73 Amateur Radio Today

JANUARY 1995
ISSUE # 412
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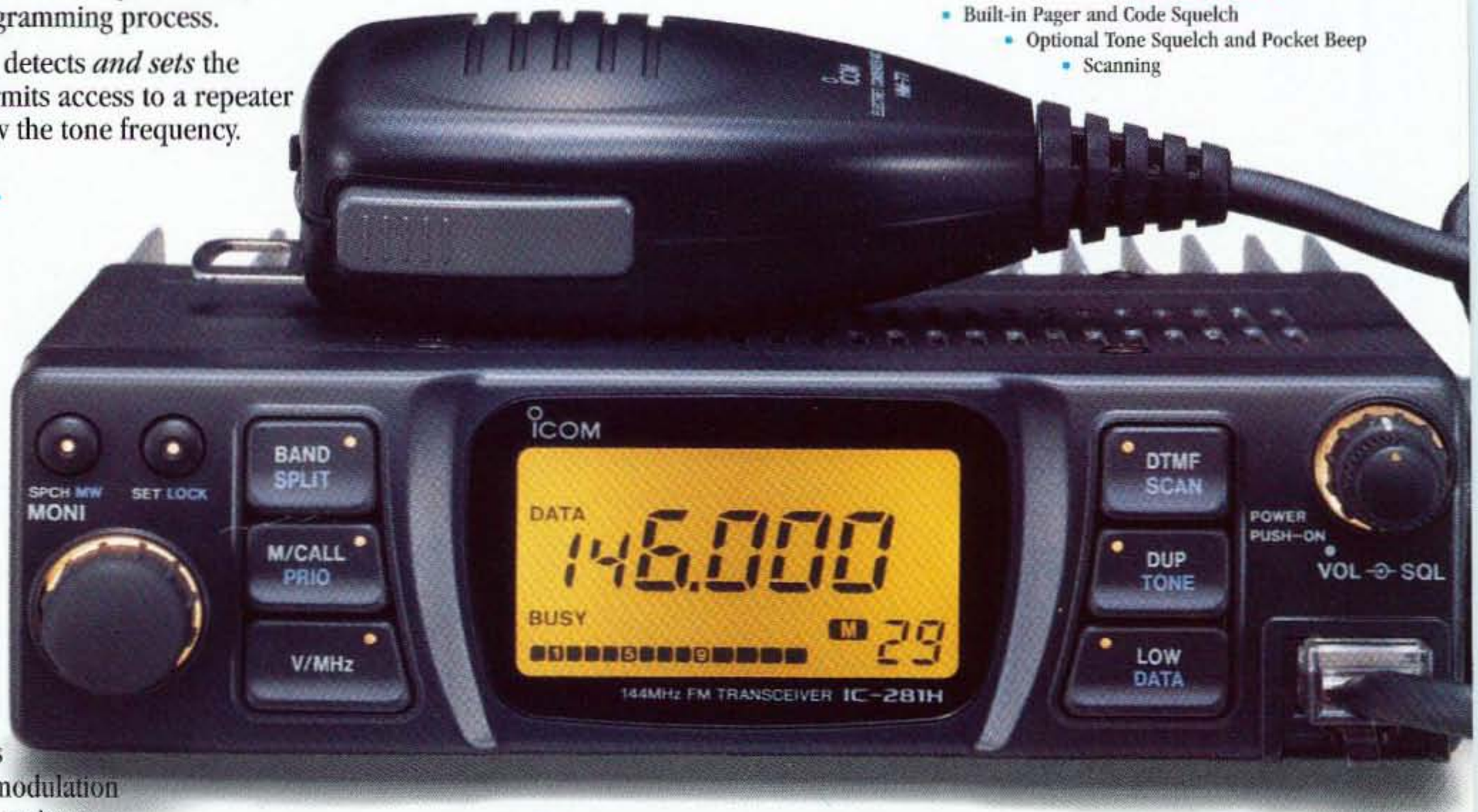

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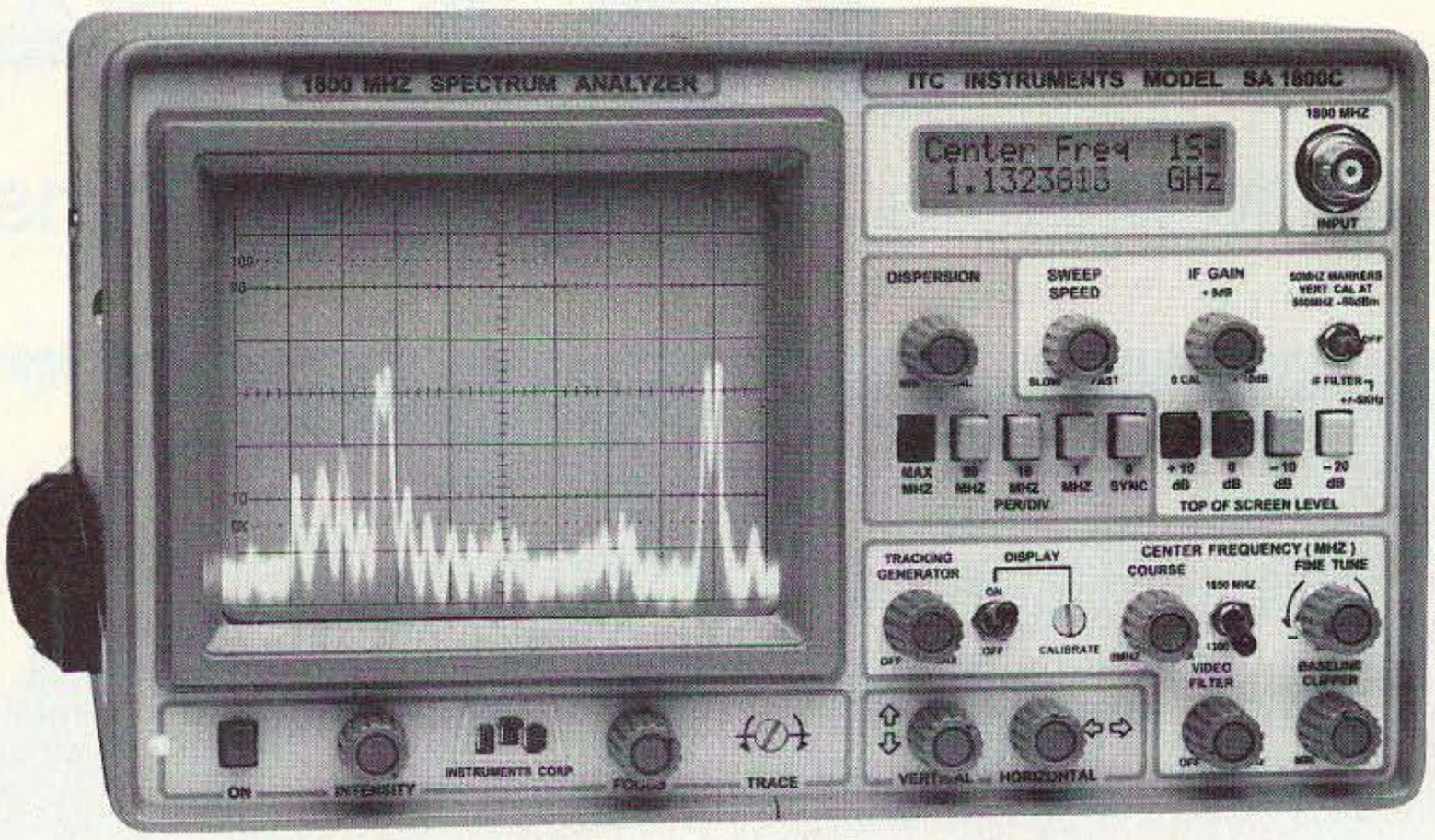

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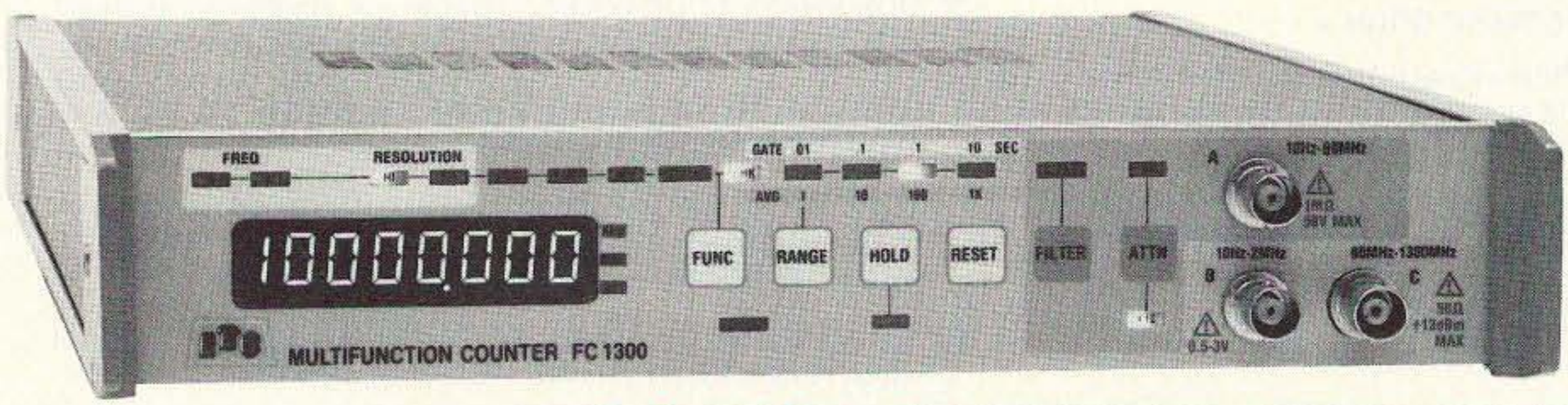

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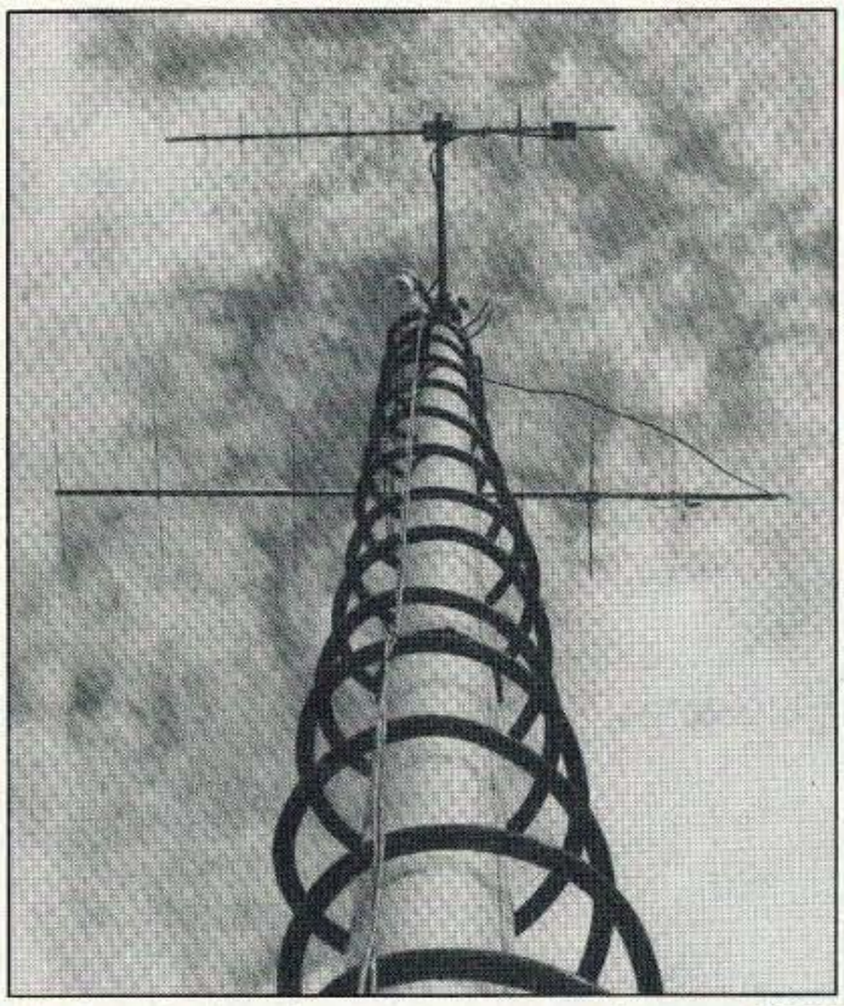

Here's a sky-view of an antenna setup at the recent AMSAT Symposium in Orlando. See "Hamsats" on page 42. (Photo by K1MON.)

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On the cover: Here is Bruce Lamb VE7IUQ operating ATV mobile on the Sonoran Desert. A one-year subscription/extension goes to Bruce in the 73 Photo Search.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1

I Need Your Help

The two things that readers enjoy reading the most in *73* are simple construction projects and new product reviews. Make that three things by adding antennas to the list.

Charlie Warrington says he's got a darned good review crew, but he can still use a couple more hams with good technical backgrounds and who enjoy writing to try out the latest in new equipment and give us reports to publish.

That's fine, but I'm even more interested in what *your* experience as an average ham is when you buy something new. The next time you buy some ham gear be sure to keep notes and send me a report telling me how it did for you. I'd love to try every new piece of equipment that comes out, but you know, when I had the time I didn't have the money. Now that I have the money, I haven't got the time. Phooey.

So I'm depending on you. One of the most fun aspects of hamming is buying something new and putting it on the air. It's a real challenge to put a solid signal on any band. It takes a good receiver, transmitter, amplifier, and antenna. Every antenna I've put up has a story in it. I'll never forget the two twin-three antennas I hung up at my fraternity house when I went back to college after WWII. They were bi-directional beams hung between the house and nearby trees, and they worked out like gangbusters. Wow, did they put out a signal! My signals were heard first and dropped out last due to their particularly low angle of radiation. They were by far the best antennas I've ever used on 20m, including some very expensive big beams.

I keep hoping you'll write and tell me what the most exciting thing is that you've done in amateur radio. I've been telling you about mine. Grab your word processor and send me a disk, okay? And don't forget to tell me what you like best about the rig you're using. Don't just sit there mumbling into your D-104, start writing.

Yes, I get a ton of mail. And I read it. No, I don't answer it all, and I don't want any nastygrams about my lack of courtesy in not answering. I write to well-known people all the time and rarely get an answer. Meanwhile I whup out at least a dozen letters a day.

Ho Ho Ho

Yes, kindly Santa, that cheap old codger will be around, nagging you to give presents in his name.Well, it is the time of year to remind friends that you haven't yet won that coveted *QST* Silent Key Award. You're probably expecting me to suggest you take care of this with 12 monthly reminders of your thoughtfulness, namely a gift subscription to *73*, right? Hmm, if I'd thought about it, that would have been my recommendation. I'd have mentioned that I have a choice for you, the el cheapo gift subscription, which is $19.95, or the deluxe gift subscription, which is $24.95. Your choice. They get the same magazine either way. This is just a test of how cheap you are. If you've read any of my travel booklets you know how thrifty I am. Thrifty, not cheap.

There's another gift you might consider for your ham friends. This is the first compact disc of ham music. Ham

music? The songs were written and sung by Andrew Huddleston and Lissa Ladefoged, OZ1ADL and OZ1XY, and they're good. Darned good! There's one on DXpeditions, another on Morse code, and the XYL's lament that he's "Always on the air." Andy says, "I'm not climbing up the tower any more!" There's one about "The Trip to Dayton," where Andrew and Lissa spent their honeymoon at the HamVention. And I loved "Rotuma Bound," another DXpedition song. The music varies from country to soft rock and it's great stuff. Give yourself one of these for Christmas, and then get some for friends. Ham friends, of course. But then, what else have you?

The CD title is "Seek You." They wanted to call it "CQ" but *CQ* magazine threatened to sue them, so they had to change it at the last minute. I wish they'd called it "73." Maybe their next CD will go that route. The disc is by Last Resort Records. You'll be able to buy it direct from Last Resort, or from Uncle Wayne's Bookshelf.

Now, let's get the CD and start sending the digital information on the CD over the air. Yes, it's legal to send music over the air . . . if you do it digitally.

Cold Fusion Update

The researchers in the field are making progress, but no one has yet made a stand-alone cold fusion power generator. My *"Cold Fusion"* magazine got off to a good start with a 100-page first issue, packed with information. The next two issues looked nice, but were short on real information. Frankly, I was disappointed in them content-wise. The third issue, while dreadfully short of new material, won the 1994 Ozzie for the best designed new technical magazine.

Between the weak second and third issues, plus a 90% shortfall on expected advertising and subscription revenues, I decided to to be practical and retrench to a less expensive newsletter format until the field starts to grow. This triggered the termination of my science-writer editor. However, a recent front-page article in *The Wall Street Journal* on the reality of cold fusion may help. As the new editor, I'm up to here in mu-mesons and various cold fusion theories. I've got a cracker-jack technical support team, which will help make up for my physicist weakness.

I really didn't need this aggravation at the same time as another financial crisis, but I'll have an interesting blow-by-blow story for you one of these days. I've sure found out who the people are who can be trusted when things get tough and who are ready to take every possible advantage.

The first newsletter format (which ran 32 pages) only triggered two requests for subscription refunds. Most of the mail was congratulatory on the improvement in material, plus the end of the previous editor's absorption with ridiculing the cold fusion foes and with articles about how wonderful the world powered by cold fusion is going to be. A little of that stuff goes a long way. Now we're concentrating on trying to figure out why researchers are getting all that anomalous power. If you're into physics or electro-chemistry, you'll enjoy the publication. But you'd better bone up on your quantum mechanics.

The 5th issue is a corker and more good material is coming in regularly, just as I expected. The original subscription price was $98 a year. I offered a special charter rate of $58 for the first four issues, but now it's back up to $98. For anyone interested in research every issue is worth more than that. If any *73* readers are interested, I'll continue the $58 subscription rate for you. Just menion Wayne's special offer.

There are two other newsletters in the cold fusion field, *Cold Fusion Facts,* which is quarterly, $46 a copy (12 pages) and $120 a year, and *Fusion Facts,* monthly, $30 a copy (24 pages) and $300 a year. At $98 per year and $10 a copy (32 pages for #4), *"Cold Fusion"* is a bargain.

A Quote from *Forbes*

In a *Forbes* column by Peter Huber last year he discussed the effect technology is having on us. For instance, when I was young we spent a lot of time in school on penmanship. Well, handwriting was how one communicated then. Typewriters were too expensive for most homes and typing wasn't taught in school. Once typewriters were cheaper, the need for good penmanship disappeared. So did good penmanship.

Spelling was a big deal when I went to school. Now it's handled by my word processor, which catches my errors. Peter suggested that before long making kids memorize all the irregular spelling rules will be like making radio engineers learn the Morse code. Heh.

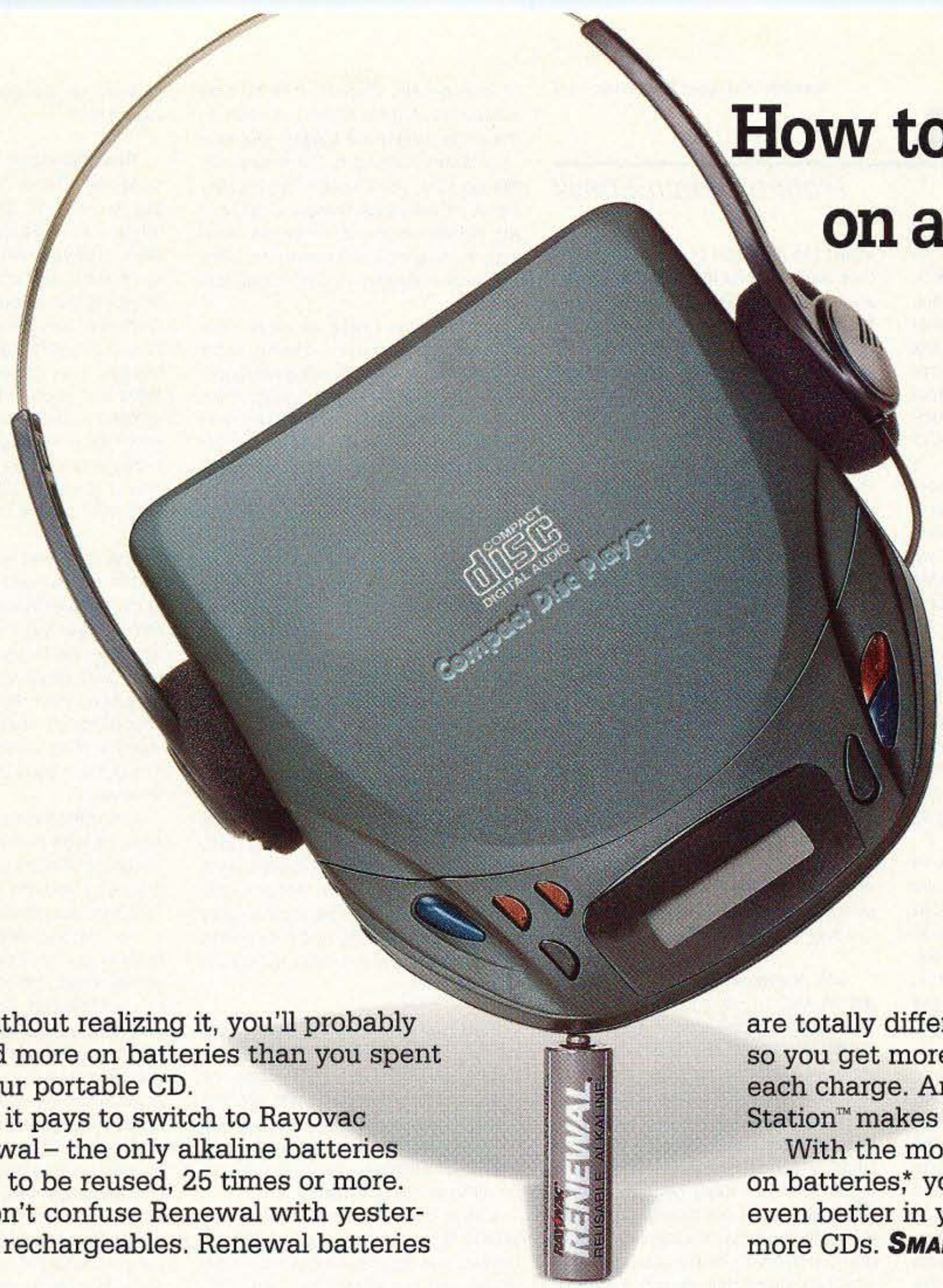
We'll soon have automatic language translation, and computers with voice input. Look where we are with bar-code and checkout counters which add up the items, calculate the change due, debit the store inventory, and presumably even automatically add in a few cents here and there to pad your bill and improve the store's profits. Fast-food cash registers have pictures now instead of numbers, which is handy since fewer and fewer kids are being taught how to make change, and many are reading-challenged.

There used to be a good reason for memorizing the multiplication tables. Now, with calculators cheaply available, that's almost as antiquated a need as learning the code.

If you're into video you can have a complete video production lab at home and do what used to take millions of dollars in equipment all by yourself. In audio, DAT recorders are under $1,000 and outperform a whole studio full of gear from a few years ago. Gas stations let you pump your own and pay with a credit card, with no attendant

Continued on page 74

How to save $150 on a CD player that costs $100.



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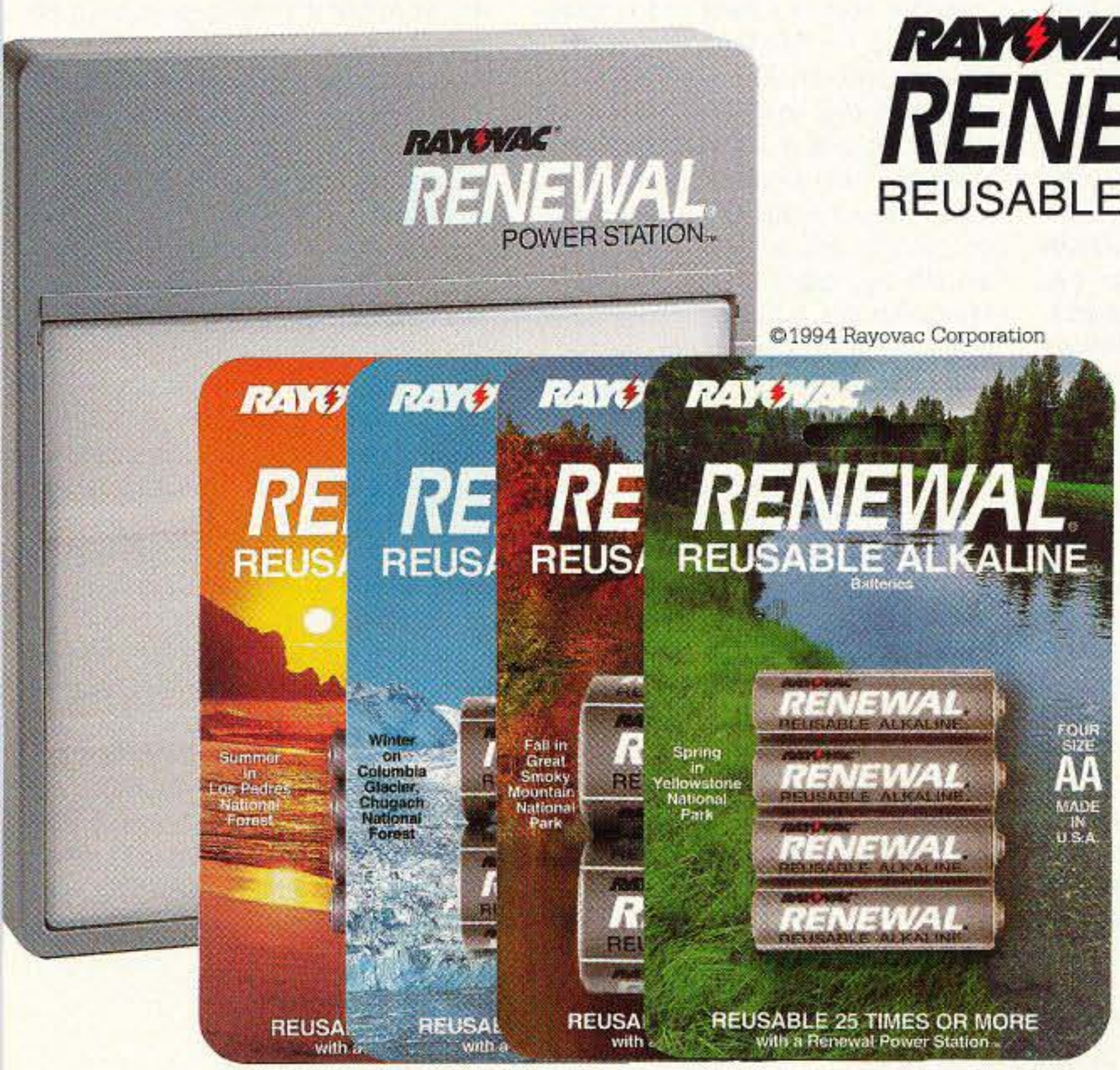

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LETTERS

Number 2 on your Feedback card

From the Ham Shack

Michael Farrar VE3WMF, Richmond Hill, Ontario, Canada Dennis D. Powers ("Letters," November 1994) and many others make the statement that the CW requirement somehow weeds out those who have not "demonstrated some commitment to both themselves and the hobby." Supposedly, this commitment through the knowledge of CW will maintain its high standards.

If this is the case, then Mr. Powers would explain to us why the HF bands are rampant with aggressive, ill-mannered and abusive behavior. Where we have interminable racist, sexist tirades by redneck ya-hoos who, no doubt, have mastered CW at the highest required speed, but have not mastered the requirement to ID at the end of each transmission or every 30 minutes. Standards? What standards? I'm a No-Code Tech (VE variety), and I think I have a very strong commitment to the hobby. I do not want to see it die or, in fact, commit suicide, which is what it is doing by clinging to CW.

The CW requirement is going to be the death of the hobby. As long as we are perceived as a bunch of "old geezers" we are going to continue to lose spectrum, and as long as we keep CW as a requirement, then we remain "old geezers." Eventually we might end up with only the 30 meter band (it is a CW band, so all will not be lost.)

Tom Ewing VR2GO/WH6GC, Hong Kong To whom it may concern: I was shopping for simplex repeaters over the last few days, when I called a North American distributor for information and availability on a particular unit. When this vendor asked where I was calling from, I told him Hong Kong, which brought laughter and disbelief from the vendor. "It's impossible . . . I can't hear the delay in the phone line." Well, sir, you were wrong, and by basically calling me a liar you have succeeded in losing a sale.

Vendors, please wake up and utilize some basic PR skills.

Ronald T. Cyre KE4QWP, Jacksonville FL Wayne, I believe we have seen the end of the free licenses for ham radio operators. The reason: money. There are only 400,000 hams. If they charged $10, the FCC would have 4 million more dollars than they have today. Licenses would be renewed every five years, not 10.

I am not opposed to the fee, if we get something for it. I figure we are going to lose more frequencies and parts of bands, and have more band sharing as the FCC gets money-hungry. Do not depend on our friends (fellow hams) in the FCC; they all have bosses who want to keep their jobs and their fiefdom of employees.

I believe that in this day and time the fee is justified. I would hope that you would see the value of a fee. But negotiate something for it; world frequencies will be changing. Our future is not in HF, but in UHF and above. I hope the CW guys can see the future. We need CW and do not want to lose it, but they are chipping away at our UHF and GHz areas. (From a new ham.)

Ron, the government doesn't work that way. You haven't been reading my editorials! Tsk. When the FCC levies license fees the money goes directly into the Treasury, not to the FCC. And every time there is a new source of money into the Treasury, Congress salivates and bargains among themselves as to who will get it for their local pork projects, with the old-timers being first on the pork list. The FCC won't even get a smell of the bacon or a taste of a pig's knuckle. The only way I can see for amateurs to "pay their dues" these days is to recruit a million or two young hams. This will (a) give us a stronger voice when Congress decides to sell off more frequencies, and (b) will generate enough high-tech career scientists, engineers and technicians to pay the rent . . . Wayne

Jim Kornacki KD4WYS, Jackson SC Wayne, let me introduce myself. I was born in Connecticut and raised by Mom W1UBM and Dad W1YOC. I still have both original parents (a rarity today). I moved to South Carolina in 1990 when I left the Navy after 10 years for a real life. Up until this time I had absolutely no interest in radio at all. Then one day I began to feel a little guilty about not having carried on the family tradition of wireless. A week later, thanks to the miracle of the No-Code Technician license, I did the folks proud. Then a really strange thing happened: I started to get into this radio stuff!

To make a long story short, I'm having a blast with the new-found hobby. I consider myself a Plus in the ham community, always wanting to try new things, and doing my best to tolerate the Minuses. In the past 18 months I've worked all states on 10 meters, upgraded to Advanced Class, worked stations via satellite, racked up a lot of DX, participated in contests, served on the Board of Directors of the local club, coordinated this year's Field Day effort, and volunteered my time to various community service events.

I've recently decided to try my hand at QRP operating. Why? Because it's something new, it's challenging, and it will get me away from all the Minuses who have staked out their territory on the SSB portions of the HF bands. I received a nice welcome to the 75 meter phone band when I tried to say "hi" on the local shoot-the-breeze frequency and all I got in reply was a "K4" making fun of my callsign. I've since done a lot of listening and it seems that "he who holds himself in the highest esteem" on the air is usually the biggest jerk who contributes nothing to the hobby. On the flip side, you couldn't find a better bunch of folks than those operating in the Novice portion of 10 meters. Anyway, imagine my joy at seeing the October issue dedicated to QRP. Good timing!

By the way, I read all three ham magazines because I like to know what's going on. They're all pretty good, and each has its strong points. I like your editorials ("Whadaya Read?" had me laughing out loud), and the article on building the simple 10 meter QRP rig was cool.

I'd like more help on building stuff because I'm not much of a builder. Seems like every time a hammy mag offers a simple project to the ignorant non-builder it's an antenna or some stupid gadget I would never use. Useful things, like radios, are fairly complicated and presented all at once. This tends to overwhelm and discourage me. Maybe you can take a "simple" rig and present it in smaller, easier-to-handle parts, with some explanation as to why this thing needs to be done instead of just "what to do." I remember hearing about a book that was written like that, where you built different components and they would all work together later on. There seems to be a giant gray area between learning all the electronic theory associated with radio and actually applying it.

Red Costlow W7GXR, Scottsdale AZ Wayne, I really enjoy *73*, mainly for the construction articles. Though my eyes are weak and my hands not that steady, it still makes me salivate to see the neat articles. I also enjoy your column. I don't always agree, but you sure do stimulate the gray matter.

I have been a ham since 1948 as WØQQM in Minneapolis, W8DNR in Dayton, and my present call here. I am retired and live in an apartment. The manager here is a ham and is letting me put up my R7. I am also laying a Delta Loop from *73* on the flat roof. I may have to go to QRP as some of the tenants here do not have cable and I know that I will probably get into some sets. I have a Heath SB 1400, an Alinco DR 110, and an MFJ-1278 TNC. I am still very green on the digital stuff. My computer is a 486 made up of scrounged boards and parts.

My pet peeve is the heavy emphasis on contesting. I have no argument on contests, as I used to be into that. What I do object to is that just about every weekend there is one that runs for the entire weekend. With the equipment we have today, automatic ID, etc., and scores of a billion, something is wrong. I would like to see some restrictions. Why not force all stations to operate QRP and find out what real contesting is all about? I know I am wasting my breath. I just want to get on and chew the fat. No, not about my rigs, etc., but about what my contact does, hobbies, books, music, photography, and on and on.

Keep up the good work and keep raising hell!

Russ Streeper WA4BWB, Lynchburg VA I have never written before but just had to drop you a note to tell you how much I enjoy *73* these days. I have been an on-again, off-again subscriber over the years, totally dropping out when your involvement declined, only to subscribe again a couple of years ago. I had been purchasing your magazine at the newsstand and realized that all of the good antenna projects and most of the useful information I was gathering about the hobby was coming out of *your* magazine. I therefore promptly subscribed with one of your multi-year incentive plans.

The thing that squeezed the trigger and made me write was your editorial in the October issue. As much as anything, I get your magazine for the access to the thought-provoking experience and perspective that you have developed over the years. Portions of your editorials have been used to advise my children and inspire my wife. The October issue is in a class by itself, however.

I don't think there is another editor in America who covers as much ground (recipes to ICs) as you in a fashion that is a joy to read and think about. Thanks for being much more than a "ham."

For my part (along with the other boys in our commercial radio shop), you do a great job of keeping us current on technical stuff, too. "Carr's Corner" is well-read here for the "street-wise" applications of the latest micro goodies. His columns, like *73* itself, show us how to put things into action.

Let me propose a thought: Ham radio is a valuable resource for children. My kids have packet friends in England and exchange messages and all kinds of information about our two cultures, governments, etc., as a direct result of my involvement in ham radio. It takes a willing ham at the other end of the mike (or key), but the effort can have a big payoff. I have had a few hams from other parts of the world stay in our house. It has been an enriching experience for all of my family. Kids learn about the reality of life in other parts of the world. You can't buy experience like that they get this way! It helps them in school in ways you wouldn't imagine. This type of ham experience lasts much longer than the joy of a new QSL card, in my opinion. Human experience is a valuable thing. Kids, as part of a ham family, have direct contact to this resource worldwide. This has been a great selling point in getting a SAREX program going with the local school system, in conjunction with Lynchburg Amateur Radio Club.

Wayne, you should get an "at-a-boy" award of some type for stimulating our interests. Really, people do read and enjoy your magazine. Some, like me, don't care for the politics of a hobby, but there is a lot to consider between the pages of *73*. Keep up the good work for a very long time. We'll be happily reading the results. 73

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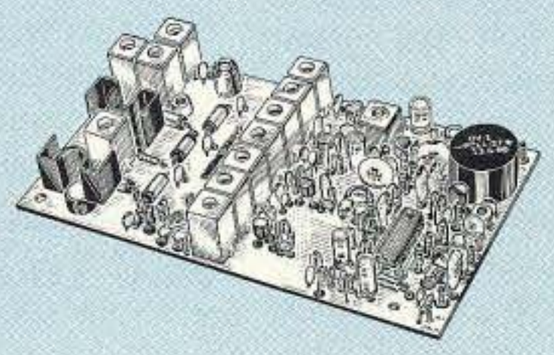

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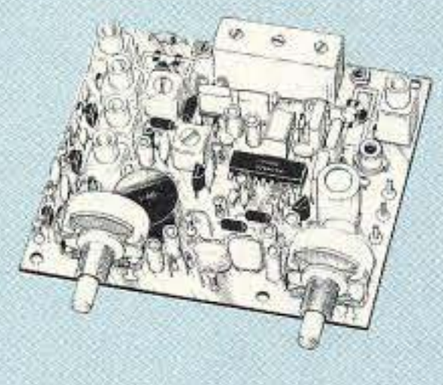

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COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier. .....kit $49

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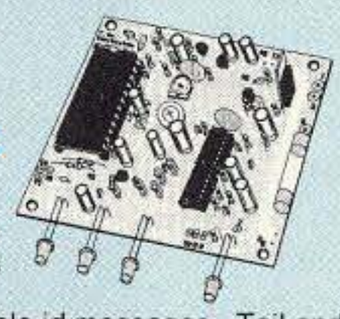
NEW

COR-6. COR & Real Voice ID on one board. Digital ic records up to 20 seconds of your voice.



Can record multiple id messages. Tail and time-out timers, courtesy beep, solid-state relay to key transmitter. kit $99, w&t $149

Versatile DVR-1 DIGITAL VOICE RECORDER Module. As a **voice ID'er for repeaters**, records your voice, using the built-in microphone or external mic. Just the thing for **fox hunt** xmtr id! May also be used as a **contest caller** to play back one or more messages through your transmitter at the press of a switch. Used as a **radio notepad,** it can record the audio output of a receiver — up to 20 sec. of anything you might want to recall later. Play back as often as you like through a small external speaker. Extensive manual tells how to use multiple messages and adapt to many applications.

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TD-4 SELECTIVE CALLING Module. Versatile dtmf controller with 1 latching output. Mutes speaker until someone calls by sending your 4-digit tt code. Or use it with a long tt zero digit to alert anyone in club. Also may be used to control autopatch or other single device. .....kit $49, w&t $79

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AP-3 AUTOPATCH. Use with TD-2 for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver .....kit $39

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LNG-(*)
ONLY $59
wired&tested

FEATURES:
- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
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**Specify tuning range: 26-30, 46-56, 137-152, 152-172, 210-230, 400-470, 800-960 MHz.*

LNW-(*) MINIATURE PREAMP
ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

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LNS-(*) IN-LINE PREAMP

ONLY $89 kit, $119 wired&tested

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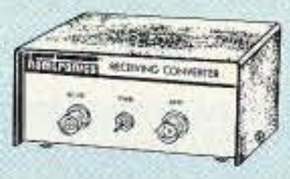
GaAs FET preamps with helical resonators **reduce intermod & cross-band interference** in critical applications.
MODEL HRG-(*), *$80 vhf, $110 uhf.*

**Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

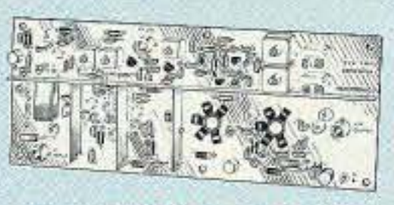
RECEIVING CONVERTERS

Low noise converters to receive vhf and uhf bands on a 10M receiver.



- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).
- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**

TRANSMITTING CONVERTERS



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

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Phase 3-D Project On Schedule

Members of AMSAT's Phase 3-D International Satellite Design Team met in Marburg, Germany, in mid-October for a "top-to-bottom" review of progress on ham radio's most advanced satellite. Dr. Karl Meinzer DJ5KQ and Werner Haas DJ5KQ hosted a series of detailed meetings on all systems and subsystems. During these discussions, team members bench-tested a number of flight hardware electronic items, and set the final operating frequencies for the spacrcraft's transmitters and receivers.

"It was a marathon session," said AMSAT's Dick Jansson WD4FAB upon returning to the US. Team members are now very confident that all key elements of the project are on schedule and that the spacecraft's integration in Florida can continue without interruption.

Phase 3-D is slated for launch in 1996. The sophisticated bird will weigh nearly 900 pounds at launch and, after reaching orbit, will unfurl a solar-panel wingspan of nearly 20 feet.

W2SKE Dead at 78

Bill Leonard W2SKE, a former president of CBS News, died at his Laurel Maryland home on October 23, at age 78. Leonard was an avid DXer and contester in the '60s and '70s and became a well-known spokesman for amateur radio. As President of CBS News, Leonard was credited with the selection of Dan Rather as Evening News anchor, as a member of the team that developed 60 Minutes, and for development of techniques

Photo A. QCWA Hall of Famer Leo Meyerson WØGFQ at the Western Heritage Museum in Omaha, NB. (Photo by Jim Musgrove K5BZH.)

which help to predict the outcomes of elections.

During a 1981 interview, Leonard predicted that computers would become more a part of ham radio. He added, "My bet is that ham radio, in one form or another, will be around 100 years from now." *TNX Mohawk Amateur Radio Club, Inc. M.A.R.C. News, November, 1994; ARRL.*

Broadcast FAX

According to Electronic Engineering Times, NBC has formed a data network to broadcast information over the air in the VBI (vertical blanking interval) portion of the network's television-broadcast signal. The first commercial offering will be a facsimile service in cooperation with a London-based firm.

The encrypted addressable FAX will send to specially-equipped computers and FAX machines. One purpose will be to send company information to employees who work at their own homes. Similar technology has been used for years to deliver closed captioning data in the VBI. *TNX Electronic Engineering Times, November 14, 1994.*

WØGFQ in QCWA Hall of Fame

Leo Intone Meyerson WØGFQ was inducted into the Quarter Century Wireless Association's Hall of Fame at the 1994 National Convention. Meyerson has been an avid operator and promoter of ham radio since he received his first license in 1928.

Meyerson founded several amateur radio related companies, including Wholesale Radio Laboratories in 1935, and Galaxy Electronics in 1962. Active in public service, Meyerson has also been a key figure in disaster relief efforts. *TNX Jim Musgrove K5BZH.*

New Paging Licenses

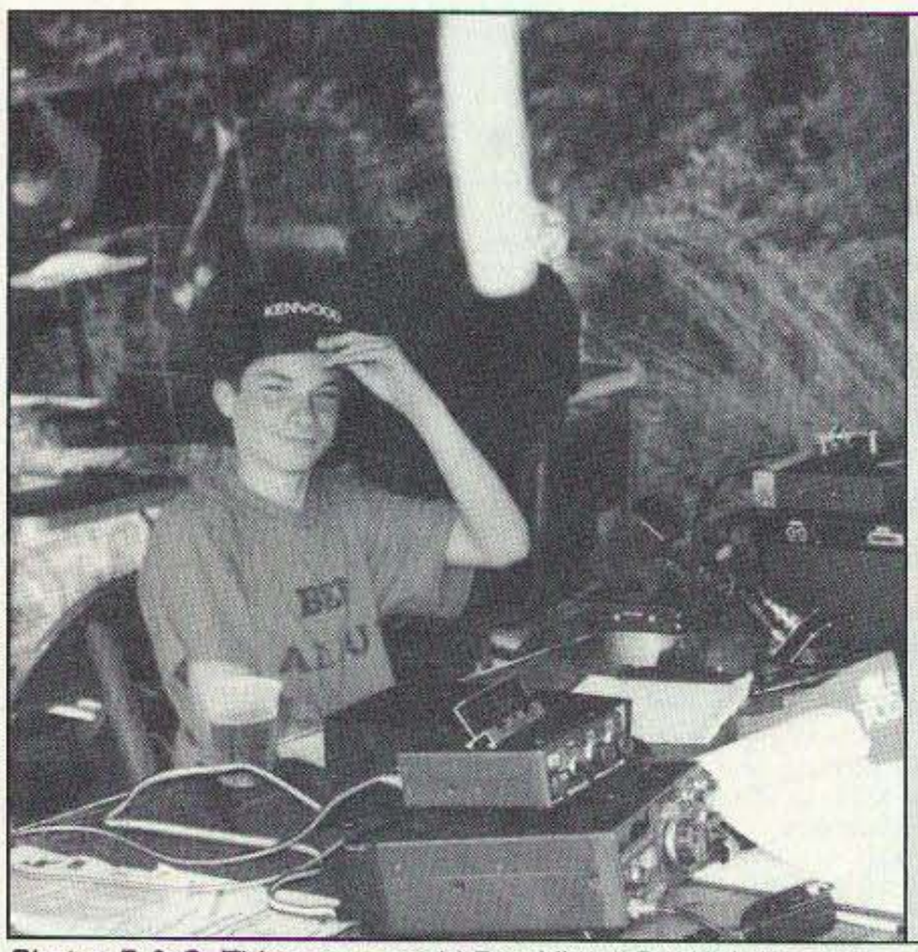
According to an article in Electronic Engineering Times, The Federal Communications Commission's auction of 30 regional licenses for advanced paging services has been completed, with bids totaling some $489 million. The government expects to net $394 million.

