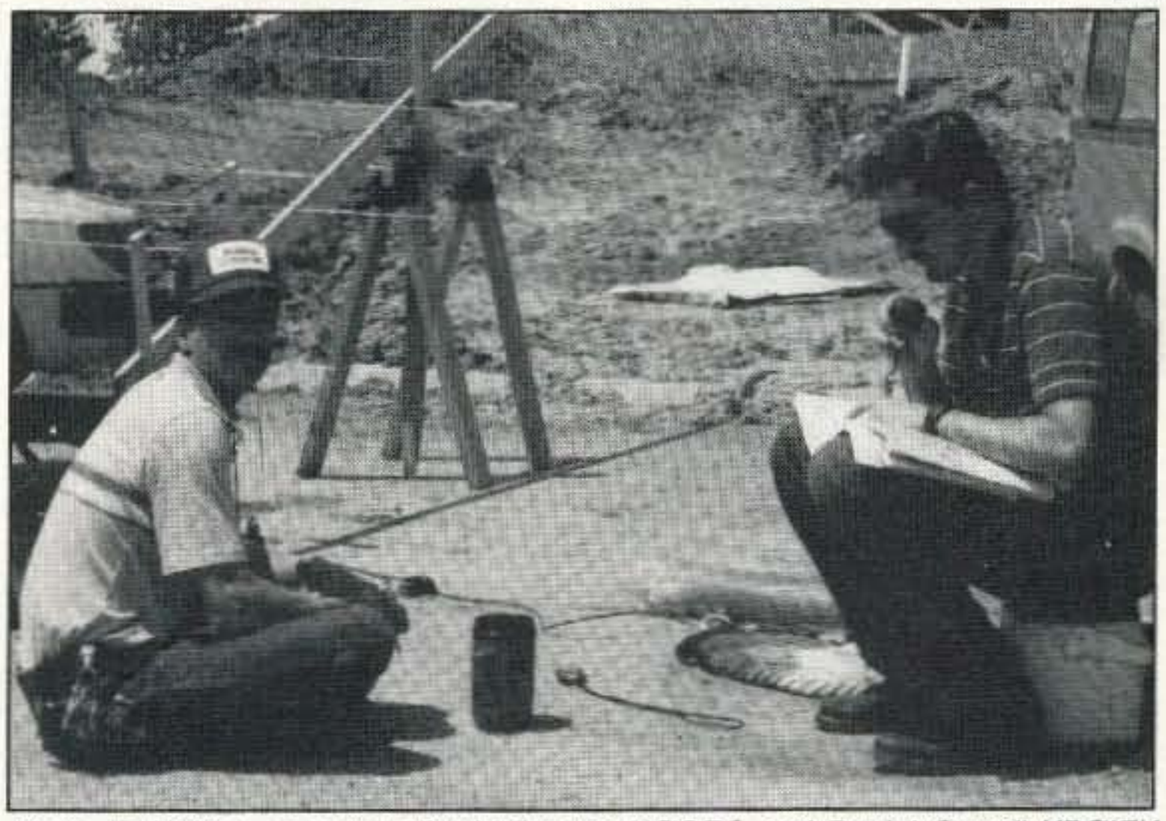

Photo E. Hidden operators David Bunger NØQEC and Daniel Cowell KBØIEK (speaking) took pains to minimize extraneous signal leakage by putting RF chokes in the coax shield and covering the transmitter with a screen. Their long quagi antenna is on the sawhorse.

Number 21 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
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AMSAT-OSCAR-13 has been performing extremely well. Signals from our high-orbit, multi-transponder hamsat have been as strong as they were when the satellite was launched over four years ago. More DX stations have been heard operating through this satellite than ever. After completing my DXCC a few months ago, I am still working "new ones" without following the DX news. It is not uncommon to hear a relatively rare DX station that would be swamped on 20 meters, calling "CQ" for several minutes on the satellite before getting a reply.

AMSAT-OSCAR-10 inspired many DX stations to try satellite communications, but A-O-13 has surpassed A-O-10's popularity. Many DXpeditions have taken equipment along for at least Mode B (70cm up and 2 meters down) operation and some have been heard on Mode J (2 meters up and 70cm down) and even Mode L (23cm up and 70cm down).

Over time the orientation of A-O-13 with respect to the sun is modified to keep the solar panels fully illuminated. These changes require changes to the transponder-mode schedule. Table 1 shows the current operating timetable as provided by G3RUH, DB2OS and VK5AGR. The "MA" numbers refer to A-O-13's position in orbit and stand for mean anomaly. A MA of 0 or 256 is perigee, the satellite's closest location with respect to the earth. A MA of 128 is apogee, when A-O-13 is farthest from the earth. The terms Alon and Alat refer to the orientation of the satellite at apogee. When Alon and Alat are 150/0, the satellite is aimed at the earth before apogee. The best pointing angles (orientation of the satellite's gain antennas with respect to earth observers) correspond closely with Mode L and S (70cm up and 13cm down) operating times. This is necessary due to the narrow beam patterns of the satellite's microwave antennas. An experimental schedule with mode changes based on the day of the week in addition to MA counts was not well received earlier this year.

Table 2 presents the calendar of events for the control of A-O-13 through the end of the year and Table 3 is an element set for A-O-13, good for about six months. These orbital elements have been averaged from 10-element sets over a 90-day period by James G3RUH and provide excellent long-term accuracy.

As mentioned in previous columns, A-O-13 is scheduled to re-enter the atmosphere in late 1996 due to the gravitational effects of the sun and moon on the orbit. Until then we can expect excellent communications and a continued rise in DX and other activity through the transponders.

Field Day on A-O-13

This year's Field Day provided many newcomers an opportunity to observe and participate in satellite chasing via A-O-13. Long-time satellite enthusiasts forget the many hurdles they have overcome to get quality satellite communications. Equipment used on Field Day, from the antennas to the power source, represents the simplest configuration needed for contacts. All of the system components are usually out in the open for inspection by future satellite operators.

This year provided superior conditions for A-O-13 operation. The Mode B passband sounded like 20 meters. Excellent signal levels on 2 meters were heard by all during Saturday's evening hours.

Our group in South Texas used the call K5ERP (Effective Radiated Power) to make several dozen contacts on A-O-13 using the Cushcraft AOP-1 satellite antenna package, a Yaesu FT-736R transceiver, RG-8 coax and amplifiers from RF Concepts and TE Systems. Signals through the transponder were weaker than expected. Troubleshooting the system revealed some problems requiring immediate attention.

The Yaesu rig did not work well when voltages dropped below 12 VDC. The radio and amplifiers were on the same battery. Output was low and the SSB signals sounded garbled. This was cured by wiring radio power to a separate deep-cycle marine battery. Signals got better, but close inspection of the amplifier battery showed continued low-voltage levels. When a generator was brought online and connected to a power supply providing 13.8 VDC, power output increased substantially and quality voice contacts were pursued in earnest.

Experiments were performed with a Lightning Bolt 7-element quad for 70cm Mode B uplink activity. The Cushcraft 416-TB 70cm crossed yagi (wired for right-hand circular polarization, RHCP) was temporarily removed from the array to allow some quick comparisons. The small quad (described in last month's column) performed well. Received signal levels were within a few dB of those heard when using the crossed yagi. No spin modulation was noted. The small quad cannot be expected to exceed the performance of the larger RHCP yagi, but for simple portable work it is a good option.

Other Hamsats on Field Day

A-O-13 wasn't the only active satellite available for Field Day 1992. Many stations were heard and worked through Mode B on A-O-10, the Mode A transponder (2 meters up and 10 meters down) on RS-10, the analog J transponder on Fuji-OSCAR-20 and the digital modes of the PACSATS.

For a lucky few, voice contacts were made with KB5SIW on the Space Shuttle *Columbia* during mission STS-50. Dick operated the Shuttle Amateur Radio Experiment (SAREX) on 2 meters FM. His class and section were announced as "2C SPACE."

Continued on page 74

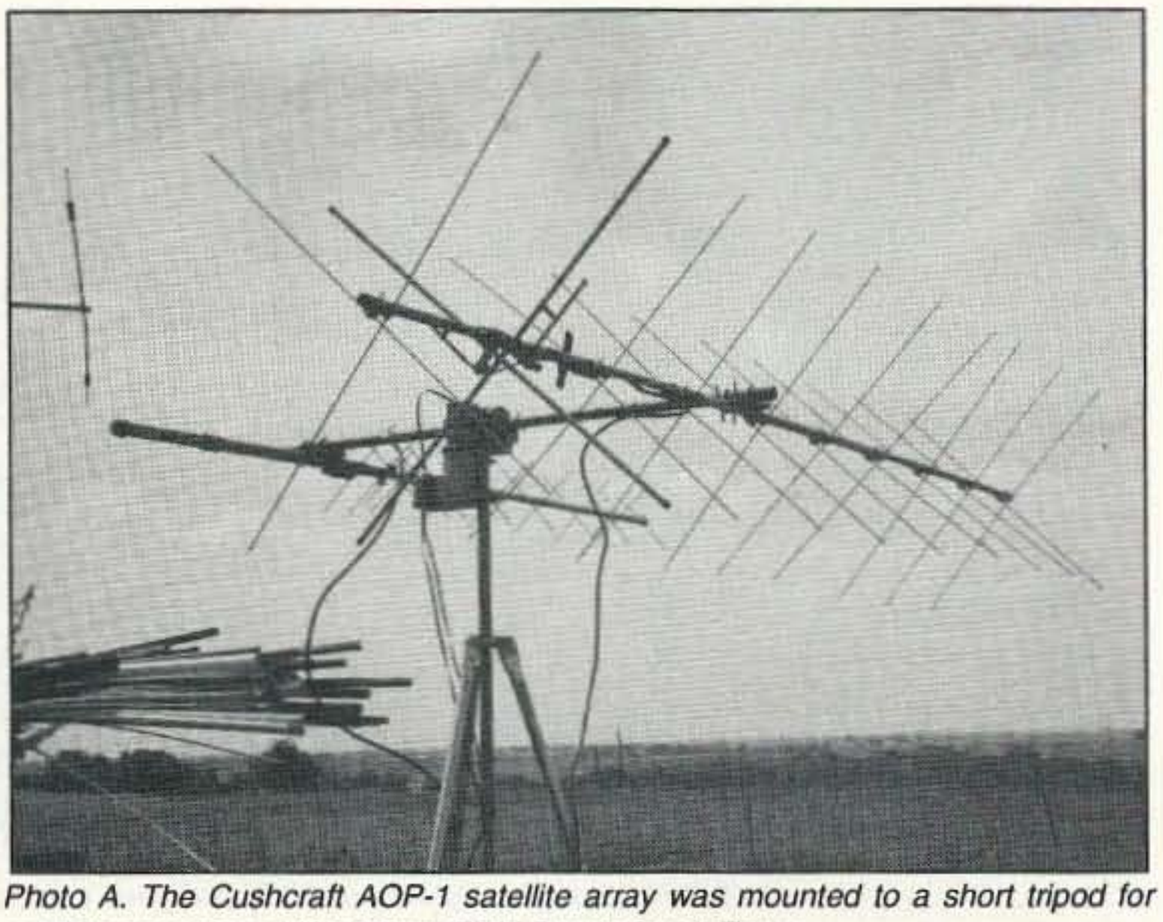

Photo A. The Cushcraft AOP-1 satellite array was mounted to a short tripod for satellite operation at K5ERP on Field Day in South Texas.

Photo B. Bob N5LCO modifies the Field Day satellite/packet station while Dave K5ERP works HF and Victor N5VPC observes.

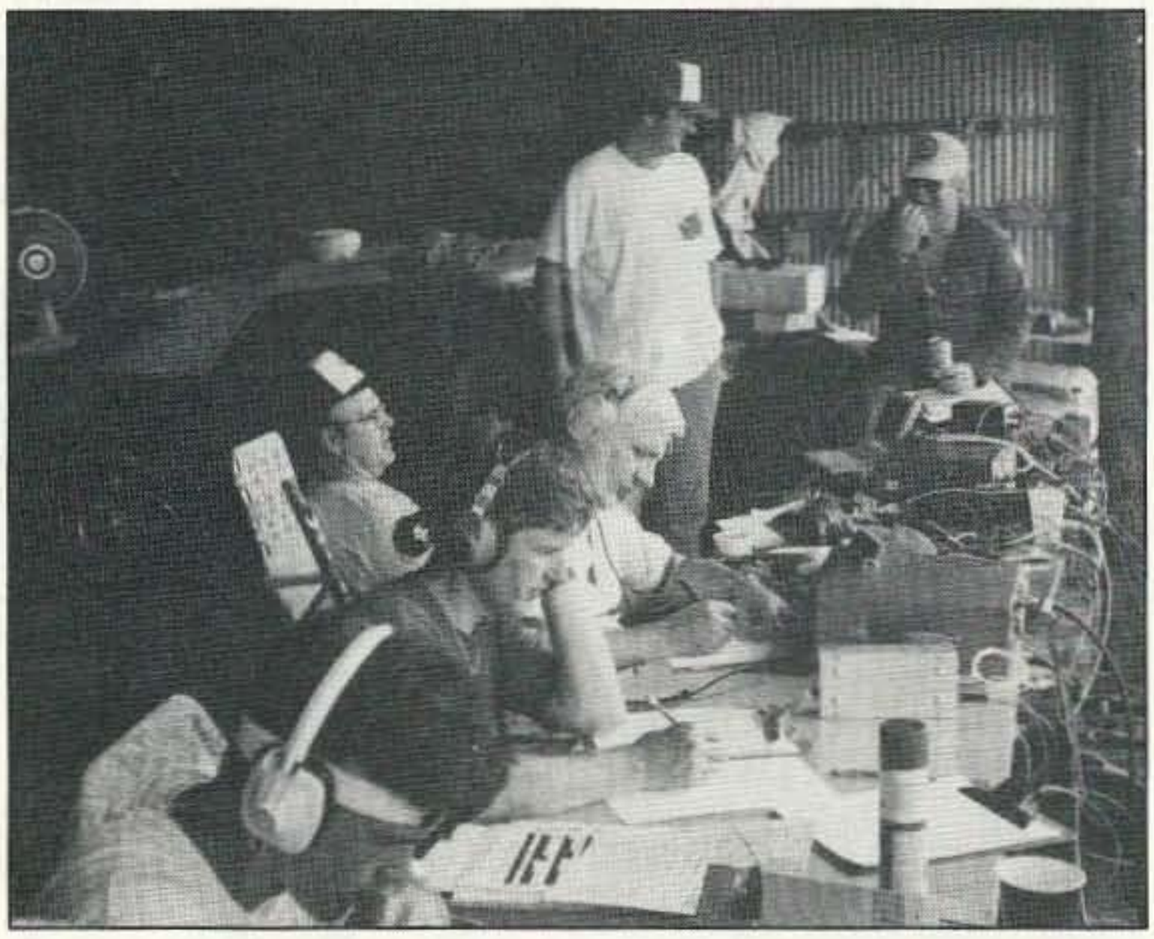

Photo C. Some of the crew at K5ERP on Field Day 1992. From left to right down the table: KB5NZK, K5ERP, N5EM, N5XGW, N5RPQ and WA5LHM.

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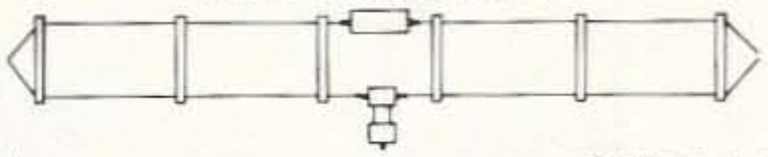

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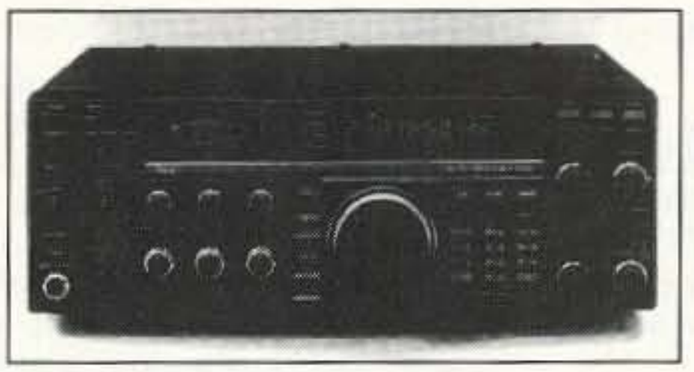

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Hamsats

Continued from page 72

Table 1. A-O-13 Transponder Schedule for 17AUG92–21SEP92

Mode-B	: MA	0 to	40	from 1992 Aug 17 until Sep 21
Mode-S	: MA	40 to	50	- S transponder; B trsp. is OFF!
Mode-LS	: MA	50 to	55	- S beacon + L transponder
Mode-JL	: MA	55 to	70	This schedule operates
Mode-B	: MA	70 to	256	every orbit, every day.
Omnis	: MA	160 to	10	Alon/Alat 150/0

Please DON'T uplink to Mode B MA 40-50—this interferes with Mode S.

Table 2. Calendar of Events for A-O-13 for Remainder of 1992

Date	Event	Modes
1992 Jul 20 [Mon]	Move to 150/0	B
1992 Aug 17 [Mon]	JLS ON	B JL S
1992 Sep 21 [Mon]	Move to 180/0	B JL S
1992 Nov 23 [Mon]	Move to 210/0	B JL S
1992 Dec 14 [Mon]	JLS OFF	B
1992 Dec 28 [Mon]	To be announced.	

Table 3. Smoothed G3RUH Element Set for A-O-13

(Good for at least six months.)

Satellite	OSCAR-13 Smoothed
Epoch year	1992
Epoch time	151.596991 days
Inclination	57.0387 deg
R.A.A.N.	22.3910 deg
Eccentricity	0.730235
Arg perigee	287.1693 deg
Mean anomaly	10.1596 deg
Mean motion	2.097182 rev/d
Decay	0.0 rev/d/d
Revolution	3033
Semi major axis	25781.821 km
Perigee height	576.90 km

For those who didn't try satellite operation, there's always next year. A satellite station is a "free" transmitter for any group operating at least two HF rigs. In addition to the 100 point bonus for a single satellite contact, it is possible to get as many as a few hundred contacts with a well-managed station through the many hamsats in the sky.

73

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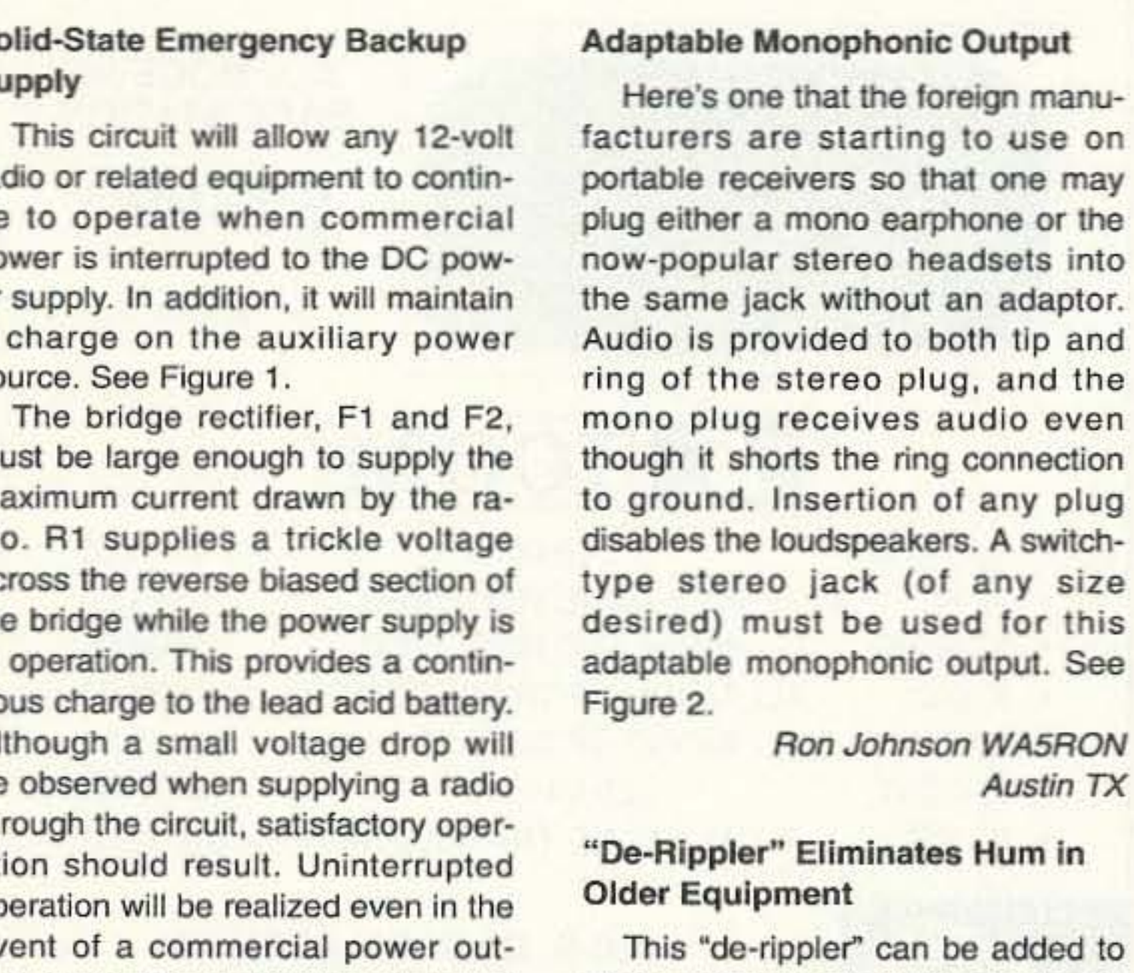

Figure 1. Solid -state emergency backup supply.

Solid-State Emergency Backup Supply

This circuit will allow any 12-volt radio or related equipment to continue to operate when commercial power is interrupted to the DC power supply. In addition, it will maintain a charge on the auxiliary power source. See Figure 1.

The bridge rectifier, F1 and F2, must be large enough to supply the maximum current drawn by the radio. R1 supplies a trickle voltage across the reverse biased section of the bridge while the power supply is in operation. This provides a continuous charge to the lead acid battery. Although a small voltage drop will be observed when supplying a radio through the circuit, satisfactory operation should result. Uninterrupted operation will be realized even in the event of a commercial power outage, without the radio "dropping out" at all. This circuit is being used in commercial radio installations with excellent results.

Butch Herring KE5V
Jonesboro AK

Adaptable Monophonic Output

Here's one that the foreign manufacturers are starting to use on portable receivers so that one may plug either a mono earphone or the now-popular stereo headsets into the same jack without an adaptor. Audio is provided to both tip and ring of the stereo plug, and the mono plug receives audio even though it shorts the ring connection to ground. Insertion of any plug disables the loudspeakers. A switch-type stereo jack (of any size desired) must be used for this adaptable monophonic output. See Figure 2.

Ron Johnson WA5RON
Austin TX

"De-Rippler" Eliminates Hum in Older Equipment

This "de-rippler" can be added to older unregulated power supply circuits to eliminate hum. Unlike a voltage regulator, it doesn't change the voltage much, and thus is suitable for adding to existing equipment. All parts are available at Radio Shack.

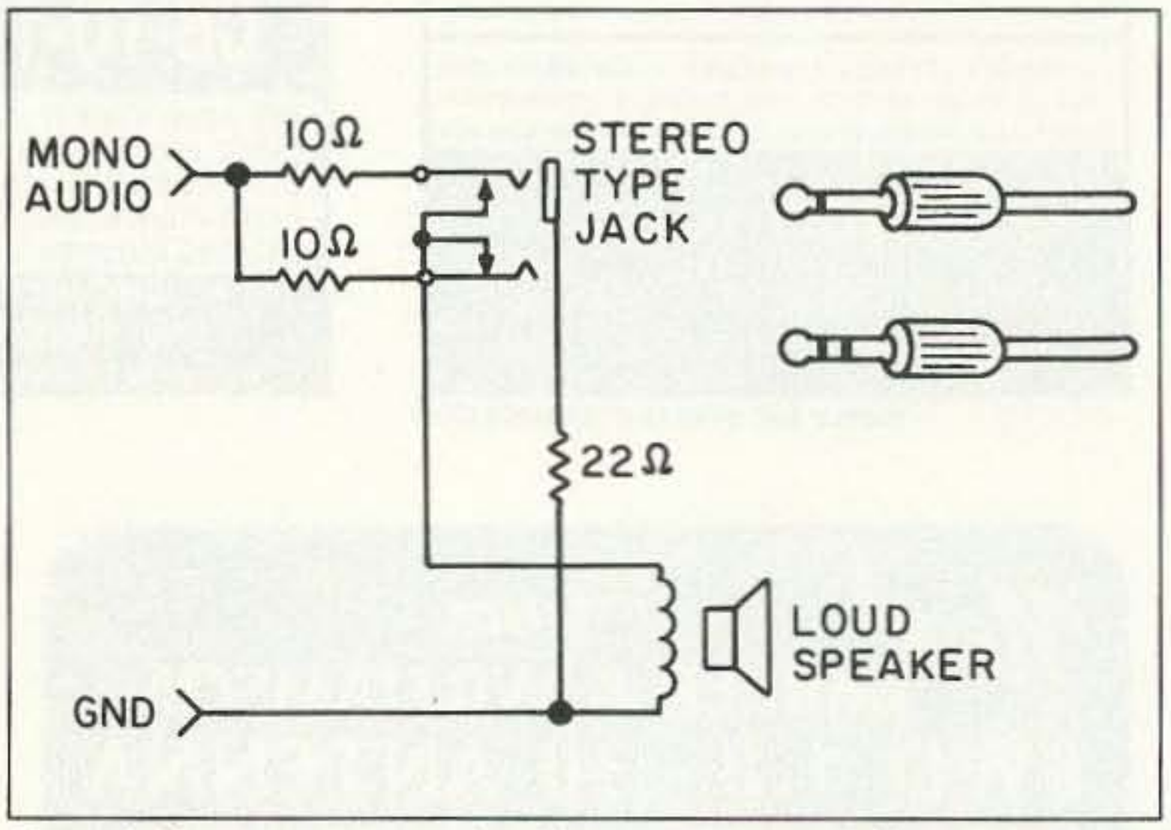

Figure 2. Mono or stereo type headphones may be used. Speaker is disabled when plug is inserted.

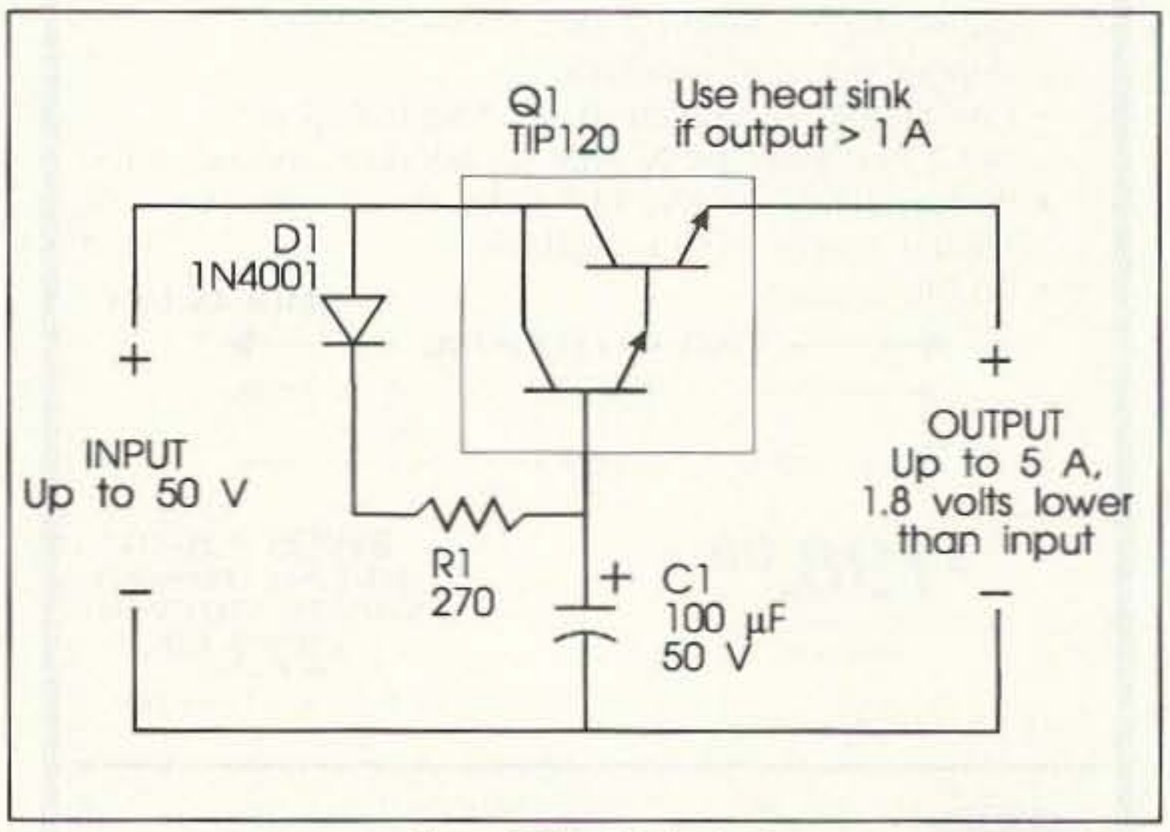

Figure 3. The "de-rippler."

Ripple must already be less than 1.8V peak-to-peak. If ripple is less than 1.2V p-p, D1 can be replaced by a direct connection, and the voltage drop will then be only 1.2V. See Figure 3.

Michael Covington N4TMI
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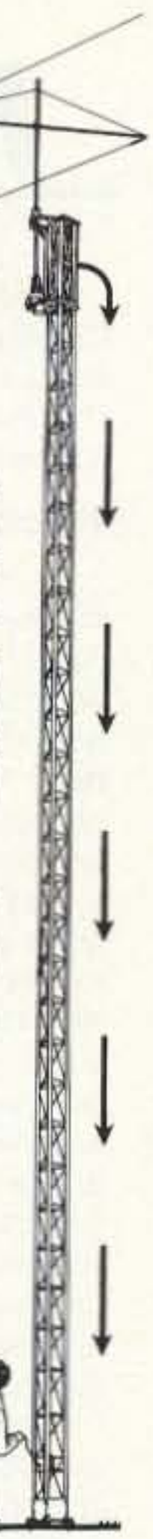

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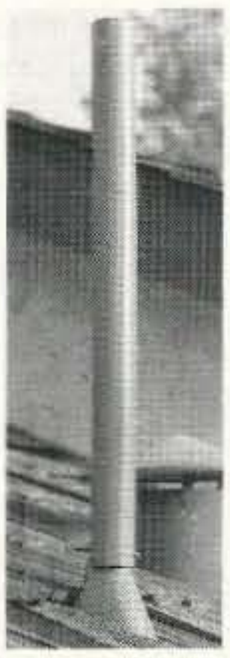

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Teaching the Teachers

For the past 12 years most of the teachers at my school would slow down their pace a little as they approached my room in order to better hear what was going on in "The Radio Room." If my eyes accidentally made contact with theirs, they would smile and quickly move on for fear of being invited to "come on in." Those few brave souls who were daring enough to cross the threshold into this unique classroom were rewarded with many surprising experiences. They've all been back many times since their first encounters. But, many of the teachers at Intermediate School 72 in Staten Island, New York, were afraid to inquire further about the ham radio program because they were intimidated by the unknown and were afraid of seeming ignorant.

Finally, this year, I got the chance I had been waiting for. Our school district sponsored a professional growth project and asked me to teach a course about how to use ham radio in the classroom. I knew the importance of this kind of exposure, so I really did my homework.

The course was to be given in two parts. The first session was designed to make the teachers feel comfortable in my room with the radio equipment, and to introduce them to the different aspects of amateur radio. I bombarded them with lots of handouts I got from the education department at the ARRL. Teachers always love to leave a workshop with lots of reading material that they can peruse later.

During the first session I also gave each teacher an outline of lessons that could be used to enrich their respective curriculum areas through the use of ham radio. At my workshop there were teachers from various departments of the school. We had social studies, science, language arts, ESL (English as a second language), art, and journalism teachers in attendance. I was able to give each one of them a highly motivational idea to incorporate in a unit of study through ham radio curriculum.

I left some time to do a live radio demo. They all enjoyed listening to various hams check in on the 2 meter repeater, but no one would volunteer to come to the mike. It has been my experience that adults are more reticent than children to get on the air for the first time. Well, after two or three lively conversations with some terrific hams who gave encouraging greetings to the teachers in my room, one brave soul, Larry Orange, a social studies teacher, went right up to the microphone for his first QSO. He was graciously welcomed on board by the ham he was in contact with. We all applauded him, and a great time was had by all!

As they left my room they were able to view some of my students' projects which were on display. Of course I made sure to have all the different disciplines represented in the exhibit. They were really amazed at the many applications there are in every major subject area. The interdisciplinary approach to education has always been the way I bring in the different areas of study. The 6th, 7th and 8th graders in my program are eager to learn the material because it's on a need-to-know basis. Geography isn't taught as an isolated collection of facts. In my room, the children race to the big wall map, or scramble for the atlas or globe to find out where the voice they're listening to on the radio is coming from. I firmly believe that this kind of learning is very meaningful because it is relevant to something they are interested and involved in.

I was pleased to see that there was animated discussion going on amongst the group as the teachers left my room. I told them to begin looking for opportunities to creatively use ham radio in a unit of study in their classes. One of the best comments I overheard was, "Now I see why the kids love coming here." I knew that these teachers were starting to see the possibilities of bringing some fresh approaches into their lessons for the students to have fun with.

The Second Session

During the second session I spent some time giving out information about the FCC license structure, and in discussing the various reference and study materials that are available. I also showed the ARRL video "The New World of Amateur Radio" so they could get a good overview of the myriad of activities ham radio has to offer. I spoke about my love for ham radio as a hobby and the great personal satisfaction I've gotten out of it.

Next, I showed them a video of the children in my classes having fun with ham-radio-related activities. The teachers of course recognized many of the students in my video ("Reading, 'Riting and Radio"). They were impressed with the way that even the "more reluctant learners" of our school were genuinely interested and involved in various projects with the radio. I pointed out that ham radio has something for everyone. The material can be adapted to be both appropriate to the slow learner and challenging enough for the more gifted.

Several special education teachers had joined our group, and were especially interested in the hands-on approach for teaching skills needed in the learning of Morse code. Amateur radio in the classroom affords the teacher the chance to use a multimedia approach to the curriculum. Supplying the students with code practice oscillators is a terrific hands-on activity. I have found that the special education students especially truly enjoy handling the oscillators and adjusting the tone and volume knobs. The special ed teachers were really excited about the way I explained how I teach auditory skills with the oscillators. Every child is forced to listen only to the student sitting right next to him. When 20 keys are all going on at the same time, it's no easy task to pick out the single tone you're listening for. It is truly amazing to observe the progress of the students as their listening skills improve through the term.

I demonstrated each teacher's name in code, and then had them identify it on the board. Just as I do with the children, I made sure it was a fun experience. By the time they left the room that day, several teachers were already planning how they would be studying Morse code in teams. As a homework assignment, I asked each teacher to write up a lesson plan based on something they had learned in the ham radio workshop.

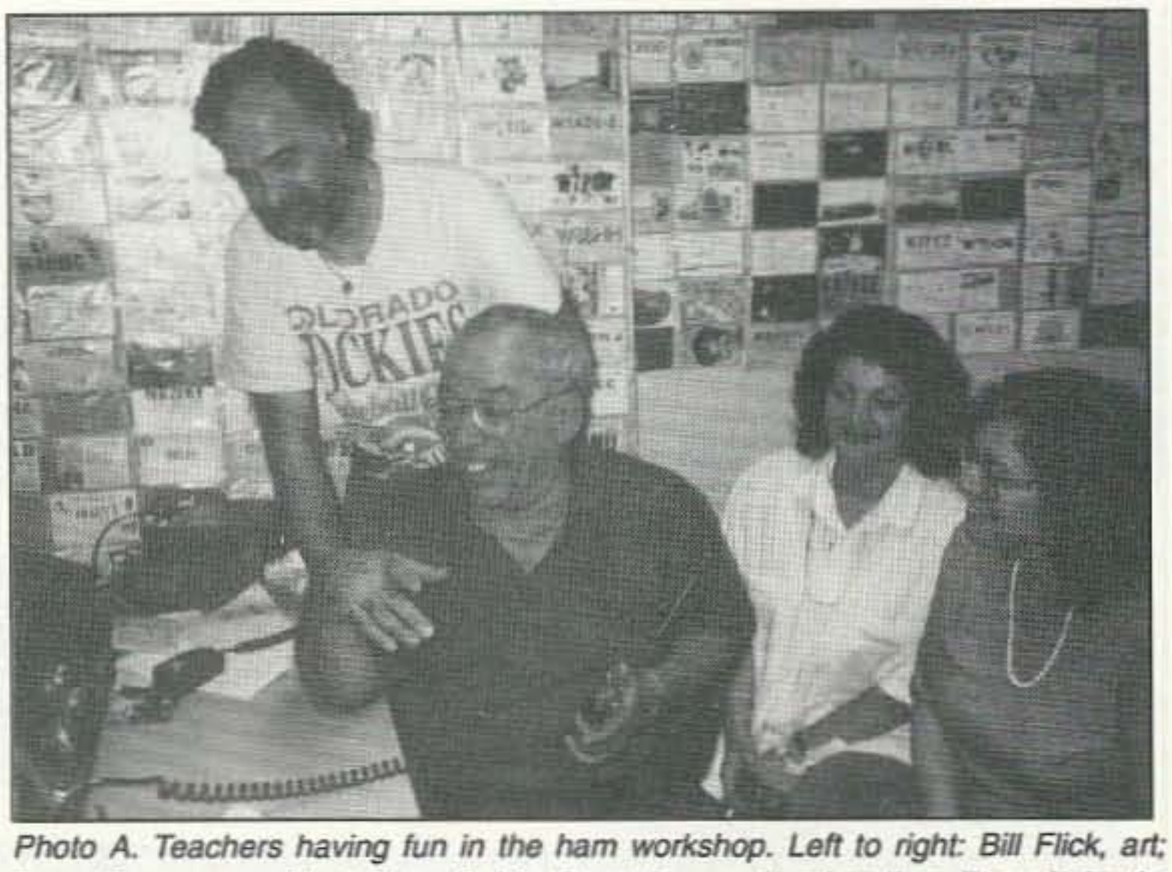

Photo A. Teachers having fun in the ham workshop. Left to right: Bill Flick, art; Larry Orange, social studies; Robin Gerstel, special education; Theo Zalantis, language arts.

The Results

Arrangements were made for me to work with the social studies classes when the teachers would be introducing different regions of the world. We all agreed that it was a lot more exciting to be able to speak directly with a citizen of a specific area in the world than to just read about it in a book. One of the teachers, Norman Pianko, said he would be planning on working on interview skills so that his classes would be prepared to ask questions about the culture and background of the people his students could speak with on the radio. Another social studies teacher, Larry Orange, saw the immediate advantage in the area of current events with the radio. He was excited about the possibilities of speaking live with people who are in the midst of events like hurricanes, earthquakes, floods or plane crashes. He was intrigued as I told him how we had spoken with children in Los Angeles on the CQ All Schools net right after they had experienced a minor earthquake. He saw the advantage of children speaking directly to the victims or participants of a disaster, and then comparing their accounts to the media reports later on. Lots of good lessons to learn in this area.

The ESL teacher was fascinated by the obvious highly motivational opportunity to have a non-English-speaking child sit at the radio and listen to the different dialects and various languages that can be heard on the air. Peggy Koutsantonis said that her ESL students would probably love the idea of using Morse code to communicate with others. She could encourage them to give oral and written reports about hams they would be able to contact. She plans on doing lots of exchange lessons with me next term.

Iris Sweig and Theo Zalantis are language arts teachers who immediately saw the application to skills that they teach to the need to instruct children to speak clearly and succinctly on the radio. They loved the idea of having the kids exchange videos and letters with the other children they meet on the air. We all agreed that every teacher should be teaching good communications skills, no matter what their subject area may be.

Even if each teacher who attended that workshop includes just one unit relating to ham radio, it was all worth it. The teachers were challenged to incorporate new ideas and approaches into their curriculum. It was stimulating to consider new ways of motivating the children. I hope to have the opportunity to do more of these workshops.

If each of us can convince one teacher to enrich a lesson by using ham radio material, we will truly be making a difference in the learning of children. Please let me know how your attempts work out. 73

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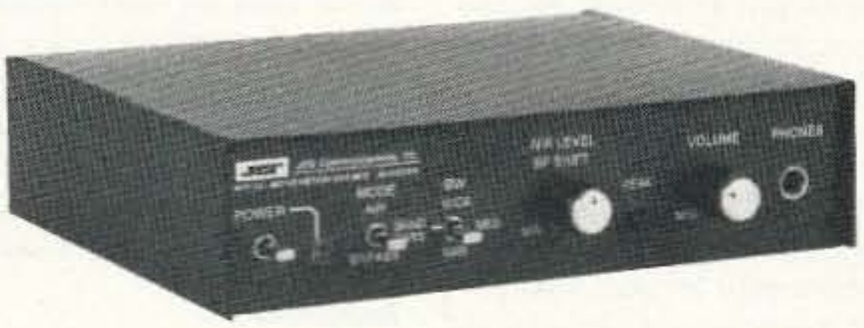

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Tuning Up Your Packet Station

So you've got the TNC connected to the radio and the computer, and it works—sort of. You are starting to wonder whether part of the packet hobby is watching the LEDs on the TNC's front panel go on and off—'cause you sure spend lots of time doing that, compared to actually reading stuff from the computer's display. Well, don't despair, there are some things that you can do to tune up your station so that you can spend more of your packet time reading messages instead of LEDs.

You Are a Node on a Network

Many of the performance problems packet users experience are related to the LAN (Local Area Network) on which they are a node. To understand how this can come about, let's take a look at some of the base technology of packet radio. Amateur packet radio is based on a data exchange protocol (set of rules) called AX.25, for Amateur X.25. AX.25 is based on a principle called CMSA/CD—Carrier Sense Multiple Access/Collision Detection. Breaking down this important sounding term will make its meaning very obvious.

Carrier Sense: Any ham who has worked phone knows what this means: Just as you wouldn't try to talk over someone who was using a repeater, the TNC doesn't try to transmit if it hears someone on frequency. For some TNCs, this will mean any time the squelch breaks. Others provide better performance by listening for actual data and ignoring noise. This technique is called DCD, for Data Carrier Detect.

Multiple Access: This just means that more than one network node will use the data channel. While this may seem obvious from the radio point of view, when it was invented it was revolutionary. Think of the serial cable that runs from your TNC to your terminal—prior to schemes for multiple access, this is how all data communications was done, one-to-one.

Collision Detection: While the TNC will listen to the channel to avoid transmitting over another station, there are at least a couple of conditions where two stations will transmit at the same time. The most common situation is where two stations can't hear each other. In this case the TNC will assume that the frequency is clear, and will transmit whenever it has a packet to send. A third station, say a PBBS, can hear both stations—and so a collision occurs. This is sometimes referred to as "hidden transmitter syndrome."

The second situation is where two stations that can hear each other find the frequency clear and decide to transmit at exactly the same time.

AX.25 can detect collisions because part of the data packet—from which packet radio gets its name, but more properly called a frame—is a checksum. A checksum is the result of a mathematical operation performed on all the data in the frame. The receiving station performs the same calculation, and if the received checksum is not the same as the calculated one the packet is discarded. The receiving station then requests a retransmission of the packet, repeating the process until a complete packet arrives. On a wire, a collision is just about the only thing that can damage a packet. On the air, noise, fading, and collisions can all damage packets. These retries are one of the biggest channel and time wasters in the packet world.

Because you are a network node, what you do affects everyone else. It is very important to keep in mind that the LAN is a resource shared by everyone, and anything you can do to improve your station's performance helps everyone else, too.

Speak Up, and Listen Carefully

Many of us use a hand-held radio for our packet station. It is convenient, and besides, it's a good excuse to go out and buy a newer model to carry around. There is nothing wrong with using a hand-held radio, but keep in mind that the ideal situation for the packet LAN is that *every* station hear every other station. Think about your handheld: Is it three watts? Five? It is not just important that the PBBS hear you—remember the Carrier Sense part of CMSA/CD. If the PBBS hears you, but other stations don't, *you are a hidden transmitter!*. Ever wonder why your station sometimes times out with a "retry count exceeded" message? Hidden transmitters! You can't hear them but your PBBS can and, being a very polite sort of PBBS, it is going to wait until the channel is clear before sending you an ACK (ACKnowledgement). It waits so long, in fact, that your poor TNC figures it's gone, and disconnects. Hidden transmitters are one of the biggest problems for the packet LANs around the US.

To keep your station from being a hidden transmitter there are a few steps that you can take. First, put up the best *omnidirectional* antenna you can manage. While a beam may let you hear the PBBS—and it hear you—really well, remember the point of the discussion above: It is just as important that the other LAN users hear you, too.

A nice antenna that can be had cheap is a J-pole. It is easily built from almost any sort of metal tubing and works very well. You'll find plans for J-pole antennas in nearly any antenna book, and in back issues of *73*. If you don't feel like building an antenna, and you don't mind spending a bit of money, antennas like the AEA IsoPole or the Cushcraft Ringo Ranger are available from any amateur radio dealer and work very well. Whatever antenna you use, put it up high. VHF communication is pretty much a line-of-sight affair; the higher you get that antenna, the farther you can talk.

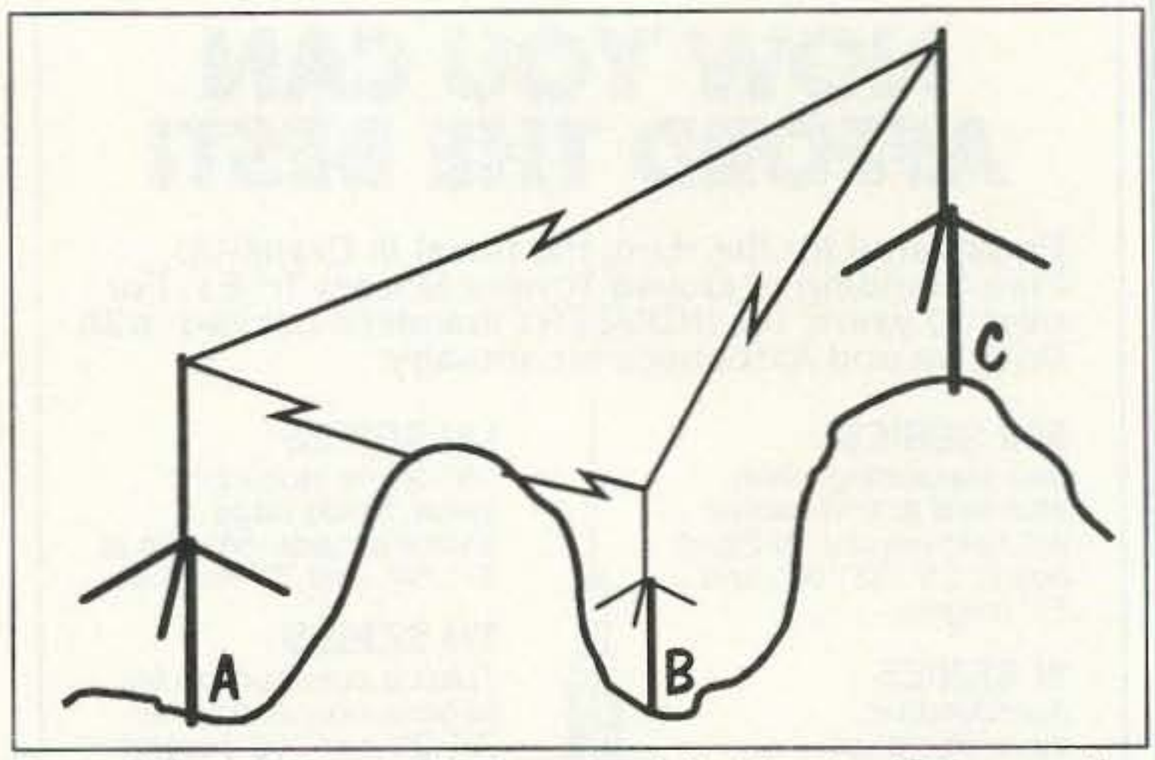

Figure 1. While the PBBS—at station C—can hear both stations A and B, they cannot hear each other. Since each is hidden from the other, they cannot tell if they are interfering with each other's transmissions (Carrier Sense). If the station at C were a repeater, A and B would not compete, blindly, for the frequency. See the text for more information.

Once you get yourself the best possible antenna, it may be time to consider an amplifier. Depending upon the area covered by your LAN, it may be necessary to run more than the five watts your handheld can manage. You might also consider getting a used mobile rig at a hamfest, but if you do, try to get something relatively new. The switchover time between transmit and receive on older rigs may make them difficult to interface with the TNC. Once you have a good signal out there you can consider some other factors that might effect your packet performance.