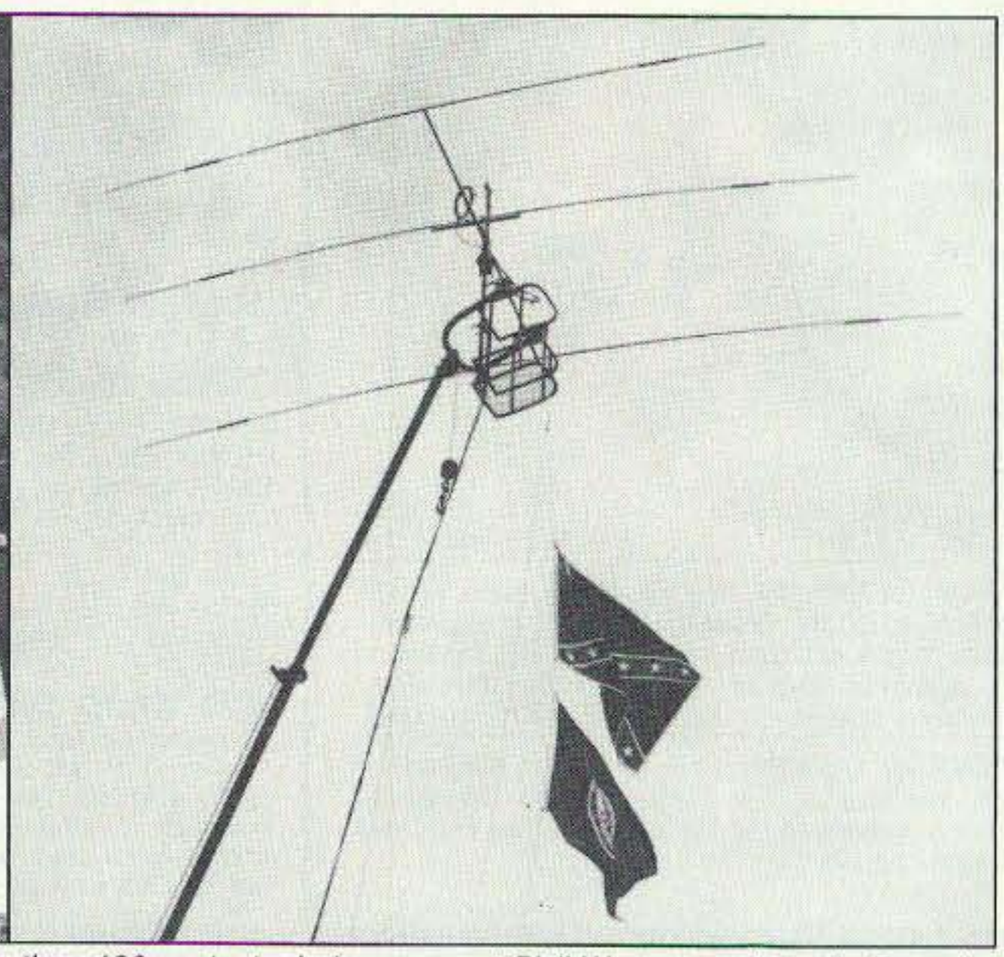
Six licenses were issues in each of five regions from the narrowband wireless auctions. Each region will soon have two licensees ready to deliver two-way voice-quality communications and four others equipped for two-way paging. *TNX Electronic Engineering Times, November 14, 1994.*

FCC To Expand AM Band

The Federal Communications Commission is in the process of expanding the AM broadcast band to incorporate spectrum between 1605 and 1705 KHz. The commission has determined that by expanding the AM band, interference would be reduced and overall quality would improve in the existing 535 to 1605 KHz band.

Eighty AM stations have been identified as being qualified to apply to migrate to one of the 10 new frequencies. Travelers' information stations broadcasting traffic and road conditions at 1610 KHz would remain protected. *TNX W5YI Report, November 1, 1994.* 73





Photos B & C. Thirteen-year-old Ben Vlug AD4UR logged more than 100 contacts during a recent Civil War reenactment in Roanoke County, Virginia. The Extra Class ham is a member of the Roanoke Valley Amateur Radio Club, sponsor of this special events station. A 24-thousand-pound Kinsey sign crane lumbered into Green Hill Park to set-up this tribander beam some 75 feet in the air. The Battle of Hunter's Raid was revisited, while 43 states and more than 500 contacts were made. TNX Mark Green KE4FPL.

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73 Review

Number 4 on your Feedback card

by Arnie Johnson N1BAC

The Yaesu FT-840 HF Transceiver

Enjoy a simple-to-operate full-featured HF rig.

Yaesu U.S.A.
17210 Edwards Rd.
Cerritos CA 90701
Telephone: (310) 404-2700
Price Class: $1,099

As we all probably know by now, there are hams who want all the push-buttons, lights, and knobs they can get, and there are those who are intimidated by all those controls and lights. For those of you who are among the intimidated, I've found a great rig for you. I had a chance to play with a radio that is very straightforward and easy to use, and offers nine bands and a general coverage receiver: the Yaesu FT-840 HF transceiver.

Now, don't get me wrong—just because a radio doesn't have a bunch of buttons to insert the frequency and bands doesn't mean that it isn't capable of frequency memorization and interfacing with a computer. This radio performs a lot of great functions.

The package as it came to me consisted of three boxes; the FT-840 HF transceiver, the optional FP-800 power supply/speaker, and the FC-10 automatic antenna tuner. All were well-packaged, and the contents were well-protected. Hooking everything up was very straightforward.

The Front Panel

I was very happy to see that the FT-840 is a somewhat small radio, approximately 4" (H) x 9-1/4" (W) x 12" (D), counting connectors, and very easy to put in your car without asking your wife or friends to sit in the back seat while you put the radio in the front. The front of the radio is not very imposing, just straightforward: 28 well-labeled buttons, seven knobs, frequency/mode read-out, an S/PO/ALC meter, mike connector and 'phones jack. The first group of buttons on the left side of the panel control power, meter choice (PO or ALC), MOX (manual transmitter activation), attenuation, mike processor, AGC, noise blanker, SSB, CW, AM, FM, and frequency lock. Others on the right side control functions of the A & B VFOs and memories, split, tuning speed, choice of ham/general receive, and changing of bands. The last button group manages the automatic antenna tuner (if used), memory choice, scanning, and clarifier on/off.

Centered under the large, well-lit and easy-to-read frequency/mode read-out is the main tuning knob which has a very nice touch of movement. Knobs on the left are inner/outer knobs for microphone input level for SSB & AM transmission and RF power output in all modes. The other inner/outer knob set is AF, which adjusts the volume of the receiver, and Squelch, which sets the signal threshold at which the receiver audio is muted in all modes. The last two knobs, on the right, control the Clarifier offset frequency up to +/- 1.25 kHz, or optional 2.5 kHz, and the IF passband center frequency from the displayed frequency in modes other than AM and FM.

All the controls are well-labeled and easy to see. The large read-out shows the receive/transmit frequency, modes, memory channel used and whether you have tuned off that frequency, antenna tuner operation and high SWR, clarifier use, scanning selected, FM +/- offset and CTCSS tone use, frequency lock in use, fast tuning, VFO choice, general coverage receiver in use, split frequency selected, squelch open, and transmitter in operation.

The Back Panel

But there's more to a radio than just the front panel. The radio can't do much for you unless the signal can make it out to the antenna. Turning the radio around to hook up the antenna provides a view of the some of the rest of the controls/connections that continue to make this radio what it is.

There are only three set-and-forget controls on the back: speech processor compression, CW semi-break-in timing control, and CW sidetone level. Also on the back are connectors for antenna coax, the power connector, 200mA/13.5 VDC output, CW keyer, constant-level receiver audio output for use with a packet TNC or other terminal unit, external ALC, external Push-To-Talk, external speaker, a 6-pin mini DIN input/output jack for external computer control, a 5-pin mini DIN jack for the FC-800 external automatic antenna tuner, a 8-pin mini DIN jack for the FC-10 external automatic antenna tuner, and an 8-pin jack to output control signals for the FL-7000 linear or FC-1000 ATU.

One more feature that needs to be mentioned is the grill on the back, which hides the internal thermally-switched fan that allows full transmitter output without any rear panel protrusions.

Hookup

Hookup is very straightforward. The MH-1 B8 hand-held microphone, providing up/down frequency changes and speed of changes, connects easily to the front panel. The frequency change buttons on the mike can also be used to start and stop receiver scanning. The radio comes with a double-fused DC cable and plug to hook to your own 13.5-V DC power supply or automobile electrical system, but I used the provided FP-800 power supply/speaker.

Lastly, I hooked up the FC-10 Full Automatic Antenna Tuner. Again very easy: Hook your antenna coax to the ANT connector, the coax jumper between the TRANSMITTER

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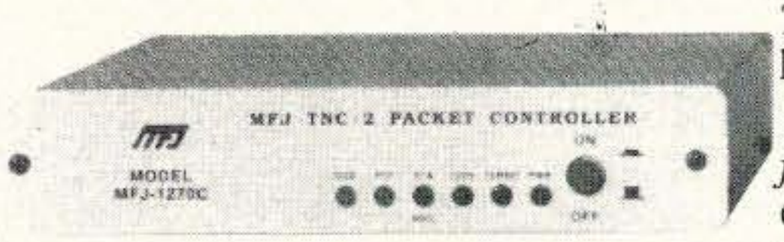

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connector and the radio connector, and the controller cable from the CONTROL connector to the 8-pin DIN jack labeled TUNER 2 (for the FC-10 tuner) on the back of the radio. Don't force the connectors—make sure that the pins line up before inserting and that you are inserting the 8-pin male connector into the 8-pin female receptacle, not the 5-pin labeled TUNER 1 (for the FC-800 tuner).

General Description

Yaesu developed the FT-840 to be a high-performance transceiver that provides up to 100 watts transmitter output power on all HF amateur radio bands in CW, SSB, and FM modes, and up to 25 watts carrier in AM. The receiver tunes all frequencies between 100 kHz and 30 MHz in 10-Hz steps.

Modular circuit design employs surface-mount components on composite epoxy boards for high reliability and serviceability. Twin direct-digital synthesizers and a magnetic rotary encoder provide silent, silky-smooth tuning. Frequency accuracy and stability are assured by driving both synthesizers from a single master oscillator, and the optional TCXO-4 temperature-compensated crystal oscillator is available for enhanced +/- 2ppm stability from 0-50° C.

The FT-840 features a low-noise, high-performance receiver front end. Interference rejection is facilitated by the unique "up-down" conversion scheme, and includes an IF shift circuit. The optional YF-112C crystal filter can be installed to provide enhanced CW reception, and an AM-wide filter is also available for greater fidelity during broadcast reception.

A 16-bit microprocessor in the FT-840 is programmed to provide the simplest possible control interface for the operator. Two independent (A/B) VFOs for each band (20 total) hold their own frequencies and mode settings. One-hundred memories store all of this data for both VFOs, giving a total of 220 independent sets of frequency, mode, and other selections. Flexible scanning features allow all 100 memories, or only those selected to be freely-tuned and scanned. Group scanning allows you to organize your memories into 10 groups, and only scan channels within a selected group. In addition, 10 special memories also let you limit the tuning/scanning range between their stored frequencies. Scan resume is selectable between timed or carrier-delay, and scanning speed is also adjustable.

Operation

Well, as it is said, "the proof is in the pudding." How does it play? The tutorial suggests that you check the following switches and knob positions before any hookups: POWER & MOX switches off; MIC, RF PWR, SQL all ccw (minimum); AF 10 o'clock; CLAR off; SHIFT 12 o'clock. After hooking it all up, it is very easy to operate. When using a power supply, Yaesu suggests turning the power supply on first, then the transceiver, to avoid having voltage spikes damage the radio.

Power switch ON, display lights on, no smoke! That always makes me feel good. Normal hiss from the speaker. I started tuning around; nice feel to the tuning knob. Good signals coming from the speaker; nice audio quality.

Specifications

General
Receiving frequency range: 100 kHz-30 MHz
Transmitting frequency ranges: 160-10 meter amateur bands
Frequency stability: +/-10 ppm (or +/- 500 Hz FM), from 0-4°C and +/-2ppm (or +/- 300 Hz FM), from 0-50°C (w/TCXO-4 option)
Emission modes: USB, LSB (J3E), CW (A1A), AM (A3E), FM (F3E)
Frequency tuning steps: 10 Hz/100 Hz (CW, SSB); 100 Hz/1 kHz (AM,FM)
Antenna impedance: 50 ohm nominal
Operating temp. range: -10 - +50°C
Supply voltage: 13.5 VDC +/- 10% negative ground
Power consumption (approx.): 1.2A rx (no signal); 20A tx (100 watts)
Dimensions (WHD): 238 x 93 x 243mm
Weight (approx.): 4.5 kg

Transmitter
Power output: Adjustable up to 100 watts (25 watts AM carrier)
Modulation types: SSB—balanced, filtered carrier; AM—low-level (early stage); FM—variable reactance
Maximum FM deviation: +/- 2.5 kHz
Harmonic radiation: Greater than 50 dB below peak output; 45 dB (10, 18 MHz)
Spurious radiation: Greater than 40 dB below peak output
SSB carrier suppression: Greater than 40 dB below peak output
Undesired sideband suppression: At least 50 dB below peak output at 1.5 kHz modulation
Audio response (SSB): Not more than -6 dB from 400-2600 Hz
3rd-order IMD: -25 dB @ 100 watts PEP, 14.2 MHz
Microphone impedance: 500-600 ohms

Receiver
Circuit type: Dual-conversion superheterodyne
Intermediate frequencies: 1st—47.055 MHz; 2nd—8.215 MHz; 3rd—455 kHz (FM)

Sensitivity:

Freq/Mode	150-250 kHz	250-500 kHz	0.5-1.8 MHz	1.8-30 MHz
SSB,CW (2.4 kHz)	Less than 5 µV	Less than 2 µV	Less than 1 µV	Less than 0.25 µV
AM (6kHz)	Less than 40 µV	Less than 16 µV	Less than 8 µV	Less than 1 µV
FM (28MHz-30MHz)(8kHz)	——	——	——	Less than 0.5 µV

Selectivity:		
Modes	Min 6dB BW	Max 60dB BW
CW narrow (optional)	500 Hz	1.8 kHz
SSB, CW, AM narrow	2.2 kHz	5.0 kHz
AM-wide (optional)	6 kHz	14 kHz (-50 dB)
FM (optional)	8 kHz	19 kHz

Squelch sensitivity 1.8-30 MHz (CW, SSB, AM)L Less than 2.0 µV 28-30 MHz (FM) Less than 0.32 µV
IF rejection (1.8-30 MHz) 60 dB or better
Image rejection (1.8-30 MHz) 70 dB or better
IF shift range +/- 1.2 kHz
Clarifier tuning range/steps +/- 1.25 kHz/20 Hz; +/- 2.50 kHz/10 Hz
Maximum audio power output At least 1.5 watts into 4 ohms with less than 10% THD
Audio output impedance 4-8 ohms

One of the first things I decided to do was see how the automatic antenna tuner would work. I selected TUNER and the TUNER logo came on the display panel. Now what? I keyed the mike and saw TX and WAIT (under the TUNER logo). I correctly assumed that this meant that I shouldn't do anything until the tuner did its thing. I assumed that to tune I should hit the button marked START. I glanced at the Operating Manual just to make sure. Yep! I then watched the Power Out indicator fluctuate up and down as the tuner worked and the transmitter dropped out, showing completion. I later inserted a two-needle SWR meter between the transceiver and tuner to watch the show. Quite interesting.

After using the tuner once on a band, it recalls previous settings from memory (the tuner has 31 of its own) during reception, whenever you tune to the same part of the band again. It's fun to watch the WAIT light flash on as you tune through a band (only with TUNER selected). It even does a great job on 160 meters which some other manufacturers' tuners do not. I did find that the tuner didn't reach proper tune on some frequencies using my 160 meter dipole, but could reach the tune if I worked my way up or down to the frequency, starting at a point where it would tune. No big deal, just some extra time involved.

I then tuned around and responded to several CQs. The reports of transmitter audio quality were quite good; processor audio just increased the "punch" a bit. While playing with the hand-microphone, I noticed a switch on the back labeled TONE - 1 or 2. Changing the selection changed the tonal quality of my voice. Setting 2 suppressed the low frequencies in my voice. I left it in a position (1) that reports said was best for my voice. I also played with the DWN and UP scan buttons on the mike, and checked how FST affected the scan rate.

Next chore, make some memories. Is it easy or do I have to read the manual? Select an unused memory channel with the MEM DOWN/UP buttons, select your frequency, press the VFO>M button for 1/2 second (hear 2 beeps), and it's done! Is that easy or what?

I must also say something about the well-written Operating Manual. From what I can see, it has left nothing out and is not too technical. One thing that I really liked was at the start of the Operation Section. It began with a tutorial: step-by-step samples of what you can do to get started and become familiar with the equipment.

The rest of the time operating with the FT-840 was spent playing with all the knobs and buttons. No surprises! It made many contacts during its time with me and never caused any problems. I'm going to hate giving this one back! A rig like this could keep me happy for many years to come.

If you are looking for a small, quality, well-featured, all-band HF transceiver that is easy to operate, the Yaesu FT-840 HF transceiver could be a good choice for you. 73

Optional Accessories

- Two external automatic antenna tuners: the FC-10, styled to match the size and appearance of the FT-840 in the shack; and the FC-800, which can be mounted outside at the antenna feedpoint or in the trunk of your car;
- The FP-800 AC power supply with loudspeaker;
- The SP-6 external loudspeaker with audio filters and the optional LL-5 phone patch;
- The MMB-20 mobile mounting bracket;
- The YH-77ST headset;
- The FM unit—747 narrowband FM reception and transmission;
- The FIF-232 CAT system interface to convert the TTL levels required by the transceiver to the RS-232C levels required by the serial port of a computer;
- The MD-1C8 desktop and MH-1B8 hand microphone;
- IF crystal filters for CW and improved AM reception.

The Pyramid Antenna

Harness the power of this 10 meter workhorse.

by Dave Brown W9CGI

Do you believe in "pyramid power"? I do. But not the kind where you have to sit under a pyramid, or put things under it. In fact, I would not even recommend that in this case, as the effects of RFI on the human brain are just beginning to be understood. It is best and safest, therefore, to *not* sit under or to close to *any* antenna. The pyramid I am about to tell you about grew out of my continuing experiments with all types of antennas.

I became a ham originally because I found antennas, and that invisible link or transfer of power from a physical object to thin air, absolutely fascinating. I think you will find this antenna, the "Pyramid," interesting in construction and concept, easy to build, and quite rugged. That last part always has been interesting to me, as when I do build a winner from a performance basis I hate to be repairing it all the time—instead of *using* it on the air! This one, like a bridge, has inherent structural ruggedness.

Why a Pyramid?

That's a fair question, considering I have never seen anything that looks quite like my antenna. The design sort of evolved from trying to get an idea from paper to the sky. That is true of many antennas I have used over the years, and I'll own up to the fact I am not an antenna engineer by trade. I get antennas that work, and work well thank you very much, quite like Edison got inventions. I derive concepts from others' ideas and articles to be sure, and often times an antenna like this one truly is revolution by evolution. I started off by wanting to try the extended ideas of the bi-square, or extended dipole. This is nothing more than a regular dipole with an extra 1/2 wavelength added to the driven side of it. I learned years ago when I first used it that PVC tubing is the way to go whenever possible to do the "plumbing" (forgive the pun) on any of my antenna projects. It is strong, easy to cut, and many of the joiners you require for a particular configuration already exist as the 45 degree ELL, the 90 degree elbow, and of course the TEE. The mechanical construction of the Pyramid is nothing more than the proper collection of these with the correct lengths of 1/2" PVC tubing. A word of warning to those of you who do not do any amateur home plumbing or repairs: All plumbing items and pipe refer to flow, and therefore to *inside* diameters. Electrical conduit, on the other hand, is measured by *outside* diameter. This can be a great convenience when intermixing the two for antenna projects, but can be quite confusing to someone trying all this for the first time. The 1/2" tubing used to build the Pyramid is actually nearer to 7/8" *outside* diameter.

When you are trying to visualize my antenna, I'm sure that it might help you see something just a bit bigger, and stronger, than the 1/2" implies. To further explain why this Pyramid, like all Pyramids, is a joining of several triangles along their sides: It has long been known in the structural trades that the triangle is the *strongest* natural shape known to man. Thus, when you unite several of them, as in the side rails of older bridges you still see, you end up with a very strong truss or support.

There was one caveat I learned after the first attempt to build a 10 meter version of the Pyramid: The heat of summer *does* cause PVC, a plastic, to sag somewhat. Not wanting to find out the hard way how far the sag would go before breakage would result, I built the first version of the 10 meter Pyramid with a few more webs for the spiders to walk on and the birds to try to avoid. On the backside, as you will see, this also led to a very convenient place to run a nice centered feed down to the reflector element and keep the electrical construction well balanced side-to-side. The use of tubing at the corners nicely takes care of a place to run the feed for the driven element as well. Consider if I had merely run the feed down the center tubing at the front, and done the reflector "feed" down the center back to a normal reflector element—voilà—a standard 2 element yagi beam. Admittedly it would look different, but that is all it would be.

Bend Here—Tuck There

Bending the driven element as I did into the Pyramid was for two reasons. The first was the simple fact that if you do not do so, even on 10 meters, you would wind up with the bi-square about 33 feet long. That puts you out of the VHF "plumbing" league, and right back to unwieldy and usually unsteerable wire antennas. My Pyramid had to "steer" like a yagi, but beat it in performance. After all, it was my newfound and totally accidental love for QRP on 10 meters that led to the Pyramid in the first place. "Folding in" the ends of the bi-square allows the width to become about 16-1/2 feet, and back to what I consider manageable yagi-type antenna sizes. The electrical reason to bend the ends in did not come to mind until I began a rather vigorous evaluation of the antenna against my usual 10 meter antenna (a three-element home-brew yagi), and a reference dipole also made up into PVC for strength and weathering. Just as any other time you bend/fold an antenna element, both the feed impedance and the pattern of radiation are going to change. When you start bending things around in an intentional manner as I did, you can only hope the other changes are going to be ones that are favorable. I'm happy to report these certainly were very favorable. Bending cut the apparent beamwidth by about half as compared to the bi-square out straight, and to about a third as compared to my dipole! Now that does *not* make it like the razor-sharp VHF/UHF antennas I have built, but it sure puts a lot of gain in the direction you want it to go. It makes an ideal contest antenna for me, as the apparent beamwidth of about 20 to 25 degrees at the major lobe, and no nasty minor lobes, lets me put everything "on-target," and still not be so narrow as to miss half the fun going on. This 5-watt fetish I seem to have caught only since getting the use of 10 meters (I was a 30-year Tech licensee, with absolutely no interest in the other HF nonsense and quibbling), and needing an antenna like the Pyramid to make up mostly for the other guy's killer-watts. On a quiet band devoid of the horsepower hogs, I managed even before the Pyramid to get my WAC in a month, the 1,000 mile-per-watt club in two months (Paraguay, S.A. with 100 mW), and lots more fun. It is much easier now with the new antenna, much like having about six elements up there without all the hassle and mechanics that would require. By the way—it only goes up 16.5 feet in the air for you non-climbing amateurs!

Build It—Hang It—Get It On

See Figure 1. The actual construction is best covered by the pictures and drawings, but I will verbally walk you through it as well. One cardinal rule: PVC pipe is *great*. It will give you a lot of fun, it is inexpensive

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```
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```

- Standard Display shows RX/TX VFO freq's, time and current memory

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```
TNX FER QSO. 73
```

← Incoming data

← Outgoing data appears here

- Store up to nine 256 character messages.