Cooperation

Because packet depends on all of the LAN's users to get good performance, local cooperation is very important. Even if you have a wonderful signal, a single hidden transmitter can ruin your packet day. This is where local packet organizations come in. If you have one, join it. If you can, and are so inclined, get on the technical committee. Help packet newcomers to get a good signal on the air. There are some things that a group can do to help make things better for everyone. For example, there are some parameters available in the TNC-2 firmware which were developed by Phil Karn KA9Q. These parameters—PPersist and Slotime—help make the stations acquire the channel more randomly, reducing collisions, but this only works if everyone uses them.

Repeaters

A repeater—like the kind used for voice operation—makes an enormous improvement in LAN performance by effectively eliminating hidden transmitters in its service area. Even low power stations are heard by everyone since they go through the repeater.

For packet, a system that regenerates the digital information is actually better than a normal audio repeater. This type of repeater is almost identical to a voice repeater but instead of just passing the audio from the input to the output, it reads the digital information on the input and regenerates it—transmits its own clean version of the bits—on the output. This is very similar to what some repeaters do with DTMF and CTCSS tones.

If repeaters are so great for packet, why aren't there more of them? I'll give you a one-word answer: money. For some reason we are perfectly happy about—in fact, often insist upon—giving money to support our local voice repeater. Yet somehow, when it comes to packet, we expect the sysops to foot the bill. Think about it: When was the last time you wrote out a check for the local repeater organization? Your PBBS sysop? Why not send ten or twenty bucks to the guy who spends lots of time and money to make sure that you can read your packet messages and mail? If we can make it normal to pay for packet access, then maybe we can start putting up repeaters and getting serious about our LANs. The money is not going to magically appear—it's got to come from you.

Portable Packet

I get involved in helping during disasters whenever I can, so portable packet stations are of great interest. How many of you are doing portable—or mobile—packet? N1EWO/M consists of a Heath HK-21 portable TNC and a Yaesu FT209-RH handheld. The terminal is variously a TRS-80 Model 100 and a number of different notebook computers that move through here. It has two battery options. First is the normal NiCd pack for the radio and a 12-volt pack that I built for the TNC (the internal battery was too expensive). The second is based on Gates Cyclon battery packs. These are sealed lead-acid batteries—not GelCells—with some really exceptional properties. One of these 5 Ah batteries will run the station for several days of intermittent use. If you are doing portable packet, what is your station like? How do you power it? I am very interested in what people have come up with.

Talk to Me

I really want to make this column what you—the readers—want it to be. Don't be shy; tell me what you like and don't like about it. I really need your feedback to make this an information resource for *73* readers. I am interested in any questions, or ideas for future topics, that you might have. Thanks for reading and 73 de N1EWO. 73

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Surplus Equipment 10 GHz Amplifier

Last month I covered component parts and a 12 GHz LNC modified for the 10 GHz amateur band. One question surfaced concerning that column. Just what is the difference between an LNA and an LNC?

An LNA is just an amplifier for the frequency in use, hence Noise Amplifier (LNA). An LNC (Low Noise Converter) is an amplifier, mixer and converter assembly all contained in one remote antenna-mounted unit. LNAs are common on the 0.7 to 4.2 GHz satellite bands while LNCs are the in thing on the Ku 12 GHz satellite band. LNCs must convert to a lower frequency for transmission on the coaxial feedline to the station equipment. The loss on a length of coax feed cable at 12 GHz would be quite excessive! With that cleared up, let's get on to this month's topic.

This month let's cover another useful microwave component that is available from the surplus market: an Avantek quarter-watt power amplifier. The neat thing about this device is that it can be modified for 10 GHz operation. This item was advertised in the April '92 issue of *Nuts and Volts*. It was the featured item on the inside of the front cover, titled "14 GHz Satellite Antenna Bits." The down-converter (last month's "Above and Beyond" column), as well as the Avantek amplifier (this month's column), were offered for sale. I hope you did not miss this bargain as I believe Halted Specialty, who ran this ad, was swamped with requests for these items and they ran out of stock on some. I know that the amplifiers are gone and I hear Halted would like to have more to sell.

For those who picked up on this item, you will be pleasantly surprised that both items can be converted to our 10 GHz band with a little effort. Specification wise, the Avantek 14 GHz module, as Halted advertised, is Ku band, 14 to 14.5 GHz, 0.25 watt output with SMA coaxial connectors. The unit has both monitor and power detection outputs. The great part is that it operates on +12 to +15 volts DC. The unit is brand-new and measures 4" x 8" x 1" high. Halted wanted $24.95 for the unit—what a bargain! I believe the amplifier was designed for satellite service, such as gas pump credit card transactions, and was an early design. Manufacture dates on the units that I obtained varied around 1986, so the design was not too old.

Kerry N6IZW was the first in our San Diego Microwave Group to spot the ad and order an evaluation unit. Kerry was instrumental in retuning the first unit to 10 GHz with the same power output as was normally provided at 14 GHz. Needless to say, we ordered more units. Remember, from the last month's column: Don't jump into something until it's been evaluated. Well, this unit proved so hot we got a daily quantity report from the many different amateurs who were placing orders for it.

We helped spread the word, and it went around so fast we even received some calls alerting *us* to the item. The word spreads fast when it's a premium useful item available. I heard a rumor that one sale of these amplifiers was for 100 units in one transaction. I don't know where all of these amplifiers went, but the original quantity must have been substantial. Let's get on to the meat and potatoes of this unit.

The Avantek amplifier enclosure is a machined box that has a cover plate fastened with a multitude of screws. The cover can be removed quite easily, but you might have to pry gently with a knife edge to break the seal of the rubber gasket under the cover plate (with the screws removed). With the cover plate off you can see the three-stage power amplifier running along the top of the amp. The bottom compartments contain the power supply and power monitoring circuitry. Differences have been noted on several of the amplifiers we observed. We feel these were due to changes in design. This difference is not of much concern as most of the units noted are the old design.

The difference (old to new) can be verified by looking at the top right side of the amplifier at the circulator, amplifier portion of the circuit pointed up. The old design has a metallic square circulator, while the newer circulator looks like a ceramic device in the same spot. Performance-wise the newer unit can deliver a dB or two more than most of the older units. From the outside of the units, the break in units (old to new) seems to happen around serial number 5600. In reality, both units work well and this is a minor difference.

The first priority before starting modifications is to set up a static-free work station on which to do the actual circuit changes. Use a ground plate to hold the amplifier and ground all instruments to this plate. That includes your soldering iron (low voltage temperature-controlled type desired here). Ground yourself with an approved wrist strap, not a direct connection to ground. Most wrist straps have a megohm or so in the leads to prevent an accidental direct connection between yourself and the common ground. This prevents a high current conduction through you. The idea here is to discharge static, NOT LIGHT UP YOUR LIGHTS.

Back to the modifications. The original adjusting tabs that were used to tune the amplifier (stripline) to 14 GHz need to be removed. These tabs were added at the factory to adjust the unit for peak performance at 14 GHz. When tested after the tabs were cut away with an X-acto™ knife, the amplifiers modified to this point gave between 5 and 10 dB of gain at 10 GHz. The important thing is that there is something to see (gain at 10 GHz) before actual modification.

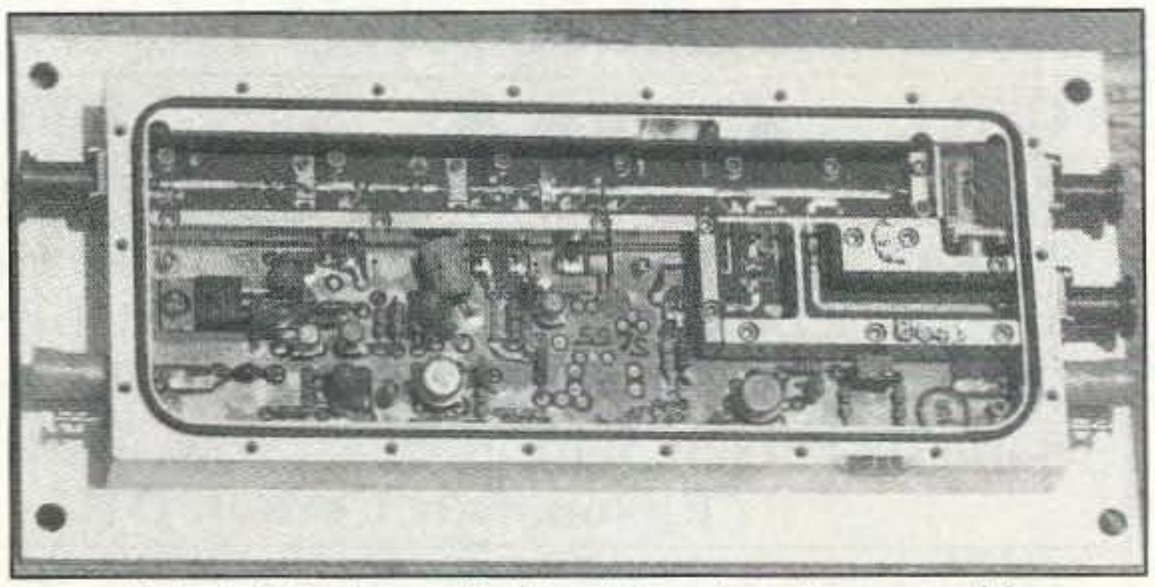

Photo A. Original unmodified Avantek quarter-watt power module.

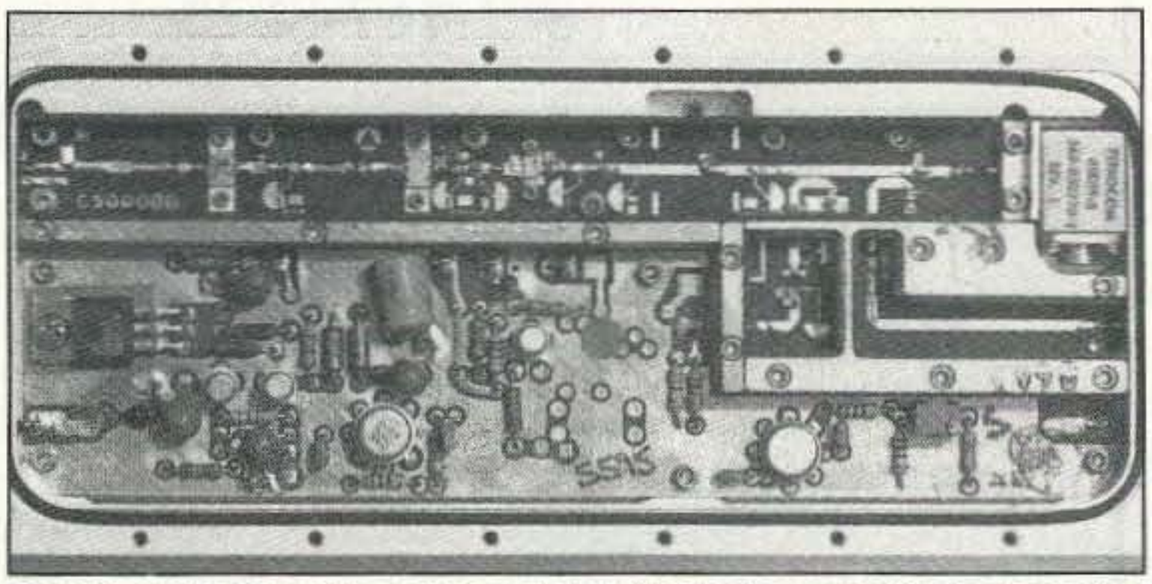

Photo B. Modified Avantek power module, with only the top portion (amp circuitry) modified. No change to the power supply circuit.

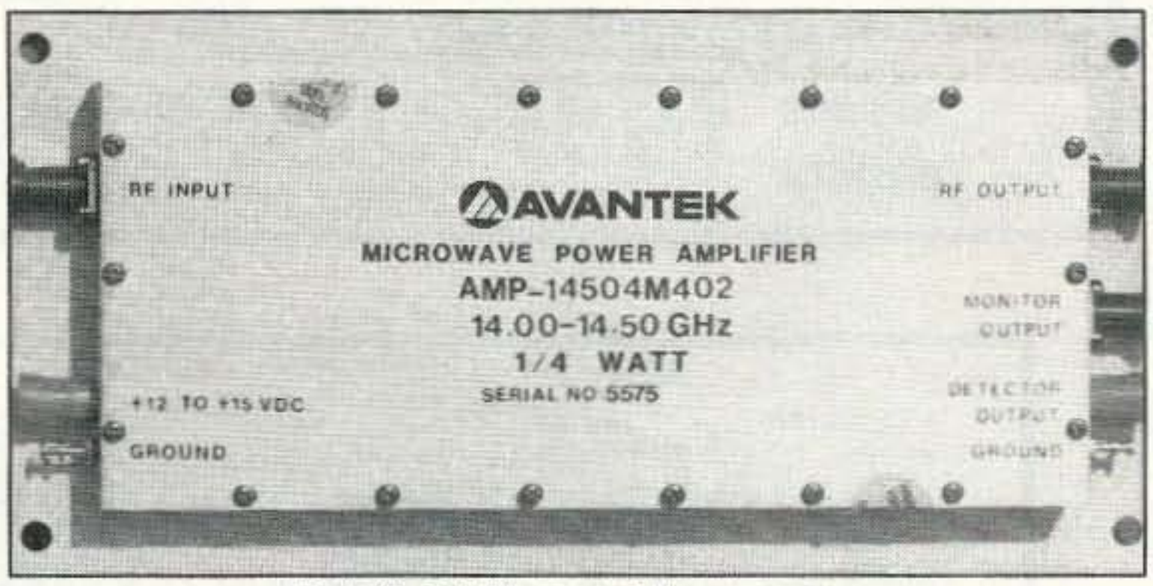

Photo C. Outside case of the power amp.

The procedure to retune the amplifier at 10 GHz is made in small steps using wooden toothpick tools. The toothpick tools were made by cutting a flat end on one end of the round toothpick. Superglue a small piece of copper (snowflake size) to this end of the toothpick. Several of these were constructed and graded as to size of the copper snowflake.

Place the tool on the stripline at various points to determine where similar-sized permanent copper stubs are to be affixed. Toothpicks in several sizes can be used to find the best copper tab to use for best gain. By having several sizes of copper toothpick tuning tools we can duplicate what size of copper bit is needed on the stripline to adjust to 10 GHz. This optimization is done with power applied, but at reduced input levels (drive) so as to not have the amplifier at full output power.

Kerry used -15 to -10 dB input drive during this adjustment phase. Note the output gain achieved with the toothpick and then remove the DC power/drive. Then, in a static-free involvement, a similar copper snowflake as the toothpick tool had placed on the stripline exactly where previously noted. Solder tack it to the stripline and retest with low drive power and DC applied. Check for similar power gain as noted before. If it is OK, proceed to the next stage or stripline section and check for gain with the toothpick test tool at this new location until you are satisfied with unit's performance. There will be some interaction with tuning and all must be rechecked for final adjustment. Most amplifiers yielded an overall gain of about 24 dB.

Just where to place the copper bits to retune each amplifier will vary from amp to amp. We have found that the tuning will go something like this for tab insertion, and this too will vary from unit to unit. The input stripline almost at the input connector needs a tab added first. First amp stage: not much to do here. Second stage: nothing noted at the input but requires a large tab on the output right at the device for the best gain at 10 GHz. Third stage (final): has a very thin input line width; needs to be wider and have a tab attached for best gain. The output needs a very wide line/tab added. The output stripline towards the circulator needs to have tabs added about 1" and 2" away from the output stage for final gain adjustments. Be careful when placing tabs and line width copper bits near the

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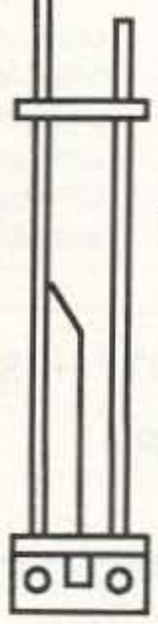

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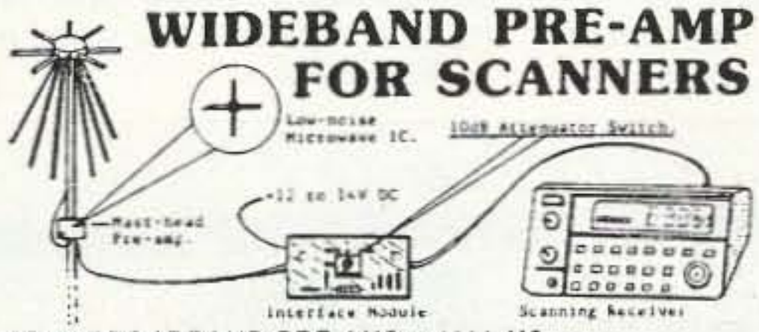

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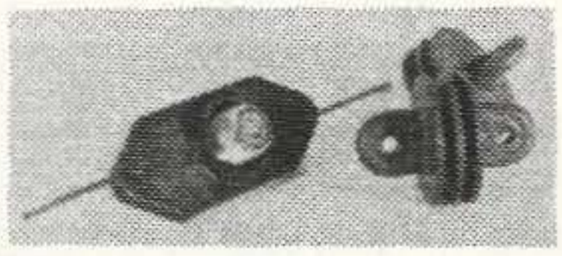

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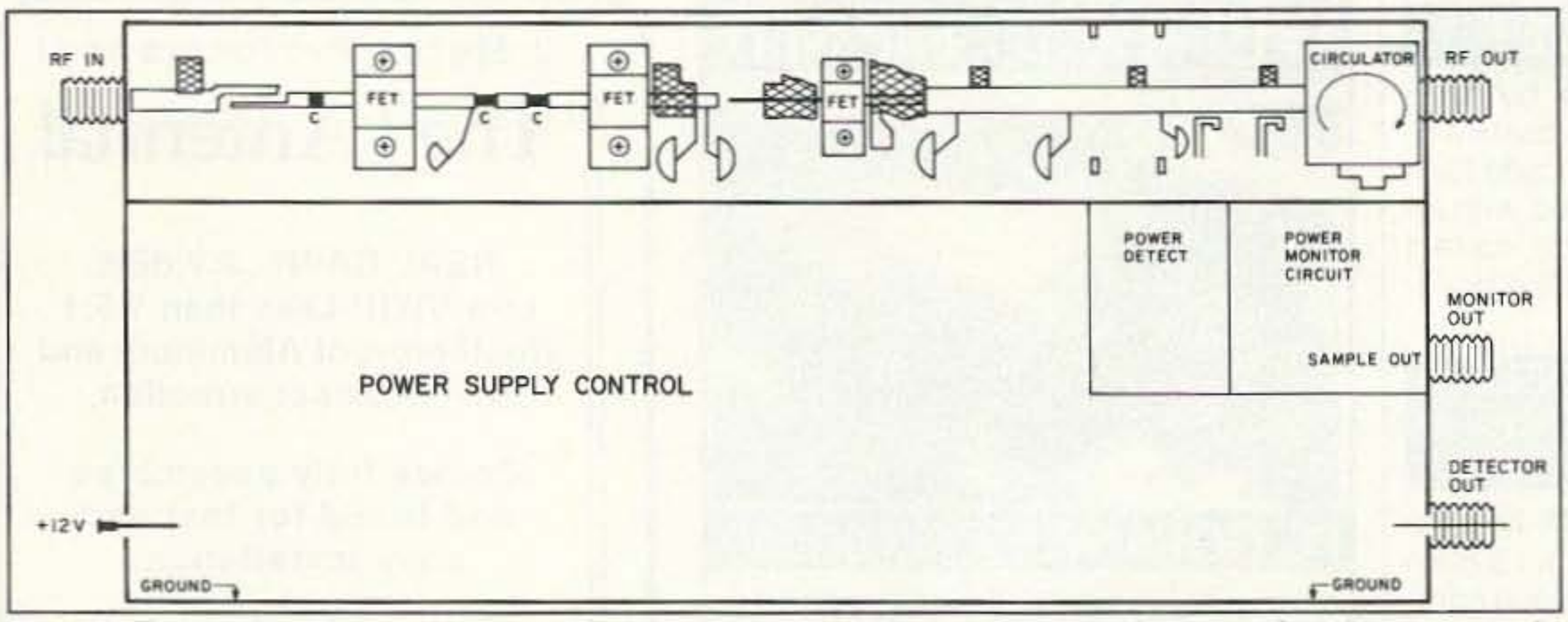

Figure 1. The Avantek microwave power amplifier, originally 14-14.5 GHz, modified to 10.368 GHz. Crosshatched areas indicate the position of the copper "snowflakes" soldered to the stripline. The exact position must be determined by testing.

devices—inspect them before applying power. I suggest using a high power eyepiece to check everything. Remember—take your time; it's just like cutting a piece of wood. You can measure two or a dozen times but you can only cut once! GaAsFETS do not like static or shorts with power so be careful.

Soapbox

I have a friend who runs a computer-oriented business in San Diego. He has been very instrumental in getting me up and running on the IBM computer systems and away from my old prehistoric CPM-based systems. He is very high-tech and has offered some memory space on his information retrieval systems which are fax-based. How the system works is quite interesting. Just phone up the system and all operation is totally voice integrated in selection. You confirm direction on the system by touch-tone answers to the system's voice questions.

After selecting the particular document you want you place your fax machine in the receive mode and off it rips at 9600 baud. This system is quite sophisticated. We are not talking text but high quality photographs and schematics, all computer generated, are possible. When time is available we plan to try some artwork transfers. The trial tests look so good they don't even look like the normal faxes I am familiar with. This system is in communication service and I will be glad when it is online assisting our amateur applications.

Some time will be devoted to testing such things as dimensional stability and aspect ratio, and length-to-width scan dimensions. After some testing I hope to have this service up and running for your use. The exciting thing is that this is not a one-line telephone based system, it's multi-line so quite a few users can operate the system at the same time. We're talking a very big system here. More on this later when we have some files set up.

Newsletters from Great Britain

There are several newsletters for microwave operations that have been forwarded to me for information. The first is a monthly newsletter from Lambda House, Cranborne Road, Potters Bar, Hertfordshire EN63JE, England. This is a monthly publication from the Radio Society of Great Britain, edited by G3PHO and G8AAGN. The April '92 edition that I received covered several construction projects. One had modifications to an oscillator board for a multiplier at 2.5 GHz for a 10 GHz transceiver. Another article covered a very unique method of power supply conversion, converting 12 volts to +20 volts at 400 mA. Also, it provides -5 volts bias at 50 mA. Other articles covered news and views from "the world above 1 GHz." Quite a nice newsletter.

The other newsletter is the "VHF/UHF DXer," c/o Dave Hardy G8ROU, Thorntree House, Wensley, Matlock, Derbyshire DE42ll, United Kingdom. This newsletter covered microwave kits' availability and news and operations TV DXing, the results of a local noise figure measurements contest and a few construction articles. The cost of this newsletter is $14 a year for bimonthly distribution.

A U.S.-based newsletter, the "AMRAD Newsletter," is devoted to amateur radio and computer experimenters. They advocate experimental designs and promote ideas and the dissemination of such information through several means, the newsletter and the computer bulletin board. Their BBS is operated by Lawrence Kesteloot N4NTL (703-734-1387) 300, 1200, 2400 baud, 8 data bits, 1 stop bit and no parity. Their newsletter further identifies services to the handicapped and a repeater on 147.81 in 147.21 out that is located in McLean, Virginia. This month's topics, two of my favorites, are lasers and 10 GHz conversion covering the Radio Shack "Flavoradio" which is used in an IF amplifier application for 10 GHz. Membership in AMRAD is $15 a year. They give honorariums of one-year-free membership for original material accepted for the newsletter. Their address is Editor, "AMRAD Newsletter," P.O. Drawer 6148, McLean VA 22106.

This amplifier conversion is just the application for expanded/detailed information to be placed on the fax system. Let's get it up and running for my applications and I will let you know all the details on its operation. As always, I will be glad to answer questions concerning related topics. Please send an SASE for a prompt reply. 73 Chuck WB6IGP. 73

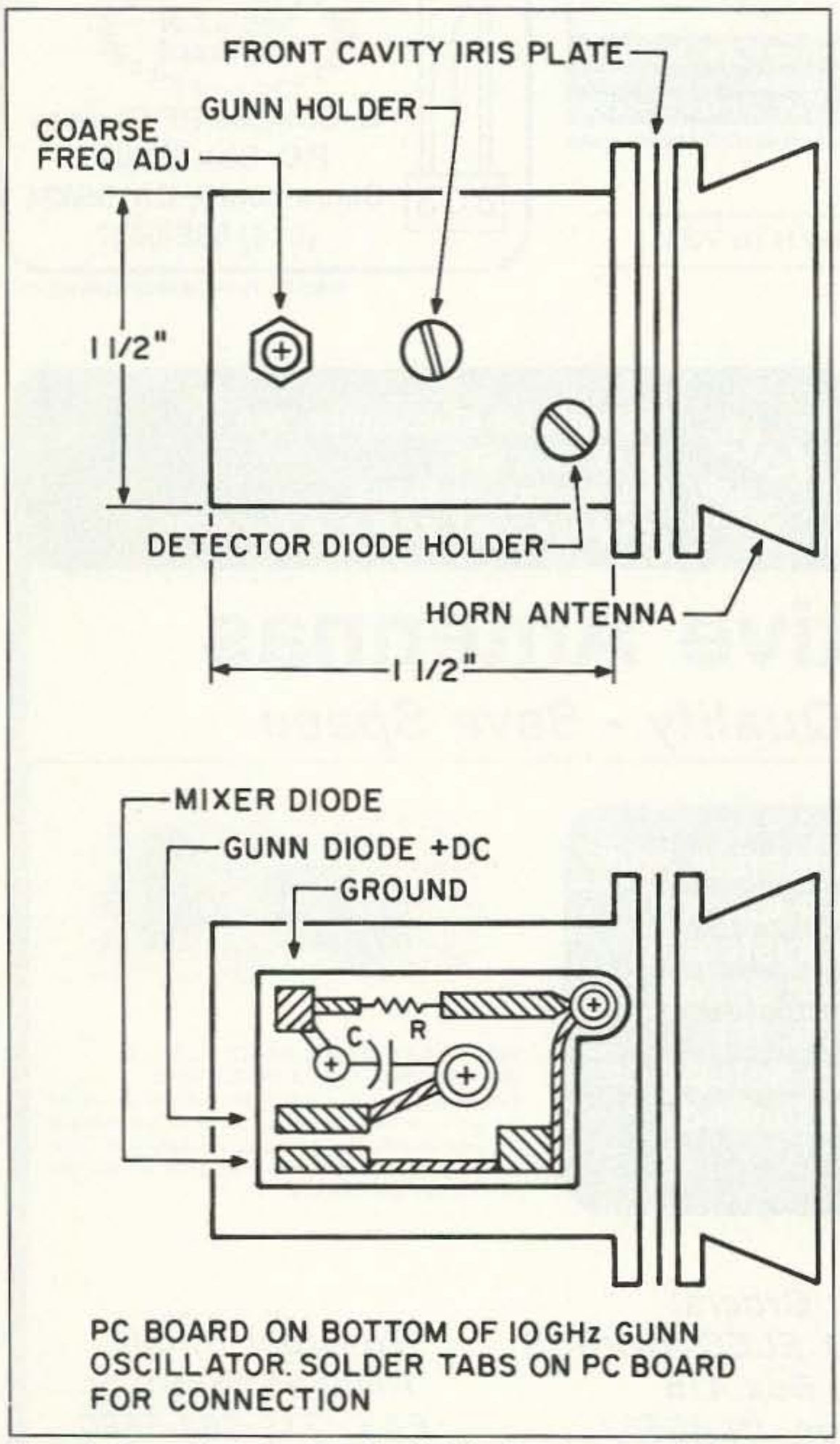

Figure 2. Gunn detector/oscillator for 10 GHz. Samples are available from Emcomm Inc., 10 Howard St. Buffalo NY 14206; (716) 852-3711; cost: $50 each new.

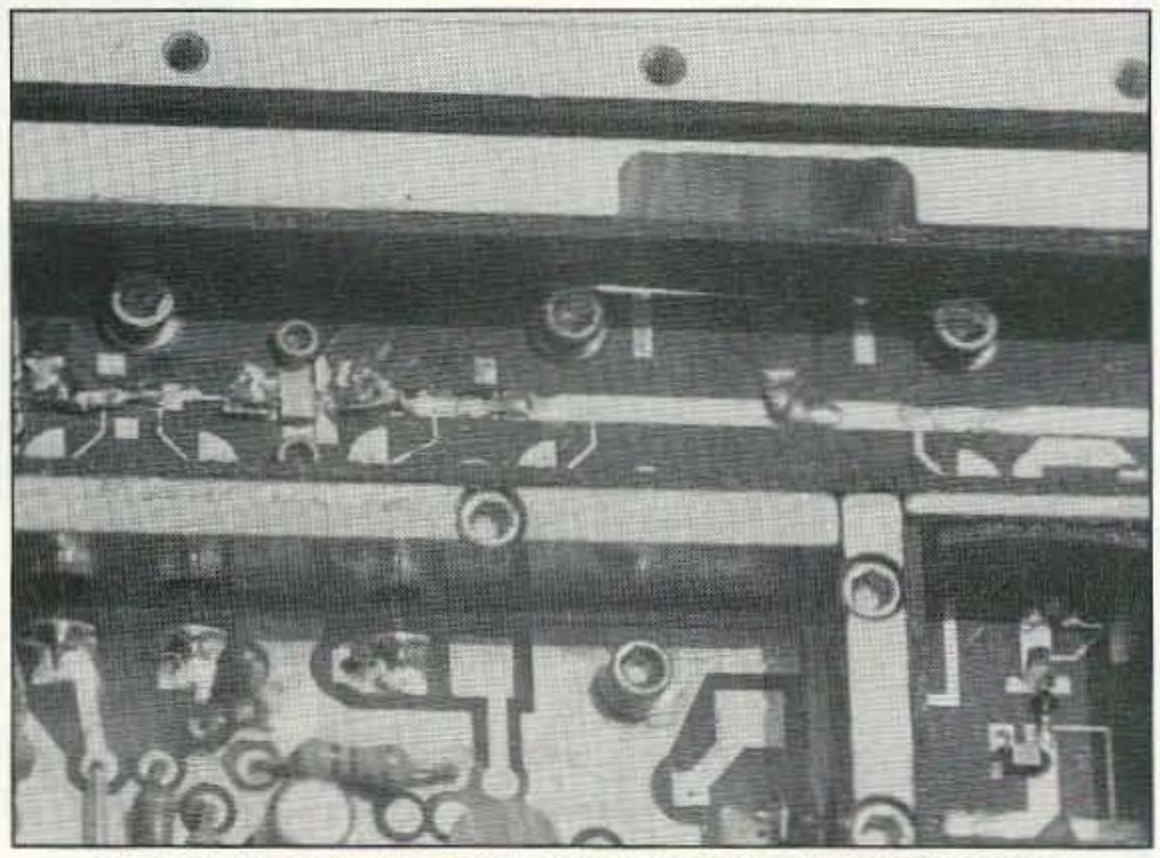

Photo D. Close-up photo of the driver output, final amp modifications.

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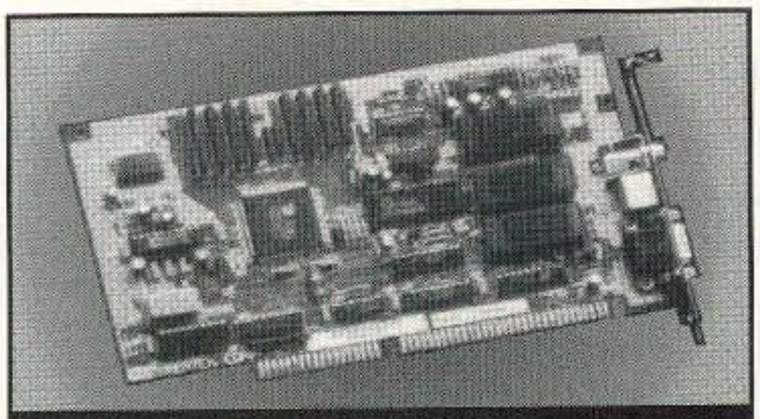

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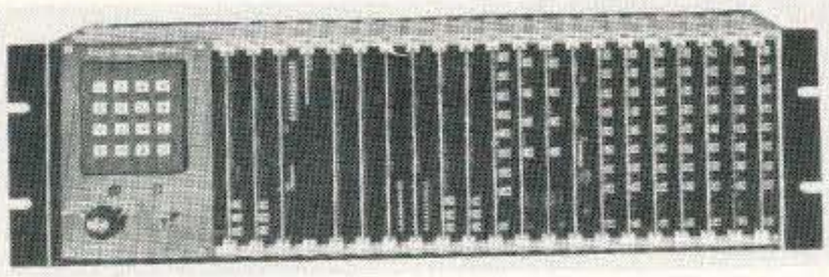

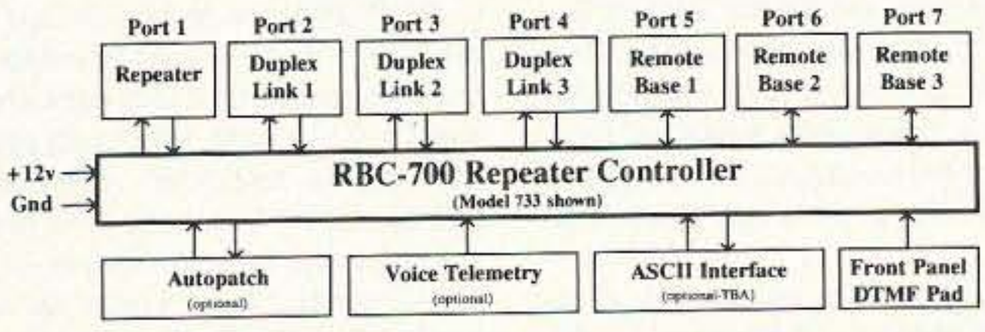

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting a Repeater, 3 Duplexed Links to different sites, and 3 Remote Bases. Using simple commands, a user could tie the Repeater and a Remote Base to one Link, while the other Links are communicating through your site, holding separate conversations. Or, connect all of the ports together - like a big party line !!

Several models are available and are software configurable to support up to 3 Repeaters, 5 Duplexed Links, and 4 Remote Bases. A group or club can start with the basics and **expand** their controller anytime by simply adding boards and software. Free software upgrades for one year after delivery. Finally, a real controller for the Linked system operator !

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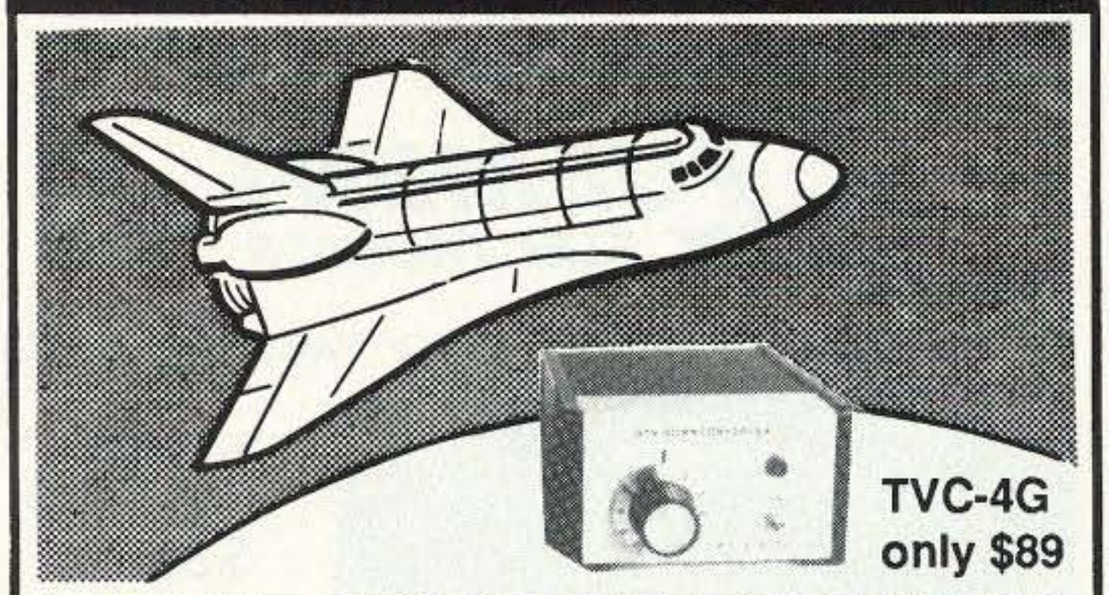

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QRP

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Measuring RF Power

It seems fitting this month to talk about measuring RF power after discussing what a "QRP" is. Just about every QRPer I've ever known has his or her own way of measuring the output of a transmitter. I've used just about every known way myself, and never really found one I think is the best way.

Way back when, some of us hams used RF ammeters in the feedline to indicate maximum RF current. This usually occurs when the feedline is matched to the antenna feedpoint. The RF ammeters are kind of useless at QRP power levels.

One method I use on the testbench to measure RF when designing a transmitter is to read the RF voltage across a resistor. This requires an RF probe and a VTVM or other high impedance meter. I use the 50 ohm resistor in my Cantenna dummy load when using an RF probe. Here's how you do it: Place the RF probe across the dummy load. Apply power and key down the transmitter into the dummy load. Read the resultant voltage on the meter. Now, calculate the power by means of P (watts) = E (rms)^2 divided by 50 ohms. This works, provided you have a good RF probe and are willing to do the extra work. It's not the method of choice if you're in the mood to check your RF power in the middle of nowhere.

An easier way to get a ballpark figure is to simply measure the input power to the transmitter. This is simple, requires only an ammeter and some simple math. It's not easy to tell if the total amount of current you're reading on the meter is really going to the transmitter. There are buffer stages, oscillators, sidetone generators and other circuits that all require current when the transmitter goes online. If you can cut the VCC line on just the PA transistor, insert an ammeter, then measure the current, you'll get a much more accurate reading of INPUT power. Since power equals current times voltage, it's a simple matter to multiply the two together to find the input power to the transmitter. For instance, if your transmitter is running from a 12.5 volt supply, and is drawing 400 mA, then the input power to the transmitter is 5 watts. Now, the problem here is we really don't know what the OUTPUT power is.

The Bruene Circuit

As a rule of thumb, figure about 50 to 60 percent transmitter efficiency. Monitoring transmitter current can sometimes be a pain in the neck too. Sometimes placing the ammeter in series with the transmitter is either too much trouble or results in a voltage drop across the amp meter itself. The voltage drop may cause the transmitter to put all kinds of critters on the air.

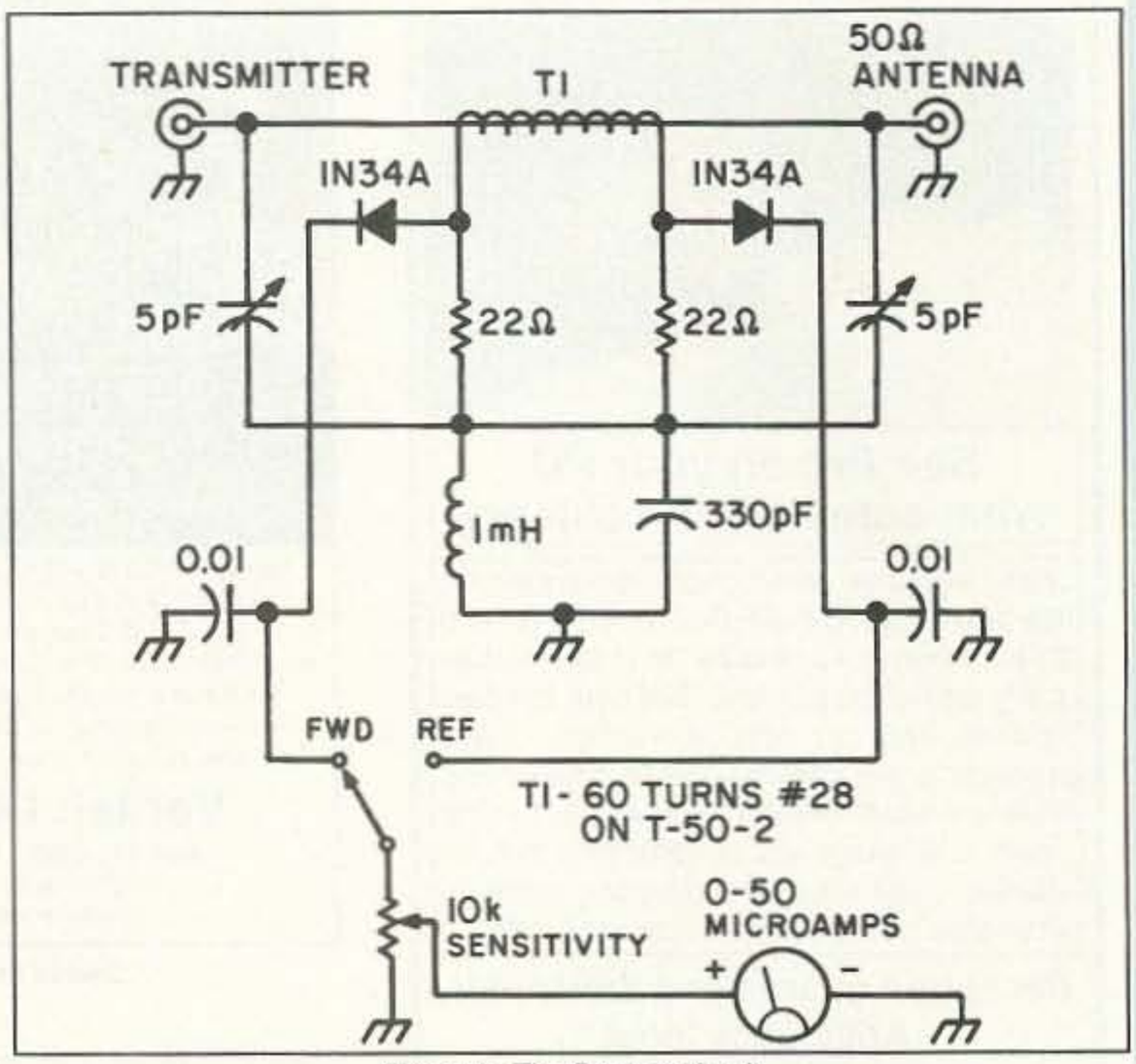

Figure 1. The Bruene circuit.

What we need then is an RF wattmeter which will give us a good accurate reading in the 0 to 5 watt range. A classic circuit by Warren Bruene of Collins Radio is shown in Figure 1. There have been many variations of this circuit over the past years. It's still a good performer and you'll see it used commercially in today's transceivers.

In a nutshell, here's how the Bruene circuit works. A toroidal transformer samples the 50 ohm RF line and causes RF current to flow through the secondary winding. Think of this as a simple transformer with the primary side being powered by the RF from the transmitter. On the secondary, two diodes convert the RF into DC to be read by the meter. One diode will read the forward voltage produced and the second diode will read the reflected voltage. This way, the Bruene circuit makes a very good SWR meter.

The Bruene meter circuit needs to be balanced and this is the reason for the two small value trimmer capacitors. Depending on the sensitivity of the meter used, RF power levels under 500 milliwatts will provide full-scale deflection.

Now, the only problem with this sort of metering circuit is in the construction. It should be built on a single-sided PC board and the parts layout needs particular attention. Also, a metal box is a must. This circuit won't behave itself if you put it in a plastic box. You can use some double-sided PC board stock to make an RF-tight box, then put this into a plastic box if required. If you're sloppy in the construction, you won't be able to null out the meter.

Up to a point, the Bruene meter circuit is frequency sensitive. A watt of RF at 3.5 MHz may not be the same amount of power needed to produce the same meter reading on 30 MHz. When building this circuit, calibrate it for the highest band you plan on operating.

Calibration requires either using another wattmeter of known accuracy, or digging out the RF probe and the VTVM. I use the first method and find it works quite nicely.

I've built several versions of the Bruene meter. Most have worked just fine, some were real dogs. There is one thing I did do to change the way it operates and that was to do away with the calibration pot. Now, you'll need this pot when you're doing SWR checks, but for measuring power, I've never been able to reset the calibration pot to exactly the same place every time. I never knew if I had the pot set right and thus was never sure of the reading I was taking.

I fixed this problem by adding a rotary switch to select up to four different trimmer pots. I had one position set for 0 to 1 watt, a second for 0 to 2 watts and the third for 0 to 5 watts. The fourth position gave me the calibration pot for setting SWR sensitivity. I also used this position in the forward reading position for very low RF levels. I found I could sense RF under 100 mW if my basic meter movement sensitivity was 50 micro amps. By using the three positions, I was able to keep the reading on the higher end of the meter's scale, where its internal accuracy is at its best. If one wanted to, a small one-transistor amplifier or a 741 op amp could be used as a DC voltage amplifier to allow use of the common 0-1 mA meter movements. Take it from me, the idea is good, but you'll need a battery to operate the amp. Without fail, the battery will be dead when you need it most.

Next month, I'll show you how to build a directional wattmeter. It's an easy project. A kit is available for those of you who don't want to spend a summer looking for parts. 73

HAM HELP

Number 27 on your Feedback card

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8l1.2l" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS /Special Events Message Area #11. (2400 baud, 8 data bits, no parity, 1 stop bit. (603) 924-9343). Please indicate if it is for publication. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters 1 or i, or even the number 7. Specifically mention that your message is for the Ham Help Column. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Wanted: Wayne's *excellent* old *Hot CoCo* magazines for my old Tandy Color Computers, and software for same. Also, how can I use the CoCo as a packet TNC? *Charles Scanlon KA1UVE, 2 Eagle Lane, Simsbury CT 06070. Tel. (203) 657-8373.*

Needed: Any data, manual, schematic, updated rolls for a Jackson Model No. 648 Dynamic Tube Tester. Does anyone know if there is a successor to Jackson Electric Instrument Co. of Dayton OH? I will pay for copies of above items. *Don Jenkins WA6OGH, 5045 Donna, Tarzana CA 91356. Tel. (818) 342-3917; FAX (818) 345-8192.*

Needed: Schematic for "St. Clair" VTVM. No model number or serial number on the case. The Model number on the meter movement is #451—St. Clair Engineering Co., Benton Harbor MI. Meter Ranges: 3v, 10v, 30v, 100v, 300v, 1000v. Ohm Ranges: RX1, RX10, RX100, RX1000, RX10,000 and RX1 Meg. Circuit Selector: Off, -volts, +volts, AC volts and ohms. Tubes: 6X5, 6H6 and 6SN7. I will pay for copy. *Bergen Wilson, 1403 Lyttleton St., Camden SC 29020.* Thanks.

I am looking for the complete latest mailing address of a manufacturer of TRICK brand sheet-metal bending machines. Any *73* readers with this info please write to me. *Benjamin Tan, UNITED MARKETING, Isabela, Basilan Province, 7300 PHILIPPINES.* Thanks

I need operations/maintenance manuals for the following: Radio Receiver R-390A/URR manufactured by Collins Radio; Hewlett Packard Model 608D VHF Signal Generator; Textronix Type 545A Oscilloscope; Test Set Electron Tube, TV-7/U; Audio Oscillator TS-382 D/U. I will pay reasonable copying and mailing costs. Please write or call before shipping manuals. *Larry Keith KF8BX, 418 Heritage Drive, Warner Robbins GA 31093. Tel. (912) 329-0030.*

Wanted: Young hams (18 and under) wishing to start a club. Please write to *David Kukier N8UDP, 620 W. Lewiston, Ferndale MI 48220.*

Wanted: A copy of the manual for Heathkit Ignition Analyzer IO-20. I will pay copy cost and shipping. Ship to: *Ed Nell WB2OEB, 103 Bar Harbor Rd., Freehold NJ 07728. Tel. (908) 462-8918 eves.*

Needed: Schematics for Montgomery Ward scanners made by Bearcat. Model numbers are GED-836A and 835. Clear copies are fine *Bob Flesch W3IEZ, 7500 E. Pocono Dr., Iverness FL 32650.*

73 INTERNATIONAL

Arnie Johnson N1BAC
43 Old Homestead Hwy.
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Notes from FN42

As I am writing this, one of hamdom's annual events is taking place: Field Day in the United States. I usually chat about it in my column because it's one of those events that ALL can take part in and have a good time. Whether you are interested in HF or VHF/UHF contesting, satellite contacts, packet, home-brewing antennas, etc., Field Day has something for everyone, even camping out and cooking.

One thing I have found out in the past is that there has to be at least one contact person to turn chaos into order. Those of us in the Keene, New Hampshire, area were very lucky to have Doug KD1GJ volunteer to coordinate our efforts. Of course there were many others who got involved but won't be mentioned in print here due to lack of space.

Location is another important factor. This effort took place in Wheelock Park, one of the many parks in Keene. We were able to operate, as well as be spectators at many softball games, some that went late into the evening. We even had some of the spectators of the games coming over to our location and watching what we were doing.