```
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3> CANNED     MSG
```

- Messages can be: edited, sent & appended to outgoing message

← Format & Edit stored MSG's here

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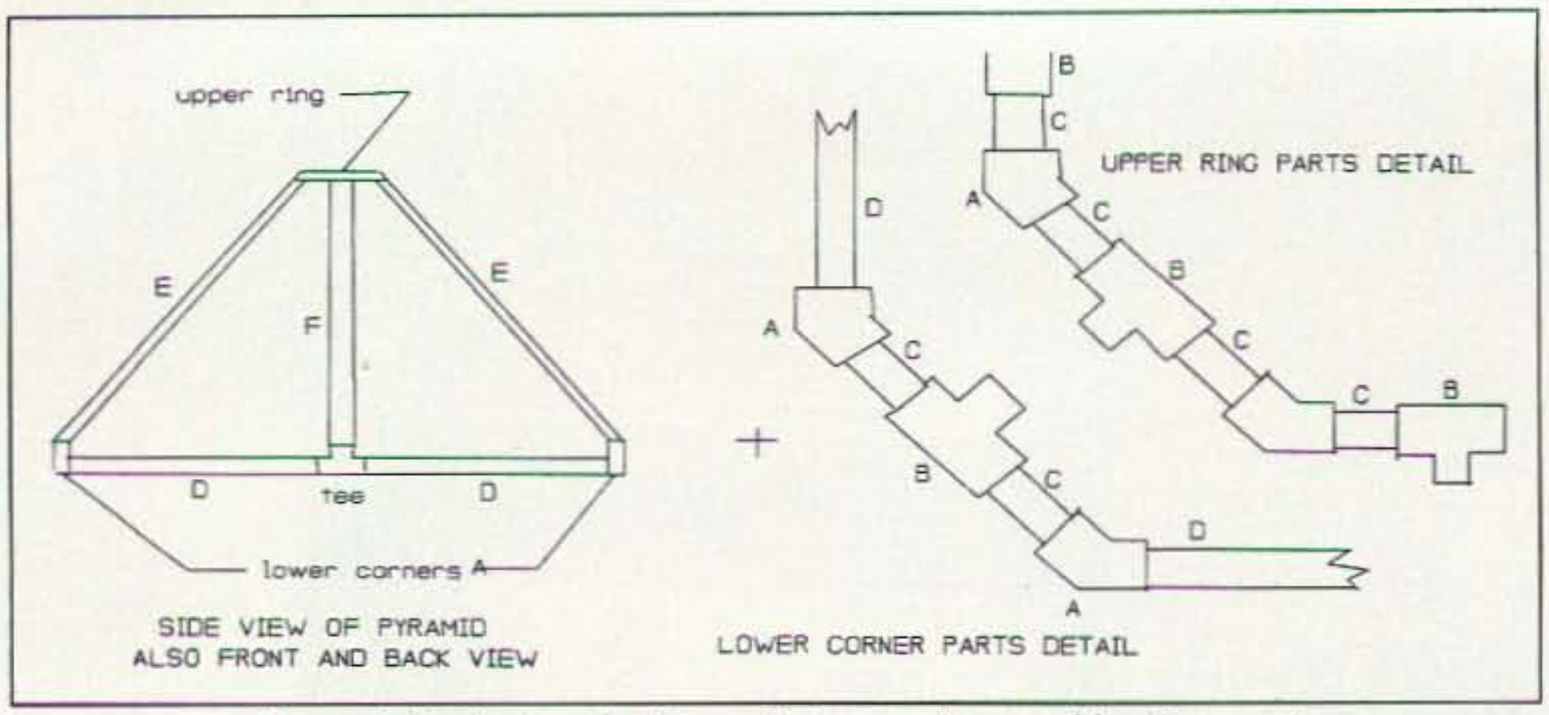

Figure 1. Beginning the Pyramid Antenna's assembly. (See text.)

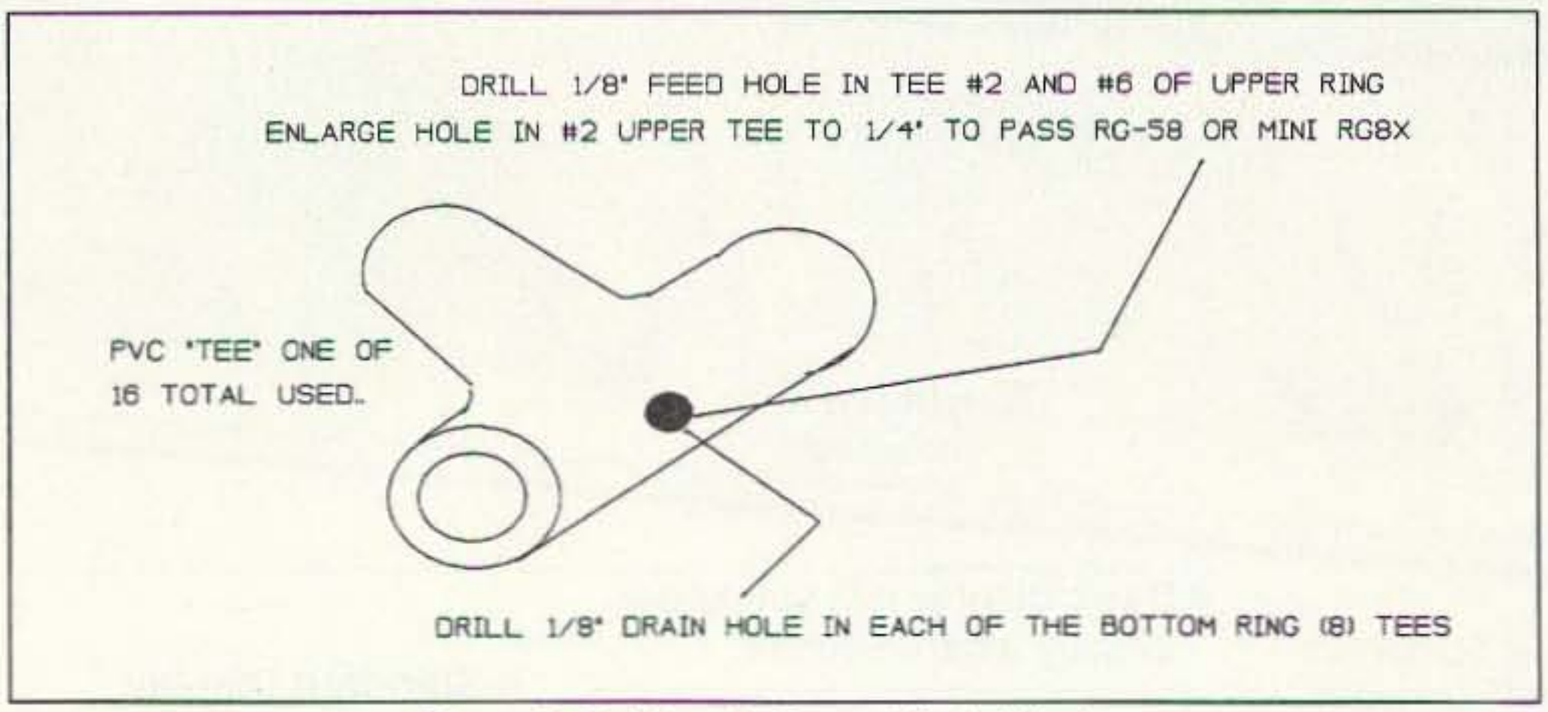

Figure 2. Drilling the Pyramid's "T" holes.

construction material, and is quite forgiving in all but one way: Whenever you get ready to glue two parts together (cement, to be technical), *make sure you mean to do it!* This stuff puts epoxy to shame. The process you are using actually bonds the two pieces by fusing, so it is not just a glue joint. When you are done, you will have a one-piece antenna. I can't impress that often or strongly enough. The materials and cement are quite safe to use if you follow the directions, and by all means do pre-fit *everything*, no matter how sure you are that your cut and gloop shot will work. Begin by cutting all the parts except the four I will cover later: the shorter uprights at the center of the sides. The easiest parts are the corner uprights, part "E," because all you do is buy them, bring them home in their full 10-foot-long glory, and use them—no cutting required.

Next, you do cut some tubing, and I recommend using a hacksaw or backbow saw with fairly fine teeth. Something you would use on metal tubing or aluminum will work fine. Use of a saber saw in this day of electrical aid and abetting is quite all right, but not necessary. There are not all that many cuts to make. In order to practice your cuts, we'll start on something simple but necessary. Try very hard to keep the cuts 90 degrees, or a cut straight across the tubing. This eases matters a lot when you go to put them into the joiners later. Take one piece of tubing and clamp it firmly, but gently, into a vise or firm clamp. Then proceed to demolish it by practicing your cutting and making 24 pieces that are two inches long. I will admit that absolute accuracy in the length is not required, but in order to end up with a nice symmetrical antenna, neatness *does* count.

Now that you are a real pro at cutting (hey, there *is* a knack to it), we can move on to the only other cutting required. (See, I told you this was also an easy antenna. Just remember the GLUE thing, OK?)

Take eight pieces of PVC tubing and cut the store length of 10 feet down to eight feet long. If you already considered yourself capable of cutting the 2" pieces above, then yes, you could have cut them out of the two-foot pieces that are coming off these 10-foot pieces and saved buying one piece. I just want to be sure you are comfortable working with PVC, and offer the information that you can do it either way. When you are finished, you will have the eight necessary pieces marked "D" in the drawings. Right now I will tell you that no matter how neatly you saw, the edges are going to end up rough, and the hole inside somewhat plugged. Sand all edges smooth and clean out that hole carefully with either a box cutter, an X-acto knife, or the sharp edge of a common screwdriver. Do each one *as you finish cutting it,* or sure enough, you will miss one, and later that becomes critical.

Now you get your first try at playing in the glue pot, but I'll let you get your feet wet slowly. That is a joke, and it pays to keep the cement *off* of you and *on* the pipe, though my skin does not seem to mind small amounts accidentally spilled if it's cleaned off quickly. This is not, I am happy to say, like working with some of the super-glue which, if it hits your skin or you put your fingers together, makes you "welded" for life!

It likes the PVC a lot, but your hands are reasonably safe. Do pay very close attention to the can directions and, of course, keep it away from your eyes and the like. Begin the actual assembly by picking up eight of the 45-degree "L" pieces, part "A," and cementing them to each of the eight pieces you just cut to eight feet long, part "D." If you follow the can directions at this stage you can't go very wrong. Be sure the part is seated well, and follow the 1/4-turn instruction to help that, like screwing a nut onto a bolt. By the time you've done one I'm sure you will be impressed with how fast the cement sets up.

Continued on page 18

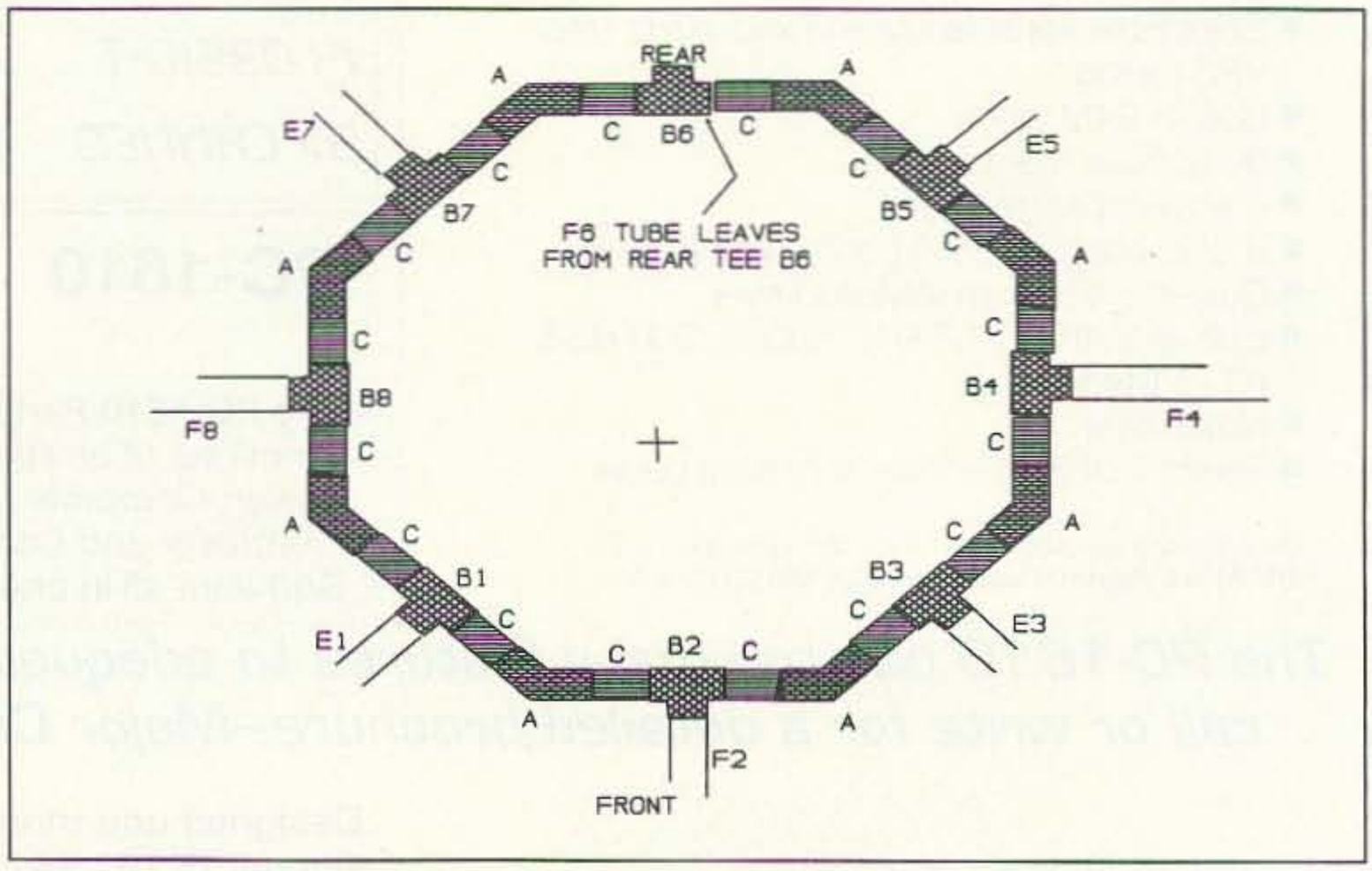

Figure 3. Pyramid's upper ring detail.

FEEDBACK

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The Pyramid Antenna

Continued from page 16

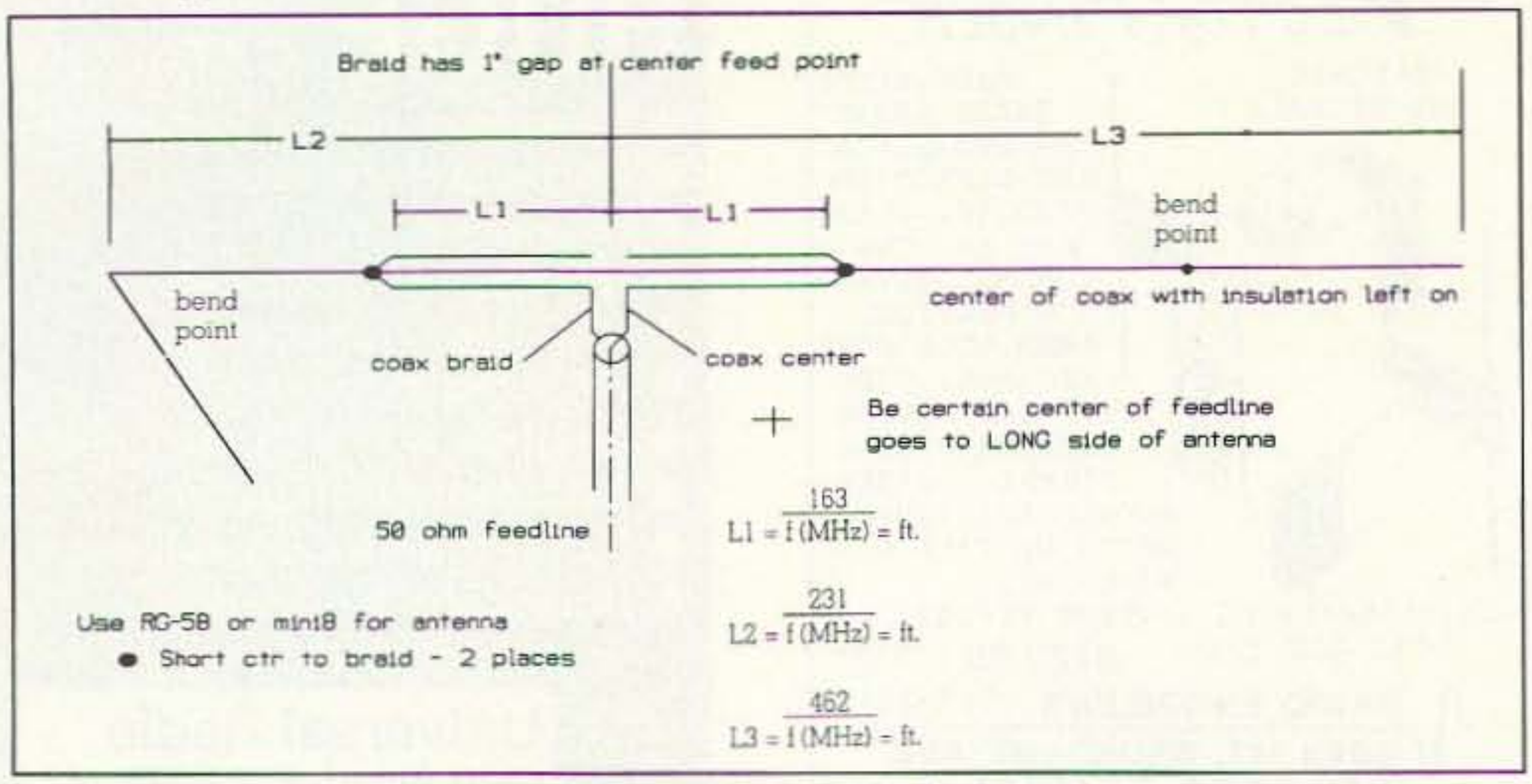

Figure 4. Pyramid's bazooka feed detail.

Five-minute epoxy, my foot! This stuff is, for all practical purposes, instant. It is for that reason I want you to follow along with me slowly and work your way up to the final assembly, where things can get really complicated unless you really appreciate the speed at which this cement works. Into the opposite end of each "L," cement a two-inch section of tubing. This will use up eight of your "C" parts, and at this point you should have eight assemblies of C-A-D sequence.

Now that you have become an expert gluer-upper, we can tackle another eight-to-eight assembly that is also non-critical, and is the miniature of what you just did with the eight-foot tubes. Take eight more of the 45-degree "L" pieces and cement them to eight of those two-inch pieces you cut off first.

One more easy step: Take eight more two-inch pieces and cement them into the other end of the 45-degree "L," part "A," just completed. Now, put the lid on the cement and *put it away* for now. That is for your own good, I promise.

Take 10 of the "T" part "B" pieces and drill 1/8" holes in the back of them directly opposite the larger opening (see Figure 2).

Enlarge one hole to just over 1/4" to pass the RG-58 feedline you will add later. This becomes "T" number 1 in the drawing. In the next assembly paragraph, use a second of the drilled "T" parts as number five. All the other "T" parts in the upper ring are undrilled (six, total).

Next, we need to do a little practice assembly, and since the top of this Pyramid is just a mini-version of the bottom, we will begin by assembling the top ring. Note: Assemble—do not cement. Press-fit a "T" onto one end of the eight 45-degree "L" part "A" just done, and then press-fit another into the opposite end of the "T." Continue alternating "T"s and 45s with two straights until you form a complete circle. The whole thing should be just flexible enough to fit the last pieces together without distorting or stressing the overall circle too much.

If you follow the diagram, you will end up with a circle of parts in a B-C-A-C B-C-A-C sequence all the way around, and have eight "T" parts "B," eight "L" parts "A," and 16 straight two-inch pieces, parts "C." Do the assembly on a flat surface and leave the "T" pieces heading straight out from an imaginary point at the center of the circle (for now). Be sure you have the numbered "T" parts (one and five) where they belong in the ring.

Now you can go for broke and assemble the lower ring. It goes very much the same as the upper ring. The exception is that the "L" 45-degree "A" parts now have parts "C" and "D" in each in place of the much smaller upper ring C-A-C combinations, so a bigger ring will result.

The easiest way to assemble the lower ring is to first find an open area in the shape of a square about 20 or more feet on a side. (Two-car garages are great, but I don't have one, either.) Any flat open area will do. By *press-fit only,* assemble the lower ring, following the diagram shown in Figure 3. I found it easiest to put the eight-foot pieces into a "T" and build each side, and then assemble the corners. Any order is all right, just *don't glue things yet.*

Mechanical to Electrical

Do the first cut on your feedline by cutting a piece of RG-58 to exactly 13.0 feet long. This is 1/2 wavelength at 10 meters, in coaxial rather than free-space terms. Continue on to the dipole.

Now is the time to build the "real," or electrical, parts, of the antenna. You can see by Figure 4, and the references to the two other antenna articles listed at the end of this article, that I have at last found a matching device for dipoles that works, is super-easy to do, requires *no* setting, and has *never* ended up with higher than 1.2:1 SWR on any I have made. Re-checking that one even proved that I just plain did not measure accurately. Do it right the first time and you will have no problems, I assure you. Taking just the outer insulation off the dipole center, then splitting the braid, and lastly soldering the feedline to it is admittedly delicate work, but just take your time and follow my sequence of doing it. First look over the diagram carefully and study it until you are sure just what is being done, and are familiar with all the dimensions. Then cut the insulation as shown, move inward and cut and remove the center one-inch of braid and solder the feedline to the feed point. The ground braid side of the feedline solders to the braid on the shorter end of the bi-square. The center conductor solders to the braid on the longer side of the antenna. Follow the diagram closely, as this is the easiest place to reverse something and end up with a dud instead of a winner.

When all that is done, half of the electrical work is done—the hard half. For the reflector element you can use copper wire in #14-#18 gauge, just like light-duty house wire. #10 or #12 is usually used for houses nowadays, but is a bit heavy, and does not work a bit better—I tried it! If the wire has a coating or insulation you will have to remove an inch or so at the reflector feed point in order to solder the reflector feed wire to it. Another good wire material is TV twinlead. Run from the hub at the center of the upper hub down the back center tube "F" part. Then solder another piece of twinlead as shown that is one wavelength in length on either side. That is fed out the back tubes of

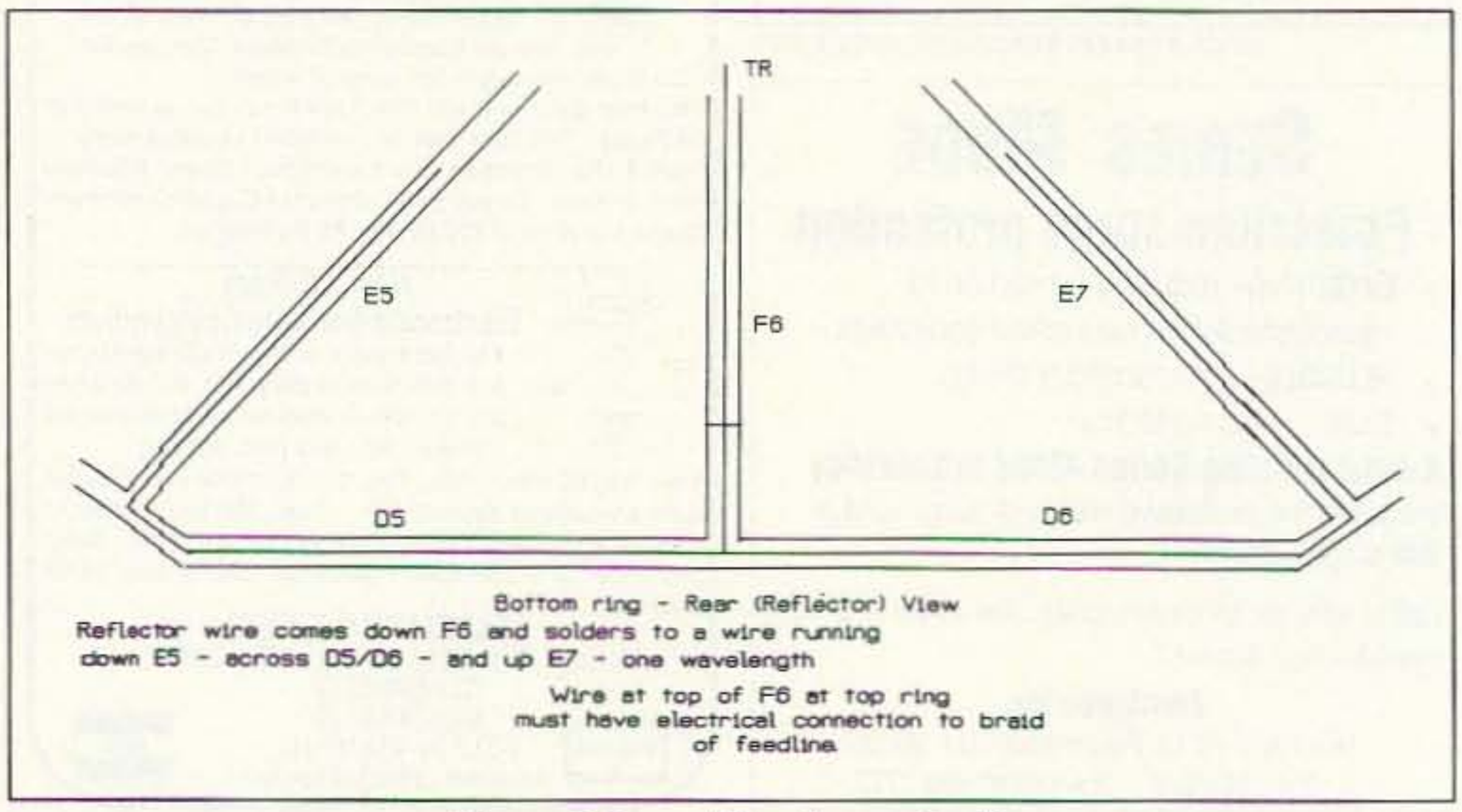

Figure 5. Pyramid's reflector detail.

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MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

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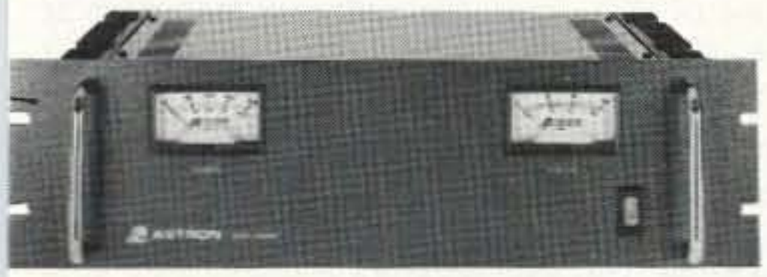
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

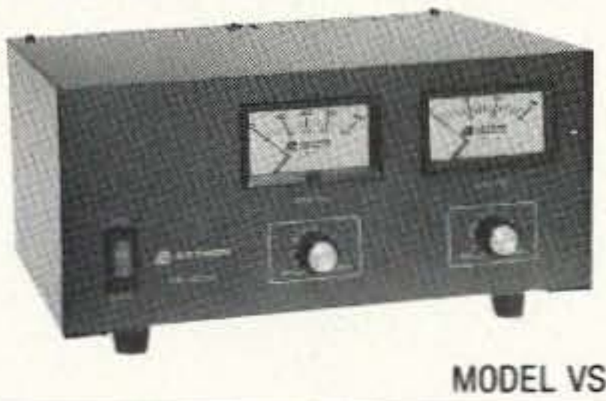
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES



MODEL VS-35M

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

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

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

CIRCLE 16 ON READER SERVICE CARD

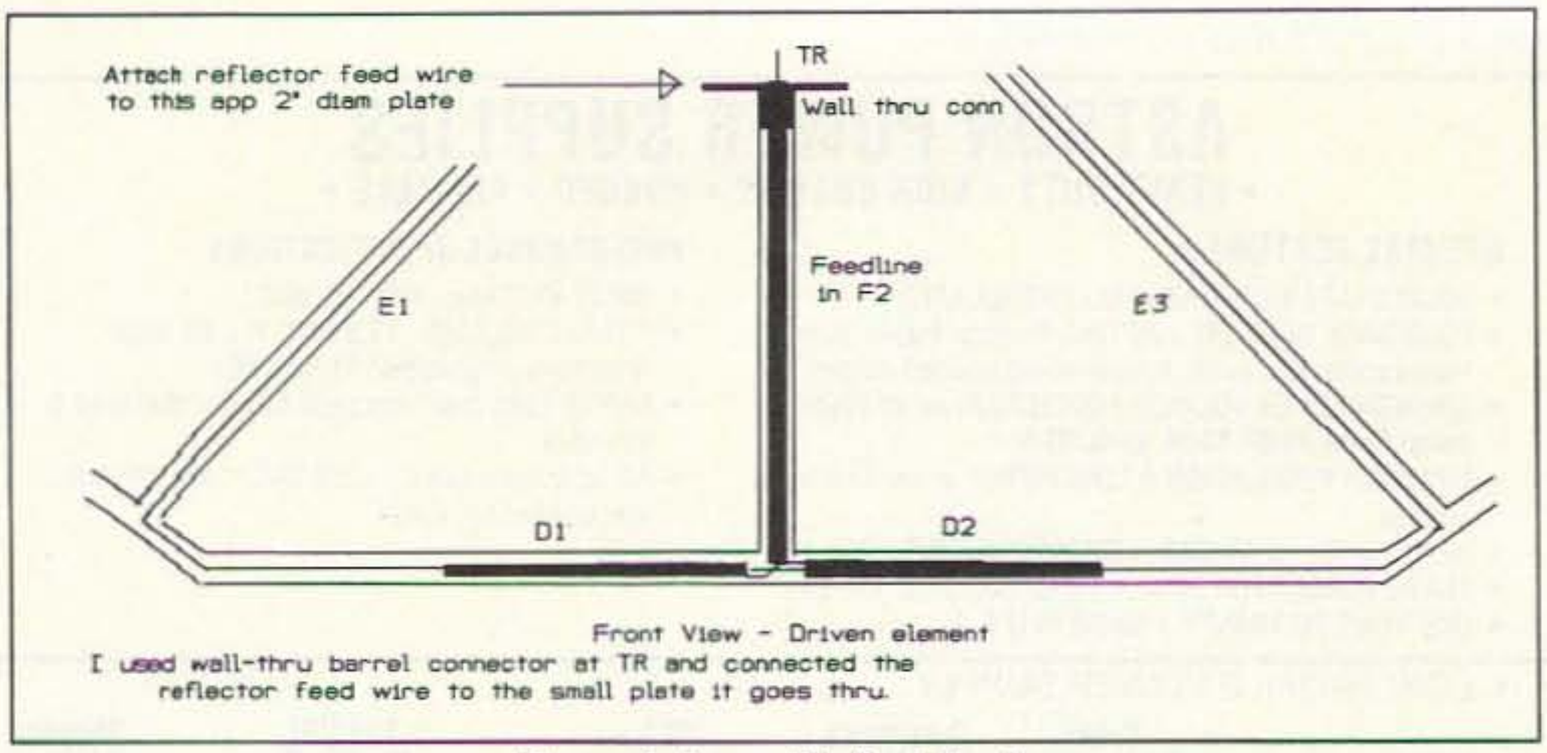


Figure 6. Pyramid's feed detail.

the lower ring, turns, and continues about two-thirds or more of the way back up the back corner tubes. The shape is like a large triangle, not quite closed at the top, and fed at the bottom center (see Figure 5).

Sound Assembly

See Figure 6. It is now time to turn all these carefully cut and crafted pieces into a real working antenna. Take your time feeding the wires through the PVC tubes or kinks and cursing will result. I have found the old "tie a string to a fishing sinker small enough to drop through tubings, and then tie on the cable being pulled, and pull it" trick to work like a champ. If you are not a fisherman, and I'm not, it is still worth buying a sinker just for this job. It is the perfect size (you choose the right one), and shape (teardrop) to do the job. Now that you know all of the lower ring fits together, carefully take the driven leg "T" apart. Slip each half of the bi-square into the "T" open end and head each half out opposite ends of the "T." Be sure the shorter end goes out the direction of D1, and the longer end out the end in the direction of D2. Feed these parts of the antenna out through D1 and D2 respectively. Center the feed in the "T" between D1 and D2. When all is nicely centered, with no kinks, and a smooth-looking "Y" as in the feedline drawing, fill this "T" with RTV, a small amount at a time, working from the center outwards. This is your final weatherseal, so do it slowly and carefully. While the RTV is drying, go to the back center of the Pyramid to the "T" between D5 and D6. Run the reflector element through the correct D5 and D6 tubes. This will no doubt require disconnecting corners, so go all the way around the lower ring and disconnect all non-cemented connections. Remember, the first fit was just a trial fit. Now you are loading the antenna real parts into the tubes, and when reassembled the next time you will cement things together.

By the time you work the reflector wire through the back lower tubes and around the lower corners, through the correct "T" parts and up two more 10-foot PCV tubes that become "E" part back corners, the RTV should be dry. Leave the feed part of the reflector just lying on the ground and running toward the center for now. I found the next assembly to work for me after trying many different ways. Take any one of the 10-foot-long "E" tubes and lay it in the corner connecting the upper ring and the lower ring at point 1. You must now find a stable means to support the center ring about 3'4" off the ground. Small stepladders are just about close enough, or some kitchen stools, sawhorses, or whatever means you have to support the ring at this height. Now fit the #1 "E" tube into the "T" at #1 upper ring corner and cement it into the "T." *Do not* cement any other part(s) of the "T." Do the same at the corner "E" tubes at #3, #5, and #7 corners. You can cement any "E" tube into its "T" at each corner—but not other parts of the "T." This is very important, as the "T" parts of the upper ring eventually must slope downward at about a 30- to 40-degree angle, just as the "T" connections at all the lower ring points must slope upward. The exact amount you will next find out by actually forming the Pyramid. Take each corner 1-3-5-7 in turn and cement the "T" of that corner at the lower ring "T" point. Be careful not to spill any cement into the lower "T" fittings and thus welding the "T's" ability to rotate upward. When four corners are done, you will have a Pyramid top and sides, and as you reassemble the lower ring pieces, the lower ring will come back together. Go around the lower ring cementing *only* the corners at 1-3-5-7, and being sure the "T" at each of those corners slopes upward directly toward the upper ring. The tubes do bow a bit, so try to keep a line through the lower "T," a corner tube "E,' and its upper ring "T" as a straight line, as that removes a lot of twist stress when the antenna is later hung from the center of the top or upper ring. Leave the "F" tubes and center front/rear/sides "T" parts *not* cemented. Using the four remaining PVC tubes, make your "F" tubes by cutting them as follows:

Turn the "T" on the lower ring and the upper ring to face each other, much the same as you did the corners. Now measure between the open ends of the upper and lower "T," and add one inch. The add is for the 1/2" that goes into each "T" at each end of the tube. This is a careful measure-and-fit operation, but not critical. If it's just a bit short it will bow the Pyramid's base upward a bit at the center sides. If it's a bit too long, it will bow it downward. These tubes are mainly mechanical support to prevent sagging between the corners. Mine were cut to fit, and if you do all your other cutting carefully, that should work for you as well. Slip one of these over the reflector feed wire at the back center, and feed the other end out through the upper "T" at #6, where the second upper "T" with the hole is located. If twinlead is used, or larger gauge wires, etc., then you may have to enlarge this hole to suit, or solder a wire to feed through the hole onto the reflector feed. You are trying to reach the center hub, where these wires will ground the reflector to the mast, coaxial feedline shield, and all grounds. Do the same with the coax feedline through the front "F" tube running between the upper "T" #2 and the lower "T" #2 that got the RTV filling. This gets the feedline back up to the upper ring and the mast.

When all this is in place, begin cementing these "F" tubes in place, upper and lower, all around the Pyramid at locations 2-4-6-8. A word to the wise at this point: When fully assembled, it can be difficult to tell a cemented joint from a tight joint under tension from all the other parts—until the whole thing falls apart when it's 16 feet in the air!

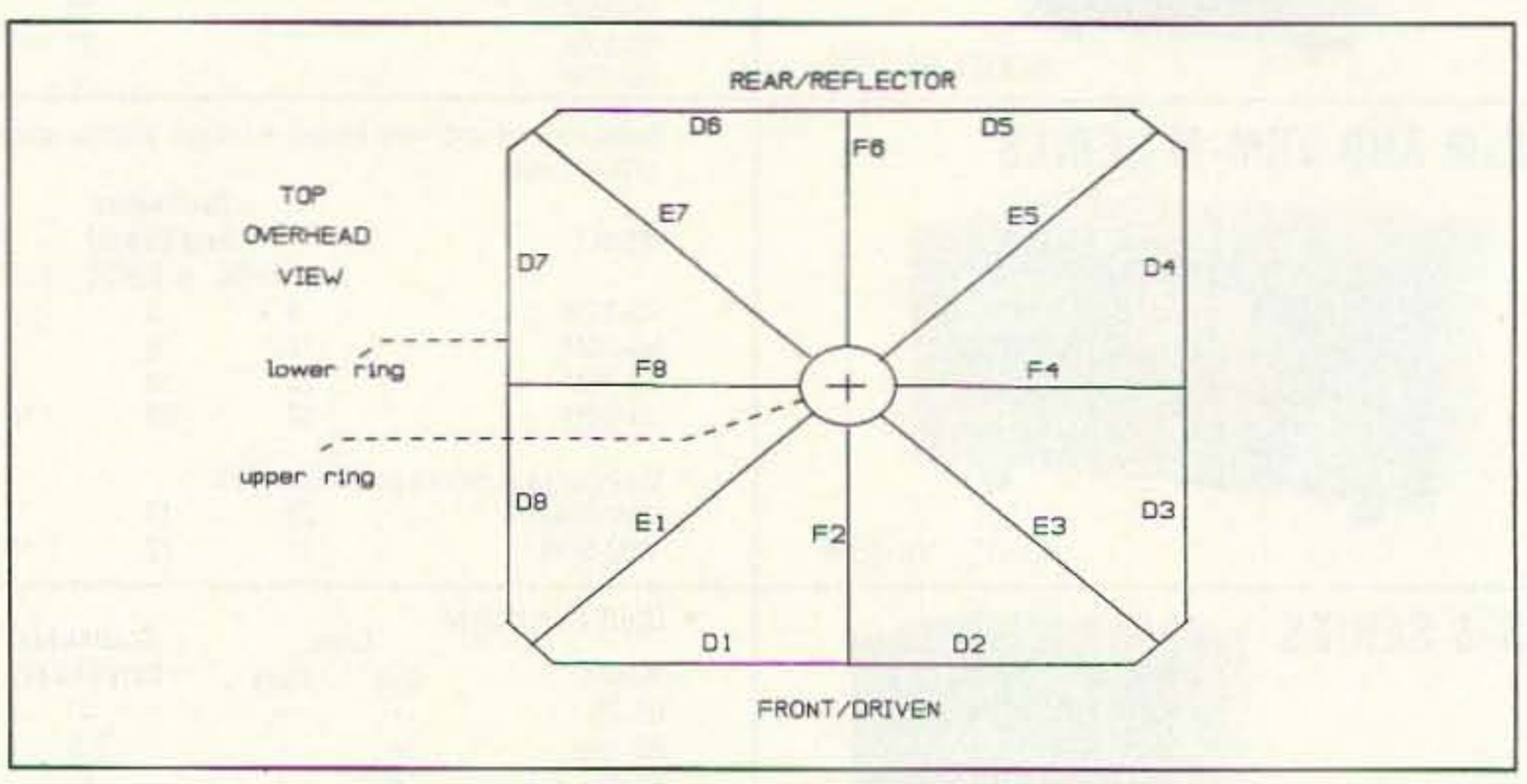


Figure 7. The Pyramid Antenna's overall design.

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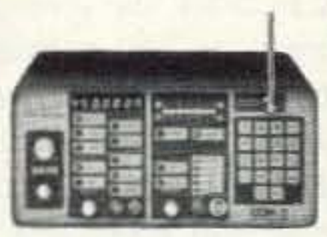

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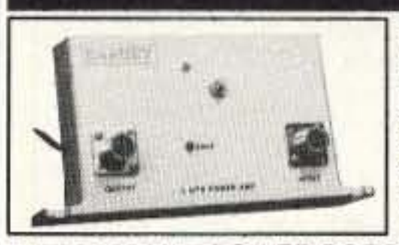

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CIRCLE 34 ON READER SEVICE CARD

Do use some means to mark the outside of every joint you cement as you cement it. Tape you can later remove (black/red/yellow high visibility), or magic markers like that work really well. When you are finished and ready to raise the beast, you want to be able to do a walk-around-the-whole-thing inspection and find loose ends at a glance.

Assembly Tips

I discovered a few helpful hints on the final assembly trail, and hope they make assembly for you a lot easier than my first try (live and learn). When cementing the last of the bottom ring, give up any hope of the twist assembly method. Just coat the tube part, insert in joiner, and hold 15-30 seconds. The same holds for all the final assembly of the upper ring, which you can now do. Just coat all the way around the tube for about 1/2" that is going into the joiner, and insert the tube straight in, keeping the overall ring flat.

For those of you with machining and aluminum plate at your disposal, the mounting plate for the upper ring could be 1/4" aluminum plate. I have no such source, so 3/4" marine-grade plywood has done well for me for years. Use a piece 2" larger around than the ring's outer diameter, and give the wood several light coats of marine-grade varnish or other weatherproofing material. Rustoleum "Wood Saver" paint also seems to do well, but is a relatively new product, and I'm just now doing some testing on it myself. After the first few soaking coats of whatever you decide to weatherproof with (aluminum users skip on), drill holes to pass the legs of U-bolts that will wrap around each part "C" in the upper ring and through the plate (16 in all). These can and should be light-duty 3/16" variety U-bolts used throughout the TV antenna industry and available in most hardware and discount stores. Heavier U-bolts would have been fewer in number maybe, but harder to find and of a strength really not necessary. Using the lighter version U-bolts allows more distribution of the stress points where the antenna mounts, and spreads that stress when the wind starts blowing things around. To be sure, the antenna will bob around a bit in the wind, as overall it is quite light for its size. Not to worry, mine made it through 64 mph winds this year, and kept on tickin'. Mounting from the plate to the support mast is left to the user, but I found floor flanges to work very well. Take time to find aluminum types used in office/factory handrails and pallet shelves if possible. They don't rust, and tend to have higher collars on them. The latter I like to drill and tap holes at 120-degree spread around the collar and run into them 3/16" to 1/4" bolts about 1" to 1-1/2" long. This stops the obvious, "If I can screw it onto the upright mast, the wind can surely 'unscrew' it!" Take time to seal the plywood edges, if used, and whatever you do, do not use any kind of chip or particle board. The strength is just not there.

I hope you find the antenna as easy to build and as much fun to use as I have. At only 16.5 feet up (through the center line of the lower ring), or about 20 feet even at the center plate, it is quite a worthy performer. It took quite a bit of fiddling to decide how much reflector to use and where to run it, as well as the guts to try this type of a driven element, but I had all those years to evaluate all the smaller parts of this antenna. I even built scaled-down VHF models for the first time in my life, and hey, scaling does work—sort of. And if all else fails, and the band goes all quiet, you can always go sit under it (power OFF of course), and test the other theories of pyramid power.

If I can help you in any way, just drop me a line (14670 N. Cumberland Rd., Noblesville, Indiana 46060). Please include an S.A.S.E. and allow a few days for me to to digest your question and reply. 73

References: Charles Whysall W8TV, "The Double-Bazooka," *QST*, July 1968. p.38.

John Schultz W2EEY, "The Double Coaxial," *73 Magazine*, June 1973, p.79.

Parts List and Specifications

Type of pipe/tubing used: White PVC plumbing pipe; 1/2" Crestline (or equivalent), schedule 40, PVC 1120, 400 PSI. Black and gray are usually sold as electrical conduit. There is a tan PVC that is for hot water and is higher in cost, with no increase in value as used in this project. Overall, the white PVC cold-water pipe is the least expensive, and is more than sufficient for strength.

Cement used: Hercules brand, clear, PVC, medium body, medium set plastic pipe cement; up to 6" diameter; schedules 40 & 80.

Parts:

PVC tubing as above	1/2", white, app. 7/8" o.d.	17
PVC connectors	45-degree, ELL	16
PVC connectors	Three-way joiner, T	16
Can of cement	To join tubing and joiners	1
3/4" plywood	Marine if possible, app. 24" x 24"	1
Pipe floor flange	Minimum 1-1/2", four-hole mounting (to suit vertical support pipe coming from rotator	1
U-bolts	Aluminum or plated hardware, with legs long enough to encircle tubing and go through plywood mounting plate, app. 1-1/4"	8
Coaxial cable	RG-58, solid-center conductor	App. 50 ft.
RF connector	As appropriate to connect to lead-in to shack (BNC fittings were used, but PL-259 type are adequate)	1

Approximately a pound of care and patience (be sure to prefit and try everything before you glue—the glue works, fast)

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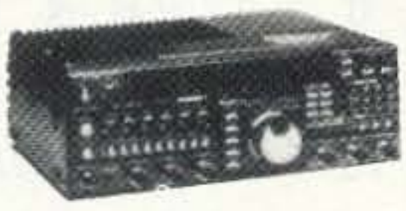

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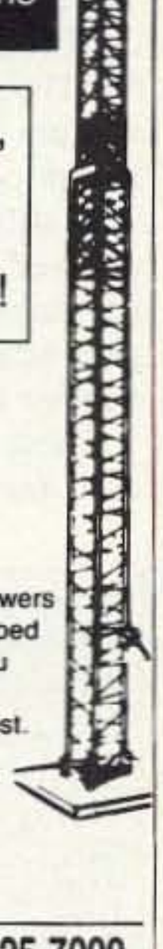

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CIRCLE 41 ON READER SERVICE CARD

Using GE Progress Line Receiver Strips

A low-tech solution for many situations.

by Robert B. Whitaker KI5PG

Like most hams, I am a terrible pack rat. I hate to get rid of anything that still has some use or value left in it. In recent years, manufacturers and advertisers have done a good job of convincing us that we always need the newest, highest technology gear to solve our problems. Often, however, we don't need state-of-the-art equipment to meet our needs. In many situations, a simple and inexpensive solution is just what is called for. This article will describe how to use General Electric Progress Line VHF and UHF receiver sections as practical stand-alone receivers without bulky cables, control heads, and heavy cases.

General Electric designed and produced the Progress Line series of radios back in the 1960s. These radios were widely used and are still widely available today at very low prices. I've talked to a number of hams who still use these old radios and are very pleased with them. I will not cover the transmitters since they use now-scarce vacuum tubes for the power amplifiers. Perhaps another writer can pick up that topic.

These crystal-controlled receivers can be used for quite a number of practical monitoring purposes, such as monitoring local repeaters, weather radio broadcasts, and police or volunteer fire department frequencies. They also make excellent receivers for repeater systems or control links for repeaters. Some receivers have an optional subaudible tone access (called Channel Guard, by GE) which is especially well-suited for repeaters or control links.

Where to Hunt for Older Radios

These GE Progress Line radios, like many older radios, can commonly be found for rock-bottom prices at swapfests, usually for $15 or less. Manuals, which are a little more scarce, can often be picked up at the same time. Other good sources for the radios are local commercial radio dealers. Many dealers will just give them to you to get them out of storage. If your city or county has surplus equipment auctions, you will find these and other good radios at great values. Even used commercial vendors sell these radios at good prices. Shipping weights increase costs for mail order but these dealers will often have a wide selection of radios and just the proper tone elements, accessories, or manuals.

Photo B. The receiver strip shown wired for permanent use.

I spoke to one ham in California, John Lansdell WA6HRH, who has almost 100 of the Progress Line radios. He offered to sell the whole radios, or just receiver sections alone, at a ridiculously low price. John's phone number is (909) 873-1319.

Wiring the Receiver Strips

The same receiver strips for the Progress Line series were used both in mobile radios and in base stations or repeaters. They are easily interchangeable. The VHF and UHF models are identical in their outward appearance, and wiring for either band is the same. The receivers are all solid-state and have held up well over the years since they were manufactured. They require only a handful of parts for separate (external) operation. A 10-volt regulated power supply, a 13-volt power supply and trimpots for volume and squelch controls are all that are needed.

The regulated +10 volt power is easily supplied with a 7810 regulator. The 7810 is a little harder to locate than the more versa-

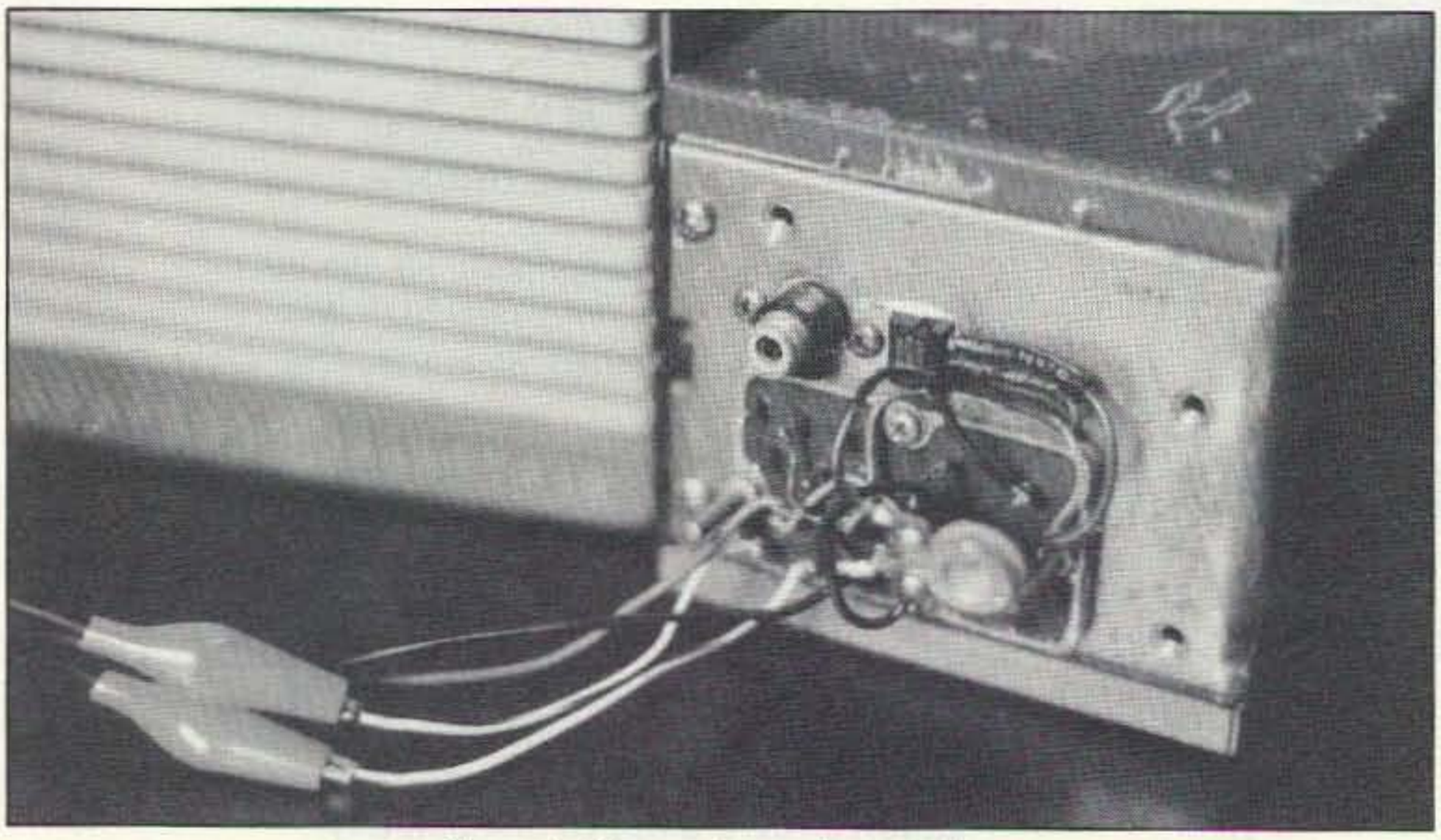

Photo A. The receiver strip test plug.

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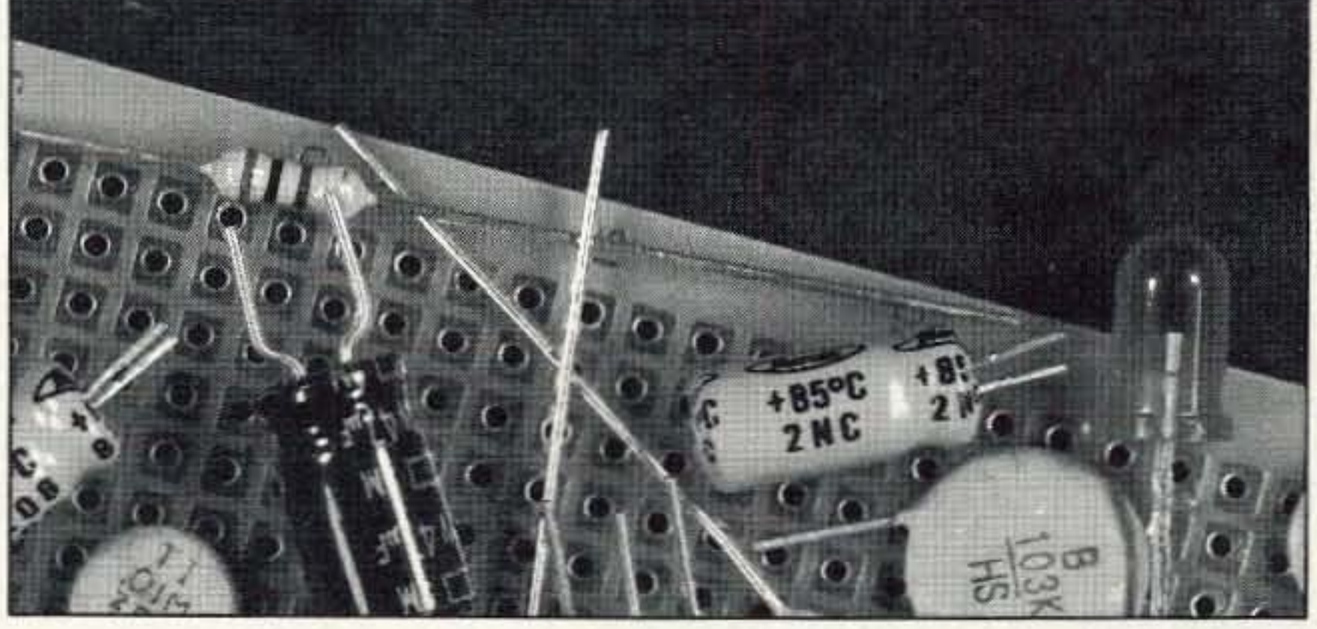

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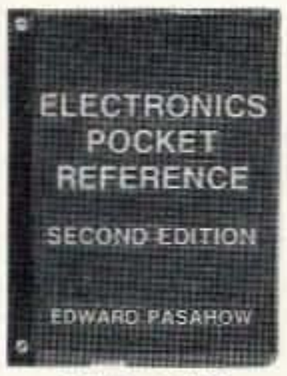

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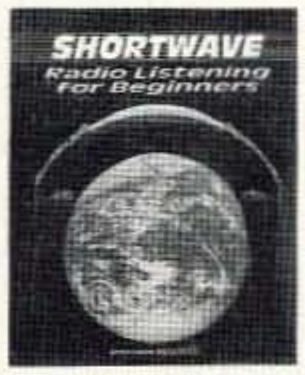

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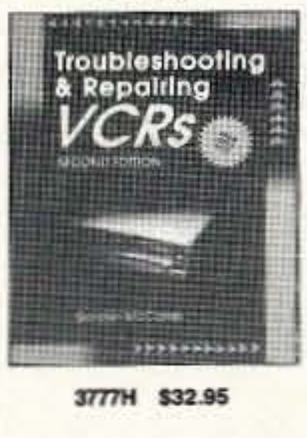

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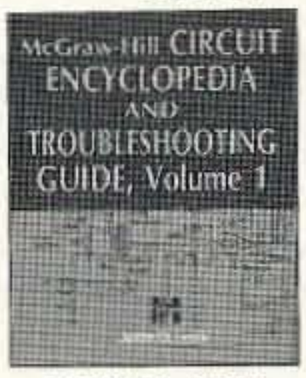

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tile 317 regulator but it has a couple of advantages over the 317 regulator. The 7810 does not require a resistor network to set the voltage output as the 317 regulator does. Also, unlike the 317 regulator, the 7810 can be attached directly to the receiver strip case without an insulating spacer since the heatsink tab on the 7810 is the negative common connection. The receiver +10 volt current draw is only 150 miliamps but the regulator will run fairly warm without fastening to the receiver case for heat sink. The only stage of the radio requiring 13 volts is the 5 watt audio power amplifier.

Figure 1 shows the pin outputs of the receiver. If you have a number of the strips, you might want to find a separate plug to use as a test wiring harness, as shown in Photo A. For permanent use you can simply solder connections directly to the pins as shown in Photo B. If your receiver has two or more channels you will need to select the desired channel by strapping that channel pin to +10 volts. The single frequency models are wired internally and do not require this connection.

The receiver remains muted until +10 volts is applied to pin 2, Receiver mute. As originally designed, the +10 volt power was removed from this pin when the transmitter was keyed so the receiver would not operate during transmitting.

If your receiver has the optional channel guard board and a tone element you can invoke channel guard operation by connecting pin 18 to ground. In this mode the receiver will remain muted or squelched except for signals with the correct subaudible tone frequency.

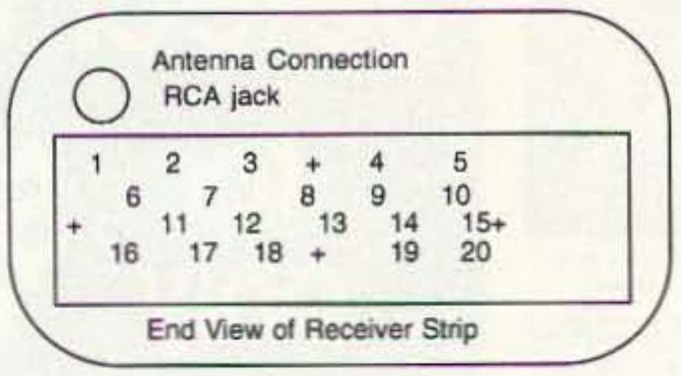
Tuning the Receivers for the Ham Bands

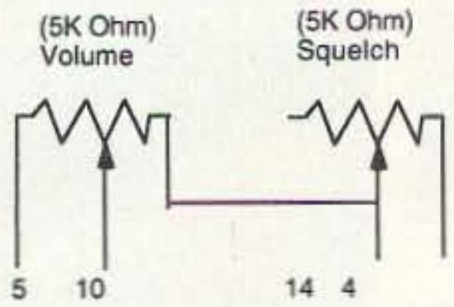
Tuneup on the radios is fairly straightforward. Experience definitely helps, but even a neophyte (like me) can get the hang of it. The information in the sidebar gives basic tuneup directions for the front end of the radios. You don't need a complete test bench with a lot of expensive service equipment. A decent multimeter and a synthesized handheld or mobile radio for signal generation will usually suffice. For complete tuneup, refer to the GE maintenance manual. Most of the VHF strips around these days were designated for VHF operation from 150 to 174 MHz. These receivers almost always will tune down through the entire 2 meter ham band without a problem. The UHF receivers designated to operate from 450 to 470 MHz will also tune down to 440 to 450 MHz operation without problems. GE conveniently provides a test jack for measuring voltages and signal levels in different stages of the receiver. The sidebar describes tuneup techniques for the poor man without access to expensive test equipment.

Using the Receiver Strip in a Repeater System

The metal shielded cases and reliable design of the GE Progress Line receivers make them ideal for repeater use. At a time

GE MASTER PRO Receiver strip connector for both UHF and VHF designs





1. Ground
2. Receiver Mute (+10v)
3. Encode Out
4. Squelch High
5. Volume high
6. Frequency 1
7. Frequency 2
8. Frequency 3
9. Frequency 4
10. Volume Arm
11. +12 Input
12. Regulated +10 Input
13. System Negative
14. Volume Low/Squelch Arm
15.
16. Speaker Output 1
17. Speaker Output 2
18. Channel Guard On-Off
19. C.O.S. Feed
20. Monitor Lock

Notes:

1. Connect power leads, volume control, squelch control, and +10 volts input as shown. Connect +10 volts also to Pin# 2 (Receiver Mute) and the Pin to select the frequency if the receiver is a multi-frequency receiver

2. +10 volts should be accurate and well regulated. Use +10 volt 3-terminal voltage regulator or 317 type.

3. On multi channel strips connect frequency select pin to +10v.

4. For Channel Guard Operation (PL) connect Pin 18 to Ground

5. Disconnecting Pin 2 from +10 volts will mute the receiver during transmitting.

VHF MODELS ER-41-C and E
Crystals are GE Part # 19B20657P4
Crsytal frequency = (Operating Freq. - 5.3 Mhz) divided by 9

UHF MODELS ER-42-E and G
Integrated Circuit Oscillator Module (ICOM) are GR Part # 4EG26A10
ICOM freq = (Operating Freq. - 12.4 Mhz) divided by 24

Figure 1. GE Master Pro Receiver strip connector for both VHF and UHF designs.

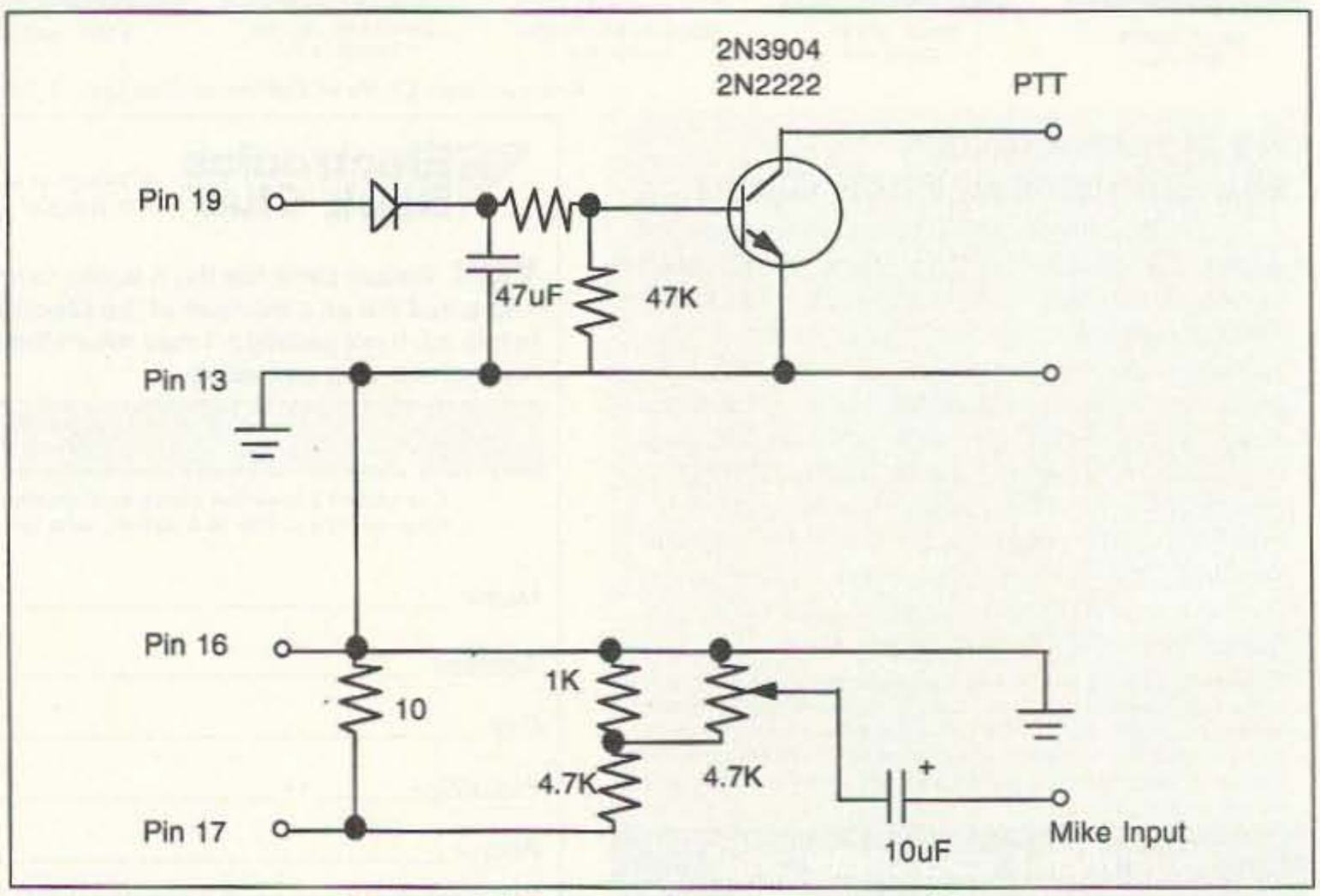


Figure 2. GE Progress Line repeater interface.

Travelin' Man's Dual-Band Antenna?

The extra reach could be of lifesaving importance in an emergency.

James H. Gray W1XU

During my years of traveling around the eastern United States on business or vacation, I often wished I had a small, inexpensive and easy-to-use antenna to match my little hand-held 2 meter radio. Occasionally I had an HF rig in the car, but more often it was the little 2 meter radio which was useful and fun. On long road trips it alleviated boredom, kept me awake and almost always assisted me in finding a motel, restaurant, or other ham's QTH. On such trips the mobile antenna was very satisfactory and I seldom needed any other antenna.

However, when I traveled by plane, the "rig" was the hand-held without a "brick" or amplifier to boost its output. Further, it had only a small telescoping whip that I could extend to about 19 inches. If I happened to be close enough to a repeater in a large city, that was fine and I managed to "work" the locals in spite of low power and a minimal antenna.

Nevertheless, there were occasions when there was no local repeater, or when I was inside a steel-and-concrete building. At such times I wasn't able to make any contacts at all and had to resort to the usual dull and tedious television programs before going to bed.

If you have faced similar problems when traveling "light" and by air, you know how it feels to be alone among the many. No doubt you have tried some of the same "fixes" I did; perhaps a small briefcase antenna or even a foil antenna put up to the window with some kind of sticky tape and a paper clip to fit into the BNC on the handheld—or other and stranger things. Inevitably, these were failures.

The Solution

Today, the travelin' man needn't worry; he has a ready solution to the problem—a neat antenna produced by Antennas West and called the Pico-J—an antenna which meets all of the requirements set forth in the first sentence of this article. Pico means "small," as in "pico-farad," and "J" is the rough configuration of this antenna. The J-pole is well known in the

literature and is usually made of tubing that can be mounted to a bracket on the side of a tower, a building, or mast. It has the advantage of a low-angle, omnidirectional and vertically polarized radiation pattern—just what's needed for 2 meters.

As you'll see, however, Antennas West's Pico-J offers some features not found in the well-known J-pole. For example, the feedpoint is already found and matched for you, and the antenna is small and light—so much so that it can be rolled up and stuffed in a small eyeglass case. Actually, it doesn't look like a "J" at all. The smaller "lip" portion is now made continuous with the upper radiating part extending the length to 55 inches from the top to the point where a six-foot length of small-diameter coaxial feedline is attached. The feedline is terminated with a goldpin BNC for direct attachment to your radio.

A small loop of heavy-duty fishline is attached to the top of the Pico-J, and this can be slipped over a curtain rod or a nail or any other suitable projection. But, if by chance you don't happen to find a suitable support, Antennas West thoughtfully provides a small suction cup with an embedded hook that can be slapped up on a window or any smooth surface. Then, all you need to do is slip the fishing loop onto the hook in the suction cup, and—presto!—you have your antenna support.

As Jim Stevens of Antennas West says: "It waits like a powerful genie in a bottle until you need a full-quieting signal." It is completely weater-sealed and could be hung outdoors if you wish. Otherwise, you can hang it in a closet or a doorway; in fact, anywhere that is convenient and where your signal won't be blocked. The extra reach provided by this beauty could be of lifesaving importance in an emergency and is always useful when just plain chatting with the locals.

Your Pico-J stretches range, improves reception, reaches far-away repeaters, and saves your battery pack.

The measured VWSR is less than 2:1 between 142 and 150 MHz—ideal for CAP and other services near the 2 meter band—and is less than 1.5:1 between 143 and 150 MHz, bottoming out at a very beautiful 1:1 at 146 MHz. Not bad, eh?

Best of all, considering the benefits, is the price: $19.95 for the 2 meter model, $26 for the dual band 2m/70cm model, which includes the soft vinyl case to store your Pico-J when it's not in use.

On a recent trip I tucked Pico-J into my briefcase right next to the handheld. No, I didn't even use the "duckie" or the telescoping whip because I had all I needed in this one neat antenna. Maybe you'll find the same.

—Condensed from ***Radio Fun***

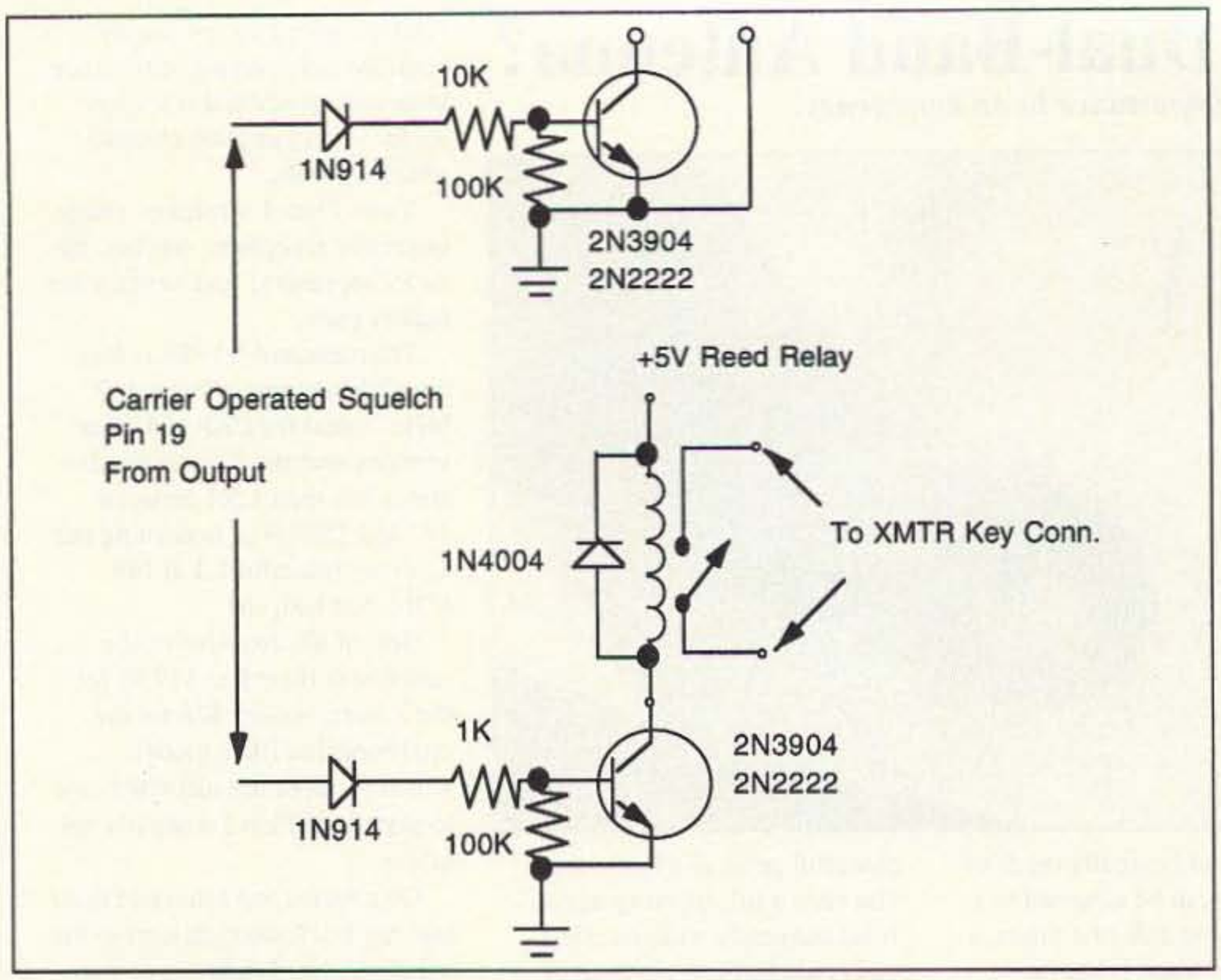


Figure 3. Transmitter keying schemes: a) Open-collector NPN switch, b) Alternate technique using a reed relay.

when many area coordinators will not assign repeaters without subaudible tone access, the Channel Guard option for these receivers is a valuable bonus. A new tone decoder board would certainly cost more than one of these receiver strips with Channel Guard and tone element. The Channel Guard operation (CTCSS or subaudible PL tone) can be enabled or defeated with a simple switch between output pin 18 and ground. Figure 2 shows a simple interface for directing the audio output into a transmitter. Even if a speaker monitor is not used, be sure to use 10 to 20 ohm resistor across the audio output leads to provide proper loading for the receiver audio amplifier. The input level to the transmitter is set by balancing both the receiver audio level and the 10k ohm input audio level control. If subaudible tone operation is not used, a tap for audio could be taken directly from the high side of the volume control, pin 5 on J443. This point, however, would be raw unsquelched audio, with any unfiltered subaudible tone present. A capacitor is used for audio coupling and DC isolation.

A carrier operated relay (COR) for keying a transmitter is also relatively simple. Pin 19 of the Progress Line receiver connector plug is a carrier operated squelch feed. This line outputs about 3 volts when a signal is received. An alternative method of keying the transmitter using the absence of voltage could also be employed. Pin 20 of the receiver, labled monitor lock, normally presents about 8 volts when the radio is squelched but the voltage on this pin falls to near zero when a signal is received, regardless of Channel Guard setting.

Two very simple keying techniques are shown in Figure 3. In the first case (Figure 3a) an NPN switching transistor is used with an open collector circuit for most transmitters which key by taking the PTT line to ground. The voltage from the radio forward biases the transistor causing the emitter to collector resistance path to fall very near zero and key the transmitter. In the other diagram (Figure 3b.) a similar circuit operates a relay which keys the transmitter. A slight delay or repeater tail could be achieved with an added resistor/capacitor network. Varying the component values

Parts List

1	7810 +10 volt regulator	Mouser Electronics part No. L78S10CV or equivalent
2	5k ohm trimpots	Mouser Electronics part No. 320-1510-5K or equivalent

Optional parts for repeater control and interface:

10 ohm resistor for loading	Radio Shack
5k ohm trimpot	
1k resistor	
4.7k resistor	
1N914/4148 (or similar) diode	RS#276-1122
2.2 to 10 µF capacitor for audio coupling	
2N2222A or 2N3904 for COS keying transistor	RS# 276-2009

Sources
Mouser Electronics
2401 Hwy 287 N.
Mansfield, Texas 76063—4827
1-800-346-6873

Crystal Manufacturers
(This is not a complete listing, just a representative sample of suppliers.)

Bowmar
201 Blackford Avenue
Middlesex, New Jersey 08846
1-800-777-2197

International Crystal Manufacturing Co., Inc.
P.O. Box 26330
Oklahoma City, Oklahoma 73126
1-800-725-1426

Jan Crystals
2341 Crystal Drive
P.O. Box 60017
Fort Myers, Florida 33906-6017
1-800-526-9825

Commercial Radio Vendors

(Thanks to Larry N5DH and Harvey WB5MCT for these hints.) (Again, this is not a complete listing, just a representative sample of dealers.)

VersaTel
1-800-456-5548

C. W. Wolfe Communications
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Billings, Montana 59102
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SIMPLE, AFFORDABLE & FUN

DESIGNED FOR ONE REASON . . . TO HAVE FUN!