We operated 2A (primarily on 40 and 80 meters) with one HF rig hooked to a delta loop antenna hung from one of the tall pine trees surrounding our position. The other HF rig used a five-band vertical antenna positioned in the outfield, behind second base, on an unused softball field. Both rigs and computers, used for logging, were supplied with AC power from a generator which ran very nicely for 24 hours, without ever being shut down.

The last position contained the satellite operation, powered by a battery which had been charged by a solar cell for many days before Field Day. I think putting the antennas together for the satellite operation brought us the most spectators during the setup.

One thing that I will always remember about Field Day happened several years ago while I was on vacation in Gunnison, Colorado. I was able to operate with some hams there, contacting several stations back here with operators I knew personally. Well, this year I didn't make it to Colorado but I did the next best thing: I was able to contact WØGYV, the group in Gunnison, on 15 meters. The fun thing about it was that I was mobile at the time with my trusty Atlas 21ØX, on my way home for some sleep.

I guess the central theme of my comments in this column, as well as many of my other columns, is that this is a very small world indeed. We are able to make lasting friendships, sometimes without ever meeting the other person. But, many times we get lucky and meet some fantastic people who become our friends for life.

What am I trying to say? Make the best of everything now, cultivate new friendships, and enjoy life to its fullest!—Arnie, N1BAC.

Roundup

Bulgaria *From Milen Postadshieff LZ2MP:* Just a reminder that the LZ DX Contest will take place on the first Sunday in September from 0000 to 2400 UTC, 3510-3560, 7000-7040, 14000-14060, 21000-21080, 28000-28100 kHz, CW only. Send logs for each band with a summary sheet not later than 30 days after the contest to Central Radio Club, PO Box 830, Sofia 1000, Bulgaria.

Japan *From a letter from Frank L. Striegl 7J1AAL/KA2TNZ, President of TIARA*: In 1972, a few foreign hams organized TIARA, the Tokyo International Amateur Radio Association. At that time, the world was a different place. Japan did not command the attention and interest that it does now. Most people outside Japan did not know about sushi and sumo, and Japanese amateur radio equipment was coming into greater use. Amateur radio operation for foreign hams in Japan was also different. Those were the days before reciprocity, when all non-Japanese hams who wished to operate in Japan had only two options: operate a Japanese club station, or pass the Japanese language amateur license examinations.

The founding members could not have foreseen the immense changes that would occur in Japan, nor could they have guessed that TIARA would grow into a major organization with about 100 members.

In the mid-1980s, TIARA club officers were instrumental in facilitating reciprocity agreement negotiations between Japan and the U.S., and now such agreements exist between Japan and the United States, Canada, France, Germany, and Australia. Foreign hams coming to Japan can obtain information from TIARA on operating in Japan and assistance in setting up. Several TIARA members are VEs, and they hold frequent testing sessions for hams who wish to obtain or upgrade U.S. licenses. *[That's great!!!-Arnie]* In addition to serving the needs of foreign hams in Japan, we work to further comradeship and cooperation between Japanese and foreign hams. The Japan Amateur Radio League (JARL) and TIARA have built a cooperative relationship, and under the sponsorship of JARL, TIARA participates in the annual hamfest at the Tokyo Harumi Fairgrounds.

Japan is complex. It has the largest Asian-language-speaking amateur radio community in the world, with over one million licensed hams. Many of Japan's hams are highly advanced, with sophisticated equipment and technical knowledge. TIARA must function as both a bridge and an outpost; this is a real challenge! Many of our foreign members cannot function in Japanese. High member turnover occurs since many members are here for a short time. We have a few retired members with extensive free time to dedicate to the club. Also, unfortunately, we tend to be isolated from support from ham communities and associations in our home countries.

So congratulations are due to all members of TIARA, past and present, foreign and Japanese. It is their efforts that have built and sustained TIARA. We hope that during the next 20 years TIARA will continue to be of service to its members, and to the worldwide amateur community . . . de Ron Fenne, 7J1ABE/NA3G.

Weddings are always happy events, but even more so when both bride and groom are hams! Photo A shows the wedding reception of former TIARA Vice-President Keishi Kishomoto JF1BNR, Billett DU1BE, and some of the many invited guests. All but one of the people in the photo are hams! The only non-ham is the XYL (in kimono) of the person taking the photo, JA1SQD. Several of the speeches given during the reception mentioned Keishi's deep interest in ham radio, and how it came to be a key factor in bringing him together with Billette. *[Frank L. Striegl 7J1AAL, 4-39-7-503 Kaminoge, Setagaya-ku, Tokyo 158, Japan]*

Scotland *From John "Paddy" McGill GM3MTH:* The Scottish Tourist Board (Radio Amateur) Expedition Group events for September are: GB2NTS at Culzean Castle, Maybole, Ayrshire, and the 4th Annual 8 Nations National Trust Event with 10 stations operating in the UK and Ireland from National Trust Properties on September 19-20. Some of these stations besides GB2NTS are GB2NTU, EI7M/P, EI4DCD, GB2NTW, GB2NTC, GB2NTE, GJ3DVC, and GT3FLH. More information is available from Paddy at 9, Ramsay Place, Coatbridge, Lanarkshire, Scotland, ML5 5RE. The next scheduled event is November 30.

Switzerland *From the International Telecommunication Union (ITU) Press*: The instrument of accession of the Government of the Republic of Croatia was deposited with the ITU on 3 June 1992, making this country the 169th member of the Union.

Croatia is bounded on the north by Slovenia and Hungary, on the east by Serbia, and on the west by the Adriatic Sea. It covers an area of about 56,500 square kilometers, with a population of approximately 4,764,000 (1991). Its capital is Zagreb.

Photo A. The wedding picture of Keishi Kishimoto JF1BNR and Billette DU1BE.

AUSTRALIA

David Horsfall VK2KFU
PO Box 257
Wahroonga NSW 2076
Australia
Internet: dave@ips.OZ.AU
Packet:
VK2KFU@VK2RWI.NSW.AUS.OC

Following further development of amateur radio in Australia, the regulations are about to be significantly overhauled, and the "Code-less Novice" is about to become a reality. Details are sketchy at the moment, but it looks like Novices will gain a part of the

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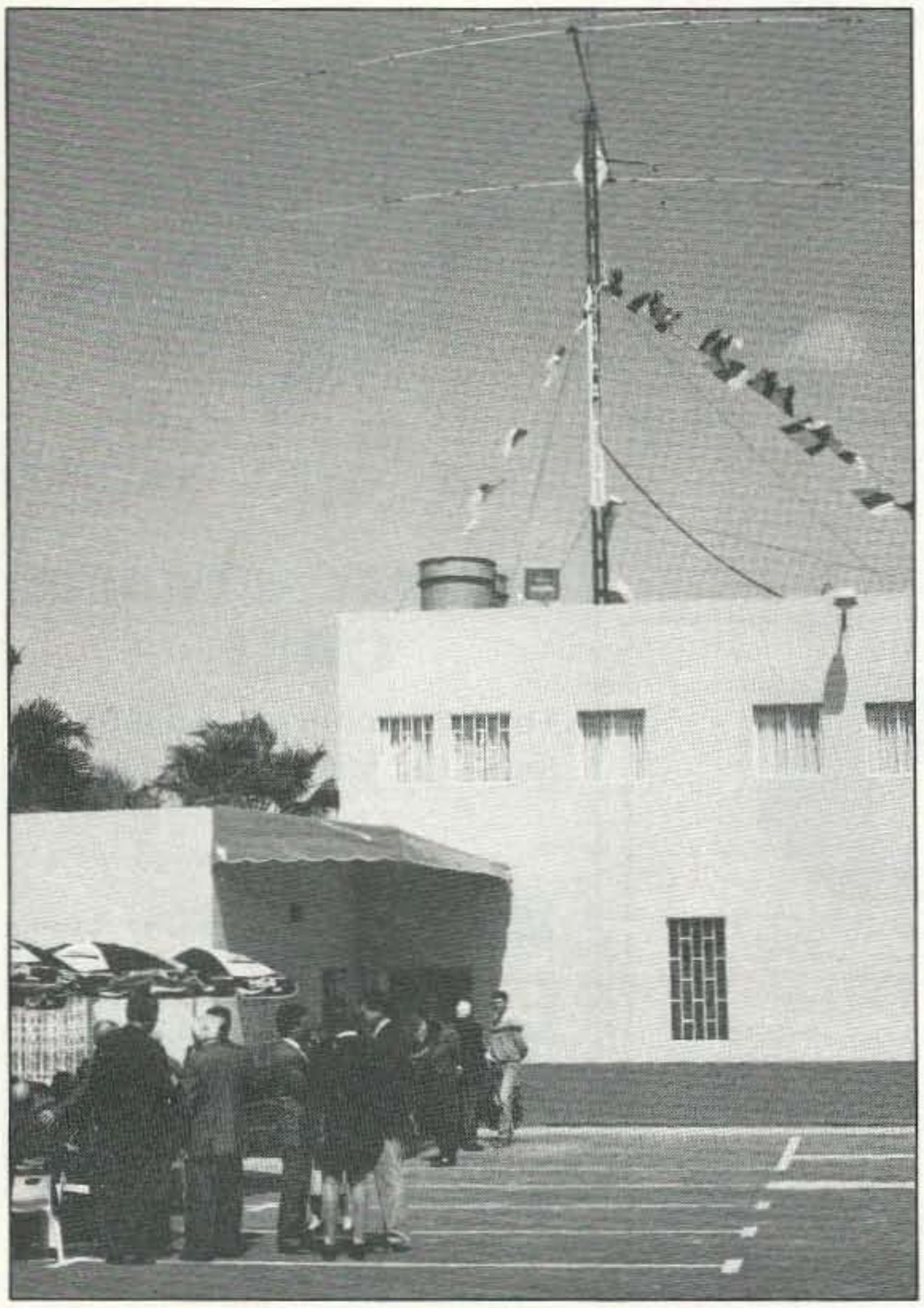

Photo B. New URL clubhouse, visitors, and antennas.

70cm band, as well as their current 2m FM privileges, with HF an option.

It is not known whether they will gain a special suffix (there are not a lot of suffix blocks left) or whether callsigns will be issued from the current Novice blocks. There was talk of a special prefix (as distinct from VK), but personally I see no need to distinguish code-less Novices from their CW-qualified brethren.

Packet radio does not appear to be included, but there is pressure to do so. If Novices are permitted to use packet radio (with no CW qualification, hence no access to HF) this will be one of the most significant developments in amateur radio in this country. Packet radio needs an influx of technically-inclined people, usually the same ones who see little relevance in Morse code, and the Novice license is particularly attractive to young people. Let's hope that Novices will be allowed to "trade" CW for packet!

Full details will be available soon and I will summarize the changes next time.

BRAZIL

Carlos Vianna Carneiro PY1CC
Afonso Pena, 49/701
20270-240 Rio de Janeiro
Brazil

Radio Amateur in RIO-92 Ecology Summit

A few months ago, before the International Ecology Summit for Environment and Development took place in Rio, the Federal University of Mato Grosso do Sul, in the southwestern part of Brazil, got in touch with our LABRE RJ (Rio de Janeiro branch) and Paulo PT9PDS, Director of Mato Grosso do Sul's LABRE MS, and started initiatives so that three or four students of journalism could come to Rio and have official facilities for their stay here.

The day finally came for the three or four students to arrive to cover the most important conference in the world, the Rio Ecology Summit. You know students and journalists, don't you? Or do you?

The three or four expected visitors were, in fact, a noisy group of 25 young girls and boys, all excited by the feverish opportunity of such an experience, their first real contact with responsible journalism!

One by one, all promises for sheltering and nourishing the now 25, instead of the announced three or four, FAILED! And what was left was the bitter reality of a question, WHAT DO WE DO NOW?

The Army's Copacabana Fortress Command offered a "camping solution" using military emergency barracks and a "camping site" inside the fortress. Not bad at all! After all, the students would get safety and Copacabana Beach! After two days of a meager diet, food was guaranteed by the Rector of another university.

The last problem to solve was where the students' headquarters for operation would be. The LABRE RJ opened its doors for them for as long as necessary, and this meant 15 days of wonderful familiarity, boys and girls shuttling to RIO-92 and having their articles sent by packet radio and HF radio twice a day, by at least 1000 and 1500 UTC, and receiving news back from their far distant relatives and loved ones.

The BRA-NET was a Packet Radio Program in Portuguese for BRAZIL, and in English for DX, with Paulo PU1JUD and Edson PU1JTE as editors. LABRE RJ was happy to show one more way radio amateurs can help people, no matter what the subject, in our society.

After 15 days use of LABRE RJ's headquarters, when the Ecology Summit RIOO-92 was over, the students moved back to Mato Grosso do Sul University knowing more about radio amateurs, this almost unknown fantastic helping tool for the development of nations.

LABRE RJ offered them a final farewell cocktail, and this sure was a happy ending to an unusual adventure, joining with university youth, to plant the seeds of our hobby in the wonderful soil of one of our high-class universities.

73 de Carl, PY1CC

CANARY ISLANDS SPAIN

Woodson Gannaway EA8/N5KVB
Apartado 11
35450 Sta Madre Guia (G.C.)
Islas Canarias
Spain

This spring saw the official dedication of what is almost certainly the most beautiful clubhouse in the world. In an earlier report I mentioned that the URL was busily enlarging and remodeling their "shack" in Las Palmas (de G.C.). They took an already nice clubhouse and completely redid it, complete with a second story and new antennas.

Richard Baldwin W1RU and his wife Phyllis came from mainland Spain to participate. As the IARU conference was in session and Richard is the head, they were relatively close. Richard commented that the idea of the clubhouse for the whole family was a Latin phenomenon and that this was by far the nicest one he had seen in his travels. Alfonso and all the club members are justly proud of it.

Although the clubhouse auditorium is ample, it was filled to overflowing for the official dedication. As usual the top government officials attended and participated. As you know, the King of Spain is a ham, and early plans included the possibility of his honoring us with his presence. The skiing accident he suffered ruled out this possibility, but he did honor the club with a personal radio contact during the festivities. The HF radio room was jam-packed during that contact but I heard a little from the hall. Afterwards there was a lunch at a nearby restaurant and Canary folk music. Unfortunately I had to leave to attend another meeting but I have no doubt that it was a memorable afternoon. It included fireworks—I saw and heard them from the bus as I went down the hill towards town.

73, Woodson, EA8/N5KVB

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
D. Negev 85530
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Packet: 4X1MK @ 4X4SV.ISR.EU

UFOs in Eilat

Meir 4X4JP recounted in a regular report from Eilat, Israel's southernmost point, that an unknown amateur who apparently arrived in Eilat got on the local calling frequency 145.55 and called CQ CQ CQ for a week. Meir was overjoyed at the increase in Eilat's amateur population (there are only two hams residing in Eilat), but answering the caller produced no contact. Then Meir thought that the ham might be listening "reverse" and called him 600 kHz down, but still no reply. On and on went the calls CQ CQ CQ from U5MIR, with no regard to Meir's replies. In his report to the *HaGAL*'s editor (the IARC magazine) 4X6LM, Meir thought that perhaps Shlomo knew who U5MIR was. Indeed Shlomo did know, just having finished editing a special issue devoted to satellite communications. U5MIR was, of course, Sergei Krikalov "stranded" on the Russian *Mir* space station orbiting the earth. Sergei has since returned safely to the earth. Meir's signal was probably lost in the QRM when Sergei came into Israel's skies, calling CQ.

Mark Stern 4Z4KX completed a successful QSO with Sergei in Russian, having been briefed on the procedures by Shlomo who has over the past several years exchanged packet and voice communications with *Mir*. The trick, says Mark, is to listen on 143.625 MHz when *Mir* is over your skies. If you hear Russian communication, then *Mir* is in contact with one of its official ground stations, and they are not listening to the ham band. However, if the frequency is silent, then jump to 145.55 and give them a call on voice or packet.

For about three minutes Mark chatted with Sergei, who told him that they had just finished dinner up there, and passed greetings to the Israeli amateurs listening, as he is always happy to make contact with our country. Then Shlomo (who Mark calls a "veteran astronaut") came into the QSO to pass on his greetings.

OD5NG Bites the Bullet!

For many years hams operating the digital modes (RTTY, AMTOR, and packet) have seen the call of "Tom" OD5NG pop up. His bulletins, *The*

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OD5NG Hit List, were world renowned, and through his U.S.A. QSL manager he "confirmed" Lebanon for many DX chasers. He was also no stranger to Israeli hams, exchanging HF digital contacts with them, and corresponding with us in the 4X VHF Packet Net via a HF gateway in Greece. Many may recall "Mike" OD5MA from Nabitiyye in southern Lebanon who contacted us on 2 meters FM, and was even a guest of the Tel-Aviv hams. However, Mike later disappeared, and it was feared indeed from the face of the earth, as was sadly the case with so many in his war-torn land. However, "Tom" OD5NG kept on going from his QTH that he gave as Rashaiyye, also in southern Lebanon, and had no fear of continued contacts with 4X-land. A while ago it became clear as to why "Tom" had been operating from the safest place in Lebanon—mainly in Israel. The following is an excerpt from a bulletin issued by Jim 4X1RU: "Thomas `Tom' Graham, who was known to use the callsign OD5NG, was forced to curtail his clandestine operations from a small village located in the northern part of Israel. During the first part of February, the Israel Ministry of Communications raided his station and confiscated all of his equipment . . . He had acquired various awards as if he were the single entry from Lebanon, and had worked many stations giving them `credit' for working Lebanon on RTTY, AMTOR, and packet . . ."

Photo C. Officials at the dedication of the new clubhouse for the URL.

According to Corinne 4X6VT, "Tom" was an elderly man, and he and his wife were packed up to leave Israel, where they had been living for several years, to go back to his home in South Africa. He was taken into police custody for a few days for questioning, but was released and allowed to leave the country on the date he had planned to. At any rate, we in the world amateur community had "the wool pulled over our eyes" for many years by this pirate, who had never held a ham license. To quote the immortal Kurt Vonnegut, "So it goes."

Saving The Ozone Layer

Translated from the April issue of HAGAL, *the Israel Amateur Radio Club Journal:*

Attention Beam Antenna Owners

According to an announcement from the Ministry of the Environment and the Ministry of Communications, beginning April 1st it will be forbidden to use beam antennas for the high frequency bands. This is due to an international decision by the United Nations dealing with the quality of the environment and aimed to prevent the expansion of the hole in the ozone layer. The official notice from the Ministry of the Environment reached the Israel Amateur Radio Club, along with an interesting offer in which beam antenna owners will be able to receive a vertical antenna in exchange for their beam and a nominal fee. Amateurs interested in receiving an alternate antenna are requested to apply no later than the first of April to the IARC membership Services. *[WOW! I wonder just how many really did report to the IARC on APRIL 1st to make the exchange. Ron, could you find out for us, please?—Arnie]*

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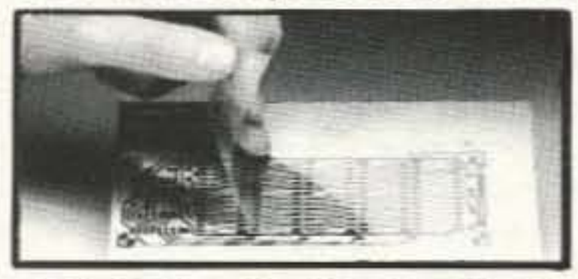

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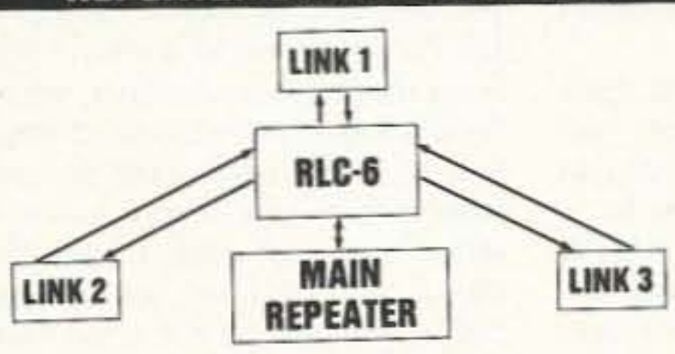

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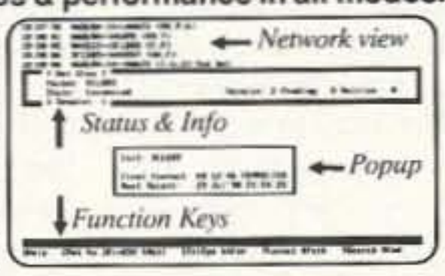

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CIRCLE 293 ON READER SERVICE CARD

Never Say Die

Continued from page 4

mosexuals do brainlessly dumb things —I count a lawsuit of amateurs against amateurs as totally unforgivable—but then to start calling names when someone objects to their poisoning the amateur radio hobby with their paranoia almost gets me into writing something libelous. No, I'm not mad, just disgusted.

Unless Lambda retracts their lawsuit against the League, repays any expenses they've caused us members, and issues a blanket apology for libeling me, I will put them in my book, as a group, along with K1MAN and KV4FZ as embarrassments to the hobby.

Most of our worst villains are gone. W2OY, W2KR, W1BUD, and W2BIB come immediately to mind. There's a few more that have dropped out of sight, thank heavens. We don't need sewers in amateur radio.

Even Easier Newsletters

When the first practical laptop computer came out in early 1983, I rushed to the nearest Radio Shack and bought one—the first day they were available. That was the trusty old Model 100. It was so useful that I gave some away as gifts, so that others could enjoy the freedom it provided to write just about anywhere.

I've always felt that I had a good deal to do with the conception of the 100. Back in the very early days of microcomputers a Japanese ham, K. Nishi, used to visit me and talk computers and ham radio. I'd already been the first publisher of *Byte* and was publishing *Microcomputing* and *73* at the time. I'd been publishing rafts of computer oriented articles in *73* in an "I/O" section. Nishi shared my enthusiasm for these new computers, so he started an *I/O* magazine in Japan.

On a trip to the US for a computer show Nishi brought me the first LCD calculator I'd seen. It had been released the previous day in Tokyo by Sharp. One look and I saw the future—microcomputers the size of a book, with the screen built into the lid. I described my vision to Nishi—a book-sized computer, complete with an LCD screen, a built-in word processor, BASIC, a modem, and connectors to the telephone line, cassette and disk drives, and a networking bus.

Nishi went to Radio Shack and interested them in the project. Then he went to Kyocera and got them to design the computer itself. He was working with Microsoft at the time, so they did the software development. The result was my dream of a truly portable computer which could be used in one's lap.

The design was a hit. Kyocera made an almost identical unit for NEC, their 8200, and one for Olivetti for European distribution. NEC went Radio Shack a little better by making their unit so more memory could be plugged into one side, greatly expanding its usefulness. They also came out with a cute (and inexpensive) little printer—fit in a jacket pocket. Radio Shack never seemed to really have much faith in their 100. It was pretty much left to third party firms to supply accessories for it. They did come out with a tiny disk drive—which went with me everywhere, so I could save my work to disk and free up the computer for more work. Added memory modules came from Portable Computing in Seattle, giving me three or four 32K memory banks.

My trusty 100 was in daily use for nine years, going everywhere with me. Oh, I realized that the screen was limiting—only 40 characters across, but it sure was easy to read compared to anything else I could find. Sure, I got carried away by DAK ads now and then and invested in a newer laptop, but after a few days I found myself back using the 100 again.

I set up a simple letterhead in the 100, making it dirt simple to answer my mail. I had no need for a secretary, I did all my own correspondence. A letter doesn't take much longer to type than to dictate, and since I work weird hours—and anywhere I happen to be—this was the perfect answer for me. I'm not into power and prestige, so the home-made letterhead approach reflected my personality perfectly.

Some people collect prestige things. Most of the people who get listed on commissions and committees seem to be in it mostly for the prestige involved. Somehow, when I get on a committee, I soon find that I'm doing all the work. The next thing you know I'm the president. I joined the Peterborough (NH) Chamber of Commerce because I was concerned that the town had no long-range planning. I'd seen what a mess this could lead to with the growth of Nashua and Milford and didn't want that to happen to Our Town (as Peterborough is known). Sure enough, after a couple of years I found myself the president.

I didn't have a lot of success in organizing long-range planning for the town, but I did manage to put a cork on the building of new homes, and I made the Chamber meetings interesting, building the attendance from around 10 to over a hundred.

Now, getting back to laptop computers, my wife is a Macintosh fan. She does her artwork, advertising, newsletters and promotion of her how-to-dance videos (Butterfly Video) all on her Mac. When they brought out their "portable" a couple years ago she bought one immediately. Yes, it's portable, but it's so heavy I had to do most of the carrying for her on our trips.