AND BOY DOES IT DELIVER!!!

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Change bands in a second.
Just plug in desired module!

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lakes mobile or portable fun for more hams than ever before.
ts almost any car, even compacts. Measuring only 2.5" X 7.25"
9.75", this five lb. travel companion tucks in a briefcase with
enty of room to spare.

It's HOT
Receiver runs circles around rigs at twice the price. 90 dB dynamic range, low phase noise design lets you hear the weak ones even on crowded bands. It's no fun if you can't hear em!

It's SIMPLE
Just sit down and operate. Master every feature in minutes - no modern rig is as easy to use. Change band modules in a flash to work 160-10 meters including WARC.

It's AFFORDABLE
At **$549**, it's half the price of the closest competition. No other rig packs so much performance at so low a price. Have fun on HF without spending a fortune.

It's NOT A TOY
Crystal mixing (no synthesizer) coupled with meticulous circuit design yields sparkling clean receive audio. And you'll marvel at the unsolicited compliments on transmit audio.

MADE IN USA

Patented "Jones" Filter provides variable bandwidth 9 pole crystal filter - 500 Hz to 2.5 kHz. The right filter for every condition at the touch of a knob.

"SYNCHRO-LOCK" software keeps VFO virtually drift free regardless of temperature variations.

Optional Noise Blanker

SSB and CW 50 Watts Output Adjustable To 5 Watts

Runs Off 12-14 VDC
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Built-in Iambic Keyer with Legendary QSK. Speed adjustable on front and shown in display.

$549 * Includes one band module of your choice

$29 * Each additional band module

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MODEL		PRICE*
296	Mobile Bracket	$15.00
297	Noise Blanker	$19.50
937	11 Amp Power Supply	$79.00
938	Tiny Switching Supply (Only 3 lbs.!)	$95.00
700C	Hand Mike	$39.95
607	Weighted Key Paddle	$39.00
291	Antenna Tuner	$89.00

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to request your
kit catalog

Ordering GE Manuals & Parts

If you need a manual or parts for any GE manufactured radio and cannot get hold of one from local sources you can call:

For manuals: Ericsson GE Mobile Communications, Inc., Lynchburg, Virginia; (804) 528-7649.

The manuals are broken down into subparts, i.e. Exciter, PA board, Receiver, Audio-Squelch board, etc. Each subpart is generally $5. A full manual for a radio will run from $35 to $50, so try to find one locally, first! If all you need is one section, it is easy to just call Ericsson GE.

For parts: Ericsson GE Mobile Communications, Inc., Lynchburg, Virginia; (800) 368-3277.

Tuneup Hints for the Poor Man

(Thanks to Larry N5DH and Harvey WB5MCT for these hints.)

Since the tuning range of the GE receiver strips is relatively narrow, any change of operating frequency of more than one or two megahertz will require retuning the receiver front end. Not everyone has a complete test bench with a wide range frequency generator at their disposal, but most hams have all the gear needed to retune receivers. Modern synthesized radios, either handheld or mobile, are very accurate frequency generators. The problem is generally that the radios still put out too much power even on lowest power settings. Using a 50' or longer length of coaxial cable makes a great signal attenuator. Rubber duckie antennas, dummy loads, or other less efficient radiators also help reduce generated signals down to acceptable levels for retuning radios. Another trick for tuning radios is to use a scanner for a signal generator. Check the scanner specifications for the IF frequency, usually about 10.7 MHz above or below the intended frequency. Often, tuning the scanner to this IF frequency above or below the intended frequency will generate an RF frequency which can be used as a signal for tuning the receiver.

The strength of the signal can be increased or decreased by moving the scanner nearer or father away from the receiver. The basic idea is to tune the sections of the radio using an unmodulated carrier until the maximum selectivity or radio opened squelch quieting (least noise) is obtained. As the receiver comes into tune, loosely coupling the antennas of the scanner (or signal generator) and the receiver will also attenuate the signal to the receiver until maximum quieting in the receiver is achieved. In some instances, as the receiver comes into tune it may be necessary to slightly detune an early stage of the receiver to determine the maximum tuning or selectivity of later stages.

J442 Metering Jack Test

pin#	Function
1	
2	2nd IF
3	1st Limiter
4	Multiplier 1
5	Multiplier 2
6	
7	Audio output #1
8	System Negative
9	
10	Discriminator
11	
12	
13	Regulated +10 volts
14	
15	Audio output #2
16	Ground

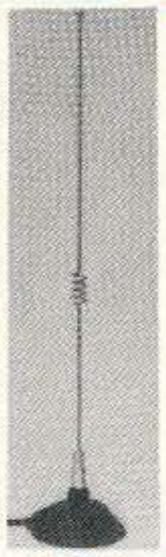
changes the length of the tail. A light emitting diode (LED) could also be used as a visual indicator of a received and re-transmitted signal.

Extra Bonus for 9600 Packet Operators

These GE receiver strips make fine monitors of both 1200 baud and 9600 baud packet. For 9600 baud packet operation, the received signal can be taken from the discriminator output at pin 10 of the metering jack, J442. Usually they work just fine, but a slightly wider bandwidth can be achieved by soldering two short leads of wire across the crystal filter next to the output transformer under the IF-Audio & Squelch Board, and then twisting the ends together to form a capacitor to broaden the skirts of the filter. Having the capability of instantaneously monitoring your own signal and connecting to yourself on another packet stream for modem calibration and testing is a tremendous benefit, as anyone who operates packet knows.

Next time you need an inexpensive receiver or monitor, this vintage receiver may be just the ticket! 73

MFJ Dual Band Mobile Antenna



For an incredible $14.95, you get a dual band 2 Meter/440 MHz mobile antenna with strong magnet mount, stainless steel radiator, 15 feet of coax and BNC adapter for your handheld -- It's the fastest selling mobile antenna in ham radio!

MFJ-1724B
$14.95

For an incredibly low $14.95, you get an MFJ dual band 2 Meter /440 MHz mobile antenna!

It's the fastest selling mobile antenna in ham radio!

You get excellent gain for solid, noise-free QSOs. On 440 MHz, it's a high gain ½ wave over ¼ wave radiator. On 2 Meters, it's a *full size* ¼ wave radiator.

Its tough *stainless steel* radiator is only 19 inches tall -- won't knock off when parking in your garage.

An extra powerful magnet holds it steady -- even at highway speeds.

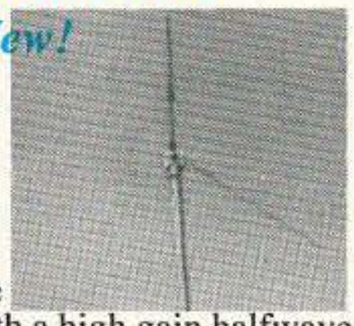
You get 15 feet of coax with a standard PL-259 coax connector for your mobile rig.

You get a BNC adapter so you can also use it with your handheld!

Your MFJ-1724B is protected by MFJ's famous one year *No Matter What*™ unconditional guarantee.

DualBand 144/440 MHz Ground Plane

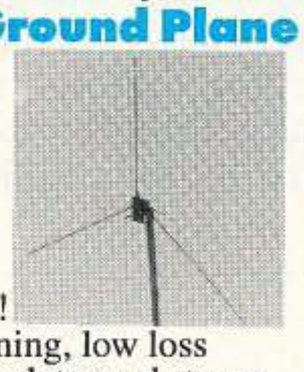
MFJ-1754 *New!*
$24.95



Dual band ground plane antenna for 2 Meters and 440 MHz gives you extra long range on 440 MHz with a high gain halfwave over quarter wave radiator. On 2 Meters you get solid quarter wave performance. Mounts on 1 to 1½ inch mast with single U-bolt. Easy-to-tune.

1/4 Wave Ground Plane

MFJ-1740
$12.95



The MFJ-1740 brings up 2 Meter repeaters as well as any ¼ wave ground plane made!

You get easy tuning, low loss ceramic antenna insulator and strong lightweight aluminum construction.

Single U-bolt mounting for 1 to 1½ inch mast. Cutting chart included for 220/440 MHz. Made in USA.

MFJ Pocket Roll-Up™

2 Meter halfwave J-pole antenna

MFJ-1730
$14.95

Roll up this *halfwave* 2M J-pole antenna and stick it in your pocket! It's the perfect *gain* antenna for traveling.

Get home station performance on the go. Just hang your *MFJ Pocket Roll-Up*™ in the clear and plug the BNC connector into your handheld.

It's omni-directional and has significant gain over a ¼ wave. It does not need a cumbersome ground plane so it's convenient for indoors and works great with handhelds. Made in USA

Dual Band *flexible* Ducks

144/440 MHz flexible ducks for HTs

A. *High Gain FlexiDuck*™, **MFJ-1717, $19.95.** Enjoy dependable QSOs when other rubber ducks give you noise. High gain ½ wave on 440 MHz, full size ¼ wave on 2M. Won't stab you -- bends, twists, flexes with you. 15¾ inches.

B. *FlexiDuck*™, **MFJ-1716,** **$16.95.** Similar to MFJ-1717. Full ¼ wave on 440 MHz, efficient loaded ¼ wave on 2 Meters. 8¾ inches.

A. B.

Shorty Duck™ for HTs

MFJ-1718
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Add this *short*, 4¼ inch *ShortyDuck*™ to your HM handheld for a Q-5 signal! Impedance matched for maximum gain. High-Q helical wound radiator.

5/8 Wave 2 Meter Mobile Antenna

MFJ-1728/B
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For *maximum range* while mobile, use MFJ's ***Maximum Gain***™ 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible gain of any single element mobile antenna!

Competitive 5/8 wave mobile antennas can't work any better -- no matter how much more they cost.

You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

You get a heavy-duty magnet mount that holds your antenna tight at highway speeds and a black magnet base that'll look good for years.

You get a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable.

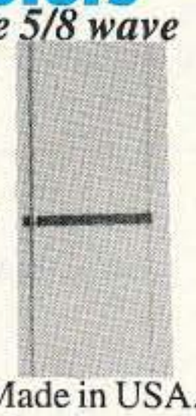
You get MFJ's one year *No Matter What*™ unconditional guarantee.

Order MFJ-1728 with standard PL-259 coax connector or MFJ-1728B that also includes a BNC adapter for your handheld.

Stacked 5/8 Wave for 2 Meters

gives twice the omni-directional gain of a single 5/8 wave

MFJ-1764
$34.95



MFJ's stacked 5/8 wave radiators give you *more than twice* the *omni-directional* gain of a single 5/8 wave radiator!

Wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum.

Fully assembled -- simply attach radiators -- no tuning required. Mounts vertically for FM/Packet or horizontally for SSB. Installs with single U-bolt on 1 to 1½ inch mast or tower leg. 1½ lbs., two 47 inch radiators, 23 inch boom. Made in USA.

Also works as excellent ***6 Meter*** full halfwave centerfed antenna.

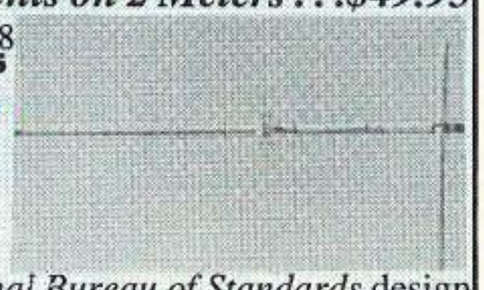
MFJ-1766, $89.95, gives you *four times* the gain of single 5/8 wave. Includes 2 MFJ-1764, phasing cables. Doubles gain on 6 Meters.

MFJ-1765, $29.95, phasing cables for 2 MFJ-1764s, other 2M ant.

MFJ dual band 144/440 MHz Yagi

5 elements on 440 MHz . . . 4 elements on 2 Meters . . .$49.95

MFJ-1768
$49.95
New!



Get two Yagis for the price of one . . . enjoy two Yagis in the space of one with single coax feed!

MFJ's *exclusive* dual band balanced feed with *FerriteChoke*™ decoupling prevents pattern skewing and gives you low SWR.

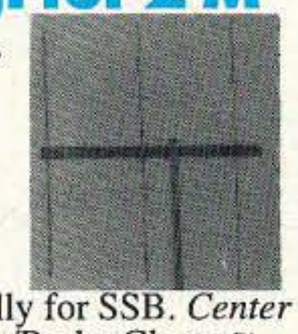
The MFJ-1768 is based on the *National Bureau of Standards* design that's optimized for maximum forward gain with high front-to-back ratio and a clean symmetrical pattern.

Mounts vertically for FM/Packet or horizontally for SSB with single included U-bolt on 1 to 1½ inch mast or tower leg.

High strength 6061-T6 aluminum 5 foot, 1⅛ inch diameter boom. 2 pounds. Elements are electrically isolated from boom. Made in USA.

Portable 3 element Yagi for 2 M

MFJ-1763
$39.95



You can set up or take down MFJ's *portable* 3 elements 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

Mounts vertically for FM/packet or horizontally for SSB. *Center* or *end* mounts with single U-bolt. Great for packet/PacketCluster™.

It's compact 2¾ foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over entire 2 Meter band. MFJ's *FerriteChoke*™ decouples feedline.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's *Permanent Molecular Bonding Technology*™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

5/8 Wave Ground Plane

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For a low, low $19.95, you get a *high performance* 2 Meter 5/8 wave ground plane home station antenna -- you'll get the maximum gain of any single element antenna.

More expensive 5/8 wave ground planes can't work any better -- no matter how much they cost.

You get . . . shunt fed matching that bleeds off unwanted static and gives you low SWR . . . strong lightweight aluminum construction . . . low loss ceramic antenna insulator . . . MFJ's *RapidTune*™ radiator . . . MFJ's one year *No Matter What*™ guarantee. It mounts on 1 to 1½ inch mast with single U-bolt and is Made in USA.

MFJ-1752, $19.95, for 220 MHz .

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CIRCLE 86 ON READER SERVICE CARD

PTT Control from Receiver Audio

Here's an easy way to key a transmitter for remote or repeater operation.

by Roland Burgan KB8XI

Does this scenario sound familiar? You needed to key a transmitter when a signal came into your receiver, but there was no way you were going to risk voiding the warranty on your new radio. That very problem has canceled many a project.

Years ago, accessing the COS line (carrier-operated squelch) was fairly easy, allowing simple control of transmitters for repeaters, base extenders, etc. However, recent advances in technology have produced radios that make such tap-offs very difficult, even for the experienced ham. And the possibility of voiding a warranty is no longer something to scoff at.

I needed a way to key a transmitter upon receiving a signal, without invading the insides of my transceiver. Adding a permanent dangling wire was not appealing, and adding another jack was appalling. There are circuits that provide a signal from an audio source, but they all seem to need voice audio to develop a keying signal (VOX). But now there is a reliable alternative.

Various Uses

This circuit will be especially useful for putting together base/mobile/portable repeaters or remote operations. It will allow the use of equipment without your having to get inside and do circuit surgery. Also, this circuit will provide a switching signal for various devices or secondary units which need to operate when a signal (with or without audio) is received.

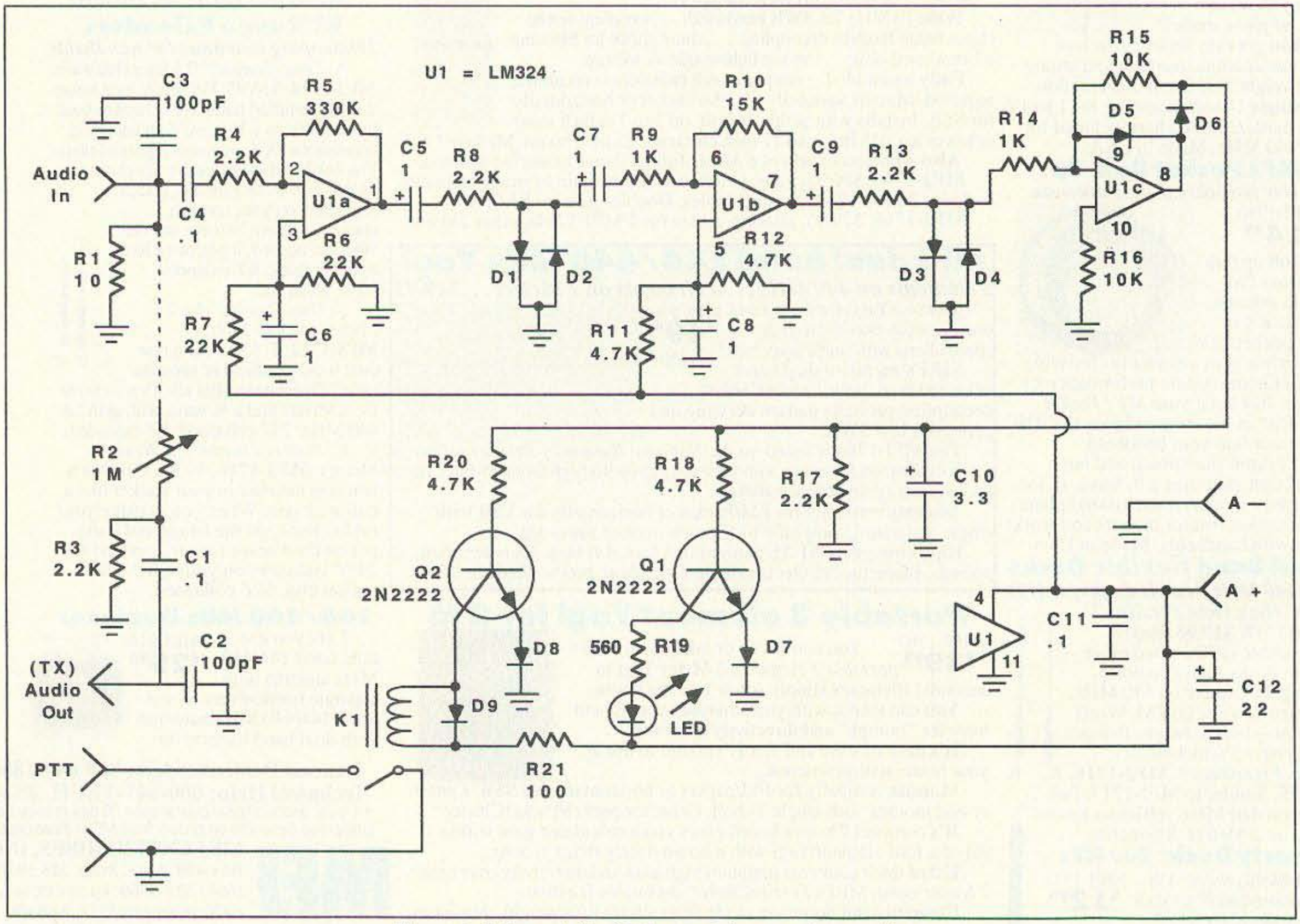

Figure 1. Schematic for PTT control from receiver audio.

Circuit Analysis

The circuit functions on the noise level difference between a full-squelched audio output and the audio noise level present when the squelch opens upon receiving an unmodulated signal. Measurements showed that, on average, there is about a 20 dB difference in levels, and the circuit uses this difference to recreate the COS signal voltage. Op amp U1a (Figure 1) amplifies the audio input, which is then clipped to 0.6V in the first of two clippers. Op amp U1b amplifies the resulting signal, which clips it a second time to 0.6 volts. The result of U1a & U1b is to highly compress and clip the incoming audio noise signal. This signal goes to U1c, which serves in a dual capacity. This op amp first functions as a precision rectifier, producing a DC voltage, and secondly acts as a DC amplifier, raising the DC signal to a TTL level. The TTL level signal voltage then feeds two NPN transistors, one controlling an LED to show status, and the other operating a 5-volt reed relay. A relay was chosen instead of electronic switching to provide reliable device control, especially in repeater/remote base applications. C10 acts as a smoothing filter for the DC signal. The slight time delay this also provides is negligible. Diodes D7 and D8 in the base circuits of the switching transistors will act to prevent false triggering. The LM-324 IC requires only a single supply of from 6 to 18 volts. The audio and A+ line are RF-bypassed. The total circuit gain is 22,500.

Audio Option

For convenience, I have included a transmit audio feed as an option. The variable resister, R2, allows the user to set the receiver volume control to some easily remembered preset point. Then adjust R2 for the required transmit 5 kHz maximum deviation. The 100 pF capacitor acts as RF bypass, while R3 sets level and impedance matching. If your transmitter is designed for high impedance mikes, then delete R3.

Construction

A printed circuit board for this circuit is available for $4.00 plus $1.50 S&H per order from FAR Circuits, 18N640 Field Court, Dundee, IL 60118. Construction may be either on a PCB or point-to-point—there is nothing critical to watch out for. An input sensitivity control was unnecessary because of the heavy signal clipping. However, if your audio source puts out more than 0.5 watt, change the power rating of R1 accordingly. If you intend use this with a transmitter, RF protection requires a metal case. If it becomes necessary to use a higher power supply voltage, changing the relay current limiting resistor (R21) from 100 to 220 ohms and changing the LED resister (R19) to 2.2k will allow operation from 16 to 30 volts (max) power sources. Low current requirements also allow the use of a 9-volt battery. All parts are available from Radio Shack and many other suppliers. 73

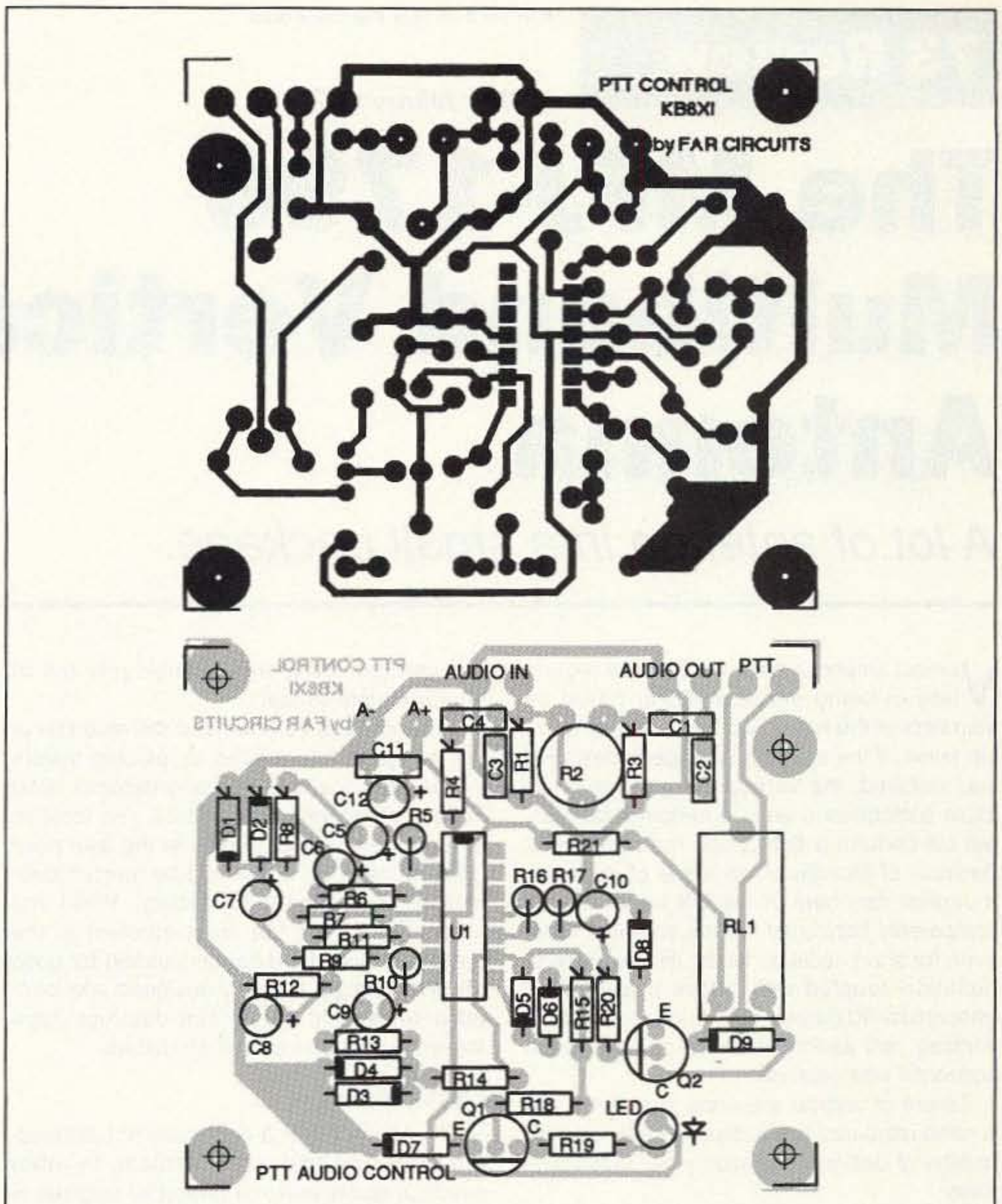

Figure 2. PC board etch pattern and parts placement.

Parts List

C1, C4, C11	0.1 µF, 50V	R/S #272-109
C2, C3	100 pF, 50V	R/S #272-123
C5, C6, C7, C8, C9	1 µF, 35V	R/S #272-1434
C10	3.3 µF, 35V	R/S #272-802
C12	22 µF, 35V	R/S #272-1026
R1	10, 1/2W	R/S #271-001
R2	1 meg. pot, 1/2W	R/S #271-211
R3, R4, R8, R13, R17	2.2k, 1/4W	R/S #271-1325
R5	330k, 1/4W	*R/S #271-1350, 271-1347
R6, R7	22k, 1/4W	R/S #271-1339
R9, R14	1k, 1/4W	R/S #271-1321
R10	15k, 1/4W	R/S #271-1337
R11, R12, R18, R20	4.7k, 1/4W	R/S #271-1330
R15, R16	10k, 1/4W	R/S #271-1335
R19	560, 1/2W	R/S #271-020
R21	100, 1/4W	R/S #271-1311
U1	LM324	R/S #276-1711
Q1, Q2	2N2222	R/S #276-2009
D1-D9	4001 diodes	R/S #276-1653
K1	5 VDC reed relay	R/S #275-232
LED	Any 2V LED	

*Note: Unfortunately, Radio Shack no longer supplies 330k resistors. Wire a 100k and 220k in series.

73 Review

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by Don Johnson K7UGQ

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The MFJ-1796 Multiband Vertical Antenna

A lot of antenna in a small package.

Vertical antennas have the dubious reputation of being either loved or hated by members of the ham radio community. In simple terms, if the antenna is properly designed and installed, the vertical will provide creditable performance and, in certain instances, will out-perform a flat-topped horizontal wire. Because of its natural low angle of radiation, a vertical can haul in the DX better than a comparable horizontal flat-top antenna. However, for short, local contacts, its low angle of radiation coupled with "cross polarization" (theoretical 90-degree shift from horizontal to vertical), will perform somewhat less than a horizontal wire antenna.

Failure of vertical antennas to perform well is often attributed to two basic problems: poor multiband design and inadequate radial systems.

MFJ has introduced a family of autoband switching multiband vertical antennas that addresses both issues. Eliminating the need for radials through a design that electrically mimics a half-wave antenna and reducing losses common with end-fed trap verticals, the engineers have addressed issues responsible for most amateurs' poor experience when using vertical antennas.

Vertical Basics

A basic 40 meter quarter-wave vertical antenna is approximately 33 feet tall and requires a very good ground or counterpoise system to perform properly. In fact, the absence of a well-designed ground system is most often the reason horror stories circulate during vertical antenna discussions. The ground system must be electrically the same as the quarter-wave vertical section, on all operating frequencies, if any system efficiency is expected. Most ham urban/suburban homes do not have enough land, free of obstacles, to connect the several hundred feet of buried or elevated wire necessary for a good RF ground or counterpoise. An acceptable way to overcome the requirement for a cumbersome ground/counterpoise system is to center feed the antenna. However, a basic 40 meter center-fed vertical will stand prohibitively tall at approximately 66 feet.

A vertical can be short and still resonate at the designed frequencies by placing matching devices (loading coils and capacity hats) in each of the vertical elements. The location of a matching device can be at the feed point (bottom loading), in the middle (center loading), or at the end (end loading). While end loading is by far the most efficient of the three, it is also the most demanding for good physical design. A poorly-designed end-loaded antenna will surely self-destruct (cantilever) during a moderate windstorm.

Electrical Design

The MFJ-1796 is a center-fed or balanced-fed electrical half-wave vertical. In other words, a dipole antenna turned 90 degrees to the vertical. As a result, both half waves of the radiated signal are accounted for. At an overall length of 12 feet, loading coils and capacity hats for each band (40-20-15-10) are placed at the ends of each vertical component. This technique provides an electrical half-wave match while maintaining a small unobtrusive overall height. The antenna provides 6 and 2 meter performance through full-sized half-wave elements.

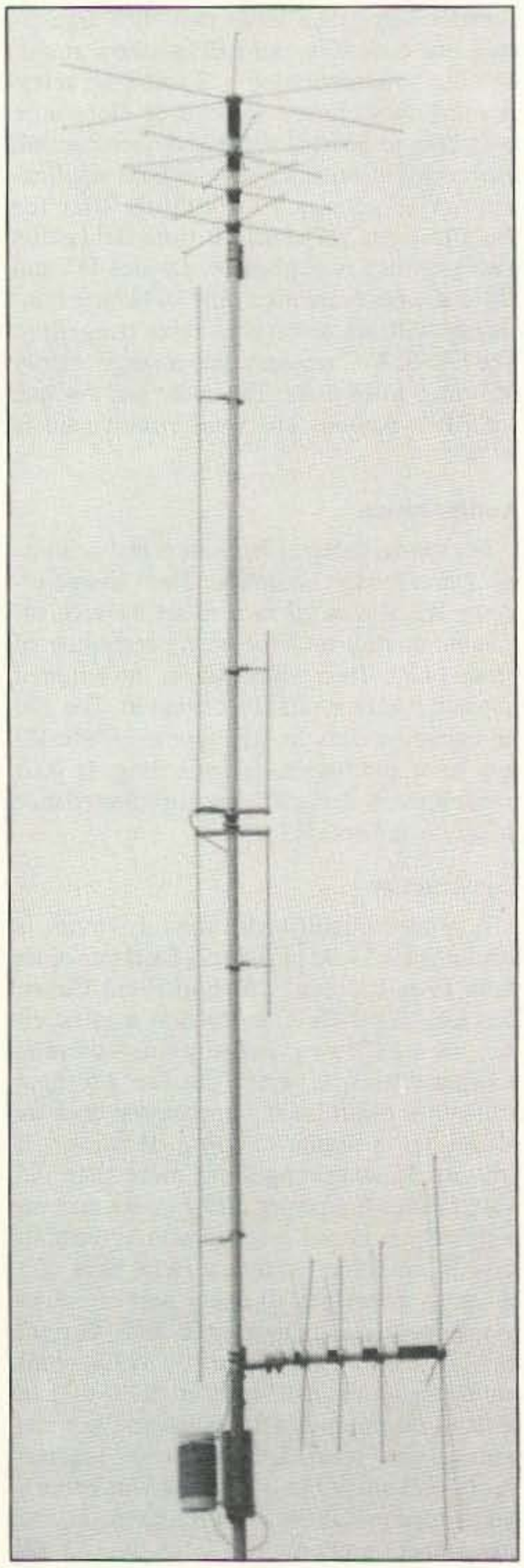
On the four HF bands, the antenna is designed to handle up to 1,500 watts of power, 750 watts on 6 and 300 watts on 2.

Physical Design

As discussed earlier, an antenna with end loading requires a very good physical design. Engineers at MFJ designed the 1796 with 1.16" diameter 6061-T6 aluminum tubing. The critical center and base insulators are made of reinforced Fiberglas, 1" in diameter. All coil forms are also made of Fiberglas.

A four-inch air-wound current balun mounted at the base of the antenna chokes off unwanted RF on the coax cable shield.

Various lengths of aluminum rods are used for capacity hats. Installation of the rods couldn't be made any easier. Once installed, they can be pruned or bent to fine-tune the different resonance points of the antenna.



Though somewhat fragile, the design of the capacity hat rods affords a substantial amount of ductility. The rods will not break under normal use. If accidentally hit during installation, they will deflect or bend. Real physical abuse is needed to break them.

Assembly

The 14-page manual offers step-by-step assembly instructions with several very clear drawings. Additionally, the manual discusses vertical antenna theory and offers hints for choosing a location for the antenna and tuning instructions. I strongly recommend that you follow the assembly manual exactly as written, especially the step that suggests that a temporary mounting or staging area be assembled before constructing the antenna. Once assembly begins, you will need a place to rest the antenna.

As with all MFJ equipment, the warranty explicitly states that the owner is authorized to attempt to repair any defective condition without affecting warranty coverage. A toll-free telephone number is provided for assembly or installation support if required.

Tuning

Nothing is more discouraging and frustrating than to assemble an antenna, perform frequency adjustment, and raise the antenna to height only to have to lower it for additional adjustments. The 1796 is designed to minimize this installation cycle.

As can be expected with a physically short antenna, the lower frequency resonance bandwidths are narrower and more sensitive to adjust than the higher ones. Range of operation (2:1 SWR points) on 40 meters is 40 kHz wide. Before any frequency adjustment is made, you should decide on what segments of the various bands you intend to operate in: CW, phone or somewhere in between.

If assembled per the instruction manual, the resonant frequency for each band will occur at or just below the lowest frequency for each band. For example, 20 meters should be resonant at approximately 13.9 MHz. To increase the operating frequency to the desired segment of the band, you must trim one spoke in each coil assembly. A chart is provided describing the effect of cutting one inch off of the spoke. If I wanted to raise the 20 meter resonant frequency from the assembled 13.9 MHz to 14.2 MHz, the chart says to cut three inches off of one of the 20 meter capacity hat spokes. Since this is a balanced vertical dipole, both sides of the antenna must be adjusted at the same time. I was able to hit my desired frequency, on all bands, the first time!

Extra spokes are provided in case you make you an error when cutting or should you decide to lower the initial frequency.

Comparisons

Antenna comparisons can be like comparing apples and oranges; they are both fruit, but are really different in many other ways. However, comparisons help make decisions, so here goes.

The MFJ-1796 works! How well it works depends upon several factors. Remember, the 1796 is not a multi-element beam, nor should one expect results to be comparable to a beam in any way. When installed 35 feet up and compared to a full-size 80 meter dipole (30 feet up) and a horizontally-mounted magnetic loop (35 feet up), comparable results were obtained . . . sometimes!

Because of two basic antenna facts, low angle of radiation and phase shift, the 1796 does not perform on local contacts as well as the magnetic loop or the dipole. However, if the local station is using a vertically-mounted antenna (same polarization), then the 1796 outperforms both of the other antennas. Because of the inherited low angle of radiation you should expect the 1796 to give a very good account of itself on long-haul DX. And it does. Stations 3,000 miles or so away were heard and worked when the dipole couldn't copy them at all.

The 1796 is a noisier antenna than either the dipole or the loop. In fact, if an electrical storm is within several hundred miles, you may not hear much of anything. This is not the fault of the 1796 but a typical characteristic of all verticals.

Several other things to consider when comparing antennas to the MFJ-1796 are: the small footprint (2 square feet), no radials, only 12 feet tall, lightweight, sound construction, and broad frequency coverage (40 meters through 2 meters).

Closing Comments

Remembering that the MFJ-1796 is a short (compromise) antenna, overall performance is less than a full-size antenna. Therefore, if you can install a full-size antenna, the 1796 is not your best choice. The engineers at MFJ have given serious thought in the areas of antenna design that increase efficiency in an effort to overcome the shortcomings of this type of antenna. If you are on a limited budget and/or must contend with restricted installation space, I strongly recommend the MFJ-1796. 73

The 80/40/30m Tripole

It's a WHAT?

by Dave Brown W9CGI

No, I did not grow a third element off of a dipole just for fun, nor did I name this project just to confuse you. Friends dubbed it the "TRI-DI-POLE." That may be more accurate, but was just too much of a mouthful for me to use as a title. The "TRI" simply reflects the fact that this is three antennas. The "DI" meant that all those antennas are DIpoles. Last, the POLE just refers to the elements used in an antenna—and this one actually has six "poles."

My need for a low-band HF antenna came about when I at last received my Advanced license, after 30+ years a happy-camper Technician Class ham. I really did not study for three decades, it just took that long for me to care enough to give it a try. I got around the 20m-and-up bands I had gained by a simple multiband vertical requiring no radials. The challenge came in trying to fit 80/40/30m into my life. I do live on a farm, but even I don't have unlimited space, much less want the hassle of maintaining three separate feedlines, supports, and so on. While I was researching every "wire" antenna handbook I own or could lay hands on, I came across the very old idea of "cage" antennas. These are usually multi-element, but for only one band. That is, much like folded dipoles are used to raise input impedances, and not to get more bands covered. What if I were to build the simple 80m dipole to cover that band, and then in somewhat that cage manner mentioned, add the 40m elements and check all that out? Last, I could add the 30m sections and then be sure the other two bands still worked. My first try at that, I left "extra" at the ends of the dipoles to be sure—it is a trim-to-fit world we live in. You should not have to do that if you stay with the wire sizes and spacings given here, though leaving a bit over and trimming is always best if you want to be "right on"!

Not only did each other add-on band fit right in without disturbing the bands put together ahead of it, but there was also an added bonus! About a week after getting the 80/40/30m portions all up and going, I was thinking, "Now, what the heck do I do about 160m?" After all, a newly-licensed HF ham is out to try all the new real estate he can cover, as soon as he can cover it. I figured that if I used low power and tried the new tripole, I had nothing to lose. I have a Yaesu FT-990 with the built-in tuner, so some might say I could load a good salami if necessary. That was the case at first. The tuner was indeed used, *and* I stayed down around 10 to 15 watts. The funny part was that when I first tried it, the tuner light came on and went off almost instantly. That led me to think, "OH-OH, this may not be such a good idea!" It was not until I had some time a week later to further investigate that the tuner had shut off because the antenna was a good match, not because of high SWR or any such thing. Cautiously, I tried it with more and more power up to the 100 watts or so output of the FT990, and on tuneup it did just fine. Then the acid test: back to low power, meter in SWR position, and switch the tuner off. Still, the antenna loaded just fine on 160m with no tuner at all. With the

	CHW (feet)	CQW (feet)	CQW (ft. & in.)	SL (ft. & in.)	TL (in.)	FT (in.)
80m	121.875	60.9375	60' 11-1/4"	60' 6"	18"	17.5"
40m	65.455	32.727	32' 8-3/4"	32' 2"	15"	14.25"
30m	46.336	23.168	23' 2"	23'	12"	8.75"

Table 1.

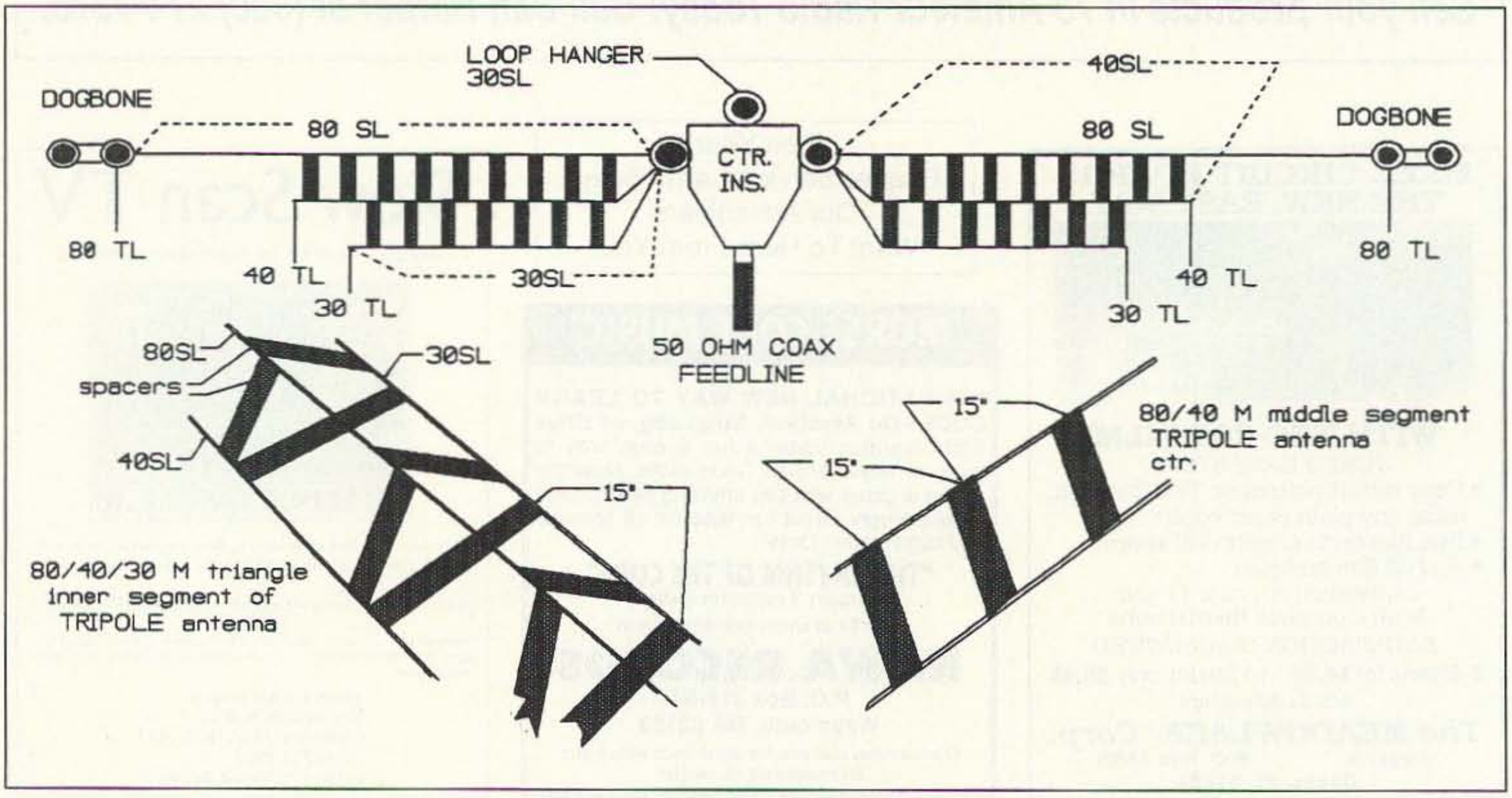


Figure 1. Tripole antenna assembly.

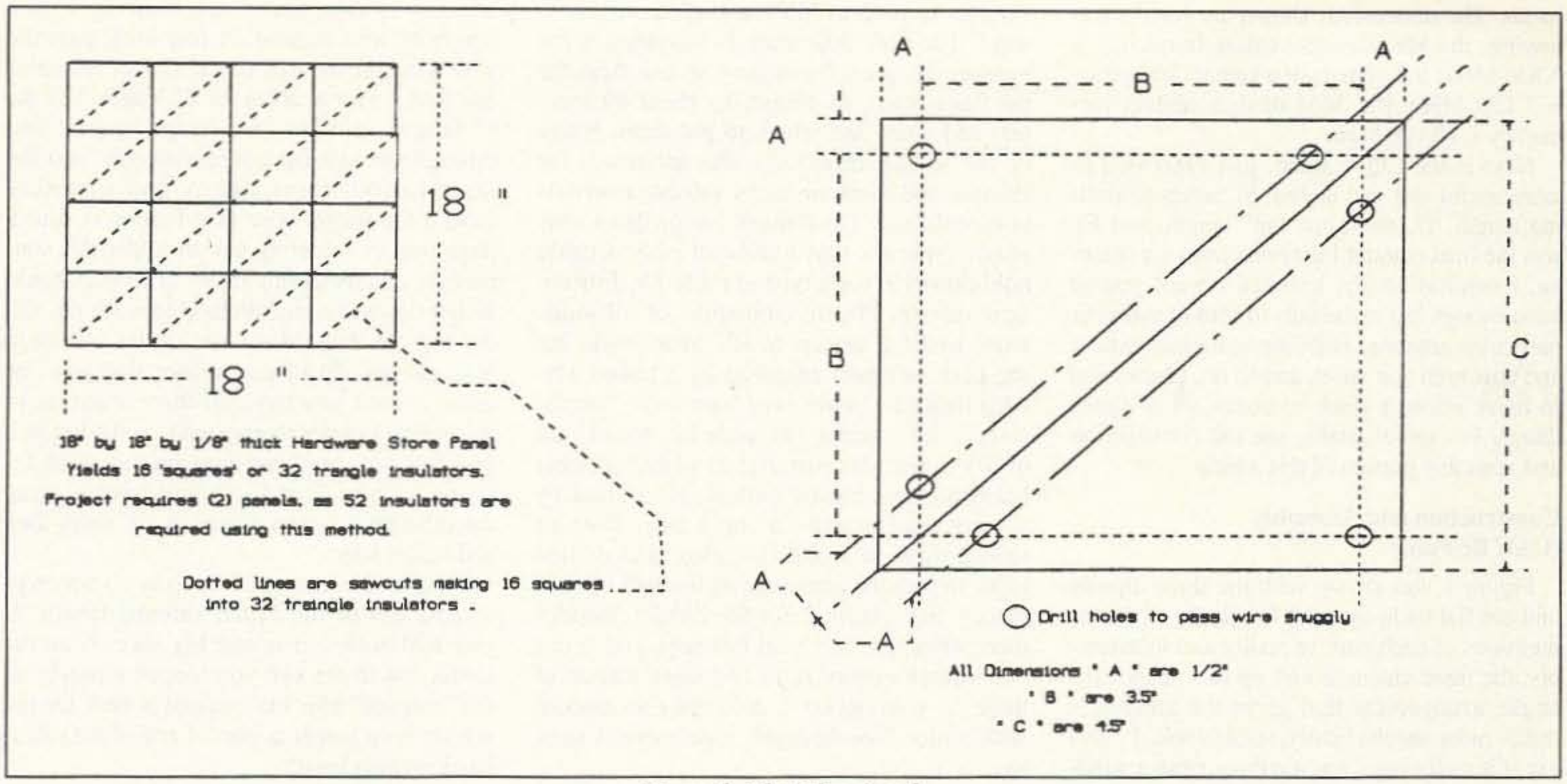


Figure 2. Plexiglas detail.

first three antennas I think I can explain the behavior being great after 30+ years of fiddling with antennas for VHF-UHF, but the exact *why* of the 160m working out so well is definitely beyond me. There are no known stub tuning or capacity effects of the 40 and 30m antennas affecting the full 80m dipole, but that seemed to be happening to some degree. Then, too, the way I put the whole thing up may have something to do with how it behaves.

How Big is "Big"?

In order to erect even a full-sized 80m dipole near my barn without looking like one of the Voice of America sites (awesome wire jobs!), I had to concede to a bit of creative wire bending. At first, my big concern was the effect the bending would have on the performance and directivity of anything I put up. That was just not to be, but more on that later.

Figure 1 and Table 1 describe the tripole's dimensions, and in each case the *finished/trimmed* length I ended up with is given, along with the calculated values and the lengths I would advise you to start out with. The column heading abbreviations represent the following: CHW is the Calculated Half Wavelength (468/frequency in MHz). This is mostly useful to determine the overall length of the antenna, and whether or not you have the space to fit it into your yard! It is never really used for anything as a cutting dimension. The way I put this one up, you need only 1.414 times the CQW length, or a lot about 90 feet wide, to have it fit. If you determine from my figures that you have the room, skip right to the CQW, the Calculated Quarter Wavelength, which is either CHW/2, or you can calculate it directly by using 234 divided by frequency in MHz. These formulas allow you to adjust this antenna for different frequencies within these bands, or even build the antenna for other

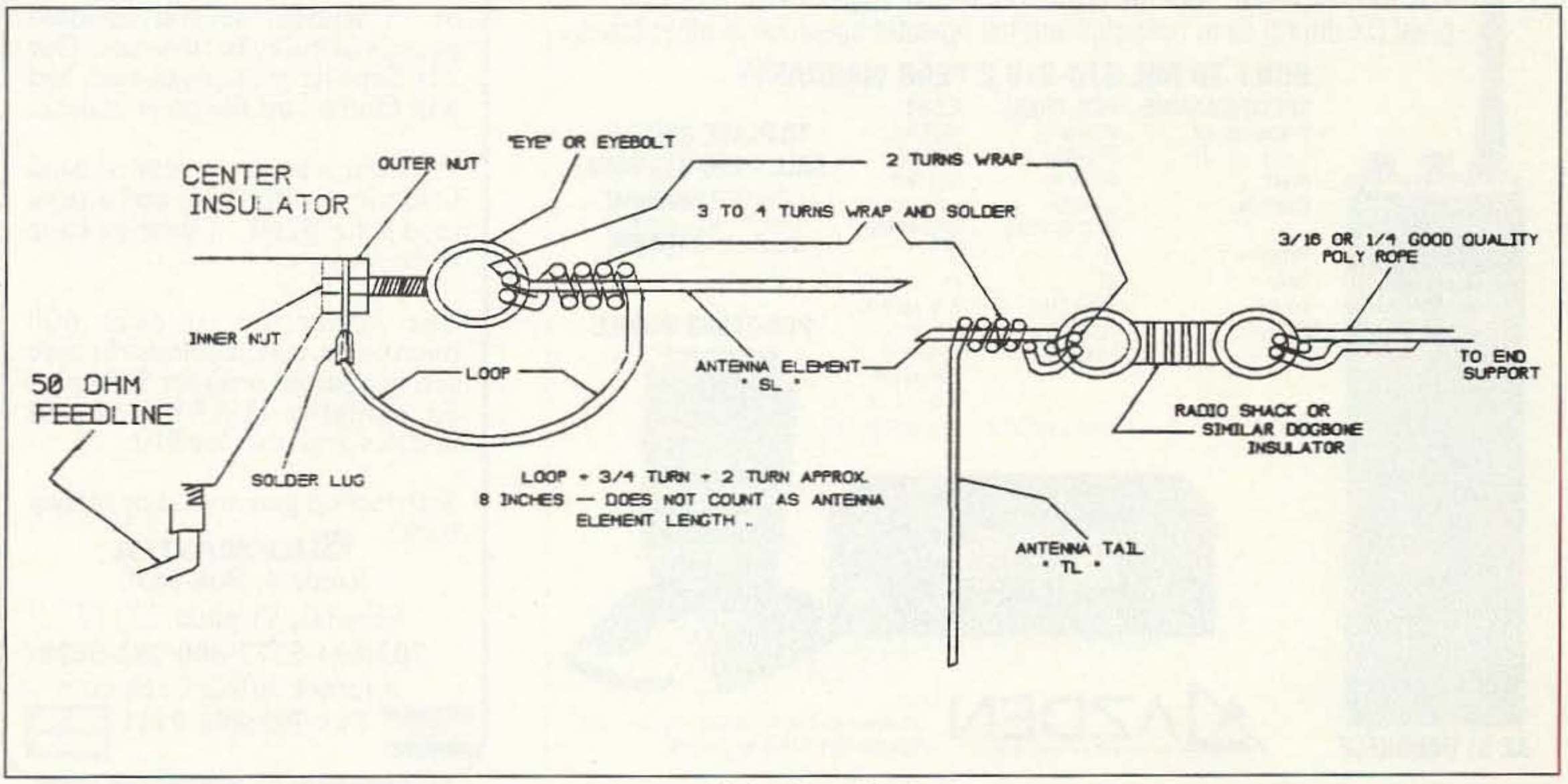


Figure 3. Insulator detail.

bands. The dimensions shown are for the following: the 80m design centers frequency = 3.840 MHz; the 40m design centers frequency = 7.150 MHz; the 30M design centers frequency = 10.100 MHz.

Next is the CQW again, just expressed in more useful feet and inches. SL refers to starting length, TL refers to "tail" length, and FT was the final amount I trimmed from *my* antenna. I emphasize *my*, because I want you to have enough left in the tails to trim to suit your particular antenna, building materials, where and how high you put it, and so on. I have tried to leave enough slack to cover all of those things. For more details, see the construction and assembly portion of this article.

Construction and Assembly (CAN Be Fun!)

Figure 1 was drawn with the three dipoles laid out flat (side-by-side) for clarity of the dimensions of each part. In reality and in assembly, the three antennas end up in a "cage" triangle arrangement that gives the antenna a much more mechanically stable look. I can't say if it really buys you anything from a windload standpoint, or if it is really more solid mechanically in that configuration than if you left it all flat, but it just plain looks better. After all, aesthetics and neighborhood appeal should count for something, right?

Yes, I have built it both ways, and the *only* difference I noted was the more pleasing look of the cage assembly, and that the flat version seemed to blow around more in the wind. The only difference in assembly is the number of spacers you have to use (less for the flat version, of course, by about 40 spacers) and when and where to put them. While on the subject of spacers, this antenna is for HF use, and there are many suitable materials you could use. I had many hundreds of gray plastic spacers that had been ribbon cable hold-downs in some type of cable TV distribution system. Plastic clothspins of all kinds work well for spacers at HF. Most work, but the best look was achieved by a friend who "duplicated" (what *real* ham ever "duplicates?) my antenna. He made his spacers out of 1/8" plexiglas material available in most hardware and plastic outlets. He started by sawing out squares 4.5" on a side. Then he sawed them to make triangles, and drilled holes to pass the antenna wire through in three places. See Figure 2 for the details. Besides more work, the only plus this buys you is just one insulator every 12 to 15 inches, instead of three . . . your option. It does make an antenna with a nice "see-through" appearance, I must say.

Figure 1 shows the layout and dimensions in accordance with the abbreviations used in Table 1. It is much easier to see what things like "tails" are in this type of drawing. One thing you must remember, if you are new at antenna building, is to leave enough wire to do wraps and solder area and the like. For that reason, I'll walk you through the 80m dipole, which you construct first. Starting with a length of wire at least 65 feet long, pass the wire through the eye of the center insulator and fold it over at about the 8" length. Use the 8" length to make two wraps around and through the eye for added strength, and the three-to-four turns tightly and smoothly around the longer wire (see Figure 3). Use a large iron or soldering gun to solder this connection, and then bring the 6" or so that should be left down in a smooth loop to reach the solder lug for that side of the center insulator. You can go ahead and solder that now, or leave it until you have all three antennas to this point. I prefer to go ahead, as the lug will probably only hold one wire anyway (built for single antennas), and you will have to wrap the other two antennas around the small loop and solder later.

Incidentally, that small loop in no way represents any of the actual antenna length! If you will notice, it is one big short from the solder lug to the eye you looped through, so the "antenna" effect is minimal at best. Do not use the loop length as part of any of the calculated antenna length.

Now, from the loop through the eyebolt, measure out the length given as SL, and mark this point (I suggest a black-ink permanent marker), then add TL, plus about 2" or so that it will loop through whatever you use as an end insulator. Don't be afraid to leave this too long—this is just like pruning legs on a milking stool. You can cut off—you can't cut on!

Just be sure the SL length is correct and double (triple) check it now, before you do anything else at the end insulator of this wire. Feed *all* the insulators of whichever type you choose to use onto the wire. Spacing is not an issue at this point, just get them all on, and double and triple check that the number present is correct! For my individual insulator construction, this is 44 insulators per side, about two every 15" as you work out from the center until you reach 36 total, and then eight more at the same 15" interval heading toward the end insulator. Now, feed the wire through the end insulator in a loop so that when the wires touch again, it is exactly at the SL marking. Make three to four turns around the main wire just like at the center insulator end, and solder thoroughly, bringing the tail away from the main antenna section at a right (90 degree) angle. The tail should be very close to 18" or slightly more. If so, you have done well. My beginning piece of wire for this segment (1/2 of the 80m dipole) was 62'10" (8" center—60'6" antenna—2" end insulator—18" tail), but I have been doing this for 30+ years! Like I said, don't be afraid to cut things long. Just be sure those SL lengths are right on—that is the antenna element!

You can now put the center insulator carefully in a vise, or tie it down to a solid object and use side one to make side two. That is another good reason for double and triple checking the first half you did. When you complete that, you have an 80m dipole—with a lot of plastic hanging on it! I like the idea of clamping the center insulator into the vise, so that I can bring the two end insulators out parallel and close to each other (a foot or so apart at the end insulator ends. This allows you to use something like a sawhorse at the end insulator ends to pull the wire out fairly taut. They must be straight and fairly close to perform the next steps.

Next Floor—Going Up, Please!