Then, this year, when Apple announced their new laptop PowerBooks, she immediately put in an order for the top of the line, the 170. She's so into the Macs that she went to San Francisco for a Mac show, where she won a PowerBook 100 in one of those business card drawings. She didn't need two of 'em, so I tried out the 100 and quickly discovered that my old Radio Shack 100 had been replaced.

The Mac 100 is easy to read and moderately easy to use. The old Model 100 was so simple that anyone could master it in 10 minutes. Well, almost anyone. The Mac 100, supported by several inch-thick manuals, is going to take me a long time to really master. But old Never Say Die will prevail. If six-year-old kids can do it, then dammit, so can I.

To give you an idea of the power of this contraption, I've just finished writing a little treatise on repairing our stupid 19th century model educational system. I wrote the whole works on the 100. I then formatted the material in the type of my choice and watched my printer turn out a 44-page book, all ready for printing. I did up a dozen preliminary copies with a photo copier—eleven 11" x 17" pages.

Hey, this is fun! I next did a paper on how to fix the lousy mess in Washington. How to make Congress honest. How to solve the deficit. How to handle the inner-city riots. How to cut down on the bureaucracy and get our civil "servants" into honest work. That printed out in 20 more pages.

I'll redo these pages and add them to my earlier Report to the NH Economic Development Commission. That should bring the whole report to about 380 or so pages. But I just couldn't get over how easy it was to write and get pages ready for printing. This is the answer for small businesses. This is the answer for clubs. This little laptop computer has enormous power. It comes with two meg of RAM memory, but can be expanded to six meg. It has a built-in 20 meg hard drive—expandable to 120 meg. If I keep writing books like this I'm going to need 120 meg. In truth, the 44-pager took under 300K of memory. Yet, unlike my old Model 100, I was able to keep this all in one document, and not have to break it up into 32K segments.

The computer automatically numbers the pages. As I get better at using it I'll be able to integrate artwork and photos. I'm not sure what the street price is for the Mac 100, but I'll bet you can get one for well under $1,000.

If you have anyone in your radio club who knows how to write, urge 'em to get a Mac 100 and get cracking on a club newsletter. It's easy and fun—and it'll help attract more members and get everyone more involved with the club activities. Has anyone ever seen a strong ham club without a newsletter?

If I wasn't so busy with my own work I'd be out looking for contract work to do. I know some people who are doing this with considerable success—all based on doing desktop publishing with the Mac. They're doing newsletters, books, promotions and so on.

A few years ago the ex-wife of an old ham friend of mine bought what was then the state-of-the-art in computer typesetters. She set it up in her New York apartment closet and started writing books—mostly on contract. She did very well at it, but the investment at that time was substantial for the equipment—and a good deal of paste-up was still needed.

Now, for under a twentieth of what it cost her, you can get a Mac PowerBook, an Apple LaserWriter printer, and that's all you need. You do the typesetting, layout and paste-up all on the little laptop computer. Then you plug in the printer and minutes later you've got a book.

Ooops, you find a typo on page 27! Big deal. You go to page 27, make the correction, and print a new page 27. If you decide to add a chapter or paragraph, the whole document automatically repaginates for you. You can even call a miniature version of the pages to your screen and see how they look, two at a time.

By the way, if you can't wait for me to get my book out on how to get America going again, you can get a dump from the *73* BBS. It's a 300+ page book, so this is going to take some time.

Millions of New Hams!

Old-timers will go ballistic over the whole idea of opening up amateur radio to not just a few hundred kids, as we've done lately, but to millions. Lordy, it'll be worse than CB! Well, maybe—if we manage to recruit millions of Southern truck driver kids. Now look here you old turkeys, we have some 95% of our allotted frequencies going begging for activity. No, I just counted it all up and we're actually using far less than one percent of our allotted frequencies for which ham gear is readily available or can be simply built.

Sure, if everyone wants to pile up on a few channels on 20m phone, it's a mess. But way down in the lower reaches of the band it's almost wide open, with a few computer-wielding adventurers going at high speed CW with only their exciters and dipoles or even verticals, working all kinds of DX. QRM? Har-de-har.

Look, you old buzzards, stop your lousy whining and griping and take some interest in something other than yourself. Your country is hurting. Millions of people are in poverty. Millions more are out of work. Well, we now have a darned good idea of why all this has happened—and we know what to do to keep it from continuing. When I say "we" know, I mean that I do, and if you've been reading my editorials, you also have a good idea of what's gone wrong. And it's got almost nothing whatever to do with all that garbage the politicians have been serving up. We don't need to pour more money into the ghettos and expand welfare, we need to attack the whole problem at its roots—and that's where amateur radio will fit in.

Yes, I hear you old bustards (that's a bird, not a misspelling), and you're not always agreeing with me. Sure, if you did agree with me you'd be right and you'd be making some use of your lives outside of filling 75m with

puerile prattle. You'd be elmering newcomers instead of trying your best to make their lives miserable. In case you don't know it, the no-code newcomers are the best thing that's hit amateur radio in 30 years. They're active. They're enthusiastic. They're actually *doing* things. And, they're buying equipment like there's no tomorrow, according to our advertisers in *Radio Fun*. This buying splurge is just in time to help the sagging Japanese economy, which has been in a tail spin recently.

As I've been doing my research for my reports to the New Hampshire Economic Development Commission, I've run into some absolutely amazing things. Suddenly, the other day, the pieces fit together and I could see what's happened—where things have gone so terribly wrong. As I explained in my July editorial, we need to add reschool education to our day-care centers so kids will build the brain networks it takes to read and work on long-term projects. I've proposed a total change in our whole educational system which will not just help America get out of last place in the developed world, but will put us firmly in first place.

As you would know, if you read much, America spends more on education and ends up with stupider kids than just about any developed country. We're also spending far more on health care and getting distressingly poorer results.

If we're able to break this losing streak by changing our educational system along the lines I'm proposing, we'll at least have kids who *can* learn and who are eager to learn. If we institute the eight-year course in the fundamentals (notice that word starts with the key—fun) of electronics, communications and computers, we'll get millions of kids interested in hamming. I can hardly wait to hear what you old curmudgeons will have to say when our bands start filling up with 8-year-old kids, all talking about the latest digital processing kits they've assembled and how to modify them—and how they're setting up a digital communications network on 10 GHz and bringing out nodes on 2m. It's tough enough trying to deal with 8-year-olds, but when they know far more about technology than you, what then? The historic ham response to that problem has been to exclude the kids from our nets and spend our time bad-mouthing them. Damned wise-assed space cadets.

When I was a kid I used to listen to the old-timer nets on 75m, with most of 'em sporting two-letter calls, and hear 'em ignoring any youngsters who dared to break into their QSOs. W1ZE, Irving Vermillia, on Cape Cod, with his AM kilowatt and loudly ticking alarm clock up next to his mike; W2KR, Mort Kahn, on Long Island; Roland W1ANA, Bill (and Olga) W1IF. Of course that was back before VFOs had been invented and everyone was rock-bound. No kid was dumb enough to buy a crystal for any of the old-timer net frequencies. Crystals were made by Bliley and they cost around $70 in today's dollarettes, so we didn't have more than one or two.

Unless we want to see our country falling even further behind in technology, we've got to radically change our educational system and get kids interested in science and engineering. And that's going to mean the sprouting of thousands of school radio clubs and the invasion of our bands by kids. I only hope I live long enough to see and enjoy it.

These kids, being smarter than we are, will not all try to get on 20m phone at the same time and spend their lives cursing each other; they'll head for our microwave frontiers, where there are wide-open spaces. When I look at today's synthesized rigs and computer technology giving us inexpensive RTTY, high speed CW, packet, and so on—and then I compare that to the crystal-controlled rigs we used to build in the 1930s—I wonder what the ham rig of 2050 can possibly look like. I'll never know. I'm doing all I can to try and hold on and see the year 2000.

Well, we know ICs are going to get smaller. Our HTs will shrink. They'll be multiband. They'll let us call any ham in the world selectively. They'll automatically translate from any language for us. They'll store and forward messages, in case we're busy. Well, all that's within the bounds of our current technologies, so they'll probably come to pass. We'll sure be glad our microwave bands didn't get taken away, as they'll be the work-horse bands in the future.

Millions of kids will bring a whole new life to amateur radio. The old-timers who are spending their declining years venting their frustrations on 75m will soon be gone. I hope someone will make tapes of how things are now and put them away so the hams of 2050 will be able to play them and see how things were just 60 years ago. I know I wish we'd had tape recorders 60 years ago so I could have preserved the ham world of the 1930s.

There's always the posibility that I'll fail in my efforts to get American education changed—that the teacher's unions, civil service unions, bureaucrats and other protectors of the status quo—will win and preserve our costly, badly flawed educational system. In that case we won't have to worry about the kids invading amateur radio.

Want To Make Millions?

If I hadn't already helped a few hundred people make millions, you might just pass my little headline off as more hot air from New Hampshire. Well, maybe. But my record of calling the shots is pretty good—just pick up some issues of *73* from 10, 20 and 30 years ago and see how far off my predictions have been. While tens of thousands of my readers have nodded condescendingly over my editorials, a few have paid attention and hit the jackpot.

Okay, outside of my normal self congratulation, what have I got for you. Well, I got to thinking about this coming digital radio stuff. With up to six separate stations on each channel, they're going to need some system to help listeners know what's playing where and when. No problem. All we need to do is send some sub-sonic signals along with the sound and have an LCD screen at the receiver read out the information.

Heck, we don't even have to wait for digital radio to do this. If I had a workshop and the time I'd see what I could do with sending the digital data via phase shifting the carrier a few hertz. The received information would be stored in a memory chip and displayed on the LCD screen. This could show the station call letters—helpful when you're tuning—and information on what's playing, the performer, composer, and so on. This would be a good medium for program schedules, call-in numbers and even some brief commercials. Of course my favorite would be the record number of what's playing so the listeners could call an 800 number and order the music being played.

Back in the early RTTY days, when we had to make all our own equipment, we made our tuned circuits for 2125 and 2975 Hz out of two coupled speaker output transformers. The circuit was designed by John William W2BFD, who did most of the early RTTY design work. He and I also experimented with the 90 and 150 Hz filters out of the old ARN-7 glide-path receivers. Much to our amazement we were able to get them to work just fine at the standard 60 wpm RTTY speed. This wasn't frequency shift as much as phase shift. With today's chips I'll bet the phase shift could be cut down to a few hertz. You'd never hear it.

Of course with FM the data could be put on a subcarrier so it wouldn't be heard. And with digital radio we'd just use one narrow channel for the data. Well, we could widen it a bit and send fax newsletters as well as program information.

I'd hoped that hams would develop the concept and use it on our ham bands. I'd love to tune 20m and see the call of every station as I tune past. DX stations could even include QSL information. One of these days someone is going to decide to give it a try and probably end up with a business the size of Apple or Microsoft. Once it gets going every radio station in the world will be using it and every radio made will have the readout built in.

The next step is obvious—a small computer built into the receiver to check out the call letters being received and let you know when a new country turns up. Or you could have your receiver look for stations you want to reach. That would be a great accessory for contests, automatically hunting up and down the bands for stations you need to get extra points.

Let's see now, if I come up with the system and license it for a royalty of a buck a radio, I'd make millions. But darn it, I'm retired these days, so I don't have the time. You do it.

The American Holy War

In my book I'm asking all Americans to declare war—a holy war—a fundamentalist war—against socialism. Sure, we beat the heck out of socialism in the USSR and Eastern Europe. We've even beat it in Vietnam, if you read the recent article by P.J. O'Rourke on his visit there in *Rolling Stone*. The one place we haven't beat socialism—the one place it's going the strongest in the world and devastating the country in the process—is right here in America. That's right, here in our US of A.

It was socialism that destroyed Great Britain and it's socialism that is at the heart of what's killing America. How did this pernicious anti-God, anti-life religion get such a powerful hold on the world—and even on America? And how can we fight such a well inculcated religion?

God? Religion? Yep, let me explain. A religion is defined as a belief upheld or pursued with zeal and devotion. Well, that's what we have here.

Getting Fundamental

Religious fundamentalism is causing wars all around the world. Perhaps it's time for us to take a close look at the fundamentals of life and start fighting for them here in America. So let's take a close look at what we've been doing and how it fits in with the most basic laws of nature. Will you be offended if I suggest that the laws of nature are the laws of God?

Okay, what is the most fundamental law for all living things? What is the most basic law of all? It's staying alive, right? Unless we're really screwed up, we'll fight the hardest of all to stay alive. Indeed, this is basic rule number one. This one is built right into the genetic pattern of every living thing. This built-in law also causes us an enormous amount of trouble, it being at the heart of all our mental illnesses and aberrant behavior. That's one of the problems that always crops up when you have a law which is enforced, no matter how unreasonable the enforcement. This is a law which helps to kill us. That's a strange dichotomy and may be difficult to grasp, but it's logical.

If self-preservation is rule one, what's rule two? The preservation of yourself through your offspring. That's why we have love, lust, and all those other great-feeling things we think about, talk about, and sing about. We're talking a very, very basic law of nature. I hope you'll agree that this qualifies as rule two. This is the rule which we feel driving us every day. This has to do with bikinis, deoderant soap, tight jeans and so on. It also leads to the concept of the survival of the fittest, which we might consider as rule three and the result of rules one and two.

The reason even the smallest of boys tend to fight is in preparation for later life when they are going to have

to fight for the choicest girls. It's genetic. Men fight off other men to ensure the survival of their offspring. Women build nests. This survival of the life forms best adapted to winning the battle to propagate has resulted in the survivors we see around us today.

Now let's look at that survival of the fittest concept and think about it. This is where socialism comes in and screws things up. Socialism has as a basic concept the protection of the weak. We see it in welfare payments. We see it in our non-profit institutions. We have hearts. We've been taught to try and go against nature. We see our whole government working on this fundamental basis.

Did democracy win against socialism in Europe? Of course not! It was capitalism that won. Capitalism is the epitome of the survival of the fittest. Socialism is the opposite—to help the weak to survive. Adam Smith's *The Wealth Of Nations*, written around 200 years ago, describes how capitalism works with an "invisible hand." It ties in closely with rule one, self-preservation. It also ties in with rule two, survival of your genes. No wonder capitalism is winning!

Capitalism is winning everywhere it's permitted. Hong Kong and Singapore are capitalist societies and enormously successful. Neither are democratic, by the way. Vietnam is emerging from the chaos of its war at a record pace because capitalism is going strong there. Capitalism is doing pretty well here in America. It's the socialist systems we still have in place that are making us sick.

Just take a look at our biggest social works—our public schools, the post office, the government bureaucracies, welfare, unemployment benefits, social security and so on. There isn't one single thing that the socialist approach can do that the capitalist approach can't do better and cheaper.

Our public schools cost more than double what our private schools do and provide a lousier educational product. We have teacher's unions to help protect the jobs of incompetent teachers who are making a mess of our kids. Every study of the post office has shown that if the service was allowed to go private we'd get far better service at a fraction of the cost. Well, the same thing holds for virtually every government-controlled service we enjoy.

We know what a cesspool the whole welfare system is. Right here in Peterborough we have people on welfare. I've had employees quit so they could go on welfare. They didn't get as much money, but they never had to work again. One of my employees has a friend who does social work. One of her cases is a 22-year-old woman with two kids. She hasn't worked in years. New Hampshire provides her with an apartment; it provides day care for the older child. None of your economy day care, mind you, we're talking $90-a-week day care. Plus the state spends $100 a week to provide taxi service to take the kid to the day care center and drive him back. Plus she gets food stamps.

This woman has no marketable skills, nor is she being encouraged to develop any. She's supposed to be getting advice from a social worker, but she's refused to talk with the worker. No one knows how screwed up her younger baby is getting at the hands of this mother.

I wish this was just an anomaly, but the more you read, the more exposés you see on TV, the more you know that something is fundamentally wrong in America. What was it about not screwing with Mother Nature? Well, we may have hundreds of millions of people who believe in the Koran, and hundreds of millions more who believe in the Bible, and more believing in the Baghavad Gita, and so on, but when I look for the hand of God, I see it in the fundamental rules of life. I see it clearly waving us on with rule one: self-preservation. With rule two: Continue your life through your children. And I see capitalism in harmony with these dynamics and socialism fighting them—fighting God's will. So that's why I'm preaching fundamentalism. I'm not talking worship or spiritualism. I'm not talking mystical belief. I'm not talking churches and ritual. I'm not talking voodoo or reincarnation. I'm talking the rules which we all can see, feel and experience. I'm talking the rules which make sense.

Are there any more self-evident rules? You bet, it's just that they aren't as all-powerful as number one and two. Our love and protection of family comes under number two. But beyond that we feel a kinship for our extended family—our group. We find there are times when belonging to a group definitely helps with self-preservation. I'm not sure this is a genetic rule. It may be a pragmatic one, but it's one we learn even if it isn't genetic. Like the other rules, this one gets us into all sorts of trouble. You can see it going berserk in Yugoslavia, Czechoslovakia, Northern Ireland, India, Sri Lanka, Timor, Ethiopia, Sudan, and so on. It's doing fairly well here in America, helping keep the blacks, whites and Hispanics at odds.

Yes, we do need government. We just don't need anywhere near as much government. Most of what the government is doing—or perhaps trying to do, but failing—could be done for a fraction of the cost and done infinitely better if we could reject the socialist mind set.

What would our government be like if it was run like a business? Suppose inefficient and arrogant workers could be fired as they are in most for-profit businesses? Yes, we'd have to change our educational system so people would have the skills they need to do the work efficiently. Well, if we can get the government to stop forcing us under penalty of law to send our kids to public institutions, we'd have people with the needed skills and the enthusiasm to use them.

We've made teaching such a lousy profession that it's mainly the poorest students who go for it—the people who don't feel qualified to compete in the capitalist world. And who teaches the next generation of teachers? The lowest 20% of the previous generation. It's no wonder we're spending the most of any developed country on education and

getting the worst results. Why, it's almost enough to make a person think.

Is There An Escape?

Sure there is, but it means war. We civilians just barely outnumber the socialists in America. By the time you add up everyone sucking on the public teat—teachers, postal workers, state and federal civil servants, social workers, school administrators, our labor unions, and the military, you can see why we're paying such high taxes and getting so little for it. Nothing is working well. We're up to here in drugs, in crime, prison problems, clogged courts, welfare, homelessness, riots, failed banks, failed loans, unemployment, lousy sewers, air we can see, polluted water, dying oceans, and so on.

Now, are we game to start fighting back? Have we had enough yet? Or is it hopeless and we should just keep our heads down and avoid trouble as best we can? How many of us are "mad as hell" yet?

Yes, I'm preaching revolution. I'm preaching war. No, not with guns and Molotov Cocktails, I'm talking about fighting first at the state level. I'm talking running for the state legislature and changing your state. I'm talking getting people who will bring change to Washington with a mandate to abolish compulsory education. Once they do that and private schools can compete with public schools, we'll see capitalism take over.

Once a private mail service is permitted the US Mule will blow away, just as Parcel Post has been decimated by UPS. Let's privatize everything we can think of. Let's get bids from private companies to run our prisons, car licensing, and so on.

If we can get education out from under the socialist system we won't need government jobs to take care of underachievers.

The best part is that we should be able to cut the costs of government by around 75% and cut our taxes significantly.

The Choir?

Not quite! With hams tending to be introverts, I'm not preaching to the choir this time. But then, I guess I never have. It took me years to get across the concept of no-code—which is still being angrily fought by far too many of you. Now I want you to become activists and help save our country from the ravages of socialism.

Of course I did have some success in getting hams to go for repeaters. Oh, I got a lot of angry letters at first. But then I got them when I pushed SSB in the late '50s. Damned Donald Duck talk. I've never let angry letters stop me.

It looks to me as if capitalism is an idea whose time has come. It's in line with nature. It's in line with God's rules. We're paying the penalty for fighting Mother Nature—and it's a stiff one. It would be nice if you could talk up revolution on the air, but I know how difficult it is to break the habits of a lifetime—and in our case that's a habit of never saying anything remotely smacking of thinking over the air. Duuh, the handle here is . . . . and so on. Well, perhaps the RTTY and packet chaps will pick up the flag and run with it. Those are our main refuges for intelligent communications. I hope the RTTYers and packeteers won't be too angry at me for letting that cat out of the bag. They've been depending on secrecy to keep their intelligent communications preserve isolated.

The Solutions

In my editorials over the last few years I've tackled many of the problems besetting America (and much of the world, for that matter). I've proposed some fairly simple solutions to miseries such as our inexcusable education system, drugs, high prison costs, the inner city riots, cleaning up the horrible mess we've let Congress get in, the deficit, our bloated government (both state and federal), eliminating college tuition, cutting education costs by around 30%, and so on. As a member of the New Hampshire Economic Development Commission I did further research on these problems and put that together with my past ideas and presented the whole works as my report to the Commission. Urged on by friends (yes, I have a few), I've put the report into book form which I'll be distributing in New Hampshire.

My solutions may not be the best, but they all seem practical and to do what's needed—and most of them aren't all that difficult to implement. We're in a time when everyone seems stunned by the problems and few people are even thinking in terms of solutions. Well, most of our problems have been solved somewhere in the world before, so it's more a question of finding these solutions and applying them here.

With the exception of Barry Goldwater, no hams have done much in politics, so I'm not sure how much of an action base the readers of *73* will make. We know the problems—we have some practical solutions—now what do we do? The sorry fact is that the fox is guarding the hen house. Trying to convince politicians that capitalism is better than socialism calls for a leap of faith few will be able to manage. We've got several politicians on the Commission and I know how deeply ingrained the whole socialist manifesto is with most of them. Private schools? Oh, my God! Get welfare people interested in working? Oh, I forgot to mention, the New Hampshire welfare people put in cable TV for that 22-year old woman so she'd be able to watch more than just the four major channels during her long, empty days sitting at home. That costs $75 to have installed and I forget how much a month. I hope they're paying extra so she can have the movie channels. And you may be sure that this same outrageous nonsense is going on where you live and that you are paying for it. That comes out of (a) the 25% of your pay you never even see, (b) the other hidden taxes like those on business which make you pay more for products, and (c) the government is borrowing from you to fund the deficit. And that's money you'll have to work for years to repay. Are you upset yet? What does it take?

QSL of the Month

To enter your QSL, mail it in an envelope to 73, Wayne Green Inc., 70 Route 202-N, Peterborough, NH 03458. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to 73. Entries not in envelopes cannot be accepted.

Another person I know well has a sister who worked for the post office for a year and a half and then got a phony letter from a doctor saying that she was suffering from stress. She was put on 2/3rds pay and retired at 22. She's been happily living on this for the last 20 years, getting full postal worker medical and retirement benefits, and with no income taxes.

There are endless examples like this—and these are the people who are going to fight any changes in the system. We're supporting these leeches. We're working hard to support them. We have to make do with old worn-out things—buy a cheaper car or rent an apartment instead of buying a home—send our kids to public school instead of a private school, thereby doing them irreparable harm—all so a welfare mother won't have to learn to type and get a job doing data input. It makes you proud to be an American. It makes you want to re-elect the lousy ba . . . er . . . chaps who've been doing this to you, right?

With both the Democrats and the Republicans talking more taxes and neither one talking change, it's no wonder so many Americans are fed up. And the challengers to the congressional seats aren't promising anything different. Most of them are career politicians and will be the same as the present crew. Any fear of not being re-elected will immobilize them when it comes to making changes which the postal, civil service or educational unions oppose.

So, as Pogo said, "We've met the enemy, and the enemy is us." We just don't care enough about having our money taken from us. We don't care about the way they waste it. We don't care that we're being screwed. Oh, I suppose we care—a little—but not enough to take time from hamming, watching ball games or having a beer to actually try and do anything about it.

One thing is certain, we can fight nature for a while, but eventually nature will win. The sooner we stop fighting against nature and start fighting for her, the sooner our quality of life as a country will start improving. God has been speaking, but not many have been listening.

Permission is granted to photocopy this editorial and send it to anyone you want to aggravate.

Please advise.

IEEE Screws Up

Alert reader KD5LV sent me a clipping from the June 22nd Electronic Engineering Times with a report that the IEEE has issued a position paper saying, "There is no scientific evidence for the alleged link of police radar with cancer."

Why does this remind me of the tobacco companies and their endless bunch of paid scientists who testified that they could see no link between smoking and cancer? And we saw the same baloney with asbestos. We're also seeing the same stuff with power companies paying scientists to testify that their magnetic fields can't be causing cancer, leukemia in children, miscarriages and so on.

Well, I have a stack of scientific papers about a foot high which back up the danger of magnetic fields and the incidents of cancer in police officers due to their radar units. 60 Minutes recently aired a segment on this. Not that they're always right, but this time they did their homework pretty well.

One of the key research scientists in this field is Ross Adey K6UI, who has given some interesting talks at ham conventions. There are even some videos available—you might try seeing if the ARRL has some for loan to your club.

Shame on the IEEE for this sellout of their members. Oddly enough, the founder of the IRE (now the IEEE) was a good friend of mine. He lived a couple blocks away in Brooklyn and was good friends with my grand parents, so we visited him often. When he died I inherited a huge stack of original patents for early radio devices. I donated them to the IEEE.

We've got enough problems with career politicians who will sell any public interest out for campaign funds without our engineering societies buckling under to special interests. 73

Number 29 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 October 31. Provide a clear, concise summary of the essential details about your Special Event. Check ***Special Events*** *in message* ***Area #11*** *on our* ***BBS (603- 924-9343).*** *for listings that were too late to get into publication.*

ANNOUNCEMENTS

GRENADA, MS The Grenada Lake ARC conducts VE Exams the 2nd Sat. of each month at 9 AM, at the Bank of Mississippi, downtown Grenada, in the upstairs Conference Room. Please use rear entrance. Directions: From I-55 and Miss. 8, go east into town to the second red light (US 51 and Miss. 8). Turn left, go to second light, turn right. The bank will be on the left about 3/4 mile. Talk-in on 146.700 (-600) rptr. You will need to bring a photo ID, your original FCC license, and a photocopy of it; your original CSCEs and photocopy, and the $5.40 fee. FCC 610s will be available. Walk-ins welcome. No Pre-registration necessary. Contact: ***Paul Wood N5UHW, (601) 227-2034; Bill Hunt AB5FI, (601) 227-1047***; or ***Bill Barbee AA5ZR, (601) 226-4014***.

SEPT 6

BURLINGTON, IA The Iowa-Illinois ARC Inc. will host Burlington Hamfest '92 from 7:30 AM-3 PM at the Iowa Nat'l Guard Armory, Summer St. Rd. (across from Burlington Municipal Airport). VEC Exams (bring photo ID and photocopy of signed license). Forums. Flights in Amateur Electronic Supply's Starship airplane mobile. Admission $4, children under 12 admitted free with an adult. Tailgaters $3 additional admission per space. Inside vendors, $6 per table plus admission fee. AC power limited. Set-up at 6 AM. Talk-in on 146.79 (146.19 input) WØLAC rptr., and 146.52 simplex. New and used dealers and computer stuff. Contact ***Chuck Gysi N2DUP, Burlington Hamfest '92, P.O. Box 974, Burlington IA 52601-0974***, or call ***(319) 752-3000***.

SEPT 12

BALLSTON SPA, NY The Saratoga County R.A.C.E.S. Assn., Inc., will host Hamfest 92 at the County Fairgrounds in Ballston Spa NY, rain or shine. Directions: Interstate Route 87 to Exit 12; follow orange and white hamfest signs. Set-up Fri. from 7 PM-8:30 PM. Limited camping w/hookup Fri. night, $15 plus tax. Admission $4 per person (includes 1 tailgate spot). Inside tables $5 ea, first come, first served (we encourage pre-payment). New and used equipment. Talk-in on WA2UMX rptrs., 146.40/147.00 and 147.84/24. Contact ***N2FEP, P.O. Box 41, Rock City Falls NY 12863***.

DALTON, GA The Dalton ARC will hold the Dalton Trade/Swap Day at Praters Mill on GA Hwy #2, 7 miles north of Dalton. Bring your own tables, chairs, tailgates, etc. Free admission. Members of DARC will be on site Fri. eve. for early arrivals (RVs, campers, etc.). Come as early as you wish and stay as late as you wish. No reservations. Talk-in on 145.230-, 443.000+ PL 203.5. For info call ***KB4MJW @ (706) 226-2583*** anytime.

DUCK HILL, MS N5UHW and Grenada Lake ARC will sponsor the 10th Annual Bogue Creek Festival at Duck Hill Community House, next door to the Post Office in Duck Hill MS, from 8 AM-12 PM local CDT. Bring your own swap tables. Walk-in VE Exams at 1 PM; bring original and copy of FCC license, original and copy of any CSCEs, a photo ID and $5.40. Talk-in on 146.700 (-600). SE Station N5UHW will be in operation. Contact ***Paul E. Wood N5UHW, P.O. Box 292, Duck Hill MS 38925-0292. Tel. (601) 565-7286***.

ELMHURST, IL The 40th annual Convention of W9DXCC will be sponsored by the Northern Illinois DX Assn. (NIDXA). W9DXCC membership includes every holder of DXCC in the 9th call area—about 7,800 active DXers. The program will include talks on recent DXpeditions, new and effective equipment and techniques, DX packet cluster, station aids, etc. For info, contact ***NIDXA, P.O. Box 519, Elmhurst IL 60126***.

ERIE, PA The Radio Assn. of Erie will host Erie Hamfest '92 at Rainbow Gardens, adjacent to Presque Isle State Park, from 8 AM-2 PM. ARRL sanctioned. There will be VE Exams at 8 AM at Room 107, Villa Maria Campus, 2551 W. 8th St. Admission $4. 12' tables $8. No tailgating. Talk-in on 146.01/61. For info, contact ***Tom McClain N3HPR, 3954 Solar Dr., Erie PA 16506. Tel. (814) 833-1640***.

LAPORTE, IN The LaPorte ARC Fall Hamfest will be held at LaPorte County Fairgrounds, State Rd. 2 West. Admission $4. Tailgating free. Tables $5 each. Talk-in on 146.520. For tables and info contact ***Tom Lewis KA9ZUM, c/o LPARC, P.O. Box 30, LaPorte IN 46350. Tel. (219) 362-6848***.

UNIONTOWN, PA The Uniontown ARC will hold their 43rd Annual Gabfest on the Club grounds on Old Pittsburgh Rd., just off route 51 and the 119 by-pass. Talk-in on 147.045/.645 and 145.17/144.57. Contact ***U.A.R.C., c/o John Cermak WB3DOD, P.O. Box 433, Republic PA 15474. Tel. (412) 246-2870***.

SEPT 13

FINDLAY, OH The Findlay Radio Club, Inc. will hold its 50th annual Hamfest at the Hancock County Fairgrounds, East Sandusky at Fishlock, in Findlay OH. Advance tickets $4 ea., $5 at the gate. Reserved tables $12 for the first (includes admission for 1) and $8 for each additional table. Make check payable to ***Findlay Radio Club, Inc.*** and send with SASE to ***FRC Tables, Box 587, Findlay OH 45839***.

JOLIET, IL The Bolingbrook ARS will host Hamfest '92 and Computer Fair at the Inwood Rec. Center, 3000 W. Jefferson St., Joliet IL, starting at 6 AM. Gymnasium opens 8 AM Sun. Dealer set-up Sat. 6PM-8 PM; Sun. 5 AM. Overnight parking, no hookups. Advance tickets $4, $5 at the gate. Reserved dealer tables indoors, $10. Reserved Flea Market tables indoors, $6. Any remaining indoor space will be available on a first-come first-served basis. VE Exams, walk-ins welcome. Bring original license and photocopy, ID and photo ID, plus test fee. Novice tests free. Talk-in on 147.33 +0.6, 224.54 -1.6, 146.82 -0.6 MHz. For info call ***(708) 759-7005***. To reserve tickets, mail your check and SAE to ***Bolingbrook Amateur Radio Society, P.O. Box 1009, Bolingbrook IL 60440***. To reserve tables, write to ***BARS, P.O. Box 1009, Bolingbrook IL 60440. Tel. (708) 759-7005***.

SOUTH DARTMOUTH, MA The South Eastern Mass ARA will hold its 5th annual Hamfest/Flea Market from 8 AM-3 PM at the Club grounds, 54 Donald St., South Dartmouth MA. Admission $2. Tables $8 in advance, $10 at the door. Talk-in on 147.00/.60 and 145.49/144.89. Contact ***Michael Enos, P.O. Box 79604, North Dartmouth MA 02747***.

SEPT 19

BERLIN, VT The Central Vermont ARC will hold the 4th annual Fall Foliage Hamfest/Fleamarket inside the Nat'l Guard Armory in Berlin VT. Directions: Exit 7 I-89, turn left at third set of lights. Admission $2. Tailgating $4. Inside tables $6 in advance, $8 at the door. For table reservations and info, contact ***Tom Girardi WA1YNU, P.O. Box 53, Plainfield VT 05667. Tel. (802) 426-3789***. ARRL VE Exams at 1 PM. Talk-in on 146.625 W1BD rptr.

CALGARY, ALBERTA, CANADA The 7th annual Calgary Ham Radio Flea Market, sponsored by the Novatel ARC, will be held from 0900Z-1200Z at the Parkhill Community Centre, 4013 Stanley Rd. SW, Calgary, Alberta. Admission $3. Tables $3. Talk-in on VE6NRC 146.76 and 146.52 simplex. To reserve a table, send your name, callsign and $3.00 for each table you would like, to ***Novatel Amateur Radio Club, 208 Canterbury Pl. SW, Calgary, Alberta, Canada T2W 1P4***.

FRANKLIN, PA The Fort Venango Mike & Key Club will hold a Ham Auction-Fest at the Venengo County 4-H Fairgrounds, Route 62 between Polk and Franklin PA. Free parking. Gates open at 8 AM. Auction begins at 10 AM. Admission $2/person, children 12 and under admitted free. Limited indoor flea market spaces $5 ea., bring your own tables. Talk-in on 147.12+, 145.23- and 145.19-. Contact ***Jim Clinefelter N3BAT, (814) 437-1781***; or ***Bruno Wolozyn K3MHB, (814) 677-8694***. Or write to ***Fort Venango Mike & Key Club, RD #1, P.O. Box 591, Cranberry PA 16319***.

SEPT 19-20

MILTON-FREEWATER, OR The 46th annual W7DP Hamfest, sponsored by the Walla Walla Valley ARC, will be held from 8 AM-5 PM at the Community Bldg. in Milton-Freewater. Registration/Admission is FREE. Swap tables (radio gear only, please) are $5. XYL activities. Potluck. ARRL Section Meeting. For VE Exams on Sun. afternoon, bring photo ID, a copy of your license, and $5.40. Talk-in on the 147.28/.88 rptr. Contact ***Carl Elsner N7PVW, 223 W. Chestnut, Walla Walla WA 99362. Tel. (509) 522-1270***.

PEORIA, IL The Peoria Area ARC will sponsor SUPERFEST 92, its 33rd annual Hamfest, at Exposition Gardens, Northmoor and University. Free parking, wheelchair accessible. Overnight camping. Flea Market opens at 6 AM. Commercial bldgs. open at 8 AM. Admission is $5 for the weekend. Forums. Manufacturer Reps. Ladies activities on Sat. VE Exams Sun. For info. contact ***PAARC, P.O. Box 3508, Peoria IL 61612-3508***, or call the Club answering machine at ***(309) 685-6698***.

VIRGINIA BEACH, VA Tidewater Radio Conventions, Inc. will hold the 17th annual Virginia Beach Hamfest/Computer Fair in the Virginia Beach Pavilion and Convention Center Sat. from 9 AM-5 PM; Sun. 9 AM-4 PM. Free parking at the doors. Admission $5 in advance, $6 at the door (good for both days). The Radisson Hotel is next door to the Pavillion, and the Atlantic Ocean is within walking distance. Gordon West WB6NOA will be the featured speaker. Exhibitors and dealers, contact ***Lewis Steingold W4BLO, (804) 486-3800***. For tickets and info contact ***Manny Steiner K4DOR, 3512 Olympia Ln., Va. Beach VA 23452. Tel. (804) 340-6105***.

SEPT 20

ADRIAN, MI The Adrian ARC will hold its 20th annual Hamfest/Computer Show at the Lenawee County Fair Grounds, North Dean St., Adrian MI, from 8 AM-2 PM. Tickets $3 in advance, $4 at the gate. VE Exams, inside Table Sales, outside Trunk Sales. Talk-in on 145.370. For reservations and info, contact ***Dennis Boydston, 2383 E. Clearview Dr., Adrian MI 49221. Tel. (517) 265-8054 after 4 PM EDT***.

BEACH HAVEN, PA The Columbia-Montour ARC will hold its 2nd annual Hamfest/Computer/Electronic Fleamarket at the Beach Haven Carnival Grounds, north of Berwick PA, on RT 11 near the Susquehanna steam electric plant, beginning at 8 AM. Breakfast at 6 AM. General admission $3, XYL and kids under 16 admitted free. Tailgating $1 per 8' space plus general admission. Talk-in on 147.225 or 146.52. Vendors: for info call ***Dave WC3A, (717) 752-6851***.

CAMBRIDGE, MA The MIT Electronics Research Soc., the MIT Radio Soc., and the Harvard Wireless Club will hold a Flea Market from 9 AM-2 PM at Albany and Main St. Free off-street parking. Admission $2. Covered tailgate area. Sellers spaces $5 in advance (includes 1 admission), $8 at the gate. Set-up at 7 AM. For space reservations or info, call ***(617) 253-3776***. Mail advance reservations before the 5th to ***W1GSL, P.O. Box 82 MIT BR., Cambridge MA 02139***. Talk-in on 146.52 and 449.725/444.725 - pl 2A W1XM rptr.

MT CLEMONS, MI The 20th annual L'Anse Creuse ARC Swap and Shop will be held from 8 AM-2 PM at L'anse Creuse High School. Directions: From I-94 take exit 236 onto eastbound Metro Pkwy, then to Crocker Blvd; left onto Crocker, then right onto Reimold to the last school. Admission $3 in advance (by Sept 8th), $4 at the door. VE Exams at 11 AM. Contact ***Don WA8IZV, (313) 294-1567***. Tables $10. Trunk sale space $4 per space at the swap. Vendor set-up at 6 AM. For more info send SASE to ***Jerry Luh KA8QBC, (313) 651-7387, 732 Brookwood Ln., Rochester Hills MI 48309***.

PENNSAUKEN, NJ The South Jersey Radio Assn. will sponsor its 44th annual Hamfest/Computer Show at the Pennsauken High School parking lot, rain or shine, from 8 AM-3 PM. Free parking. Tailgating. Swap shop. VEC Exams, all classes; register at 9:30 AM. Advance tickets $4, $5 at the gate. Tailgate, 8' space, $5 (does not include admission). K2AA Talk-in on 145.290 (-600), SJRA rptr. For advance sales, send check and SASE to ***Alan Sherman KE2VX, 222 Park Ave., Atco NJ 08004. Tel. (609) 768-8380 eves. after 7:30 PM***.

SANDY HOOK, CT The Candlewood ARA of Danbury CT will hold its annual Ham Fest at Sandy Hook Fire House, Riverside Rd., from 8 AM-2 PM. Tailgating $6. Inside Tables $8 on first-come first-serve basis. Commercial vendors welcome. Talk-in on 147.12/.72 (PL 141.3) Danbury rptr. Contact ***John N2DVX, (203) 438-6782***, or ***Craig N1ABY, (203) 426-1652***.

SEPT 26

BELTON, TX HAM EXP.O. '92, the largest indoor Tailgate Swapfest in Texas, will be held at the Bell County Expo Center. Take I-35 (exit 292). Wheelchair accessible. Free admission. VE Exams. There will be a fully equipped test bench for equipment checks. Set-up at 6 AM. Open to the public 8 AM-3 PM. Seller pre-registration $8 by Sept. 19th, $10 after. Your choice of 8' table or indoor tailgate space. Additional tables $4, $5 at the door. Electricity $2. Registration/checks to ***Temple ARC, 2014 S. 53rd, Temple TX 76504***. Contact ***Mike WA5EQQ, (817) 773-4768***.

ELMIRA, NY The Elmira ARA will present the 17th annual International Hamfest at the Chemung County Fairgrounds. Outdoor Flea Market. Indoor Dealer Displays. Gate will be open from 6 AM-5 PM. Tickets available at the gate, or in advance from ***Dave Lewis, RD1, Box 191, Van Etten NY 14889***.

SANTA FE, NM The Northern New Mexico ARC will host the 1992 Northern New Mexico Hamfest at Glorieta Baptist Conference Center, 16 miles southeast of Santa Fe on I-25, exit 299. Flea Market. Free Tailgating for registrants. Overnight camping with hookups at $9.30 per night. Camping without reservations is on a first-come first-served basis. Contact the ***Glorieta Baptist Conference Center, P.O. Box 8, Glorieta NM 87535***, with remittance, to secure your spot for Fri. and/or Sat. night. Hotel/motel rooms are available—call ***(505) 757-6161*** for info. Admission is $5 at the gate. Talk-in on 146.18/.78 and 146.52/.52. Contact ***Helenrose Burke W5IXS, P.O. Box 73, Ojo Sarco NM 87550. Tel. (505) 689-2367***.

WARSAW, IN The American Red Cross ARC of Warsaw will sponsor its 2nd annual Warsaw Hamfest from 8 AM-2 PM at the Nat'l Guard Armory, 2 miles north of Warsaw. Take Ind. 15 North to Co. Rd. 350 N. Turn East. It's just across the tracks. Tickets $3.50 in advance, $4 at the door. Tables $5. Tailgate sales free with admission. W5YI VE Testing. Talk-in on 146.985 or 442.55 rptrs. For info call ***John Sparks KA9QWV, (219) 269-5187; Harold Dunn KA9TUQ, (219) 269-9652; Paul Van Dyke KB9AVO, (219) 457-5432***. Dealers write to ***ARC2 Hamfest 92, 1516 Maye St., Warsaw IN 46580. Tel. (219) 269-5187***.

SEPT 26-27

LOUISVILLE, KY The Greater Louisville Hamfest/ARRL Great Lakes Div. Convention will be held at the Commonwealth Convention Center in downtown Louisville. Advance tickets $6 with SASE; $8 at the door. Commercial and flea market spaces available. For tickets or info, mail to ***P.O. Box 34444-S, Louisville KY 40232-4444. Tel. (502) 551-4118***.

WICHITA, KS The Wichita ARC will host the 1992 Kansas State ARRL Convention at the Ramada Hotel at Broadview Place, 400 West Douglas, Wichita KS 67202. For more info contact the ***Wichita Amateur Radio Club***.

SEPT 27

LONDON, ONTARIO, CANADA The London ARC will hold its 15th annual Hamfest at the Pot O'Gold Bingo Palace, Hamilton and Gore Rds, London Ontario from 9 AM-2 PM. $5 Admission includes door prize ticket. Vendor set-up 8 AM. Tables $5. Talk-in VE3LON 147.060+. Send reservation payments to ***London Amateur Radio Club Inc., P.O. Box 82 STN B, London, Ontario Canada N6A 4V3***. For info call ***Jim Hartford VE3NRX, (519) 672-7911***.

LONGMONT, CO The Boulder ARC will host its Amateur Radio Electronics and Computer Swap Meet at the Boulder County Fairgrounds Exhibition Bldg., Nelson and Hover Rds., Longmont CO. Free parking. Camp sites and shopping nearby. VE Exams. Set-up at 7 AM. Doors open at 8 AM. Admission $3. Tables $7 (chairs available). Call ***(303) 530-2903*** to obtain table reservation forms or make VE testing reservations. Mail table reservations and inquiries to ***BARCFEST, 1103 South Gay Dr., Longmont CO 80501***. Reservation deadline is Sep. 19th. Walk-ins welcome, first-come, first-served.

MILFORD, CT The Coastline Amateur ARA will sponsor VE Exams for all classes at the Fowler Bldg., 145 Bridgeport Ave., Milford CT, starting at 12 noon. Walk-ins. Contact ***Gary NB1M, (203) 933-5125***, or ***Dick WA1YQE, (203) 874-1014*** for more info.

NEW PORT RICHEY, FL The Suncoast ARC will hold the 2nd Pasco County, Florida Hamfest at the New Port Richey Recreation Center from 9 AM-5 PM. Directions: US Hwy. 19 to Main St. in NPR; go east 1.5 miles to Van Buren. Turn left (north) 1 mile on right side. W5YI Exams. Admission $5 at the door, children under 12 admitted free. YL and XYLs free. Sellers $15 (pre-registration required). Tables $15, includes chair and one admission. Electricity is $5 extra. Talk-in on 145.35 local, and 147.150 distance. Contact ***Suncoast Amateur Radio Club, P.O. Box 7373, Hudson FL 34676*** or call: ***Ralph N4QIK, (813) 847-4043***, or ***Mitch KM4MU, (813) 848-5526***.

YONKERS, NY The Metro 70cm Network will sponsor a Giant Electronic Fleamarket at the Lincoln High School, Kneeland Ave., off Yonkers Ave., from 9 AM-3 PM. Set-up at 7 AM. Ham Gear. Computers. VE Exams. Free parking. Free frequency checks. Admission $4 each. Kids under 12 free. First table $15; $10 each additional. $1.80 per foot (your table min. $10.). Full payment in advance. Contact ***Otto Supliski WB2SLQ, 53 Hayward St., Yonkers NY 10704. Tel. (914) 969-1053***.

OCT 3

CHERRY HILL, NJ The Pack Rats (Mt. Airy VHF Radio Club, Inc.) will sponsor the 16th annual Mid-Atlantic States Conference and Banquet on Sat. Oct. 3rd. For more info send #10 SASE to ***VHF Conference, P.O. Box 311, Southampton PA 18966***.

ROCK HILL, SC The York County ARS will hold its 41st annual Rock Hill Hamfest at the Charlotte Knights Baseball Stadium just south of Charlotte NC on I-77, from 7 AM-5 PM. Advance tickets $5, $6 at the door. One parking space included. Wheelchair accessible. Covered display space. VE Exams. Flea Market. Camping nearby. Talk-in 147.030 (-600). For info and advance tickets contact ***Tom Lempicke AB4YV, 2129 Squire Rd., Rock Hill SC 29730. Tel. (803) 328-3837***. Please SASE.

OCT 3-4

BILOXI, MS The Mississippi Coast ARA, Inc. will hold its 16th annual Ham/Swapfest at the Mississippi Coast Coliseum and Convention Center. VE Exams Sat. at 1 PM, Sun. at 11 AM. Admission $2. Weekend table rental $15 by pre-registration only. Free parking. Handicap parking. RV hookups and dump station $10 per night. No tailgate spaces or outside tables available. No commercial dealers or equipment sales in swap area. Contact ***Ernie Orman W5OXA, 15625 Little Joe Rd., Biloxi MS 39532. Tel. (601) 392-2816***.

OCT 4

CHERRY HILL, NJ Hamarama '92, sponsored by the Mt. Airy VHF Radio Club, Inc., will be held rain or shine at Garden State Park, Rt. 70 and Cornell Ave. from 7 AM-4 PM. Buyers $4 admission plus $1 parking. Sellers add $8 each 10 x 20 parking space (bring your own tables). For info send #10 SASE to ***Hamarama '92, P.O. Box 311, Southampton PA 18966***.

SPRINGFIELD, OH The Springfield Independent Radio Assn. (SIRA) will sponsor the Springfield Hamfest/Computer Expo at Clark County Fairgrounds on State Route 41, just north of I-70, from 8 AM-3 PM. Advance tickets $4, $5 at the door. Advance tables $8, $10 at the door, if available. Talk-in on 145.45/R(-), 224.26/R(-). For more info, write ***SIRA, P.O. Box 523, Springfield OH 45501***, or call ***Hamfest Chairman Ralph Pamer WA8KSS, (513) 325-1456***.

OCT 11

LIMA, OH The Northwest Ohio ARC of Lima OH will host a Hamfest at the Allen County Fairgrounds, Rt. 309E off I-75 Exit 125A-B. Advance Tickets $4, $5 at the door. On-site camper parking, $7 for electric hook-up. Security guards all night. Gate opens at 6 AM. All areas are wheelchair accessible. Set-up Oct. 10th, 3 PM-11 PM; Oct. 11th, 5 AM. Tables $8. Send check or money order with SASE at least two weeks in advance to ***WD8BND, P.O. Box 211, Lima OH 45802***. To preregister for VE Exams, send completed 610 form, copy of license, check for $5.40 made out to ***ARRL VEC***. Send to ***W8TY, P.O. Box 211, Lima OH 45802***. On a separate sheet of paper, please state which elements of exams you wish to take. Cutoff for Exams registration is Oct. 3rd. Talk-in on 146.67, 145.17, 444.925 Std. Splits.

SPECIAL EVENT STATIONS

ANNOUNCEMENT:

UFO/ET Discussion NET Join us every Thurs. evening, 8 PM-11:30 PM on 3.930 MHz, for discussions related to extra-terrestrial communications and the UFO phenomena. NET controls are Tom KA1DYE, and Kenny N1JVN.