Adding the 40m elements is the next step. Again, start by measuring off two lengths of wire in the same manner as the 80m dipole. This should be something close to 34'3" (or more!)—8" + 32' 2" + 2" + 15". You can now do the center insulator connections just like you did the 80m connections using that 8" extra wire, and go ahead and do both sides. While the wire is out of the insulators and you can still accurately measure it. Start at the eye of the center insulator once again, only this time go out 32'2" on each wire and use the black marker to mark those points. Now comes the only tricky part, and all it requires is that you think ahead and don't hurry. Start with either side element, and feed the loose end through the open hole in insulator #1, one hanging from the 80m element. Skip insulator #2, hanging from the 80m dipole, and feed on the first of 18 new insulators that you will add to this 40m element. Next you go through #3 hanging from the 80m, skip #4, and add a new one from the "18" pile. Continue this "do one, skip one, add one" until you get out past the 36th of 44 insulators hanging from the 80m dipole—18 you went through, every other one (18) you skipped—and you added 18 from the pile. You can now continue on through *every* insulator (8 more) hanging from the 80m dipole, just as you would any multi-element dipole. You might want to use masking tape as I did to set these 15" intervals and keep things neat as you go.

As the 40m element goes through the last insulator, you should check that that point is right at the 32'2" mark. If all is correct, bend the remaining wire away from the 40m and 80m elements at a right angle, and tape that point as well. Repeat the process on the other 80m element with the other 40m element addition. You should now have a combination 80m/40m dipole combination, quite useable as is. I chose to add the 30m, as well, since my other antenna is a Cushcraft R-5 Vertical, and it only covers 20m through 10m.

At Last—The Last . . .

Adding the last band is simple, but you must take your time and get all the spacers right where you want them. This gets complicated because, as you thread the 30m element through the spacers (all there now, none to add), there will also be a "space" the width of one spacer *between* each of the spacers you thread through on one side. Otherwise you would cause the whole thing to bunch up. My easiest way turned out to be just do the center

insulator work first for both sides—same instructions as the 80m and 40m—and then start feeding the loose end of the element through first the "skipped" #2 insulator on the 80m element, then through the first insulator on the 40m element, then the #4 insulator on the 80m element, then the second insulator on the 40m element, and so on until you have gone through 36 insulators. *Then* go back and space everything out nice and neat, and temporarily tape with the masking tape. You will be trying to make a nice and neat little triangle out of the three elements, keeping the wires each about the spacer hole-to-hole distance apart from one another. This forms a nice little cage about 3" on a side in my antenna, for the length of the 30m element, and then the simple 3" spaced pair out to the end of the 40m element, and of course the single wire on out to the end insulator of the 80m element. When all the spacing is nice and neat, I suggest you apply small amounts of epoxy glue (five-minute variety worked fine for me) to each side of the insulator hole where the wires pass through to keep the insulator "set" at the 15" position. You could use tape or RTV type glues if you want the ability to go back and change things as I did in the first two models. Now I have the final dimensions, you can feel safe "nailing-it-down" with more permanent gluing methods.

Some general information may be of interest. Not only did I want this antenna to serve the needs created by my new license; I also wanted an antenna that could be easily duplicated just about anywhere, so a lot of the parts ended up being from mail order in *73* magazine (so I *know* you can get them also), or from my friendly neighborhood Radio Shack store. I have no less than four of the latter on my way home, depending on the routes I take, and I keep all of them busy (and puzzled) a lot. The wire I used is from Radio Shack, and is seven strands, twisted copper, about 14 gauge, and is RS part #264-1312. The center insulator I obtained by mail order from Cable X-perts, and it is 1:1 direct connect (no balun). The insulators I explained, but you can use the plastic clothspin idea just as well—just keep the spacing at about 3". In fact, a quite colorful (kinda mod and neat) one was built this way with the "see-through" plastic clothspins of various colors arranged symetrically working, out from center. The end insulators have been either the quite common dogbone plastic variety from Radio Shack (RS part #278-1336), some teflon ones I bought at Dayton some time ago, or even the 1/8" plexiglas I mentioned earlier in the triangle insulators. I *do not* recommend the last one and mention it only because it is tempting if you are going to use the clear plexiglas for the rest of the insulators. The stress at the ends, due to the antenna weight, seems to be able to "knaw" through this type of insulator every time when used this way. It is worth the small cost to go the Radio Shack direction.

Up, Up, and Away!

The only additional tip I can offer is this: Be very careful when installing antennas. Stay away from power lines—*period*! Not only will they detune *any* antenna put near them, they can do a real mean number on *you!* By the way, *you do not* have to actually *touch* them! That is a myth. Should you be unfortunate enough to be around the higher voltage distributions that come right through neighborhoods along with the lower house feed systems, you have not only have *bare* wires to deal with, you also have considerable *fields* out from those wires. Remember your basic electronics: Pass current through a wire (in this case, the high-voltage line) and bring another wire (your antenna) close to it—and you get *induced* voltage, folks.

My antenna was put up as follows, for those who want a carbon copy of my results. The apex (center insulator) is 86 feet from the hamshack, in a due-east direction. From there, the two legs of the antenna go out to the compass points of 45 and 135 degrees (about to the NE and SE), meaning there is a 90 degree apex angle much like an inverted "V." The big exception is, the legs go straight out, not down, from the apex point. I seem to have the desired and expected E-W coverage, and yet the antenna is *not* running directly N-S as you

Continued on page 79

73 Review

Number 10 on your Feedback card

by Gordon West WB6NOA

Heil, Ltd.
2 Heil Drive
Marissa IL 62257
Telephone: (618) 295-3000
Price Class: ProSet $135.95 w/adapter cable
Pro 5 $119.95 w/adapter cable

The Heil Headsets with Boom Microphone

Listen to these quality featherlight units.

Last summer at Field Day a 20 meter station was using a Heil Pro Set headphones and microphone assembly that looked inviting to try on. When it was my turn at the rig, I went for the Heil headset to give it a try and couldn't believe how comfortable it was.

The first thing you notice while putting on the headset is how extremely lightweight it is. Unlike older headsets that would cramp your ears and weight your head and neck, the dual-earpiece headset weighs only 10 ounces, and the single-earpiece headset weighs seven ounces. Ultra-lightweight!

The headset earpieces are cushioned with a material that feels like foam and is covered with a micro-thin supple black vinyl. The vinyl has little grooves in it to allow air to circulate around the cushion, cutting down on sweat. But when you put the earpiece on, it effectively blocks out any extraneous noise.

The single- and double-earpiece headsets have a lightweight Heil microphone boom set that can be adjusted close to your mouth. Inside the plastic noise-canceling microphone pick-up enclosure is an element developed especially for maximum clarity on SSB. We looked at the response of this element on a scope, and it drops off quickly under 375 Hz as well as above 3000 Hz. The natural peak of the boom set microphone was around 2.4 kHz, for excellent articulation in the normal speech range. You can easily hear the difference between a Heil element on the air versus typical traditional microphone elements found in the mikes that accompany most HF and VHF sets.

The flexible boom mike terminates to the left earpiece. For some reason, I always use a microphone coming in from the right side of my face. There is no provision to change this, so get used to the mike coming in from the left! It took me all of about 10 minutes to accomplish this.

Whether you order the single earpiece or double earpiece Heil headset with boom mike, they come with a plug assembly that is common to the headset with a mono or stereo one-quarter-inch phone plug and a miniature phone plug. Both of these plugs go into a color-coded six-inch pigtail assembly that matches the microphone input for the following rigs:

Blue for ICOM
Yellow for Yaesu
Red for Kenwood
Red for most Alinco
Black for Ten Tec
White for Collins
Others by special request

Good news—you don't need to drag out that miniature soldering iron to play around with sub-miniature wires onto micro-miniature contacts on a microphone plug. The mike plug pigtail simply inserts into your favorite HF or VHF/UHF transceiver, and the boom set plugs into the pigtail. But wait—where's the PTT? The push-to-talk switch is a lightweight but heavy-duty foot switch that goes on the floor for a convenient method of controlling your station. The heavy-duty foot switch we tested has a non-skid rubber pad, complete with a seven-inch cable that plugs into the pigtail. If you don't like the foot switch, you can order up the HS-1 hand switch which, is similar to those air traffic controllers use. Both allow hands-free operation, and both switches terminate into a one-quarter-inch phone plug that interfaces to both the Heil boom set and the microphone.

"At first we came out with the double-earpiece headset, but by popular demand from those operators wishing only a single-earpiece headset, we now offer the Pro 5, which is identical to the double-earpiece headset," comments Bob Heil K9EID. "Here at Heil Sound, we believe in human-engineering all of our microphone systems to the requirements of the radio operators—so whether they want one ear covered or both, we have it!" adds Heil.

If you have several different radios, you can use the headset between them with additional pigtail connectors. Each cable is about $22.

The professional quality boom sets for amateur radio, including one color-coded pigtail for your particular style transceiver, sells for around $135. A descriptive catalogue showing all of the different combinations of the headsets is available by writing Heil, Ltd., 2 Heil Drive, Marissa, Illinois 62257; (618) 295-3000.

You might also ask for details on the Heil ham radio handbook that I feel is one of the best $10 values for the new amateur operator learning all about the hobby. It's a fun and descriptive book, written by Heil. It's the best I've seen. 73

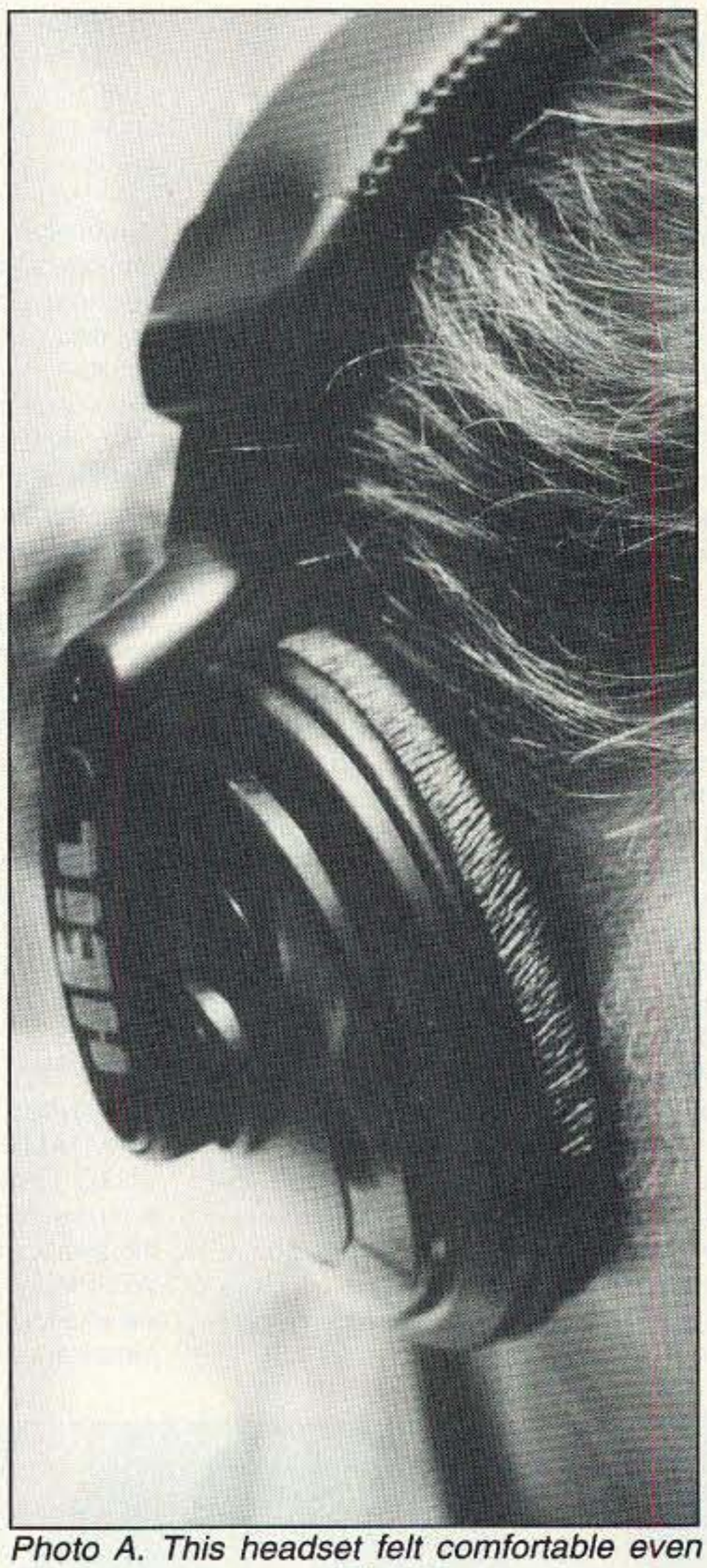


Photo A. This headset felt comfortable even after several hours of Field Day testing.

Photo B. The boom mike element is housed in a noise-cancelling enclosure.

Number 11 on your Feedback card

HAMSATS

Amateur Radio Via Satellites

Andy MacAllister WA5ZIB
14714 Knights Way Drive
Houston TX 77083

The AMSAT Annual Meeting

The 1994 AMSAT Annual Meeting and Space Symposium was held October 7-9 in Orlando, Florida. Over 200 satellite enthusiasts listened to dozens of presentations, visited the Phase 3D integration facility and made satellite contacts using an impressive antenna array set up outside the convention hotel. For all participants, it was a fantastic weekend.

Friday

The paper presentations began Friday afternoon with updates on the Shuttle Amateur Radio EXperiment (SAREX) by Frank Bauer KA3HDO, John Nickel WD5EEV, and the program's Principal Investigator Lou McFadin W5DID. SAREX did very well in 1994 with increased random contacts and many fine scheduled contacts with schools from the ham-astronauts. Joan Freeman KD4SRD presented a SAREX case study describing how her school prepared for and operated during their contact with Bob Cabana KC5VBH on the *Columbia* Orbiter during STS-65.

Dennis Wingo KD4ETA provided an update on the *SEDSAT* program. *SEDSAT-1* is a microsat-class satellite that will be flying as a secondary payload as part of NASA's Small Expendable Deployer System (SEDS). Changes in launch schedules have caused delays with this hamsat. *SEDSAT* will carry several scientific and amateur-radio experiments. The main purpose of the satellite is to test the dynamics of tethered satellites and remote sensing. Dennis also presented ideas on a *SEDSAT*-class, amateur-radio satellite to be placed in lunar orbit.

Dan Schultz N8FGV delighted the audience with his pictures from the Hubble Space Telescope. Dan showed several images representing photos before and after the shuttle repair mission, a few of which were included as handouts for those attending.

AMSAT Director Bob Diersing N5AHD told the story of *DOVE*'s recovery. The process to bring *DOVE-OSCAR-17* back online and make the satellite talk has been long and hard. Many volunteers have been involved in the process since launch. Bob also outlined plans for *DOVE*'s future to include easier recovery from problems and more speech transmissions from the spacecraft. Efforts are underway to allow the satellite to transmit telemetry values using voice.

Last year David Liberman XE1TU could not present his paper on the UNAMSAT microsat project from Mexico. He was feverishly preparing for launch. Due to many delays with the Russian commercial/military launcher program, UNAMSAT is still not in orbit. This year David was able to talk to the symposium and describe UNAMSAT's proposed operation, what to expect and how to use the data once the satellite is in orbit. With an extra year to refine the satellite, David and his group in Mexico have been able to further study and test the complete system on the ground. The meteor scatter experiment, using a low-VHF transmitter/receiver, has worked extremely well and should provide excellent results in orbit for meteor ionization trail propagation studies by both students and amateur radio operators.

Philip Chien KC4YER finished the day's talks with a quick look at launch opportunities beyond Phase 3D. Philip pointed out the difficulty amateurs will have in the future finding rides to orbit. He noted that the amateur community should be ready to go on short notice when a launch opportunity becomes available. Many potential rides have already been missed.

Saturday

Activities began in earnest at 8 a.m. when AMSAT President Bill Tynan W3XO gave an official welcome to the symposium participants and introduced the symposium Chairman Al Brinkerhoff WB5PMR. Al has been an active satellite chaser for many years and coordinated an AMSAT meeting and space symposium in Dallas several years ago. He and his crew of volunteers did an incredible job in Orlando. Registration was easy, the prizes after the banquet were great and the communications bus from Florida Power and Light provided an excellent mast for the satellite antennas used by the symposium satellite station.

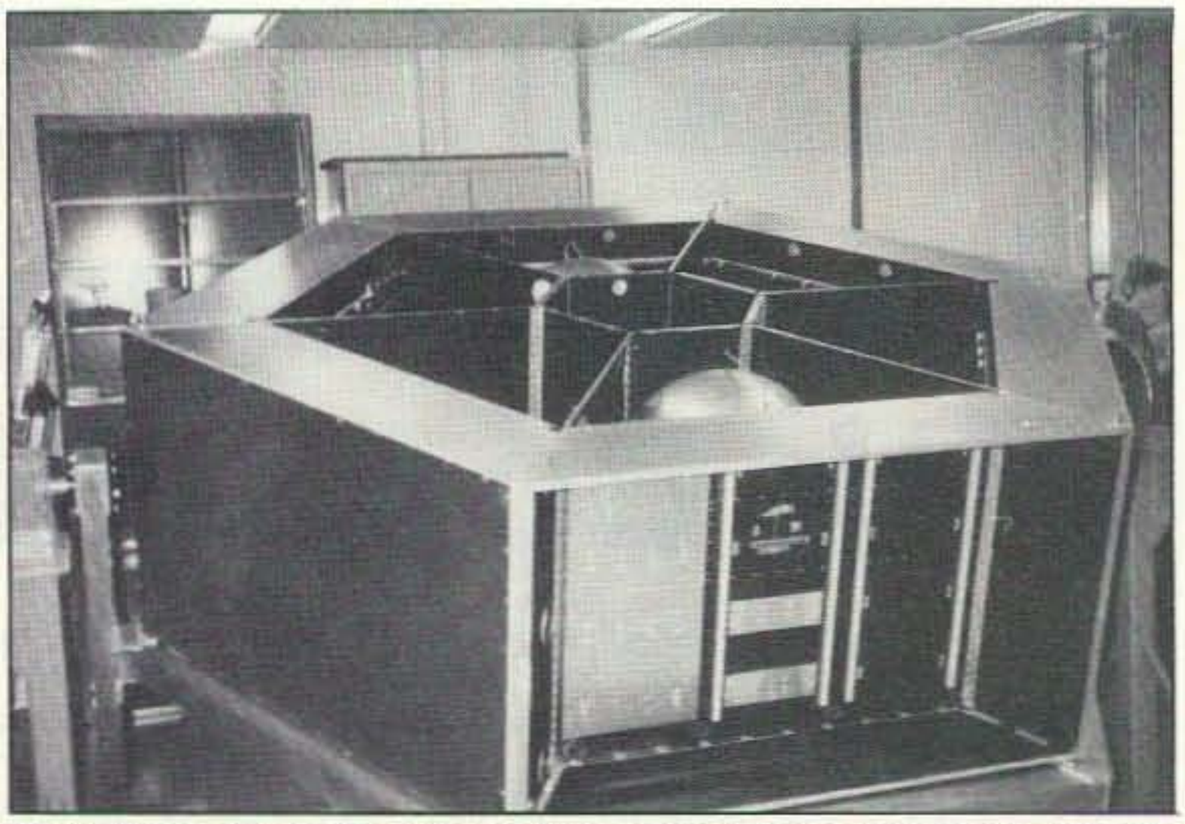


Photo A. The Phase 3D assembly is currently under construction in a special clean room at the Orlando International Airport Foreign Trade Zone. Tours of the facility were part of the symposium.

Professor Robert Twiggs of Stanford University gave the first talk of the day. Bob's presentation paralleled the symposium paper by Christopher Kitts and Richard Lu on the Stanford SQUIRT Micro Satellite Program. SQUIRT stands for Satellite Quick Research Testbed and represents an opportunity to prepare and launch educational payloads designed to operate within the parameters of the amateur radio satellite service. The first SQUIRT is to be called *SAPPHIRE* for Stanford Audio Phonic Photographic Infrared Experiment. It will be hexagonal in shape, nine inches tall, 16 inches in diameter and weigh roughly 25 pounds.

Peter Guelzow DB2OS gave two presentations on Saturday. His first was based on the paper "The Re-Entry of *OSCAR-13*" by James Miller G3RUH. Due to the pull of the moon and sun, AMSAT-OSCAR-13 is expected to re-enter the atmosphere and crash to earth in late 1996. James' guess is December 5, 1996. Peter's second paper was presented later in the day. It covered the Controller Area Network, or CAN, that will be used for digital communications between subsystems onboard Phase 3D.

AMSAT President Emeritus Dr. Tom Clark W3IWI described his Global Positioning System (GPS) experiment for Phase 3D. He titled the talk "Where Am I and What Time Is It?" Through the use of multiple GPS receivers on Phase 3D, Tom proposes to not only define the exact position of the spacecraft at any instant, but also to preserve extremely accurate time on the craft, maintain a set of orbital elements for transmission with the telemetry, and to accurately define the orientation of the craft with relation to the sun and earth. It's an ambitious project, but other groups around the world are showing interest in Tom's proposed uses and other possible ramifications of having such satellite data available.

Walter Daniel KE3HP followed Tom with a presentation on the use of star cameras for satellite attitude determination. Doug Loughmiller KO5I/GØSYX came after Walter with his description of the small satellite programs at the University of Surrey in England. Doug is a past president of AMSAT-NA and a long-time hamsat enthusiast. His presentation was well received. Later in the day he spoke on the AMSAT-UK contributions to the Phase 3D program.

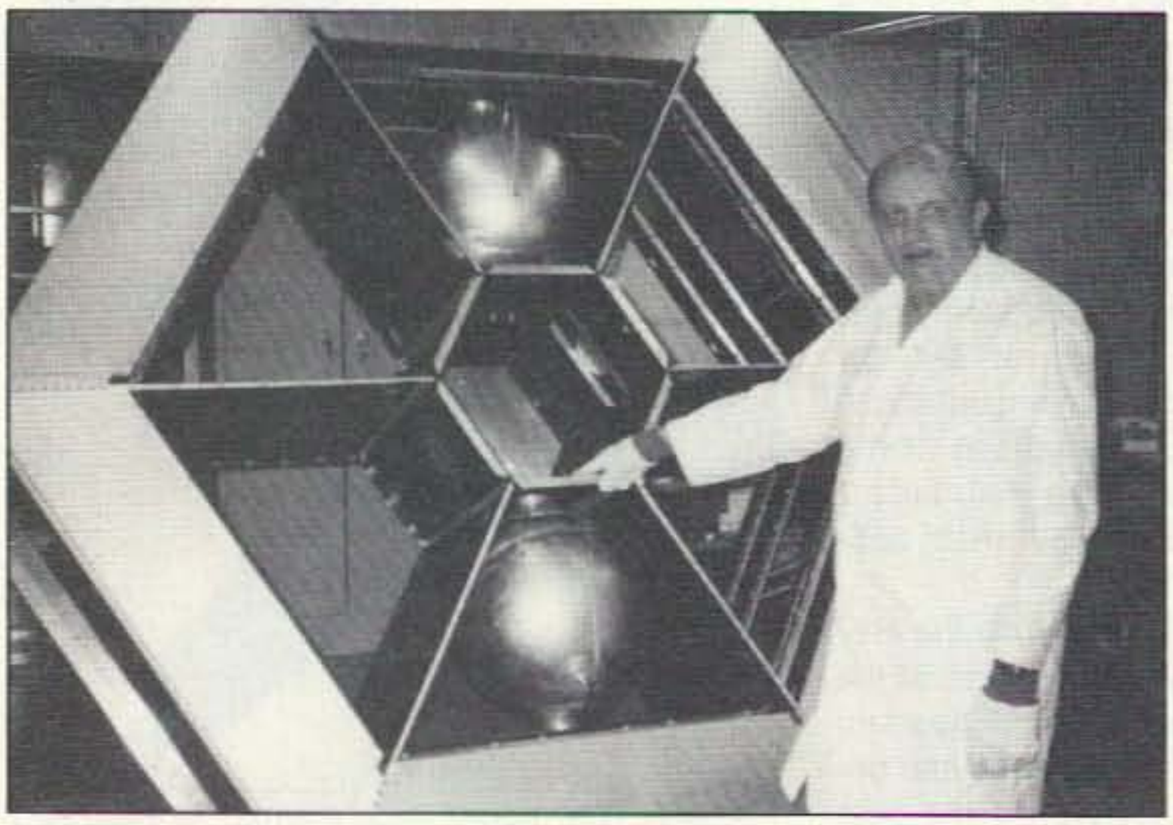


Photo B. AMSAT Executive Vice President Keith Baker KB1SF with the massive Phase 3D space frame in the clean room.

Photo C. Antennas and other satellite hardware were on display in the integration facility for symposium participants.

DAYTON hamvention® '95

April 28, 29,30, 1995

General Chairman, Ken Allen, KB8KE

Asst. General Chairman, Dick Miller, N8CBU

✷ Giant 3 day Flea Market ✷ Exhibits ✷ Activities for the Non-Ham

When and Where

April 28, 29 and 30, 1995; Dayton, Ohio at Hara Arena

Communications

FAXMail (information sent to you via FAX): (513) 276-6934

BBS via America Online: Keyword "Ham", Select "Hamvention"

PHONE: (513) 276-6930. For fast response, please obtain the committee Voice Mail box numbers via FAXMail or BBS.

FAX (incoming): (513) 274-8369

MAIL: Hamvention, Box 964, Dayton, Ohio 45401-0964

Special Services

Lodging information and special award nomination forms are in our 1994 Program. Call FAXMail or BBS for more information.

License Exam by appointment only. Call FAXMail or BBS for details.

Deadlines

In order to have time to return tickets to you, we must have advanced reservation orders postmarked not later than April 8 (USA) or April 1 (Canada). Tickets will not be mailed before January 15th, 1995. Ticket requests that are received **AFTER** the deadline will be processed and **HELD** for pick-up at Hara Arena. Tickets can be picked up beginning Thursday, April 27 at 8:00 a.m.

Flea Market

Flea Market Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. A maximum of 3 spaces per person (non-transferable). Electricity is available in a portion of the last Flea Market row for $40 additional per space. Rental tables and chairs are not available in the Flea Market. Vendors ***MUST*** order an admission ticket for each person when ordering Flea Market spaces. Please send a separate check for Flea Market space(s) and admission ticket(s). Spaces will be allocated by the Hamvention committee from orders received by February 1. Please use 1st class mail *only*.

Notification of Flea Market space assignment will be mailed by **March 15, 1995**. Checks will not be deposited until after the selection process is complete. Please indicate in the box below if you would like to attend regardless of Flea Market space assignment.

Free bus service

Free bus service will be provided between Hamvention, Air Force Museum, Salem Mall and Forest Park Mall parking areas. We are investigating ways to improve service to hotels. Please call our BBS or FAXMail for specific information.

Returned Checks

A $20 service charge will be assessed on all returned checks.

HAMVENTION Is sponsored by the Dayton Amateur Radio Association Inc.

Advance Registration

Enclose check or money order for amount indicated in U.S. dollars and type or print your name and address clearly.

Make checks payable to:

Dayton HAMVENTION Mail to -
Dayton Hamvention Box 1446, Dayton, OH 45401-1446

Flea Market tickets *Please check one and enclose **two** checks.*

❑ Send admission tickets **only** if flea market space(s) assigned.

❑ Send admission tickets **regardless** of flea market space assignment.

		How Many	
Admission (valid all 3 days)	_____	@ $12.00*	$_____
Grand Banquet	_____	@ $23.00**	$_____
Alternate Activities			
Saturday Luncheon	_____	@ $9.00	$_____
Sunday Luncheon	_____	@ $8.00	$_____
Flea Market ‡	_____	$35/1 space	
(Max.3 spaces)	_____	$70/2 adjacent	
	_____	$160/3 adjacent	$_____
Electricity add	_____	$40.00/space	$_____
Covered tent	_____	$230.00 ea.	$_____
		Total	**$_____**

Name _____ Call _____

Address _____

City _____ State _____ Zip+4 _____ – _____

Daytime Phone # ( )_____ Evening Phone # ( ) _____

* $15.00 at door

**$25.00 at door, if available

‡ Admission ticket must be ordered with flea market spaces

Photo D. AMSAT Vice President of Engineering Dick Jansson WD4FAB and Jan King W3GEY with the burst-tested fuel tank in the integration facility.

The morning talks concluded with an update on the TAPR/AMSAT DSP-93 Project. The Tucson Amateur Packet Radio, Inc. group and AMSAT agreed a few years ago to jointly fund a program to design and eventually market kits using Digital Signal Processing (DSP) to make a new modem based on software that could be connected to a standard Terminal Node Controller (TNC). The result is the DSP-93. The first production kits were out in November. The second round are scheduled for release in early March, and at least 100 should be available from TAPR and AMSAT at the Dayton Hamvention in April. The initial offering included software for 1200 baud AFSK (standard VHF packet), 300 baud AFSK (standard HF packet), 1200 baud PSK (for use with microsats), 9600 baud FSK for both terrestrial and full-duplex satellite operation, and a number of audio filters. Several other software efforts are underway for release in early to late 1995 including APT for weather satellites, a digital oscilloscope, SSTV (slow-scan television) and other HF modes.

The afternoon topics proved to be a very detailed and intense session on the current status and future efforts regarding the Phase 3D program. Phase 3D promises to be the most versatile and expensive hamsat yet. The international coordination needed to bring it all together is phenomenal. AMSAT President Bill Tynan W3XO provided opening remarks describing Phase 3D as a new era for amateur satellites.

Dick Jansson WD4FAB presented the latest findings and engineering studies on the mechanical and thermal design. Stan Wood WA4NFY showed the antenna designs and locations on the space frame for antennas covering VHF, UHF and microwave bands. Peter Guelzow DB2OS described material from Dr. Karl Meinzer DJ4ZC of AMSAT-DL on the RF subsystems and attitude control. Lyle Johnson WA7GXD talked about the computer for satellite housekeeping and a new digital communications experiment to be incorporated into the craft. Other topics covered during the afternoon session included the Phase 3D propulsion system by AMSAT Director Dick Daniels W4PUJ, more on GPS by Tom Clark W3IWI and his crew and, finally, concluding remarks from Steve Park WB9OEP, who did a great job keeping the presentation schedule running smoothly.

Following a short break to allow everyone to catch their breath and relax after data input overload, the yearly banquet began. The speaker was Dr. Paul Shuch N6TX. His light but informative topic was "The Search for Dark Matter." Paul has that unique ability to make the most complex topic both understandable and fun. Prizes and AMSAT awards finished the evening. The prizes ranged from books and maps to S-band gear from SSB Electronics and an ICOM 281H mobile transceiver.

Photo E. Joan Freeman KD4SRD presented a SAREX case study on how she got involved in the Shuttle Amateur Radio Experiment program with students in her school.

Sunday

Following the Field Operations breakfast at 7 a.m., the talks began again with topics devoted to operating via the hamsats. Keith Baker KB1SF started the forum with advice for beginners. Paul Shuch N6TX continued with a talk on orbital slight of hand and Ed Krome KA9LNV discussed feed system alternatives for mode "S" (2.4 GHz) reception.

Photo F. An operational hamsat station was set up at the Holiday Inn for interested symposium participants to operate.

Gould Smith WA4SXM described activity via the Russian RS satellites. Ned Sterns AA7A explained how the K7TR Field Day group won the 1994 AMSAT Field Day competition. Roy Welch presented information on AMSAT software and John Hansen WAØPTV reported on software for the digital birds.

During the sessions, special buses were available to take symposium participants to the Phase 3D integration lab at the Orlando International Airport Foreign Trade Zone. The integration team had set up several displays of the satellite systems, the space frame in its clean room and various experiments to demonstrate GPS, satellite attitude control, and antenna efforts. At the same time, the AMSAT Board of Directors meeting began.

Bill Tynan coordinated the board meeting, which lasted through mid-Monday with a few breaks for food and sleep. The agenda covered many items, including publications, SAREX, the DSP project status, long-range planning, commercial relationships, new satellites and the budget. AMSAT has a significant challenge ahead to pay its part of Phase 3D and still maintain its many other activities. Work on fund raising will continue to dominate AMSAT's operations until the launch. Discussions were also started on AMSAT's future beyond Phase 3D. Although many attending the Board of Directors' meeting may have found the conversation more like a philosophy session, it got everyone thinking: Where do we go from here? What's next?

Orlando, Florida, may be the site again for the 1995 meeting; an announcement is expected soon. It is sure to be a fascinating event since Phase 3-D will be near completion and just about ready for launch.

Copies of the Proceedings of the symposium are available from AMSAT or the ARRL. The book is 8-1/2" by 11", 154 pages, and softbound. It's well worth the cover price of $12. AMSAT can be contacted at 1-213-589-6062 for details on shipping charges.

Straight Key Night

For many years the ARRL has sponsored Straight Key Night (SKN) on New Year's Eve and New Year's Day. In 1972 a group of satellite chasers decided to try their hand at some straight key CW via *OSCAR-6* during SKN. The idea caught on and the tradition has been maintained whenever there has been a satellite available for the event.

AMSAT Vice President of International Affairs Ray Soifer W2RS invites interested satellite operators to participate in the 23rd annual SKN via OSCAR. He reports that there are no rules, no scoring, and no need to send in a log. Just call CQ SKN in the CW passband segment of an OSCAR between 0000 and 2359 UTC on January 1, 1995, or answer a CQ SKN call from another station. Contacts via the moon also count. Nominations for best "fist" can be sent to W2RS @ WA2SNA.NJ.USA.NA via packet or to W2RS@AMSAT.ORG via the Internet. You can also use his callbook address. 73

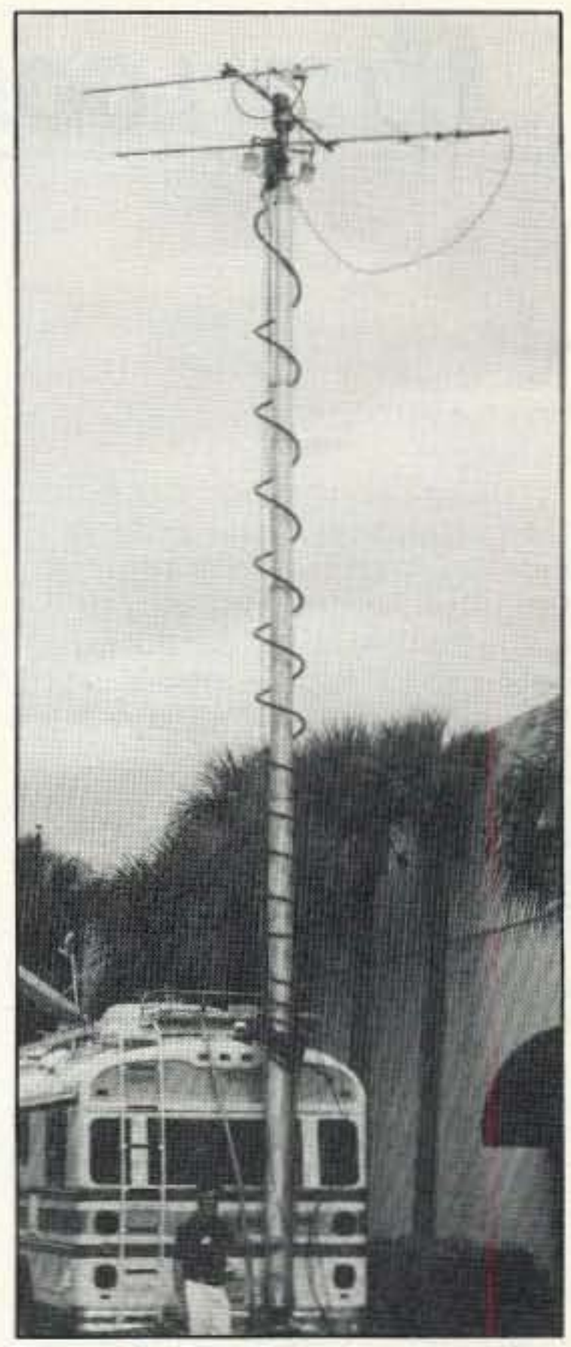


Photo G. The Orlando symposium crew provided an impressive support for the satellite antennas. (K1MON photo.)

Number 12 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

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

With the customary greetings, let me be among those of your old friends to wish you a happy and healthy new year. In this changing world, may 1995 be a year of peace and prosperity for you and yours. Now, to the business at hand. A dip into the mailbag this month.

Jim Hale KJ5TF of Kingston, AR, sends along a note which relates that he would "like to try RTTY, but I hear that I may find it difficult with low power.

"My home is in the backwoods and power poles are about $30,000 away. We have built up our solar and battery system over the years and are quite happy this way.

"My old batteries are retired telephone cells and I don't like to run more than 30 watts. My Ten-Tec Argo only has a maximum power of 50 watts.

"What band is the most interesting for RTTY and PACTOR?

"If I built a two- or three-element delta loop beam on that band, would my low power be okay? I have wire loops in the trees all around the house, and they work very well versus dipoles. I could aim one east, and another west.

"I don't want to spend a lot on a controller. What are some 'older' modems I could use with my 386 laptop?"

Well, Jim, these are some very wide-ranging questions. The photo on your QSL card looks idyllic, but I see your problem! First off, my congratulations on being able to supply your own power away from the commercial grid. That alone might be the subject of another article. Don't worry, though, as with other amateur modes, communication on RTTY is as much a factor of technique as anything else.

If you can hit a local packet repeater, commonly called a digipeater, that might be your best entry point. Monitor some of the common frequencies, such as 145.01 or 145.03 MHz, for the distinctive "brrrp" of digital communications.

Now, on HF, given your Argo, I would suggest two options. Listen around 3620 kHz for RTTY signals, and try to answer a CQ you can hear well. The other popular venue for RTTY is 20 meters, with 14.080 MHz being the center of the street. Once again, depending on how well you can hear signals, communication should well be possible.

As far as modems go, you have at least two choices. You could try to obtain an older modem, such as the HAL ST-5 or ST-6, iRL, or Flesher units, and use a terminal program such as those discussed in recent months, and available in the "RTTY Loop" collections. Alternatively, there are small, dedicated controllers that work with programs such as Baycom or PMP. Again, scan the ads here in *73* and the programs in the collection.

Overall, don't let these obstacles stand in your way any more than your distance from the power lines did. Good luck, and let us hear about your success!

Some want to get on, others want to get off. Let me share these two letters with you, as well:

Sheldon Daitch WA4MZZ, Box 182, Louisville, GA 30434-0182, writes of his large assortment of Model 28 TTY and Northern Radio manuals that he will pass along to interested RTTY buffs for the cost of postage. He says that he's carried these manuals around for several moves, and now wants to put them in a good home, rather than toss them. I don't know what he still has, as of this publication date, but it's worth a stamp if you're interested.

On the other hand, Joe Brugman WB6ALI, of Whittier, CA, wrote with some follow-up of his search for takers of equipment last year. After mentioning the availability of the mechanical teleprinters, no one exactly beat his shack door down. Then, he got an idea that maybe one of the movie prop rental houses would like to have it. After all, he does live near enough to Hollywood! Anyway, after some calling around, he located a company that accepted the material, presumably to use as a prop in some future production. Joe looks forward to tuning in one day and seeing his legacy being tuned on!

With movie and other theatrical productions taking place all over these days, even Baltimore has seen productions from the movie "Avalon" to the weekly TV show "Homicide" being produced here. This is another place to investigate when you move off the green keys to the green screen, so to speak.

Eric WA8ZJY sent along a question via AOL, in which he refers to a comment regarding possible modifications to the Hal DS 3000 to allow for output to a printer. He is also interested in any other modifications that may be available for this device. Having used it in conjunction with a Model 28, he would like to put the mechanical teleprinter aside and use a more power- and noise-efficient printer or file storage such as a PC. Anyone using the DS 3000 in this way, we all would appreciate hearing from you.

Another AOL fan is David Laustsen N3LHY, of Doylestown, PA. David writes that he has a Mac Centris 650 running system 7, with a PK232MBX used on RTTY, AMTOR and PACTOR. He has the AEA software MacRatt with FAX. Having gone round and round with AEA, David can't get the program to work on this new Mac. It worked OK on the old "toaster" Mac. He has friends who have had the same problems and have either gone to a dumb terminal program (as he has for now) or sold the 232 and gone with the KAM. Enough background. The question is: Is there any software out there for the Mac family that will run on System 7 and do a decent job of controlling a 232 on the HF modes?

Well, you might look around on America Online's Ham Radio SIG (go ham radio). There is a library of Apple programs, and while I can't say for sure that there is a program in that library for you, it may be your best first show. Again, I look forward to hearing from you.

All these folks are dropping me Email online, and you want to get in on the fun? Write me via America Online (MarcWA3AJR), Internet (MarcWA3AJR@aol.com), CompuServe (75036,2501), or Delphi (Marc WA3AJR). Sure, snailmail to the above address is OK, too! All seven of the RTTY Loop disks remain available. Drop me a line for the listings and details. For now, that's a wrap, and we'll see you next month here, in "RTTY Loop." 73

MFJ *super* DSP *filter*

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

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***Only* MFJ gives you 5 *factory* pre-set filters and 10 *programmable* pre-set filters that you can customize. Instantly remove QRM with a turn of a switch!**

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

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

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

***Automatic gain control* (AGC) keeps audio level constant during signal fading.**

Automatic notch filter

MFJ's *automatic* notch filter searches for and eliminates *multiple* heterodynes. It's *milli*-second fast -- interfering CW and RTTY signals are also eliminated.

Voice signals aren't degraded because the notch is *extremely* narrow.

With up to 50 dB attenuation, you'll copy stations otherwise masked by heterodynes, miss fewer calls and be less exhausted.

Leave the *automatic* notch filter on during a phone contest and you'll never hear unwanted heterodynes of tuner-uppers.

You can *selectively* remove tones. Say, you're on CW and a couple of annoying CW stations appear nearby. You can use the *two* manually *tunable* notch filters -- *an MFJ exclusive* -- to completely knock them out.

Adaptive noise reduction

Turning on *noise reduction* silences background noise. Noisy SSB, FM, AM, CW and Data signals become readable.

Noise reduction works in all filter modes and on all random noise -- white noise, impulse noise, static, ignition noise, power line noise, hiss and atmospheric noise.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

Reducing random noise reduces fatigue, especially when the band is noisy.

Tunable highpass/lowpass filters

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

You can *tune* the lower cutoff frequency 200 to 2200 HZ and the upper cutoff frequency 1400 to 3400 Hz.

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

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

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

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

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

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

Tunable bandpass filters

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

You can *tune* the center frequency from 300 to 3400 Hz. And *vary* the bandwidth from 30 Hz to 2100 Hz -- from super tight CW filters to wide razor-sharp Data filters.

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

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

Even with the narrowest 30 Hz bandwidth, you'll never have a problem with ringing.

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

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

You can select from *fifteen* convenient *pre-set* filters. Use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode you can think of.

If you don't like our *pre-set* filters, you can program your own -- *an MFJ exclusive!* Save center frequency/bandwidth, lowpass/highpass cutoffs, auto/manual notch and noise reduction --all filter settings-- in 10 *programmable* filters.

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

Plus more . . .

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Problems Running Your Ham Radio MS-DOS Software On That Snazzy New Windows Machine? Here's a Solution

There's an awful lot of software available for ham radio and general electronic hobbiest use, and much of it is written for MS-DOS machines. Normally, MS-DOS software runs fine on Windows machines, but sometimes you will see an error pop up that reads something to the effect of "Out of Memory Error" (or something similar—I've seen a couple variants). The error might occur on INSTALL, or when attempting to run the program.

When I saw that while trying to load one of my wife's MIDI musical notation programs on my new 486 machine, I about had a fit: "Whadya mean, 'Out of Memory'? I've got 16 whopping megabytes!" Unfortunately, the DOS core of my 486 machine still thinks it's in a 640K world. When I ran CHKDSK, the report on the screen showed that there was not enough memory left in my lower 640K to run, or even install, the program.

The problem is that memory in the lower 640K gets chewed up as you add features to the computer. Mine has a mouse, a CD-ROM drive, and a few software packages that all take up a little space in the lower 640K. As the Windows computer becomes more sophisticated, the more likely it is to go "tilt" when attempting to install a new MS-DOS program.

Fortunately, there's a workaround that should keep the software up and running until the S/W maker decides to release a Windows version. A call to the musical notation program people revealed the trick. The idea is to create new CONFIG.SYS and AUTOEXEC.BAT files that can run the MS-DOS software without destroying the old files. When you wish to run the odd software, you use a little program to swap the two files (and after you are finished, swap 'em back!).

Before you do anything, however, save the CONFIG.SYS file in a "golden" (which means you don't touch it) file. Go to the DOS prompt (C:\) and type:

```
COPY CONFIG.SYS CONFIG.SAV
```

Next, save the CONFIG.SYS file to a new file, which you will modify. My wife's music program wants to use CONFIG.MPP, so I'll just ape them (you can make up a name to fit the name of the software you'll be running).

```
COPY CONFIG.SYS CONFIG.MPP
```

You can check the CONFIG.SYS or its clone CONFIG.MPP file by using EDLIN or any word processor that will read ASCII DOS text (which is about all of them). From the DOS prompt, type:

```
EDIT CONFIG.MPP
```

Or, use your word processor software to find the same file in the root directory (C:\CONFIG.MPP). For my machine, the CONFIG.SYS and unmodified CONFIG.MPP file looks like this:

```
LASTDRIVE=Z
DEVICE=C:\DOS\SETVER.EXE
FILES=40
DEVICE=C:\SB16\DRV\SBCD.SYS
/D:MSCD001 /P:220
DEVICE=C:\SB16\DRV\CSP.SYS
/P:220
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\ANSI.SYS
DOS=HIGH
STACKS=9,256
BUFFERS=10,0
SHELL=C:\DOS\COMMAND.COM
C:\DOS\  /p
DEVICE=C:\DEV\MTMCDAE.SYS
/D:MSCD002 /P:300 /A:0 /M:20
/T:5 /I:10
```

The manual for the software ought to say something about the minimum CONFIG.SYS file needed to run the software. For the program that I was installing for my wife, the desired CONFIG.SYS should have read something like:

```
FILES=20
DEVICE=C:\DOS\ANSI.SYS
BUFFERS=20
```

They also told me that I should leave in any line that looked anything like:

```
SHELL=C:\DOS\COMMAND.COM
C:\DOS\  /p
```

The next step was to cut out anything in CONFIG.MPP (copied from CONFIG.SYS) that isn't needed. If the FILES and BUFFERS statement has a higher number than 20, then leave it (it is a minimum number). My final version of CONFIG.MPP looked like:

```
FILES=40
DEVICE=C:\DOS\ANSI.SYS
BUFFERS=20
SHELL=C:\DOS\COMMAND.COM
C:\DOS\  /p
```

You may also have to alter your AUTOEXEC.BAT file. This file is examined when the computer is booted up, and it determines whether or not any programs need to be run. Go to the DOS prompt (C:\) and type:

```
COPY AUTOEXEC.BAT AUTOEXEC.
SAV
```

and, then:

```
COPY AUTOEXEC.BAT AUTOEXEC.
MPP
```

Next, call up AUTOEXEC.MPP on either EDLIN or the wordprocessor. Mine looked like this:

```
C:\BIN\MSCDEX.EXE /D:MSCD003
/D:MSCD002 /D:MSCD001 /M:10
SET SOUND=C:\SB16
SET BLASTER=A220 I5 D1 H5
P330 T6
REM  **  C:\DOS\MSCDEX.EXE
/D:MSCD001 /V /M:15
C:\SB16\SB16SET    /M:220
/VOC:220 /CD:220 /MIDI:220
/LINE:220
/TREBLE:0
C:\SB16\SBCONFIG.EXE /S
C:\DOS\SMARTDRV.EXE
ROMPT $P$G
PATH C:\DOS;C:\EXCELL;C:\EX-
CEL;C:\WINDOWS;C:\WP51\;C:\W
INWORD
REM***MOUSEWARE 6.10 SETUP***
PATH  C:\DOS;C:\EXCEL;C:\
MOUSE;%PATH%;C:\WINWORD
SET GMKW5=C:\WORDPERFECT
MOUSE CENHANCE SER 2
REM ************************
SET TEMP=C:\DOS
```

For now, you may not have to do anything, but if the new MS-DOS program fails to run, then you'll need to start removing some things (from AUTOEXEX.MPP, not, repeat *not*, AUTOEXEC.BAT or AUTOEXEC.MPP!).

You also need to create two new batch files: SETMPP.BAT swaps CON-

FIG.MPP to CONFIG.SYS, while SETNORM.BAT swaps CONFIG.SAV (which was the original CONFIG.SYS file, if you will recall). These can be created on your wordprocessor software, and then stored as ASCII (DOS TEXT) in the root directory. The routine to make CONFIG.MPP the active CONFIG.SYS is:

```
C:
CD
COPY config.mpp config.sys
COPY          autoexec.mpp
autoexec.bat
ECHO {{PROGRAM NAME}} Configuration READY!
ECHO Please reboot computer:
Press CTRL/ALT/DEL
PAUSE
```

The line {{PROGRAM NAME}} should be replaced with the name of the program you want to run, or something that lets you know what was done. Once done, save this line as SETMPP.BAT in ASCII/DOS TEXT.

The function of this simple program is to copy the .MPP version of the configuration file to CONFIG.SYS, and the AUTOEXEC.MPP to AUTOEXEC.BAT.

Next, you need to write the program that will replace the old CONFIG.SYS file back in place (remember, this is now called CONFIG.SAV). Write the following using the wordprocessor:

```
C:
CD
COPY config.sav config.sys
COPY          autoexec.sav
autoexec.bat
ECHO Regular Configuration
READY
ECHO Please Reboot Computer:
Press CTRL\ALT\DEL
PAUSE
```

And save this program as SETNORM.BAT (again, save it in ASCII/DOS TEXT). The purpose of this program is to undo what the other program did. This configuration makes the computer think it's your Windows machine again.

Next, reboot your computer, and get to the DOS prompt (C:\>). Rebooting can be done by simultaneously pressing the CTRL/ALT/DEL keys. After all the turn on verbiage passes, type:

```
SETMPP
```

And then press <ENTER>.

The program will swap the .MPP versions into CONFIG.SYS and AUTOEXEC.BAT. Now you can try to install the new MS-DOS program. If the new program installs and runs, then no further adjustment is needed. However, if you still get the Out of Memory error, then (from DOS prompt) type:

```
SETNORM
```

Press <ENTER> and reboot the computer (CTRL/ALT/DEL). Get to your wordprocessor, and call up AUTOEXEC.MPP. Edit it to remove unwanted items. Start eliminating anything that isn't a Prompt, Path or Mouse line. I removed each item in turn until the INSTALL program ran. After each deletion, save the AUTOEXEC.MPP file and try again: From DOS prompt run SETMPP and reboot. If the program installs, you are home free. Otherwise, go back and try eliminating other lines from AUTOEXEC.MPP.

Remember, each time that you need to run the MS-DOS software that tilts your machine with an Out of Memory Error, you will have to run SETMPP from the DOS prompt (NOT from the Windows DOS prompt—Exit Windows if your machine automatically starts Windows on turn/on) and then reboot by pressing CTRL/ALT/DEL. When you finish using the MS-DOS software, then you will have to run SETNORM and then reboot (CTRL/ALT/DEL) to restore the original configuration file.

Conclusion

This solution to the problem is workable (although I wish that the software writers would write Windows versions of their product!). Someone with more computer smarts than me can probably give us a better solution (I'd like to hear from you, if you do). However, it does work. Since the MusicPrinter Plus help line people pointed out this solution in their user's manual (which I should've read), I've used it for a filter design program that will soon be reviewed in this column, and for the software the accompanies a distance learning course in economics that I am taking. Readers can reach me at P.O. Box 1099, Falls Church, VA, 22041. 73

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UPDATES

Number 15 on your Feedback card

The Traveler

See the above-mentioned article (October, 1994, page 23). The telephone number for Dan's Small Parts that we printed was close, but no cigar. The correct number is (406) 543-2872. Also please note there are only a limited number of the MC3335P ICs still available from Dan's Small Parts. Should those run out, FAR Circuits has also come up with a slightly modified PC board to accomodate the popular MC3362 chip in place of IC2. 73

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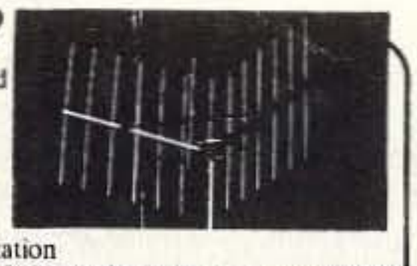

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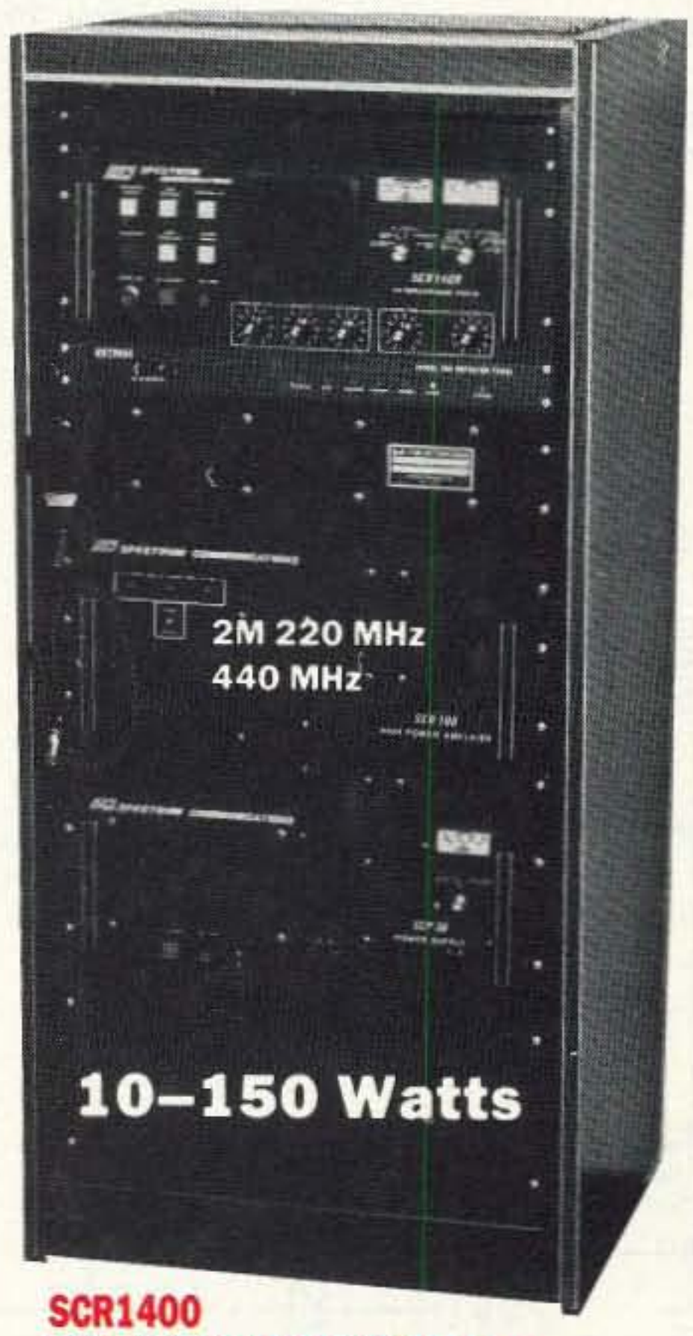

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A new year brings new projects. This month I have some small projects to make those long winter nights more enjoyable.

MFJ Modification

The first project is a modification to the MFJ QRP transceivers. I've run several modifications to these rigs before, but this one looks like a real winner. As you might expect, it deals with the lackluster audio some of the early production models had. As usual, I've not had the time to install any of the following modifications. So, if you don't know what you're doing, by all means don't mess up the insides of your rig!

The modification shown in Figure 1 for the MFJ rigs comes from KB4ZGC. Most of the work centers on the addition of an audio preamplifier to the input of the LM386. Notice the volume control inserted between the product detector and the audio preamplifier. Also note, the LM386 is operating from the unregulated power side while the preamplifier is running from the 10.5+ regulated supply.

As a side note, I've been informed that MFJ is so far behind, as I write this, that there may be a wait for the rigs. Depending on what model you want, I've been told up to eight weeks' wait is possible. MFJ suggests contacting one of their larger dealers, as they will be getting their orders done first.

NorCal 40 Modification

The NorCal 40 has been an extremely popular little 40 meter rig. The NorCal 40 is tuned by a pot controlling a varactor diode. It's a nice way of tuning the rig, but deep down inside most of us, we want a variable capacitor. Figure 2 shows a circuit to replace the varactor diode with a capacitor. I think you'll find this circuit will work just fine in place of the varactor diode/pot. It's also great to have laying around in your files, too. The 40-40 uses the same type of tuning method as the NorCal 40 and you may be able to use this circuit, too.

Buck-Boost Regulator

OK, here's a strange one: How many times have you built a rig and then needed to add on a power supply? If you're like me and want to run the critter from a battery, there's usually a problem: The popular three-terminal voltage regulator ICs fall out of regulation when approaching their operating voltage. You can use one of the low-dropout regulators, but you're still limited to the voltage set by the regulator.

While working on another off-the-wall project, I came upon a slick circuit from Linear Technology (see Figure 3). It's known as a buck-boost regulator. Its input is from 8 volts to 40 volts. The output is set for 5 volts, but can easily be changed to 12 volts. The regulator will supply up to 5 amps of current. That's more than enough for us low-power freaks.

The converter is based on the Linear Technology LT1074 switching regulator IC. This device needs only a few external parts to make up a complete regulator, including thermal protection and current limiting. This design uses off-the-shelf parts for low cost, and easy availability of components. The LT1074 is available from Digi-Key.

Here's how it works: At intervals of 10 microseconds (100 kHz) the control portion of the LT1074 turns on the switch transistor between the Vin and Vsw points, impressing a voltage across the inductor, L1. This causes current to build up in the inductor, while also supplying current to the load and capacitor C1.

The control circuit determines when to turn off the switch during the 10 ms interval to keep the output voltage at the desired set point. When the switching transistor turns off, the magnetic field in the inductor collapses and the polarity of the voltage across the inductor changes to try and maintain the current in the inductor. This current in the inductor is now directed (due to the change in voltage polarity across the inductor) by diode D1, to the load. The current will flow from the inductor until the switch turns on again (continuous operation), or until the inductor runs out of energy (discontinuous operation). The divider circuit consisting of R1 and R2 is used to set the output voltage of the supply against an internal voltage reference of 2.21 VDC. Resistor R3 and capacitor C3 make up the frequency compensation network used to stabilize the feedback loop.

I plan on building up one of these regulators, but I have not had the time as yet. It's a simple circuit, as you can see. I feel this circuit has some merit in QRP. Many of the power FET amplifiers require a power supply of at least 24 volts. This switching regulator may be used to supply a second regulated voltage to the receiver, or low level transmit stages—all without the excess heat normally generated by a linear regulator.

My only concern would be the RF noise generated by the switching at 100 kHz. The high audio gain used in most direct conversion receivers might pick up the switching noise. This should be an interesting avenue to travel.

I would also try to reduce the size of the inductors. A 5 amp inductor is a formidable-sized critter.

That's it for this month. Since we have started a new year, next time we meet, I'll have something very different. After all, the next century is only only five years away. 73

See Figures 2 and 3 on page 58

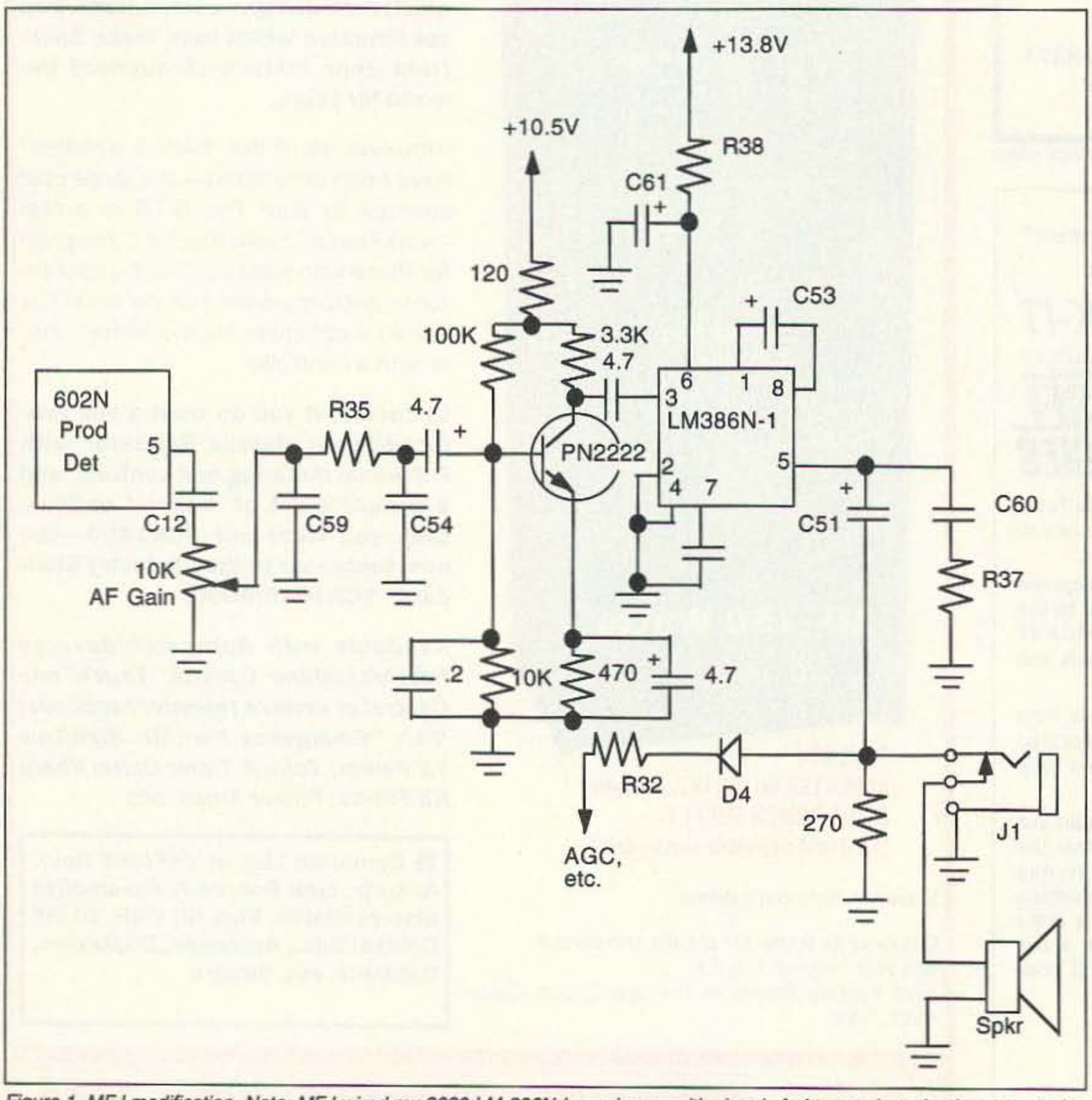

Figure 1. MFJ modification. Note: MFJ wired my 9020 LM-386N-L as shown, with signals fed to non-inverting input, an invitation to positive feedback. It should have been injected on pin 2! I installed AF preamp and changed the AF circuit as shown above. I have sufficient speaker audio, though the 386 is not driven nearly to its specified 250 mW. With no signal, a slight hiss can just be heard with AF gain put at 3 o'clock; very little full CW.

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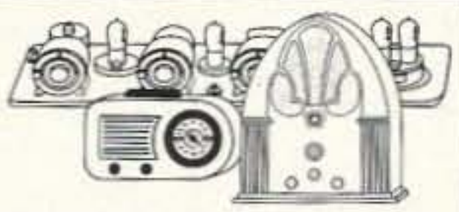

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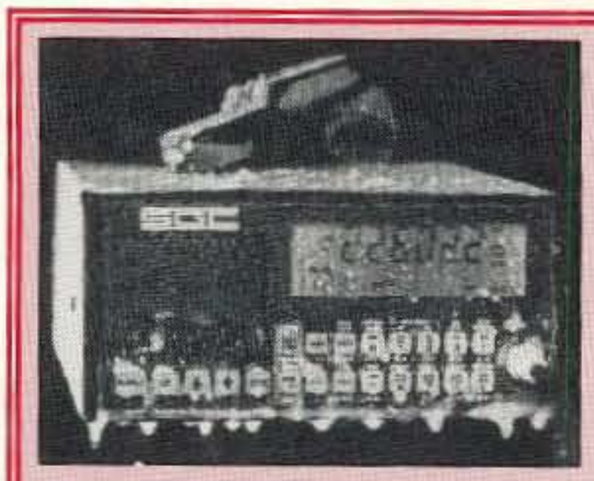

The SG2000 HF transceiver is type accepted for commercial and marine service made with traditional U.S. commercial radio quality (and of course it can be used on the ham bands also). While the Japanese radios have 2 final transistors that strain to put out 100 watts on the low bands and only 75-85 watts on ten meters, the SG2000 has 4 large transistors that loaf along at 150 watts on ALL THE BANDS INCLUDING 10 METERS! Some of the SG2000 features are: 1) A control head remotable (no special kit necessary) up to 150' away from the rig, perfect for automobiles and boats. Up to 8 heads can be utilized and used as intercoms also. 2) The largest display of any HF transceiver. 3) 644 pre-programmed memories and 100 user programmable memories. 4) operable from -50F (-45C) to 185F (+85C). You want quality right? Here is what EVERY SG2000 must endure before they're shipped from the factory: 1) They're factory aligned, 2) EVERY SG2000 is keyed down at full power (CW 150 Watts) into an open antenna for about 10 seconds, then connected to a shorted antenna and keyed down for an additional 10 seconds. 3) EVERY SG2000 is put in the "BURN-IN" rack and keyed down for 24 hours non-stop at full power CW. Don't try that with the foreign radios. 4) EVERY SG2000 is then re-checked for alignment and put in the "TORTURE RACK" where they are keyed on and off every 10 seconds for 24 hours. 5) The SG2000 is then re-evaluated and all control functions are verified to ensure that the microprocessor is up to spec. THEN AND ONLY THEN IS THE SG2000 ALLOWED TO LEAVE THE FACTORY.

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Continued from page 56

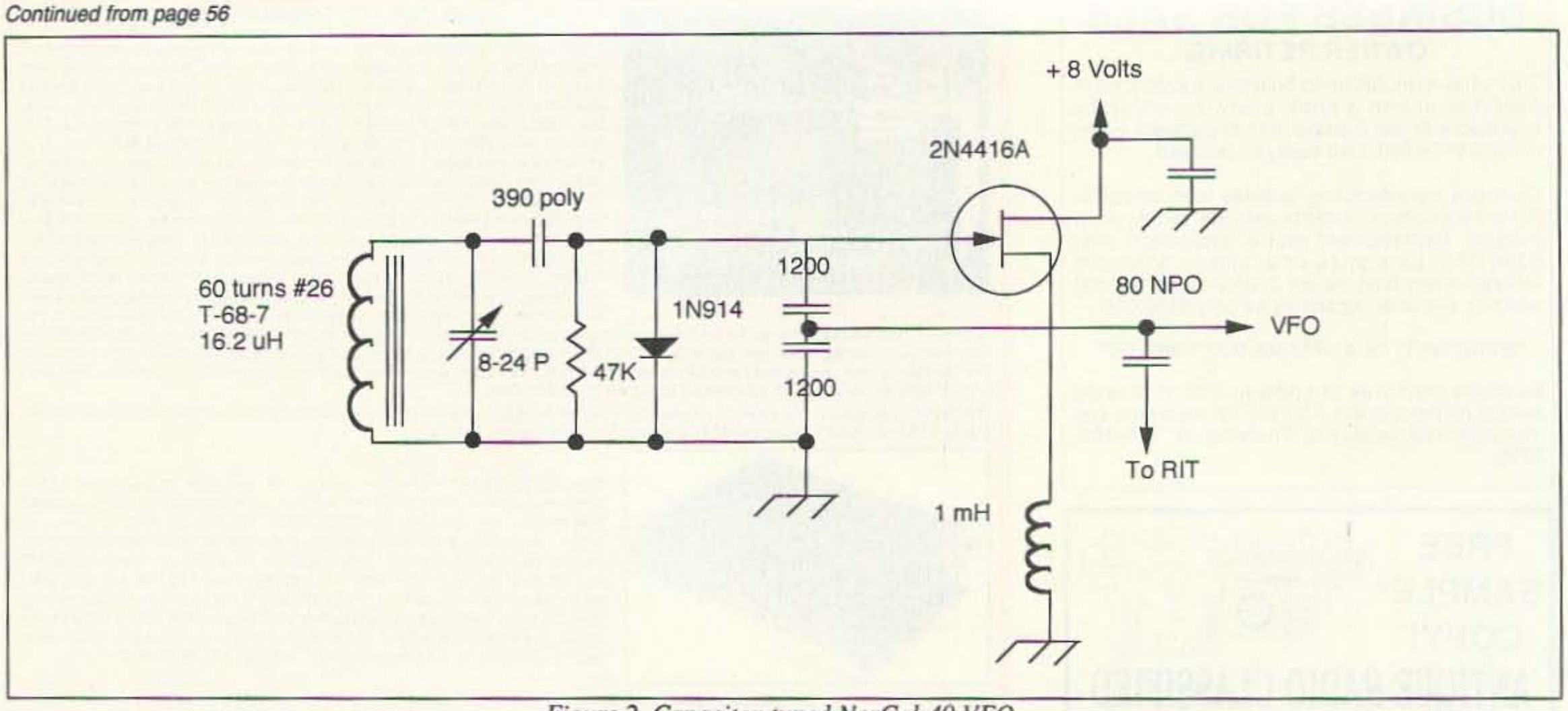

Figure 2. Capacitor-tuned NorCal-40 VFO.

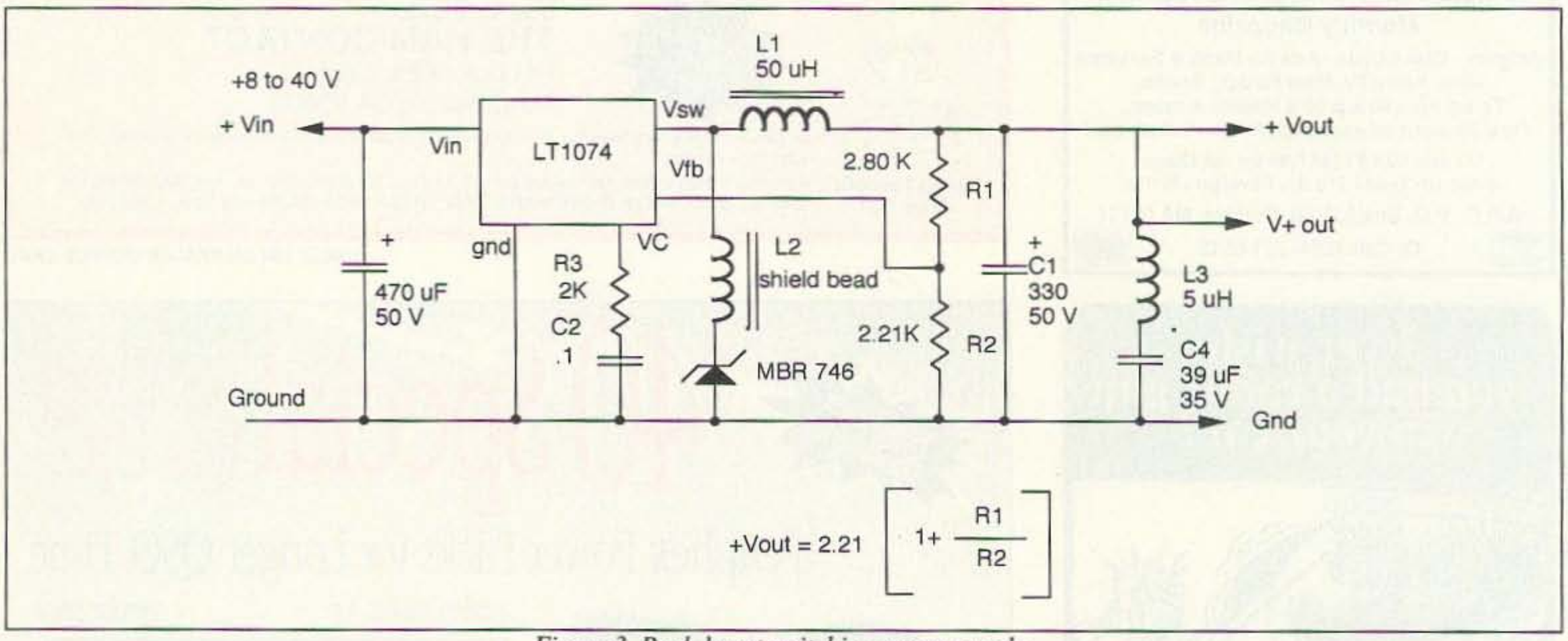

Figure 3. Buck-boost switching power supply.

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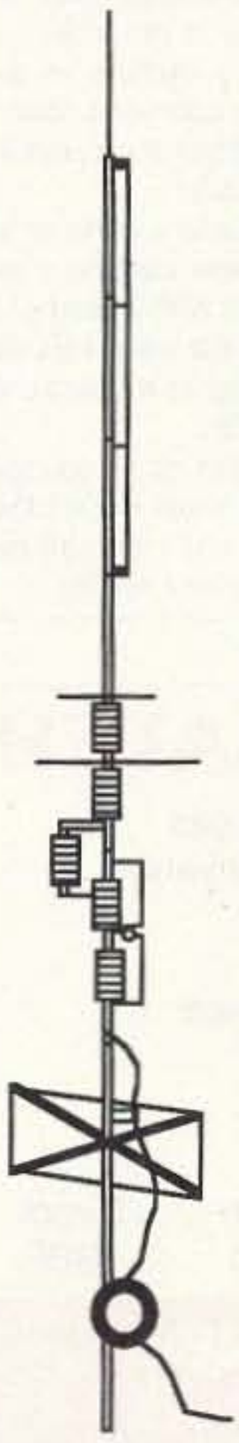

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Bright Idea for a Trip

One of the most popular trips that the seventh grade students in my school go on is the trip to the Franklin Institute Science Museum in Philadelphia, Pennsylvania. Over a million visitors a year come to this wonderful place where they are encouraged to "please touch" the exhibits. I, of course, have my own favorite spot to send the children to explore: the amateur radio station, W3TKQ.

The first thing the children see when they enter this impressive building on Benjamin Franklin Parkway at 20th Street is the 21-foot, 144-ton marble statue of Ben Franklin. For over 50 years it has sat there; immense, powerful, a symbol of the great American and Philadelphian who was a publisher, inventor, and statesman for the early United States two centuries ago.

The children always come back with terrific stories about their day at the Institute, and how they had so much fun at the radio station. The ham volunteers who are at the station are usually pleasantly surprised when a group of youngsters from my ham radio classes come through. It's generally an exciting experience for all.

This past summer I was visiting some friends in Philadelphia, and decided to extend the weekend and visit W3TKQ. My two very gracious hosts were Merrill KT3Z and Bill KA3ZHB. It's amazing how there is always "instant comaradarie" when hams meet. My friend Roger W2SLP and I were given a tour of the facility and had a chance to spend time speaking with museum visitors at the amateur radio station.

An entire wall of the exhibit is dedicated to displaying radio equipment from as early as 1918. With the help of Mrs. Gioia Marconi Braga, the inventor's daughter, the Phil-Mont Mobile Radio Club put together an exhibit which contains a set of pictures that describe Marconi and his achievements in a story fashion. There are 42 photographs that clearly show the development of Marconi's inventions. The Phil-Mont Radio Club has exclusive rights to show a video feature about Marconi called "The Spark That Shook The World."

Photo A. Carole WB2MGP with Merrill KT3Z at W3TKQ.

Photo B. Carole WB2MGP and Roger W2SLP at the mike; Bill KA3ZHB speaking to visitors.

This exciting exhibit has been in operation since 1952. It has been sponsored since 1962 by The Phil-Mont Mobile Radio Club, Inc. The recently remodeled station has been seen by more than 120,000 visitors since it was formally rededicated on October 23, 1991, by Marconi's daughter. There are seven console positions. Members of the Phil-Mont Club were asked to donate at least $15 each. Each console was marked for dedication by any person who would donate $500 for that station. In less than a month, all consoles had been "sold."

The seven positions consist of:

1. Dedicated 2 meter intercom for the club's local repeater, plus Kenwood 144 MHz and 220 MHz.

2. IBM computer and MFJ TNC running Alinco 1200 dedicated NTS system for visitors and locals.

3. Satellite tracking station: ICOM 970 and Tandy computer running "Quick Track" and "Kansas City Tracker" programs.

4. Kenwood 950 with PK232, TL922, monitor scope and Rupp SWR/power meter to a Mosley PR067 10-40m beam.

5. Guest operating position: Kenwood TS450, computer and KAM all-mode TNC for HF/VHF packet.

6. Ten-Tec Omni VI with tuner to a Cushcraft R7 antenna.

7. ATV: WR450 transceiver, local monitors, 2m intercom, video output terminal and tripod-mounted camera.

When I spoke with the club president, Ed Masarsky KB3IV, he praised the work of the volunteers who man the station seven days a week. Volunteers are not necessarily all members of the Phil-Mont Radio Club. They are all dedicated and do a terrific job interacting with the public, according to Ed. Ed also explained that the visit to W3TKQ is very often someone's first exposure to amateur radio. From what I observed, myself, when I was there, all the visitors were greeted by enthusiastic, knowledgable volunteers.

It's easy to see why the youngsters have such a positive experience at the station. If you live in the vicinity of a museum or science institute, try to get your local clubs to sponsor a radio station for the benefit of the community, especially the children.

If you plan to take a class or large group to the Franklin Institute, it would be wise to call the ARS ahead of time to make sure that the volunteers will be ready for the group at a specific time. Call (215) 448-1139.

Note: I'm still looking for youngsters for the Dayton '95 Youth Forum. Please have interested children call me at (718) 983-1416 for an interview.


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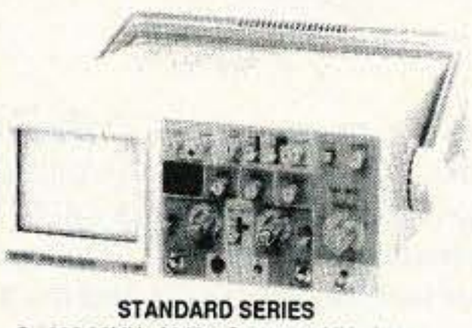

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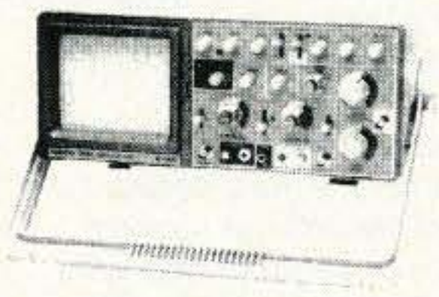

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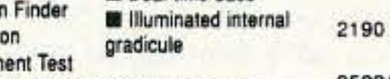

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Up and Running with GPS

"What's the bearing?" Many times an hour, that's my demand to the helpers as I drive on hidden transmitter hunts (sometimes called foxhunts or T-hunts). It is important to know the latest indication from our radio direction finding (RDF) equipment. We don't want to be caught off guard by a sudden change in signal direction as we close in or as the road meanders.

In unfamiliar areas, my second most frequent request is, "Where are we, anyway?" When there are no familiar landmarks, that question may not be easy to answer, especially at night. Fortunately, there is now an inexpensive method to determine one's exact location anywhere on planet earth: The Global Positioning System (GPS).

The GPS constellation of 21 orbiting satellites provides high accuracy UHF timing signals that are used by inexpensive specialized receiver/processors to compute your location. Most GPS receivers also perform navigation functions such as computing headings and distances to destinations or waypoints of your choice.

"Homing In" for October 1994 explained how navigation systems such as GPS came about. This month, let's take a closer look at the latest GPS equipment and methods for integrating it into automated signal tracking networks.

It's Affordable Now

Typical of early models of all new technologies, the first GPS receiver/computers were quite expensive. Commercial mariners bought them, but their prices were beyond most pleasure boaters and hikers. Hams who wanted to extract GPS position and course data for applications such as Automatic Packet Reporting System (APRS) found that bare-bones GPS receiver cards for the original equipment manufacturing (OEM) market were the only way to buy GPS capability without shelling out over a thousand bucks.

Selling for about $450, the Magellan OEM 5000 is a 3.5" x 7" GPS receiver card that operates from a 12-volt source. It puts out 4800 bps serial data at user-selectable intervals, but it has no display or enclosure. A similar unit, called the Basic Encore, is made by Motorola.

As competition and manufacturing efficiency have increased, prices of full-function receiver/processors have dived into the pocketbook range of weekend sailors and T-hunters. For most applications, a hand-held GPS display is now more economical than a receiver card. Just make sure that the set you choose has a serial data output for connection to your computer and RDF system. (Look for "NMEA-0183 interface" in the specifications.)

Last spring, the Garmin GPS-50 hand-held GPS broke the $400 barrier, and marine dealers' shelves were quickly cleared. Garmin continues to add features to new models in its line, keeping prices in the $400 to $500 range. Now, the Meridian GPS Satellite Navigator from Magellan Systems Corporation costs less and is the top contender for most popular choice among T-hunters (Photo A). It has a detachable antenna that can be separated from the receiver by up to six feet, so you can put it on your car roof. It outputs your choice of three NMEA-0183 data streams.

Discount marine stores carry the Meridian for less than $380. Its internal three-AA-cell supply lasts for about five hours (much less if you use the backlight at night). You can get an external power kit for $80 to connect it to the vehicle's 12-volt system. This kit also includes a quick-release mounting bracket and antenna extension cable.

Several T-hunters here are experimenting with Meridian GPS units. Mine gives solid indications with an external antenna. Its navigation features were second-nature to use after about a week of practice during my commute. My only gripe is that the liquid crystal display has a highly polished window. As you can see from the photo, it is nearly impossible to find a mounting position that does not give some glare in the daytime. That can make it hard to read, despite its good-contrast 3/8-inch-high numbers.

Photo A. I used a cellular phone swivel mount to attach the Magellan GPS bracket to the overhead console in the van to put it at eye level. A four-foot length of RG-58 cable connects it to the rooftop antenna.

Will GPS receiver prices drop even more? Well, improved parts are making them much less expensive to manufacture. For example, a new integrated circuit from GEC Plessey in England puts all the active circuits for converting GPS information in its incoming spread-spectrum form into the final IF stage into one chip. But many think that receiver consumer prices will remain at present levels because sales are brisk.

Someday this may change, due to competition from alternate positioning services. *Electronics World And Wireless World Magazine* reports that Inmarsat, an international satellite operator, has announced the inclusion of navigation transponders on its next generation of satellites. The system will feature signals to correct the deliberate errors introduced into Navstar GPS. Position fix accuracy will be within 10 meters, 10 times better than civilian units at present. Launches are planned to begin in late 1995.

An Automatic Pin in the Map

A GPS receiver displays your exact latitude and longitude in degrees and fractional minutes. Those numbers by themselves mean nothing to most of us landlubbers. We tend to think in terms of distance and direction with respect to familiar landmarks, instead.

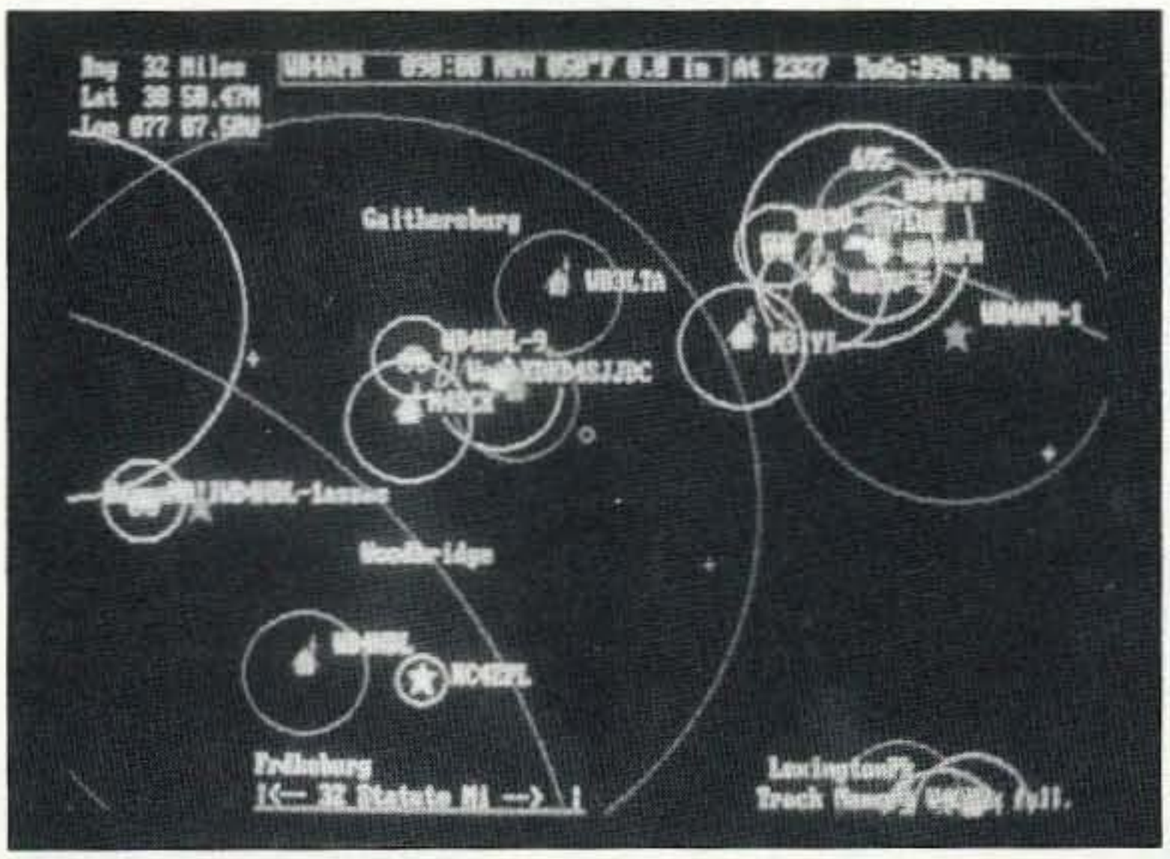

Photo B. The APRS power-height-gain display plots the radio horizon around each station. Notice the small circle of the mobiles (car symbol), the larger circles of the base stations (house symbol), and even larger green ones for digipeaters (green stars on the screen). Any two stations with intersecting circles can communicate directly. (All screen photos are by WB4APR.)

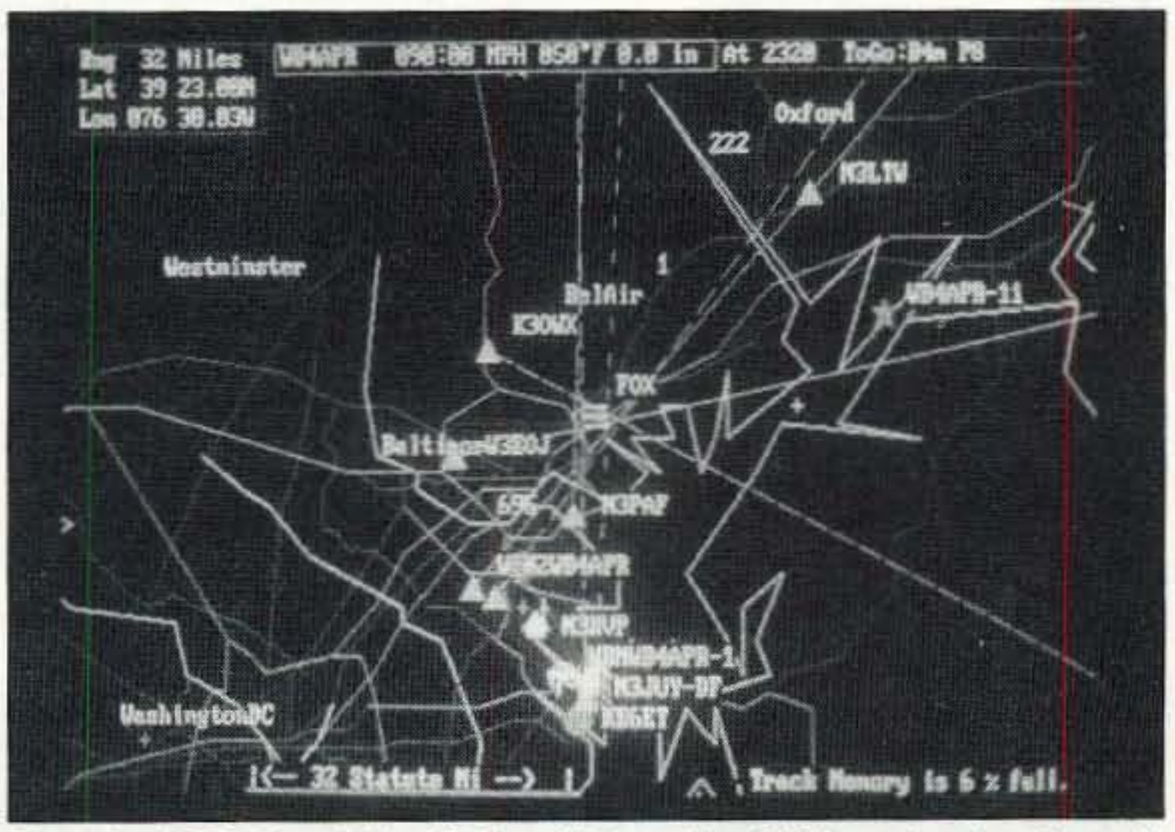

Photo C. APRS triangulation display of intersecting RDF beam bearings transmitted by packet from base stations. The location of this fox was within a half mile of the intersection of the bearings. Most were taken 15 to 20 miles away. Any APRS user in radio range can call up this display, including mobile T-hunters.

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If you enter your favorite landmarks as waypoints in the GPS set's processor, it will display your distance and bearing to them, along with your present direction of travel and speed. That's helpful, particularly for finding your way home at the end of a transmitter hunt. But what most of us want is an easy-to-read indication of our exact position on a map of some kind. Automakers are developing navigation systems like this for cars of the future, but they are still pricey.

T-hunters are inventing a number of ways to get the same kind of map display, using portable computers with serial ports connected to the NMEA data port of their GPS sets. In the September 1994 issue of *73 Amateur Radio Today*, "Homing In" described a computerized bearing display by software engineer Robert Barris KD6IFZ. Since then, Robert has added a Meridian GPS to his system. He wrote a program to use GPS serial data to pinpoint his vehicle's exact position on the complete Orange County street map that he has digitized and stored in compressed form on the hard drive in his Macintosh PowerBook.

When the coordinates come into the computer's RS-422 port from the GPS, his program analyzes them, calls up the appropriate map segment and draws it on the screen around his position point in the exact center. As he drives, the map moves under his position point to update his location.

"The new program translates your GPS location onto the map very accurately, usually within five houses on the street," Robert says. "It allows us to concentrate on driving and bearing-taking for a while, then look down and very quickly see where we are without having to unfold the map and flash a light over it.

"I added a feature that lets the GPS display communicate with the RDF program, so they run together in a multitasking fashion," he continues. "We can see the true beam bearing (the bearing relative to the car plus the true car heading) as long as we're moving. That has some limitations, because GPS only gives accurate headings when in motion. I put a threshold in the software so that when the car's velocity goes below 10 kilometers per hour, the beam heading disappears from the screen.

"We've used it on three hunts now, and the experience has been uniformly positive, especially when we are in unfamiliar areas. We can drive around instinctively for a few minutes making random turns here and there and then say, 'This isn't paying off, where are we and which way do we have to go?' Then we can look at the computer map and there we are."

Robert has not yet fully integrated the mapping program with the RDF bearing display program for real-time plotting, but he is planning on doing that soon. "It has great promise for our first-finder-wins RACES T-hunts because of the ability to take a very accurate bearing while moving," he adds. "On the freeway at 55 MPH, it could lay down successive bearings as you move along, so you get an idea of where the T is before you pass the right exit."

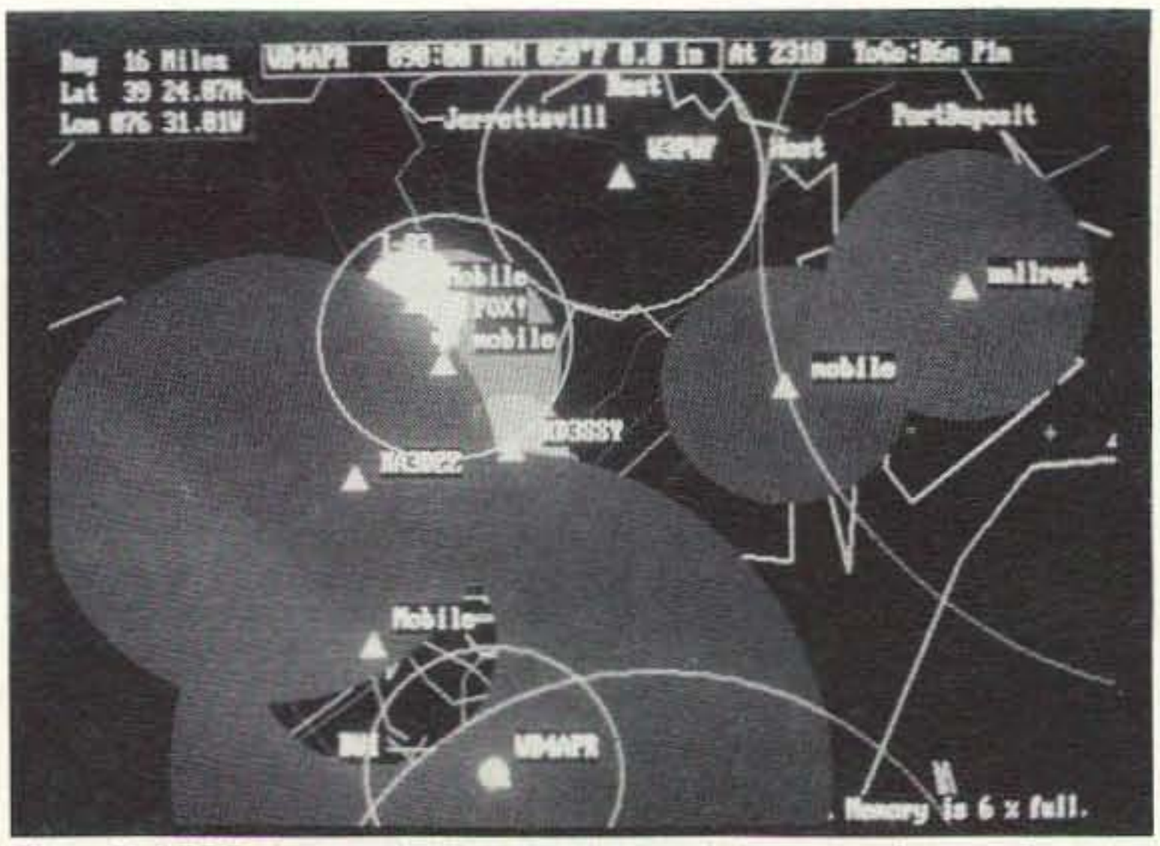

Photo D. APRS plots overlapping signal strength contours of reports from stations with omnidirectional antennas. The large (violet on the actual screen) circles show negative reports. Chances are, the hidden transmitter is not in those regions. Brighter, smaller circles in shades of blue on the screen show places where the fox signal is heard with various strengths.

Every Road in the Country

Another local hunter is using a commercial map data base program to navigate electronically. To do it, Eric Nansen N6YKE installed a PC and CD-ROM drive in his vehicle, along with a GPS receiver.

DeLorme Publishing Company produces two domestic atlas data-base

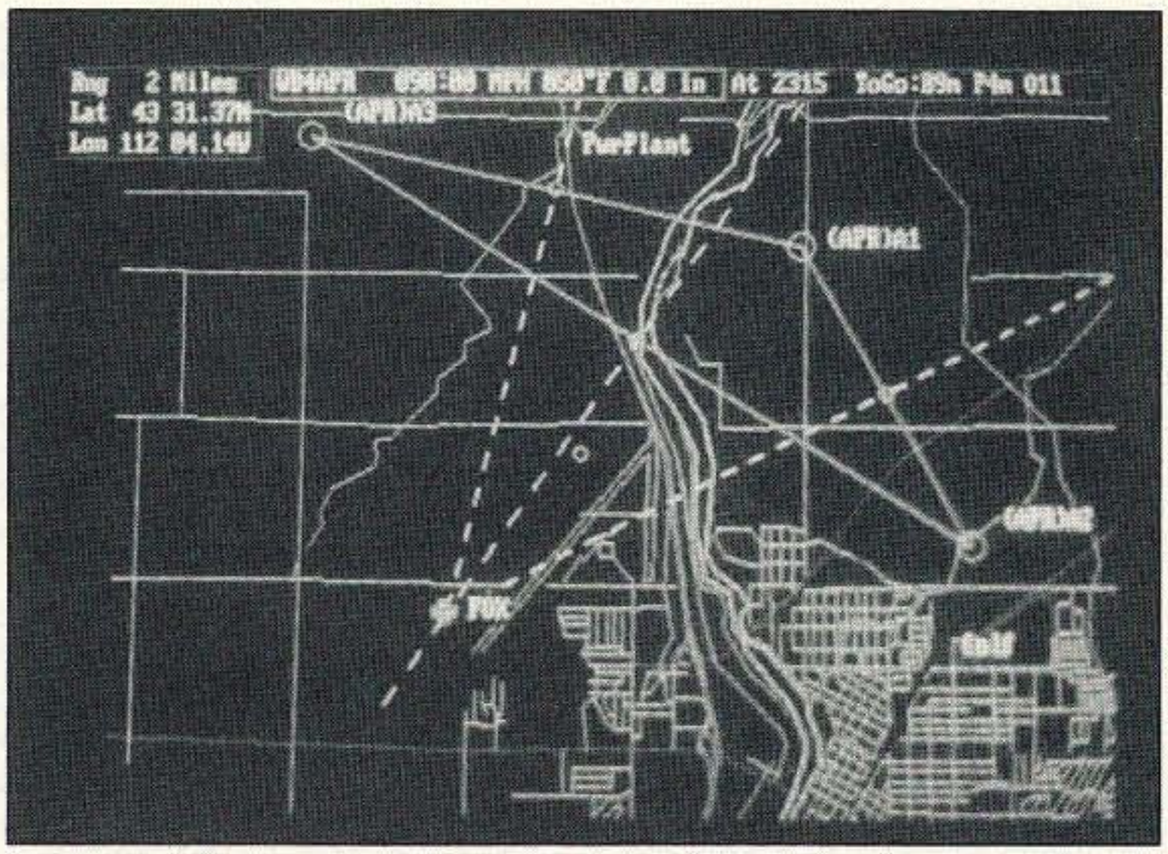

Photo E. The APRS fade circle technique computes the likely location of an unknown signal from three locations of equal signal strength. A mobile DF station with an omnidirectional antenna drives to three places where the fox signal fades out. APRS computes where a fox should be to give these fade-out points.

products on CD. Street Atlas USA version 2.0, which retails for about $170, has detailed digital road maps of the entire USA. Eric says he has used it on "All Day" T-hunts where he ended up in the middle of the California desert. He found that the digital map included many out-of-the-way jeep trails that were not on his paper maps. One reason for this is that DeLorme solicits its users to send in new road information to be incorporated in updates of both its paper and electronic maps.

The PC program requires at least a 386 running Windows 3.1 with 2 MB RAM and a mouse. There is also a Macintosh version. You can view streets and addresses with Street Atlas, but if you want to interface with GPS, you must move up to another program, Map Expert. It has the same internal atlas, but also accepts NMEA GPS data into any serial port in the computer to plot your position.

Map Expert allows you to create and save your own overlay files to add landmarks, buildings, and new roads to your map screens. Unfortunately, the overlays cannot include moving data, such as a real-time RDF indication. Eric is writing an add-on program to do this. He says that his biggest problem so far has been keeping the mobile CD-ROM drive functional while four-wheeling in the desert.

PC requirements for Map Expert are the same as for Street Atlas, but there is no Macintosh version. Retail price is $495, but it is available directly from DeLorme for $295 plus shipping and handling.

Economical Tracking With APRS

As I described three months ago, the APRS program by Bob Bruninga WB4APR is an economical alternative for GPS mapping. You don't need a CD-ROM, a large hard drive, or Windows. You can track yourself and others on VHF T-hunts using just a low-end PC laptop with a floppy and serial input for the GPS data (8086/640K/CGA or better, color preferred). APRS.EXE size is only about 300K and maps average about 15K each.

Of course, you cannot put super-detailed maps in 15K files. There is no room to store every twist and turn of every road or to hold residential street names. But if you have the disk space, you can have over a hundred map files available for automatic selection by the program as you move about.

APRS makes up for its lack of detail by incorporating a myriad of networking features unavailable elsewhere. APRS stations can use packet to map one another's positions. They can also exchange messages and data on packet, including RDF bearings.

[Editor's note: We regret that we cannot print these photos in color.] Photo B shows a typical network of APRS stations transferring packet data via unconnected (UI) frames. APRS will plot the radio range of all stations. Users instantly see potential paths for direct connection and digipeaters available for relay. Stations not sending specific values for power, antenna height, and gain in their automatic position report are given the default of 10 watts, 20 feet, and 3 dB omnidirectional antenna gain.

With another user command, APRS displays the triangulation solution for RDF stations reporting their beam bearings (Photo C). In an APRS network, everyone sees the triangulation almost instantaneously. Reporting stations assign a quality rating to their

Continued on page 67

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Space Camp Adventure

One of the advantages of living in the rocket city (Huntsville, Alabama) is the proximity of the U.S. Space Camp facility. Located at the U.S. Space and Rocket Center, Space Camp (and Space Academy) offers a variety of programs. Participants from fourth grade through adult glide through astronaut training and shuttle mission simulation. Organizers have taken an interest in demonstrating amateur radio as part of their program and are currently constructing a complete amateur radio station at the site.

To celebrate the 25th anniversary of the first moon landing, I offered to fly an ATV balloon from Space Camp to demonstrate that amateur radio could simulate the launch of a weather and communications satellite. They were excited by the idea and asked me to fly the payload as part of their International Space Camp session that included selected students from 23 countries and the teacher of the year from each U.S. state. The local chapter of the National Space Society, HAL5, agreed to co-sponsor the event and the flight preparations began in earnest.

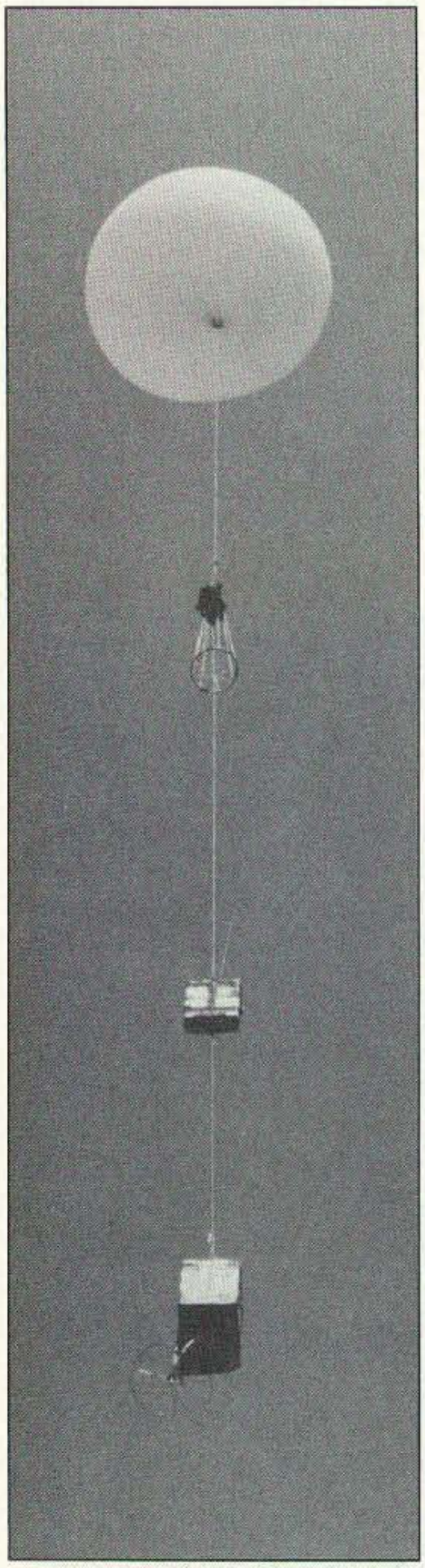

Photo A: The Space Camp balloon heads for the stratosphere after skirting past a Saturn rocket. The balloon system consisted of a simplex repeater on 2m and an ATV transmitter with a live color camera suspended on the bottom. (Photo by Jim Skala WA8VWY.)

The Payload

Using components from a number of previous flights, I put together a 5-watt ATV transmitter on 434 MHz, complete with a color camera. The exciter was a Mini-TV postage-stamp-sized transmitter (ATVM-70) feeding a PA5 power module (SAU4 brick), available from P.C. Electronics, 2522 Paxson Lane, Arcadia, CA 91007; tel. (818) 447-4565. The PA5 module is capable of 10 watts or more, but by backing the exciter power down a bit, I was able to achieve around 5 watts output with a current drain of around 1.5 amps. The current drain was critical since anything more than this would put a strain on my lithium cell pack. The color camera (model HA4500) is lightweight and compact and has a built-in electronic auto-iris. It's available from Howard Enterprises, Inc., 545 Calle San Pablo, Camarillo, CA 93012; tel. (805) 383-7444. The antenna was an omnidirectional horizontal "Little Wheel" available from Olde Antenna Lab; tel. (303) 798-5926; mounted on a dowel rod about 18 inches below the styrofoam package. The whole system was powered by five D-cell lithium batteries (15 volts @ 7.5 Ah).

A separate package was constructed to simulate the communications satellite. It consisted of an ICOM 2AT and a digital voice storage circuit that operated as a simplex repeater. It would record whatever it heard for eight seconds and retransmit it in a continuous cycle on 144.34 MHz. This proved to be a very simple and effective way to build a repeater without having to worry about desense problems. It just took a little practice to get used to the delay when using the repeater.

The Flight

Although the morning of July 31st started out overcast, the weather started clearing up as the ground station was assembled and the payload was prepped for launch. We were situated in Rocket Park, behind the U.S. Space and Rocket Center, literally surrounded by rockets of all shapes and sizes. Thanks to the efforts of Gene Marcus W3PM, Ed Stluka W4QAU, and others of the Huntsville Amateur Radio Association (HARA) and the HAL5 branch of the NSS, an impressive ground station was wired up next to a Lunar Module in the center of the park.

As the balloon was inflated, Space Camp participants assembled around the launch site to watch the activities. We slowly reeled out the balloon. I held onto the ATV payload and finally got my chance to say, "That's one small step for a man, one giant leap for a balloon!" I released the payload and the balloon skirted past a towering Saturn I rocket on its way to the edge of space. The downlinked video was spectacular, providing us with an impressive aerial view of the rockets surrounding the park.

As the flight progressed, a constant stream of intrigued onlookers glued themselves to the TV screen while they watched the city of Huntsville get smaller and smaller as the balloon gained altitude. Live views from the balloon could even be seen on a wide-screen TV in the Center's cafeteria.

A hour and a half into the flight, the payload was over 115,000 feet high and the blackness of space and the curvature of the earth could be seen in full color, with a P5, signal at the launch site. Tom WA8ZAH in Cincinnati reported a nearly P5 picture from 300 miles north of Huntsville, while Dick W8RVH (New Carlisle, Ohio) and Mark KA9SZX (Champaign, Illinois) saw a P3 picture at a distance of nearly 370 miles.

Photo B: Members of the Huntsville Amateur Radio Association and the HAL5 chapter of the NSS operate the ground station in the middle of Rocket Park at the U.S. Space and Rocket Center.

The simplex repeater on 2m worked great, with stations contacting each other over a large portion of the Midwest and Southeast. At least one contact covered a distance of over 500 miles between Ralph N4NEQ (Marietta, Georgia) and Joe KEØFF in Rolla, Missouri. Unfortunately, a screw worked loose inside the HT and shorted out the frequency-select line towards the end of the flight, causing the transmitter to shift up 22 kHz. Only a few stations were able to work through the repeater after that, due to the oddball shift.

The Recovery

Since we were having so much fun at the Space Camp ground station, most of the chase crew didn't leave to track down the balloon until long after it had burst and was nearly on the ground. It appeared that the payload would land in the hills of Tennessee (about 40 miles north of Huntsville) and it looked like it was going to be a difficult recovery. Fortunately, John Fox WB2LLB and Barry N4MSJ were able to record a clear, nearly snow-free image from the payload almost to the point of hitting the ground. The video sequence clearly showed that the payload had landed on a farm in the middle of a valley. A great place to land, but whose farm had it fallen on? Based on a few beam headings, we searched fruitlessly for the rest of the day around the Fayetteville, Tennessee, area but found no trace of the payload.

Disappointed, but not yet defeated, we returned to WB2LLB's QTH to view the landing video to see if we could figure out its location. The video was nearly P5 until about 500 feet before the payload hit the ground. There were plenty of landmarks: farm buildings, a river and a highway. There had to be a way to figure out the location with this kind of information!

Dick Curtis KK4HF and Barry Lankford N4MSJ found the solution. The next day they took a camcorder and a small TV set to the county courthouse nearest the estimated landing site and showed the video to the tax assessor. The tax assessor's clerk immediately recognized the buildings and said, "That's the McGee chicken houses!" Sure enough, after an hour of romping around the McGee farm, the payload was found in the middle of his cow pasture!

I think Dick Curtis summed up the flight nicely during his evening TV news broadcast, "From near space to the back forty, all in one day!" 73

HOMING IN

Continued from page 65

RDF reports. The highest quality bearings are displayed as continuous yellow lines, while lesser quality bearings show up as dashed lines.

Sometimes there are not enough base or mobile stations with directional antennas in range of the RDF target to get bearings for triangulation. Bob has added a mode to APRS to help in such situations, taking advantage of the power-height-gain data from non-directional receiving installations.

Photo D is the omni-RDF display, showing the overlapping signal strength contours from stations reporting only strength of the fox, not direction. Violet filled-in circles are null reports where stations do not hear the fox. They give very important data on where the fox is not. Bright blue circles are fox-heard reports.

The reports on this screen were manually entered as RDF objects, since they were voice reports taken from mobiles not participating on the mobile foxhunt. But such reports could also have been relayed automatically via packet. When interpreting the display, remember to look at the edges of the circles and not be misled by the centers. In this case, the mobile fox was right at the edge of one "not-heard" circle.

If a mobile has no RDF antenna, or wants to hunt covertly without one, that user has an additional option for getting a bearing on the RDF target (Photo E). He or she drives away from the general hunt area in several directions and presses the F5 key each time the signal fades out. APRS then computes the circle passing through these points, generates bearing lines and plots their intersection. The fox should be near the center of this circle.

The display does not show a circle because the computation is actually done using straight connecting lines and virtual bearings normal to these lines. The fade-out bearing technique can be repeated closer to the fox by inserting attenuation and finding three new fade points, repeating as necessary.

Bob continues to add new APRS RDF features and applications faster than I can test them. When he told me about the latest version (v6.0), he said, "You can now create a square, circle, or triangle in latitude/longitude coordinates and it will be transmitted as a object to everybody's screen. If you draw a boundary area of a foxhunt that way, everybody will see it. A square can be as small as 100 yards or as large as 100 miles. Rescue groups can use it to transmit the area of a search, too."

APRS is shareware, available for download on most online services such as CompuServe's HamNet. If it meets your needs, register your copy to get configuration saving and GPS port interface functions. If you cannot find the latest version, call the Annapolis BBS at (410) 280-2503 to download it. Registered copies on 3.5-inch HD disks are available directly from WB4APR.

Next time, more on APRS applications and a close look at the new Macintosh implementation of APRS. Thanks to KD6IFZ, N6YKE, and WB4APR for providing information and photos for this month's column. If you are experimenting with GPS and computer mapping for RDF, please pass along your ideas and experiences. Write to my California address atop this column, or send electronic mail to me via the Internet (joemoell@cup.portal.com) or at CompuServe (75236,2165). 73

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Bob Bruninga WB4APR
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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 (8 1/2" 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.

NEEDED: Instruction manual for a B&W Model "600" Dip Meter. I will pay for photocopies and postage. Tnx. *Neil Tanner WA4CHQ, P.O. Box 109, Gwynns, VA 23066.*

NEEDED: Service manual/schematics for MOTOROLA Mobile Transceiver, Model T53GKT-1100A. Xmtr type CC3010; S/N J-4336. Primary Power 12V DC. I will pay for copy and postage. Thanks. *John Wora K2KFG, So.-4907 Clifton Pkwy., Hamburg NY 14075-3341.*

WANTED: Functioning XTAL Filter USB/LSB for DRAKE Model TR3 Xcvr. *Bob Bartolotta K1YFE, 95 Rockwood Ave., Ansonia CT 06401.* 73

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ABOVE & BEYOND

VHF and Above Operation

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

Switching Power Supplies for Portable Operation

Switching power supplies are somewhat of a mystery to many in our amateur ranks. The secret of operation lies in a black epoxy chip circuit that defies close examination, and as such might remain a mystery. Because we cannot remove the epoxy and examine the chip or circuitry closely, let's take a short detour and cover just what is going on in a switching power supply.

First, why do we need to switch power supplies? Well, the simplest reason is to provide a different voltage level from a source that is not of the proper voltage (lower voltage). Of course, this could be just the reverse of the above: high voltage input and low voltage output. We have all constructed simple power supplies with a string of positive voltage regulators, all connected to a common input for a multiple output bench test supply. This system works well, but each output is usually low current—less than an amp. The operation in this case is to reduce a voltage through a transistor junction which is in series with the input and output of the power supply.

As a result of this series transistor, it is "on" all the time and has to dissipate power in a *linear* function. The overall efficiency of transfer of input to output power is low, being something less than 40% or so, just like your linear amplifier for SSB operation, whose efficiency is low (input power divided by output power equals efficiency). So goes the same with a power supply.

In a lot of functions this is quite acceptable, particularly for lower current systems. To make this point and drive it home, consider that you do not see a "Monster" single chip regulator for your 12-volt solid-state HF station or 10W 2 meter transceiver. You do see a very heavy bulky power transformer at 60 Hz, with a small regulator and a single or several series pass transistors that are connected to a heat sink that is required to dissipate heat generated in the regulation process. A typical 12 volt linear 10 amp power supply weighs in at about 15 pounds.

Now, to avoid a pun, let's switch to a nonlinear power supply, or *switching power supply*. This type of power supply uses quite a few extra components to accomplish this more complex task. In the long and short of it, the switching system performs better. Let's see why by taking a look at a basic circuit in comparison to the linear circuit type. Comparing the circuit in Figures 1 and 2, it is evident that the pass transistor shown in Figure 1 is on all the time. The pass transistor shown in Figure 2 is switched, or has an *on and off* period. This is the switching rate and is controlled by the circuitry in the device and its external control circuitry.

By being *off* part of the time, according to load conditions, a better power management condition exists and as a result the efficiency is about doubled, compared to a linear circuit. Another trade-off is that the switch mode power supply does not require a bulky 60 Hz power transformer. It uses a very high frequency switch frequency, and the transformer can be replaced with a toroidal-type transformer much smaller in size. The weight of a switching power supply for 12 volt output at 10 amps is less than a pound, as opposed to the 15 pounds in a linear supply.

All is not wonderful in a switch-mode power supply. It requires a larger output filter circuit, making the circuitry more complex and costly vs. a linear supply. You might remember back when there were tubes in automobile radios and the power supply for them was controlled by a *vibrator*. I kind of look at this older behemoth as sort of a marriage between switching and linear technology. It was switching of a sort, not pass regulator switching like the TTL equivalent shown in Figure 3, which uses a conventional transformer or toroid core to step up voltage.

I guess I should explain that a vibrator was a mechanical switch with 12 volts on the center contact from the auto battery. When it was turned on, a coil magnetically pulled the armature of the vibrator one way to make contact with one side of a transformer coil. It would then break the magnetic pull and in the released direction make contact with the opposite side of the transformer. The center tap would be ground and the resulting 12 volts, switched from one side to the other of the input transformer coil, would look like switched AC on the primary. Whether done mechanically or electronically, the principle is the same today: An alternating rate is required to

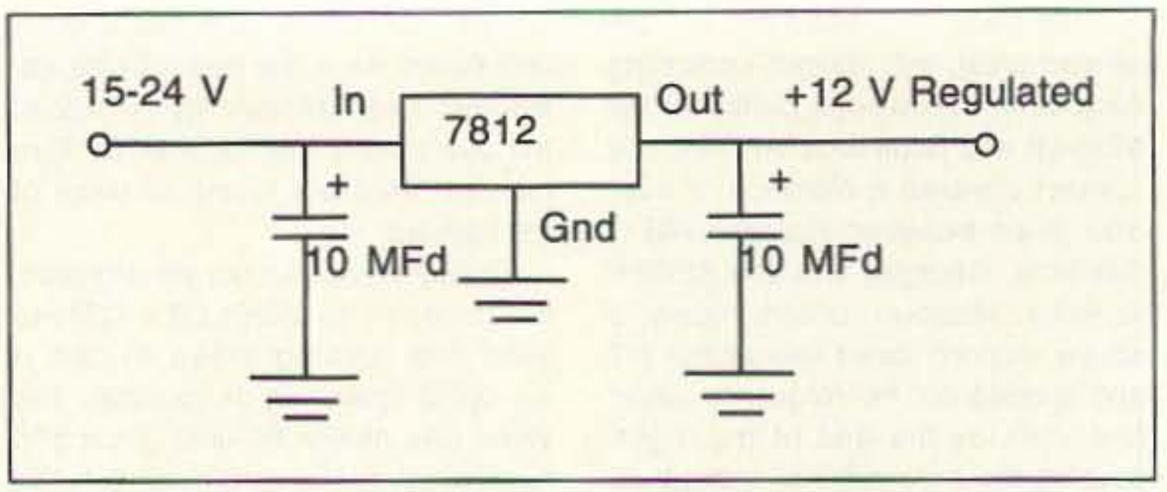

Figure 1. Basic linear regulator (7812, etc., typical).

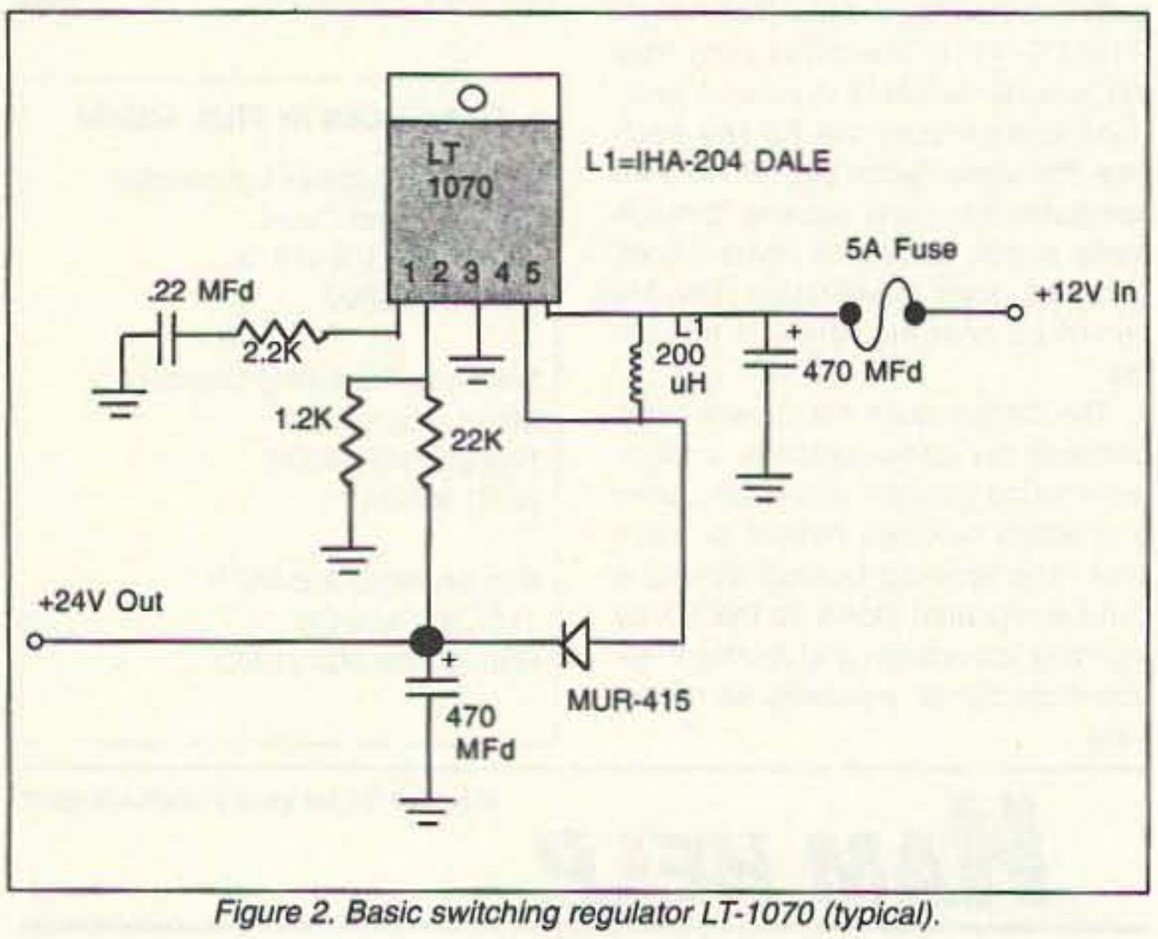

Figure 2. Basic switching regulator LT-1070 (typical).

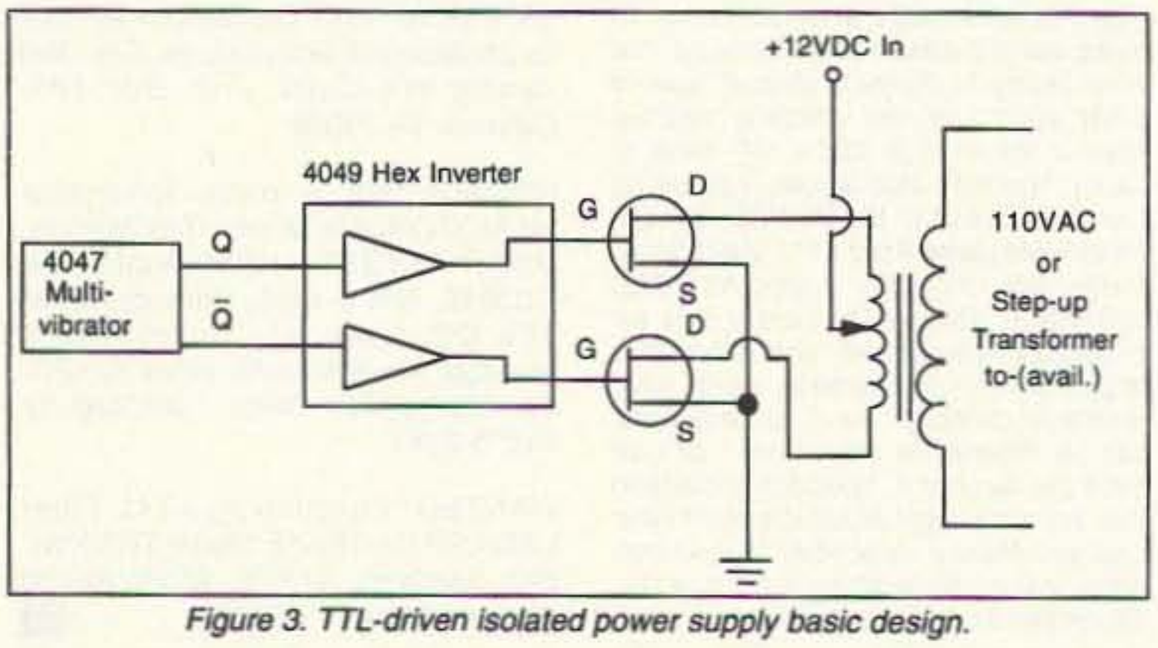

Figure 3. TTL-driven isolated power supply basic design.

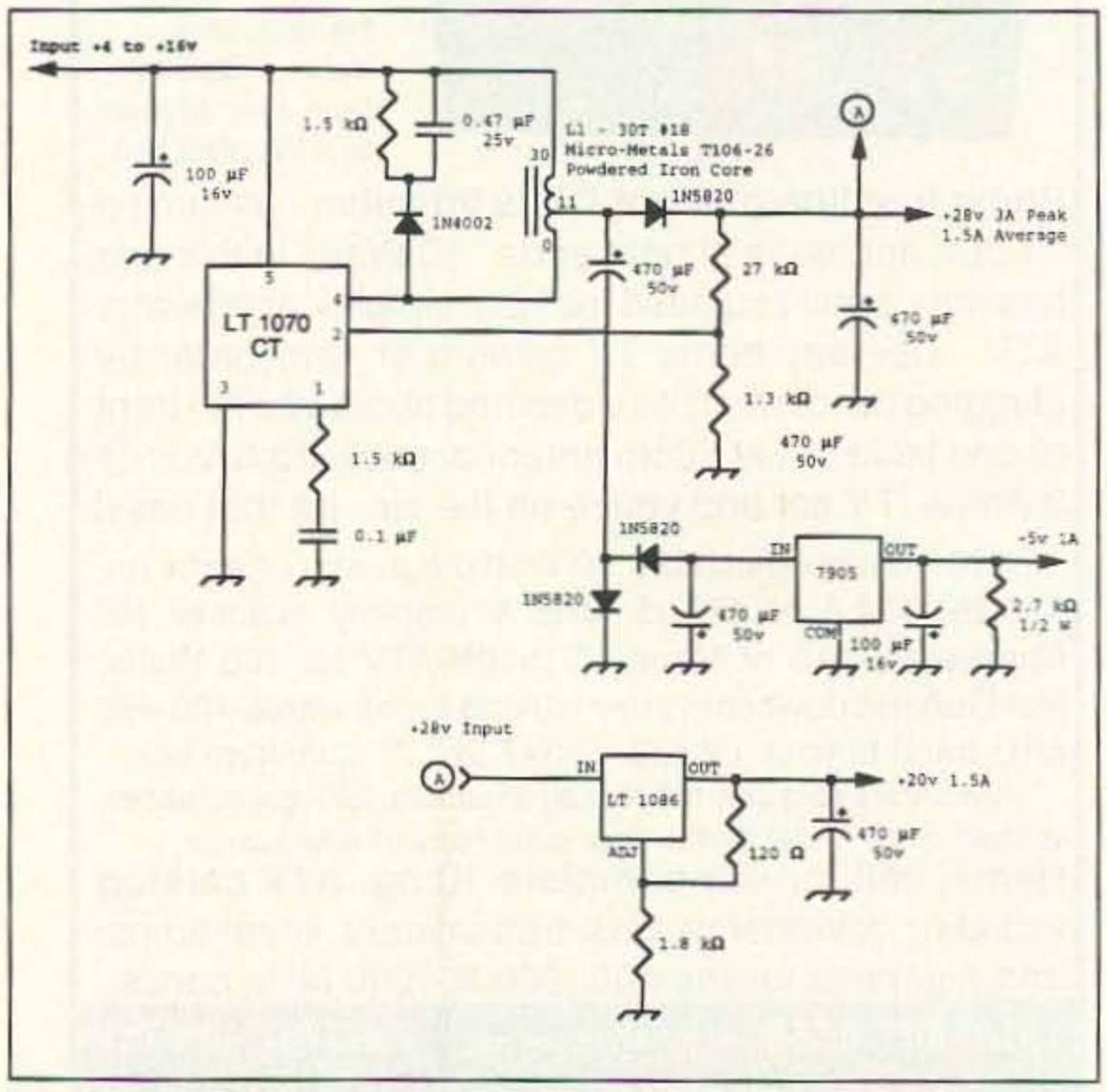

Figure 4. Linear technologies LT-1070 switching regulator, +4 to +16 volts input, +28 and -5 volts output courtesy of WA6CGR.

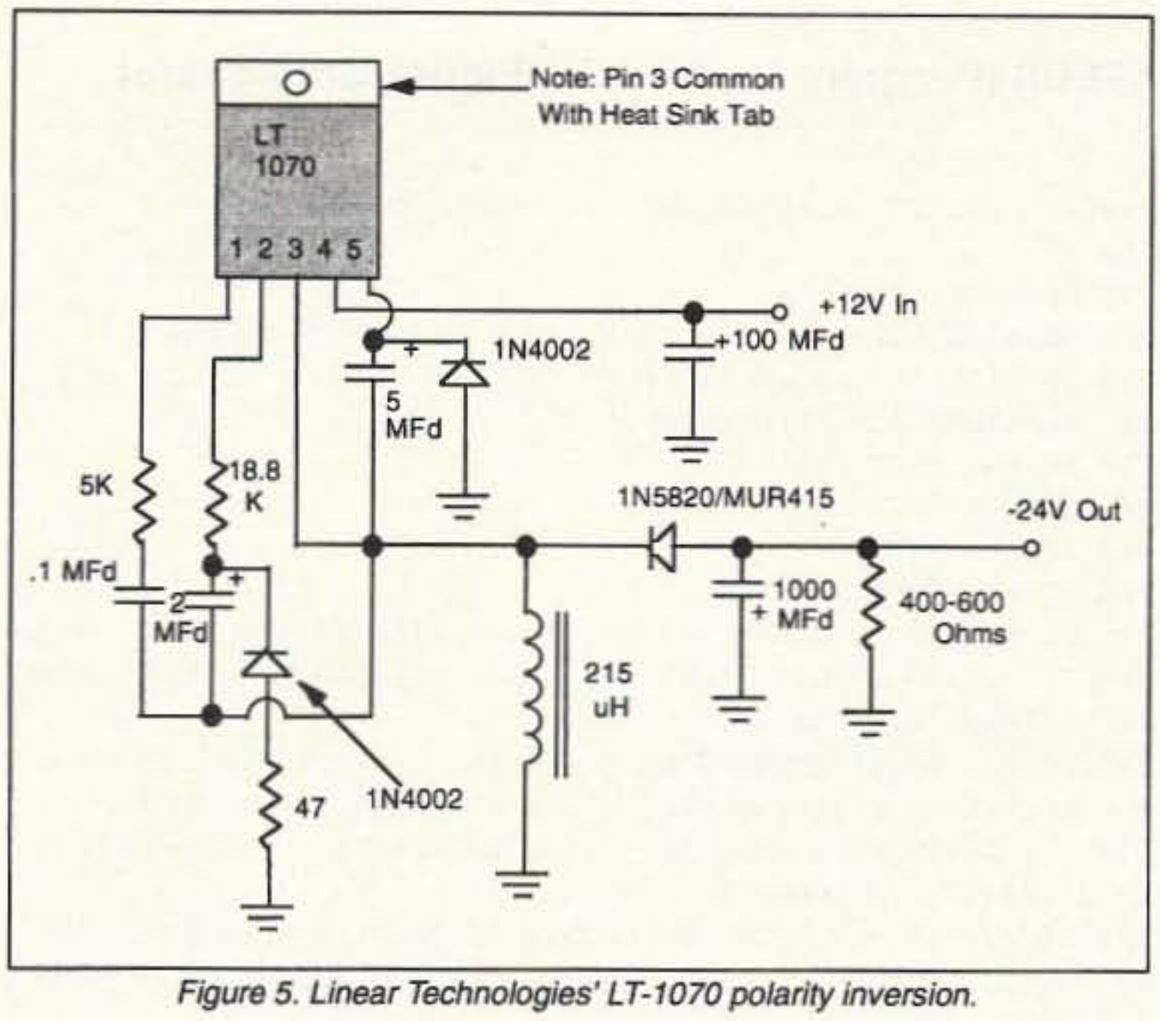

Figure 5. Linear Technologies' LT-1070 polarity inversion.

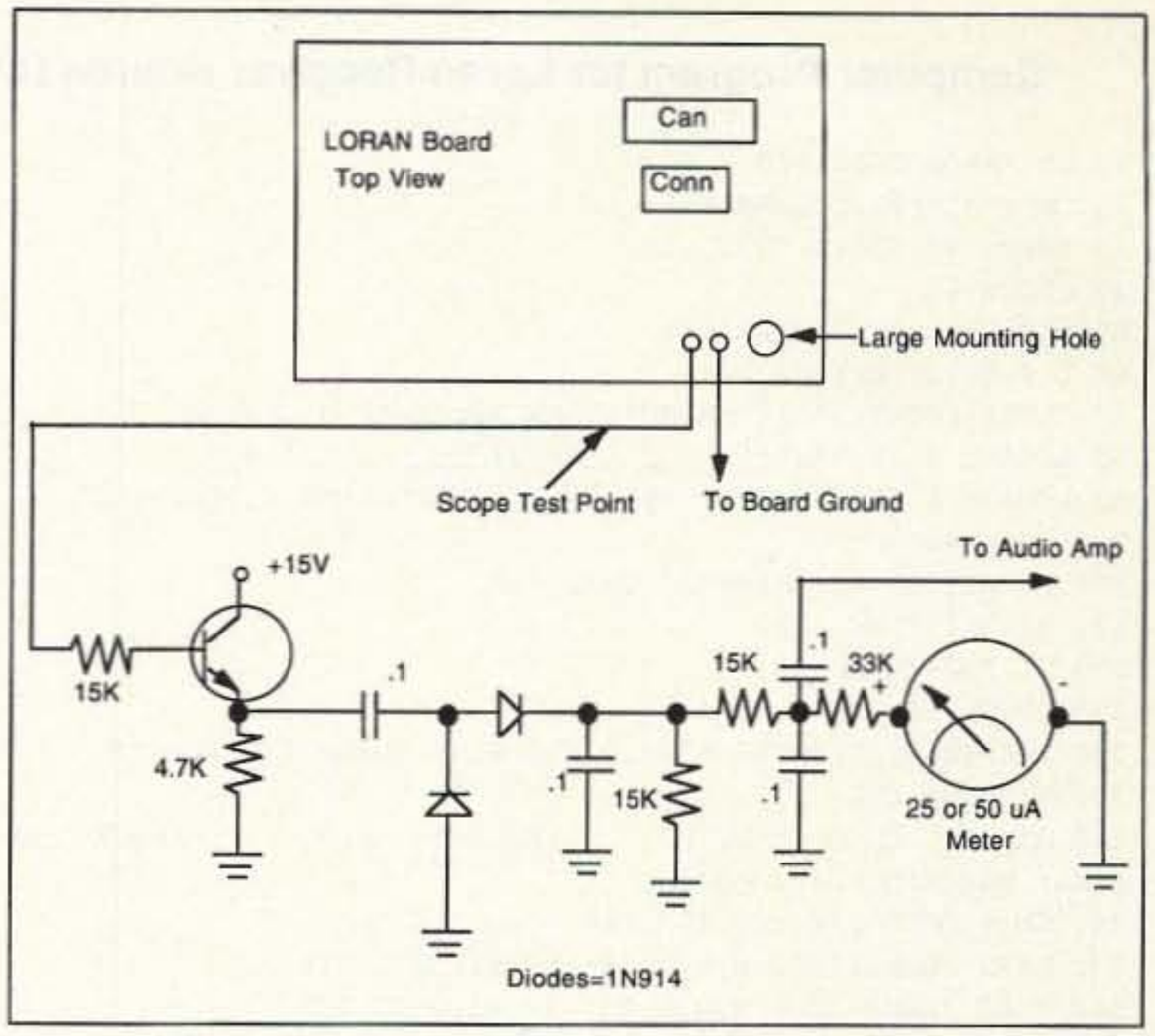

Figure 6. Loran receiver S-meter detector circuit (K9EUI).

induce current into another winding of a transformer.

Enter the LT-1070, a switching regulator from Linear Technologies. It differs from the TTL-type switching circuit as much as from the mechanical vibrator switching types in that the TTL and vibrator should not be called switching types at all. In fact, the TTL and vibrator examples are linear in all respects. Only the LT-1070 is a true switch mode regulator because it has a on and off period. See Figure 4 for a schematic diagram of this circuit.

The use of the LT-1070 can be altered to provide negative as well as positive voltage outputs of low to higher voltages from a single 12 volts input supply. This circuit has application in our microwave portable use in that most surplus relays and associated equipment are made to operate from 24 volts in military surplus. Surplus telephone microwave equipment is made to operate from 24 or 48 volts and positive ground. This little switching regulator will fill the bill to provide operation from either scenario, positive or negative output. Input voltage can be a car battery (12 volts), negative ground in either case, as in the circuit shown in Figure 4.

For the other polarity of operation for the majority output of this circuit, use the schematic shown in Figure 5, with a negative output at 24 volts. This is not the last straw but rather one method to show an application for this type of power supply.

As far as component selection goes for switching power supplies, an increased cost in their construction is necessary due to the higher value of filtering capacitors. Additionally, the inductors used must be capable of carrying a high current with very low resistances (less than 0.2 ohms), and the rectifiers must be switching-rated; that is, they must be a very fast rectifier specifically designed for switching-type use. A 1N4000 series rectifier is not suitable for this application; however, a Motorola MUR415 or similar ultra-fast recovery rectifier is rated for switching use.

Updated Loran Program Generates Gridsquare (by K9EUI)

The sidebar shows an update to the Loran receiver program. This new program was written by Bob K9EUI and is quite an improvement to the basic program presented in the August 1994 "Above and Beyond" column. Bob did a very fine job, and deserves quite a bit of credit for his innovations in adapting the concept we mentioned: merging the Loran and grid square location programs. Thanks again, Bob, for your fine contribution to this project.

The updated program allows for variation in latitude and longitude, with the mean average to be displayed along with the position status and grid square. Bob also included a signal strength indicator circuit for the Loran receiver (see Figure 6 for details). The input signal at the test point runs about 8 volts peak-to-peak, and averages around 2.5 VDC. The meter circuit can be very useful for mobile work, while an o-scope is the best way to monitor signal conditions in the shack. The test point to connect to is the second hole from the corner mounting hole (see Figure 6). I have to take my hat off to Bob for his very fine contribution to this Loran project.

Well, that's it for this month. I have been very busy with family activities and haven't had much time to spend in the shack working on construction projects. One nice test equipment update is that the noise meter that our group has been using was thought to have 5 dB of excess noise ratio (ENR) for noise figure evaluation. Well, we found it to be 4.3 dB ENR, and that gave us a big improvement concerning past noise figure measurements. It makes previous readings much lower and better than we thought. It's always nice to get some good test equipment to confirm calibration.

Next month I plan to cover microwave stripline tuning procedures. The methods are not frequency/band selective, as the Method Of Procedures (MOP) apply to all static-sensitive GaAs FET circuitry. This MOP'ING up will make working with sensitive GaAs FETs quite easy. As always, I will be glad to answer questions concerning this and other related topics. Please send an SASE for a prompt response. 73 Chuck WB6IGP. 73

See the program listing on page 70

Computer Program for Loran Receiver Boards (by K9EUI) (Program Derives Six-Figure Gridsquare)