SEPT 2-7

MOUNT PLEASANT, IA The Mount Pleasant, Iowa ARC will operate WØMME at the 43rd Annual Midwest Old Threshers Reunion. Operation will be the bottom 50 kHz of the General 80-10 meter phone subbands plus the 80m, 40m, and 15m Novice bands. For a QSL, send SASE to ***Dave Schneider WD0ENR, RR #3, Box 307A, Mount Pleasant IA 52641-9803***.

SEPT 12

DUCK HILL, MS The Grenada Lake ARC will operate Station N5UHW (and others) in conjunction with the 10th annual Bogue Creek Festival. Time: 0000Z-2400Z. Frequencies: 3.875, 7.250, 14.250, 21.350 and/or 28.350 +/- (depending on QRM, QRN, and propagation). Packet: Rose System 601453 N5UHW-1 (145.07). Talk-in on 146.700 (-600). Send QSL and SASE to ***Bogue Creek Festival, Special Event Station N5UHW, P.O. Box 292, Duck Hill MS 38925-0292 USA***. For info contact ***Paul E. Wood N5UHW, P.O. Box 292, Duck Hill MS 38925-0292. (601) 565-7286***.

SEPT 12-13

MONTANA QSO PARTY The Montana H.F. Soc. will sponsor their 1992 Montana QSO Party from 1600 UTC Sat.-0400 UTC Sun. for Class I Single Operator and Class II Single Operator, Mobile (Montana only). Montana stations send QSO number and country. Stations outside Montana send QSO number and state/province/county. Each SSB contact is worth 1 point.

CW, RTTY, AMTOR contacts worth 2 points. Frequencies: 80-10m SSB—3850, 7230, 14280, 21350, 28450. CW band edge plus 25 kHz. Novices use band edge plus 50 kHz. A plaque goes to highest scoring station out of Montana. Certificates to the highest scoring entry from each state, province, or country, with at least 25 QSOs and contacts with at least 10 diffferent Montana stations. Plaque to highest scoring Montana station, certificates to 2nd and 3rd places, and Top Mobile. Report log and summary sheet listing QSOs and multipliers by band, mode, total contacts, multipliers, claimed score, name, call, mailing address, phone, and a written signed statement of "Fair and Ethical Operation." Entries with more than 200 QSOs must include dupe sheets. You may submit your entry on disk in lieu of paper logs. Disk must be MS-DOS format, 5 1/4 inch, 360 K disk only and in an ASCII file containing all of the previous info. A separate summary sheet and signed statement is also required with disk entries. All entries must be postmarked by Oct. 1, 1992. Please mail to ***The Montana H.F. Society, 1009 Madison Ave., Helena MT 59601***. Include a business size SASE for results.

TULELAKE, CA The Keno ARC will host their 2nd annual Special Event Station, KG7VM, at the Tulelake Fair from 1600Z-0000Z Sat. and Sun. Operation will be on 10-80m as follows: SSB on lower 20 kHz of the General and Novice portion; CW on the lower 20 kHz of the Novice, and RTTY on the applicable part of the General subbands. For a certificate, send QSL and a business sized SASE to ***Keno ARC, P.O. Box 653, Keno OR 97627***.

SEPT 14-19

ATLANTIC CITY, NJ Southern Counties ARA (SCARA) will operate K2BR from the Miss America Pageant in Atlantic City NJ. Atlantic City is located on Absecon Island, which is IOTA: NA 111. Frequencies: Phone: 25 kHz inside lower General class bandedge. CW: 65 kHz inside lower General class bandedge. Novice: 28.100-28500 kHz. QSL with #10 SASE via ***SCARA, P.O. Box 121, Linwood NJ 08221***. Operation will begin from 10 AM EST on Sep. 14th.

SEPT 18-20

PORT VUE, PA Station KI3R will operate on 40m, 20m, and 10m bands during daylight and evening hours, in celebration of the 100th Anniversary of Port Vue Borough. QSL with SASE to ***KI3R, 1008 Monroe Ave., Port Vue PA 15133***.

SEPT 19

FLAG CENTER, IL The Kishwaukee ARC of Dekalb County IL will host Station WA9CJN for the Two Rivers Council Boy Scouts to help commemorate the 500th anniversary of the discovery of America. This fall camporee is being called a "Quintaree." WA9CJN will operate from 1300Z-0300Z with most activity on the Novice portion of 10m. Control operators will be KB9AGV and WB9EEE. For a certificate, send a large SASE to ***KARC WA9CJN Attn: KB9AGV, P.O. Box 264, Sycamore IL 60178***.

SEPT 19-20

VANCOUVER, WA The Heritage Trust Foundation of Clark County WA will sponsor Station W7AIA, possibly operating from the famous Officer's Row at old Fort Vancouver barracks. Operation will be from 1600 UTC-2300 UTC Sat., and from 1700 UTC-2200 UTC Sun., in the lower portion of the General class phone bands, 40m and 20m, and in the 10m Novice/Tech band, conditions permitting. A nice certificate will be available in return for your SASE to ***CCARC, P.O. Box 1424, Vancouver WA 98668***.

SEPT 25-27

PEA PATCH ISLAND, DE The Quad County IRC will operate KD3XN 1400Z-2100Z from historic Civil War Fort Delaware. Operations will be in the General and Novice portions of 10m, 12m, 15m, 17m, 20m and 40m. For color aerial view QSL, send QSL and SASE to the operator worked. Possible IOTA.

SEPT 26

PESHTIGO, WI The Marinette and Menominee ARC will operate Station WJ9X from the site of the 121st Anniversary of North America's most disasterous forest fire. Operations will be from 1500Z-2300Z. Frequencies: Phone 14.271, 21.371, 28.471 and 14.071 CW. For certificate and honorary Peshtigo citizenship, send SASE to ***William Fluegge, N3280 River Bend Dr., Peshtigo WI 54157***.

SEPT 26-27

KINGMAN, AZ The Hualapai ARC will operate Station WA7LAZ to celebrate "Andy Devine Days," an annual event in Kingman AZ, where Andy spent his youth. Andy, most remembered for his character "Jingles" in many western movies, was licensed as W6RER (Red Eyed Rooster). Some of his amateur equipment and other memorabilia is on display in the Mohave Museum. Operating schedule: 1500Z-1700Z, 28.325 MHz; 1700Z-1900Z, 21.325 MHz; 1900Z-2100Z, 14.325 MHz; 2100Z-2300Z, 28.325 MHz; 2300Z-0100Z, 21.325 MHz; 0100Z-0300Z, 14.325 MHz; 0300Z-0500Z, 28.325 MHz. If propagation is bad on any band we will shift to the next lower band. For a certificate suitable for framing, send QSL with contact number, and a 9 x 12 envelope with two units of postage to ***WA7LAZ, P.O. Box 4364, Kingman AZ 86401***, or send $1.00 with QSL and we will furnish envelope and postage.

OCT 1-2

HUMACAO, PR The Bayamon Central University ARC will operate Station ACTE-KP4 to commemorate the Annual Convention of the Assn. for Educational Communications and Technology, Puerto Rico Branch, in Palmas del Mar Resort, Humacao PR. Frequencies: 145.15, 28.477, 21.137 and 3.737 MHz. Contact the station in one frequency to get a QSL card, two or more frequencies to get a certificate. Send QSL and SASE to ***Carlos Colon KP4TD, School of Education, U.C.B., Box 1725, Bayamon PR 00957***.

OCT 3

ALAMOGORDO, NM The Alamogordo ARC will conduct a special operation, sponsored by the International Space Hall of Fame, to honor new inductees. Station WA5IPS will operate from 1500 UTC-2300 UTC, from atop the Space Hall. Operation will be in the 10m Novice band (around 28.480/.490 MHz) from 1500 UTC-1600 UTC, and on the 15m and 20m General phone bands from 1600 UTC-2300 UTC. Special QSLs will be sent from the Space Hall of Fame and will be certified by A.A.R.C. members. QSL requests should be mailed to ***International Space Hall of Fame, Route 2001 - P.O. Box 533, Alamogordo NM 88311-0533***. No SASE required. SWL requests will also be acknowledged. For more info, contact ***Ole Jorgensen WA5IPS, Chairman; Larry Moore WA5UNO, A.A.R.C. President***.

OCT 10-11

BOALSBURG, PA The Nittany ARC will operate W3YA from the authentic Columbus Family Chapel historic museum during festivities for the Quincentennial of Christopher Columbus' discovery. Hours: 1500 UTC-0100 UTC Sat. Oct. 10; 1400 UTC-2200 UTC Sun. Oct. 11. SSB: Lower 25 kHz of General 15m, 20m, 40m, 80m phone bands and Novice portion of 10m. CW: lower 25 kHz of General 15m, 20m, 40m code bands and Novice portions of 10m and 80m. Visitors talk-in on 146.76- and 146.85-. Send QSL and SASE for QSL card, or QSL and $1 for flat, unfolded certificate to ***CC500 Committee, Nittany ARC, P.O. Box 614, State College PA 16804-0614***.

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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, Sue Colbert, 70 Rt. 202N, Peterborough NH 03458 and get set for the phone calls.

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Uncle Wayne's Bookshelf

REFERENCE

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20N102 **Practical Digital Electronics Handbook** *by Mike Tooley* contains nine digital test gear projects, CMOS, and TTL pinouts and tables or reference data. Introduces digital circuits, logic gates, bistables and timers, microprocessors, memory and input/output devices, before looking at the RS-232C interface and the IEEE-488 and IEEE-1000 microprocessors buses. 208 pp., 100 line drawings. **$14.50**

20N103 **Electronic Power Supply Handbook** *by Ian R. Sinclair* covers many types of supplies—batteries, simple AC supplies, switch mode supplies and inverters. All types of supplies used for electronics purposes are covered in detail, starting with cells and batteries and extending by way of rectified supplies and linear stabilizers to modern switch-mode systems, IC switch-mode regulators, DC-DC converters and inverters. 144 pp., 90 line drawings. **$16.25**

20N104 **Electronic Test Equipment Handbook** *by Steve Money* is a guide to electronic test equipment for the engineer, technician, student and home enthusiast. Provides a practical guide to widely used electronics instruments and the techniques of measuring a wide range of parameters in electronics systems. 216 pp., 123 line drawings. **$18.00**

20N105 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair*, what they do and how to use them. Seeks to establish a firm foundation in digital electronics by treating the topics of gates and flip-flops thoroughly and from the beginning. For the user who wants to design and troubleshoot digital circuitry with considerably more understanding of principles than the constructor, and who wants to know more than a few rules of thumb about digital circuits. 204 pp., 168 line drawings. **$18.00**

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9EI* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

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RANDOM OUTPUT

David Cassidy N1GPH

A few months ago, I wrote in this space that the debate over the codeless license was a moot point—that it had proved itself successful and a positive change for amateur radio. At that time, I said it was time to move on to other matters. It seems that I was wrong, and one more time I feel compelled to beat this dead horse.

I was checking messages on my local packet BBS the other day when I came across something that shocked and angered me (I wish I had made a copy of the message, so I could give it to you verbatim). The packet message told a story of an amateur radio club that restricted its members who were Technicians by not allowing them to use autopatch on the club's repeater and by not letting them vote in club elections. The writer wanted other people's opinions on whether or not this was legal.

While the policy of this club may be legal (after all, it is their equipment and organization, and they can do whatever they want), I don't think the legality of their actions is the point. The point (other than why anyone with an ounce of common sense would choose to associate with these self-inflated snobs) is what this group is saying about amateur radio. We are in a hobby that focuses on communications. So, what exactly is this club communicating?

"We think we are better than certain other amateurs."

"We don't care about the future of amateur radio."

"We are boring people, and we could care less about new ideas."

"We're not interested in helping newcomers to this hobby."

"If we don't already know you, stay off our repeater!"

Is this what we want? Is this the spirit of the Amateur Radio Service?

I have something I'd like to say to this club, its officers, and any other group or individual who thinks there is room for this kind of prejudice in amateur radio: We don't need you or your back-of-the-bus mentality. You are hurting amateur radio, and if you can't control your zealous hatred, please do us all a favor and crawl back under the rock from which you emerged. Face it. Amateur radio has a codeless license. Eventually, Morse code will be dropped from all license classes. So why don't you just leave now and let the rest of us work on the future of this hobby?

Phew! I feel a lot better.

If You're Not Part of the Solution . . .

The future of amateur radio is not tied up in whether you or I like or don't like having the Morse code as an element of amateur radio license testing. The future of amateur radio *is* very much tied up with whether or not we tolerate the kind of regressive, bigoted ignorance displayed by the ham club mentioned above. If we can't stop living in the past, which includes hanging on to a century-old communications mode as a licensing requirement, how are we going to help pioneer and popularize spread spectrum, digital voice and video, personal satellite communications, etc.?

Do not delude yourself into thinking that we can't help pioneer these technologies, because we *must*. If we do not find justification for the existence of an Amateur Radio Service by providing advances and testing new communications modes, there will no longer be an Amateur Radio Service. Our frequencies are too valuable (not just to U.S. companies, but to the world), and the old reasons for our existence are no longer valid.

If we are going to enter the 21st Century with anything even resembling amateur radio as we now know it, we have to look towards the future, and guard against the harmful and hurtful attitudes of clubs like the one I mentioned.

A Call to Action

First of all, if you are involved with a club like the one mentioned above, GET OUT! Why should you lend your support to a bunch of ignorant bigots? Stay off their repeater, too. Without a regular infusion of new blood, they will eventually wither up and blow away.

What do you do now? Get a couple of local hams together and start your own club. You don't have to have a fancy clubhouse and a club station and a repeater to start a club. Meet in a different member's home every month. Choose a relatively inactive repeater and make it your home base (that shouldn't be too tough, since *most* repeaters are inactive). Plan fun and interesting meetings and activities, and the local hams who really care about amateur radio will flock to join your club.

One final thing. I want to hear from you. *All* of you. I want to know if there are other clubs out there like the one described above. I especially want to hear from new Technicians. Are you experiencing the same thoughtless bigotry?

I want you to name names. I want to know the names of the clubs, and the names and callsigns of the club officers. Don't worry, I'll keep your name out of this. I'll check out any information I get, and if I find clubs like the one above—clubs that are determined to hurt amateur radio—I'll see that the names of the clubs, as well as the names of the club officers involved, get printed in *73* and *Radio Fun*. We can call it "The Amateur Radio Hall Of Shame."

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As I write this, June is coming to a close. You may recall in my June forecast the days of June 6th, 10th and 16th were "likely to be the focus of some extreme ionospheric upsets . . . and violent atmospheric storms around these dates." Well, we had the violent atmospheric storms all right, beginning on the 15th and extending to the 20th! A line of tornadoes extending from southwest to northeast marched across the U.S. and hit the states of Illinois, Michigan, Minnesota, Wisconsin and others, with much damage and even some fatalities. This period was considered by the National Weather Service to be the worst in many years. The bands weren't any too good, either, on the forecast "Poor" dates. On June 25th between 2100 and 2200 hours UTC, all the HF bands went "dead" from a major solar flare at 2042 hours, followed by a satellite proton event at 2045 hours. It takes a short while following eruption of a solar flare for the full effect to reach the earth and influence the ionosphere so drastically. The bands recovered gradually in about two hours and were in full service again on the 26th. It always seems that conditions turn from very poor to very good within a day of a major flare. The Earth's ionosphere is prodded into violent activity by the influx of particles from the sun . . . sometimes even for the better!

What about September—the subject of this report? You may expect similar effects of poor propagation and violent atmospheric and geophysical activity on the days surrounding the 10th, beginning as early as the 8th and possibly extending to the 12th. Early September until about the 15th is likely to show Fair to Poor to Very Poor conditions while the remainder of the month will probably exhibit Fair to Good to Very Good conditions.

September's autumnal equinox is a great time for DX to begin rolling in from all parts of the earth, and this month is likely to be no exception. Whereas the solar flux levels began going down abruptly in June, there is reason to believe that there will be a slight increase and consequent improvement of all HF band conditions from about September 15th to 30th. Magnetic field stability will increase, and the "A" and "K" indexes are likely to be low . . . all good signs for HF propagation. Although the bands *above*, say, 20 meters will begin closing at dusk and will not be open far into the night (except on Very Good days/nights) the bands *below* 20 meters, all the way down to 160 meters will improve greatly, and can afford all night DX from the USA to some part of the world or other. Short skip will also occur, but not as frequently as in midsummer. September marks the beginning of *excellent* fall conditions on the HF bands.

Please let me know through *73 Amateur Radio Today*, or directly, how these forecasts turn out for you. I am always interested in improving my "batting average" and need your input of comments, suggestions and ideas for this column. Thanks, and see you next month. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15*	20	20	20	—	—	—	—	—	—	—	15
ARGENTINA	15	15	20	20	40	—	—	10	—	—	10	1(
AUSTRALIA	10	15	20	20	—	40	20	20	—	—	—	1(
CANAL ZONE	15	40*	40*	40*	40*	—	20	10	10	10	10	1(
ENGLAND	20	40	40	40	—	—	20	10	10	10	15	2(
HAWAII	10	15	20	20	40*	40	20	20	—	—	—	1(
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	15*	20	20	20	—	—	—	—	—	—	—	15
MEXICO	15	40*	40*	40*	40*	—	20	10	10	10	10	1(
PHILIPPINES	—	—	20	20	—	—	20	15*	15*	—	—	—
PUERTO RICO	15	40*	40*	40*	40*	—	20	10	10	10	10	1(
SOUTH AFRICA	40*	20	20	20	—	—	—	—	10	10	10	1!
U.S.S.R.	—	40	20	20	20	—	—	10	10	15	20	2(
WEST COAST	10	15	20	20	30/40	30/40	—	—	—	10	10	1(

CENTRAL UNITED STATES TO:

ALASKA	10	15	20	20	20	—	—	—	—	—	—	—
ARGENTINA	15	15	20	20	20	—	—	10	—	—	10	1(
AUSTRALIA	10	15	15	20	20	40*	40	20	—	—	15	1(
CANAL ZONE	15	15	20	20	—	40	40	10	10	10	10	1(
ENGLAND	—	—	—	—	—	—	10	10	15	15	20	2(
HAWAII	15	15	20	20	40*	40*	40	20	—	—	10	1(
INDIA	—	20	—	—	—	—	—	20*	15	—	—	—
JAPAN	10	15	20	20	20	—	—	—	—	—	—	—
MEXICO	15	15	20	20	—	40	40	10	10	10	10	1(
PHILIPPINES	15	—	—	—	—	—	—	20	10	10	—	—
PUERTO RICO	15	15	20	20	—	40	40	10	10	10	10	1(
SOUTH AFRICA	20	20	20	—	—	—	—	—	10	10	15*	1
U.S.S.R.	—	—	20	—	—	—	20	15	15	15	20	2(

WESTERN UNITED STATES TO:

ALASKA	10	15*	—	20	20	20	20	20	20	20	—	1
ARGENTINA	10	15	15	20	20	20	—	—	10	—	10	1
AUSTRALIA	10	15*	15*	20*	20	20	40	—	—	—	—	1
CANAL ZONE	10	15	15	40/30	40/30	—	—	—	15*	10	10	1
ENGLAND	—	—	—	—	—	—	—	—	15	20	15	—
HAWAII	10	10	15	20	40*	40*	40	40	15	15	—	1
INDIA	—	20/30(1)	—	—	—	—	—	—	20/30(1)	15(1)	—	—
JAPAN	10	15*	—	20	20	20	20	20	20	20	—	1
MEXICO	10	15	15	40/30	40/30	—	—	—	15*	10	10	1
PHILIPPINES	10	10	—	—	—	—	—	—	20*	15	15	—
PUERTO RICO	10	15	15	40/30	40/30	—	—	—	15*	10	10	1
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	1
U.S.S.R.	—	—	—	20	20	—	—	—	15	15	20	2
EAST COAST	10	15	20	20	30/40	30/40	—	—	—	10	10	1

* Try next higher band (1) Difficult path

September 1992

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 F	3 F	4 F-G	5 G-F
6 F	7 F-P	8 P	9 VP	10 VP	11 VP	12 P
13 P-F	14 F	15 F	16 F-P	17 P	18 P	19 P-F
20 F-G	21 G	22 G-F	23 G-F	24 G	25 G	26 G
27 G	28 G	29 G	30 G			

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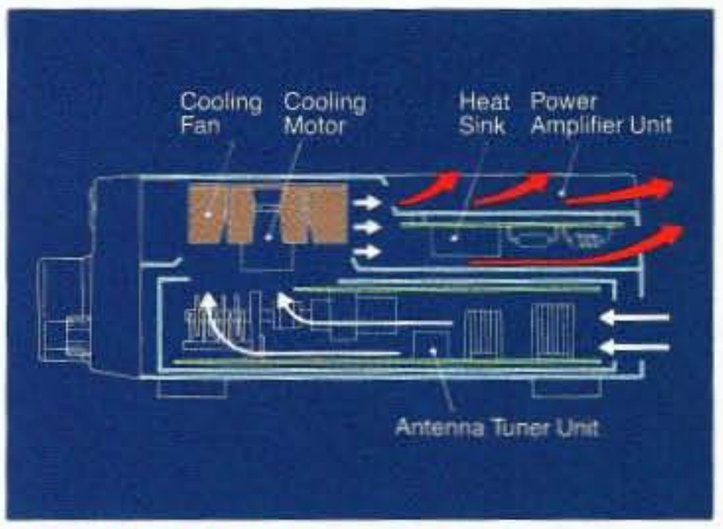
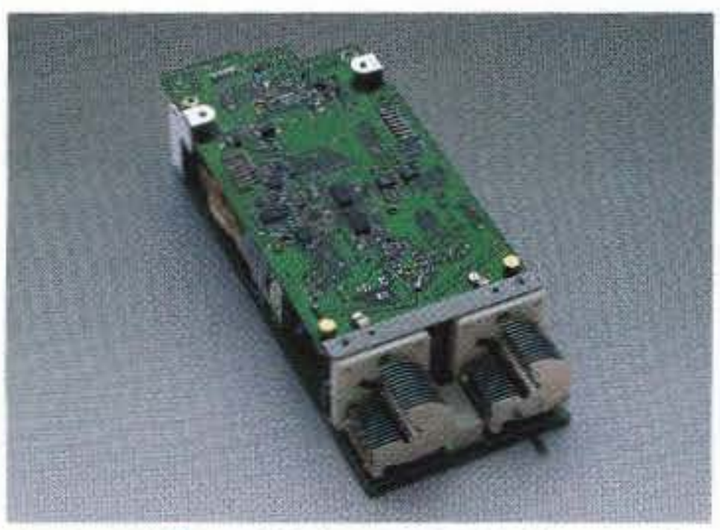
World's Smallest With Built-in Antenna Tuner

Rear Panel: Seldom used controls are located on rear panel allowing clean uncluttered front panel design.

Mobile Installation: The compact design and built-in antenna tuner makes the FT-890 a great mobile companion, using the optional mounting bracket kit (MMB-20).



DFCS (Duct Flow Cooling System): This unique system allows 100% duty cycle on FM and RTTY for up to 30 minutes of continuous transmission.



Antenna Tuner: High speed with 31 memories automatically stores most recent antenna matching settings for instant recall while changing operating frequencies.

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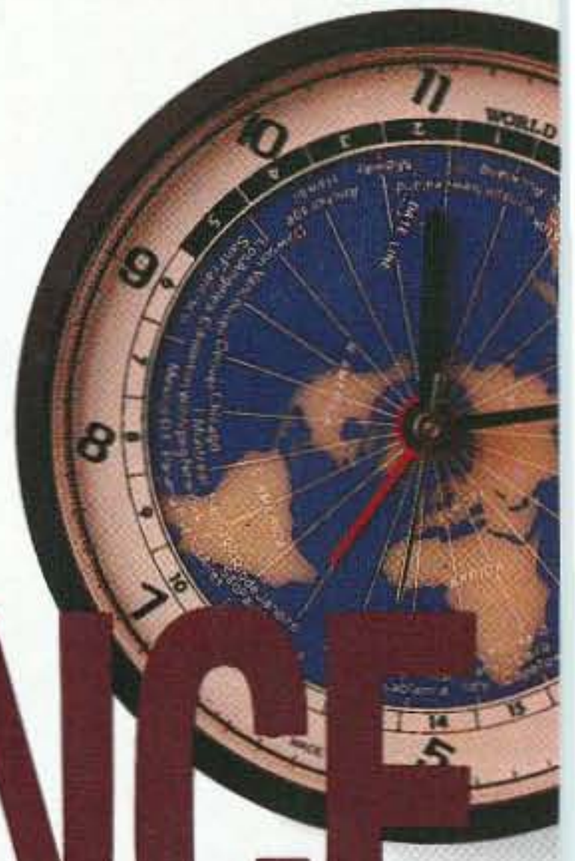
PEAK PERFORMANCE



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