```
10 ON ERROR GOTO 970
20 OPEN "I",#1,"LORAN.INI"
30 INPUT #1,P,C1$,C2$
40 CLOSE #1
50 CLS:KEY OFF:DIM X$(40)
60 L=900000!:N=1800000!
70 CLOSE:LOCATE 3,26:PRINT"LORAN Navigation System"
80 LOCATE 4,26:PRINT"________K9EUI__________"
90 LOCATE 6,30:PRINT"1. System setup":LOCATE 8,30:PRINT"2.
Run Program"
100 LOCATE 10,30:INPUT"3. Quit ",X
110 IF X=1 THEN 1020
120 IF X=2 THEN 140
130 GOTO 950
140 LOCATE 6,30:GOSUB 670:LOCATE 8,30:GOSUB 670:LOCATE
10,30:GOSUB 670
150 LOCATE 25,10:PRINT"      <ESC> to quit      <SPACE> to
clear max/min readings";
160 ON P GOTO 170,180,190,200
170 OPEN "COM1:1200,N,8,1,RS" AS #1:GOTO 210
180 OPEN "COM2:1200,N,8,1,RS" AS #1:GOTO 210
190 OPEN "COM3:1200,N,8,1,RS" AS #1:GOTO 210
200 OPEN "COM4:1200,N,8,1,RS" AS #1
210 LOCATE 9,26:PRINT"LAT    LONG    ST POSER MODE"
220 C$="I "+C1$+" "+C2$:GOSUB 330:GOSUB 350
230 C$="OD":GOSUB 330:Z=1:GOSUB 350
240 '
250 C$="A":S=0:GOSUB 330
260 GOSUB 350:IF Z=1 THEN A$=""
270 A$=MID$(A$,3,27):GOSUB 690
280 LOCATE 10,26:GOSUB 670:LOCATE 10,26:IF B$="N" AND
G$="11" THEN 300
290 PRINT A$;:GOTO 310
300 COLOR 15,0:PRINT A$;:COLOR 7,0
310 A$="":C$="B":S=1:GOSUB 330:GOSUB 350:GOTO 250
320 '
330 PRINT #1,C$;:PRINT #1,CHR$(13);:PRINT #1,CHR$(10);:RE-
TURN
340 '
350 D=0
360 X$(D)=INPUT$(1,#1):IF S=1 THEN 380
370 A$=A$+X$(D)
380     FOR I=1 TO 100:NEXT
390 V=EOF(1):IF V=-1 THEN 410
400 D=D+1:GOTO 360
410 IF S=1 THEN GOSUB 440
420 RETURN
430 '
440     FOR I=2 TO 5
450     IF X$(I)="F" THEN H(I)=15:GOTO 610
460     IF X$(I)="E" THEN H(I)=14:GOTO 610
470     IF X$(I)="D" THEN H(I)=13:GOTO 610
480     IF X$(I)="C" THEN H(I)=12:GOTO 610
490     IF X$(I)="B" THEN H(I)=11:GOTO 610
500     IF X$(I)="A" THEN H(I)=10:GOTO 610
510     IF X$(I)="9" THEN H(I)=9:GOTO 610
520     IF X$(I)="8" THEN H(I)=8:GOTO 610
530     IF X$(I)="7" THEN H(I)=7:GOTO 610
540     IF X$(I)="6" THEN H(I)=6:GOTO 610
550     IF X$(I)="5" THEN H(I)=5:GOTO 610
560     IF X$(I)="4" THEN H(I)=4:GOTO 610
570     IF X$(I)="3" THEN H(I)=3:GOTO 610
580     IF X$(I)="2" THEN H(I)=2:GOTO 610
590     IF X$(I)="1" THEN H(I)=1:GOTO 610
600     IF X$(I)="0" THEN H(I)=0
610     NEXT I
620 T=H(5)+16*H(4)+256*H(3)+4096*H(2)
630 IF T>8000 THEN T=T-65536!
640 OSC#=8*T/256+8000000#
650   LOCATE   6,26:GOSUB   670:LOCATE   6,26:PRINT
"OSC=";OSC#;"Hz"
660 Z=0:RETURN
670 FOR I=1 TO 30:PRINT CHR$(32);:NEXT:RETURN
680 '
690 B$=MID$(A$,25,1)
700 G$=MID$(A$,16,2):IF G$<>"11" OR B$<>"N" THEN 860
710 E$=MID$(A$,1,6):E=VAL(E$)
720 F$=MID$(A$,8,7):F=VAL(F$)
730 IF E>K THEN K=E
740 IF E<L THEN L=E
750 IF F>M THEN M=F
760 IF F<N THEN N=F
770 LOCATE 13,26:GOSUB 670:LOCATE 13,26:PRINT"MAX LAT ="K
780     O=(K+L)/2:LOCATE   14,26:GOSUB   670:LOCATE
14,26:PRINT"AVG LAT ="O
790 LOCATE 15,26:GOSUB 670:LOCATE 15,26:PRINT"MIN LAT ="L
800 LOCATE 17,26:GOSUB 670:LOCATE 17,26:PRINT"MAX LONG="M
810     Q=(M+N)/2:LOCATE   18,26:GOSUB   670:LOCATE
18,26:PRINT"AVG LONG="Q
820 LOCATE 19,26:GOSUB 670:LOCATE 19,26:PRINT"MIN LONG="N
830 R=R+1:LOCATE 21,26:GOSUB 670:LOCATE 21,26:PRINT"TOTAL
READINGS=";R;
840 IF R=1 THEN BEEP
850 IF R>0 THEN GOSUB 1150
860 K$=INKEY$:IF LEN(K$)=0 THEN 890
870 IF K$=CHR$(32) THEN GOSUB 900
880 IF K$=CHR$(27) THEN CLS:GOTO 70
890 RETURN
900 LOCATE 13,26:GOSUB 670:LOCATE 14,26:GOSUB 670:LOCATE
15,26:GOSUB 670
910 LOCATE 17,26:GOSUB 670:LOCATE 18,26:GOSUB 670:LOCATE
19,26:GOSUB 670
920 LOCATE 21,26:GOSUB 670:LOCATE 11,26:GOSUB 670
930 R=0:K=0:M=0:L=900000!:N=1800000!
940 RETURN
950 CLS:CLOSE:END
960 '
970 IF ERL=20 THEN RESUME 1020
980 CLS:RESUME 70
990 '
1000 '                    SETUP
1010 '
1020 CLS
1030 LOCATE 12,30:INPUT"Select COM port (1-4): ",P
1040 IF P<1 OR P>4 THEN 1030
1050 LOCATE 14,30:INPUT"Enter starting LAT. (DDMM) ",C1$
1060 IF LEN(C1$)<>4 THEN 1050
1070 LOCATE 16,30:INPUT"Enter starting LONG. (DDDMM) ",C2$
1080 IF LEN(C2$)<>5 THEN 1070
1090 OPEN "O",#1,"LORAN.INI"
1100 WRITE #1,P,C1$,C2$
1110 CLOSE #1:CLS:RUN
1120 '
1130 '                GRID SQUARE ROUTINE
1140 '
1150 LA=VAL(MID$(A$,1,2)):AM=VAL(MID$(A$,3,2))
1160 LO=VAL(MID$(A$,8,3)):OM=VAL(MID$(A$,11,2))
1170 OM=ABS(OM):IF LO<0 THEN OM=-OM
1180 LO=ABS(LO):LO=LO+OM/60
1190 AM=ABS(AM):IF LA<0 THEN AM=-AM
1200 LA=ABS(LA):LA=LA+AM/60
1210  QP=(180-LO)/20:C=INT(QP):I$=CHR$(C+65):R1=(QP-
C)*10:C=INT(R1):D$=CHR$(C+48)
1220                                          M1=(R1-
C)*24:C=INT(M1):M$=CHR$(C+65):QB=(LA+90)/10:C=INT(QB):J$=C
HR$ (C+65)
1230    R1=(QB-C)*10:C=INT(R1):L$=CHR$(C+48):M1=(R1-
C)*24:C=INT(M1):N$=CHR$(C+65)
1240 H$=I$+J$+D$+L$+M$+N$
1250 LOCATE 11,26:GOSUB 670:LOCATE 11,26:PRINT"GRIDLOC =
";H$;
1260 RETURN
```

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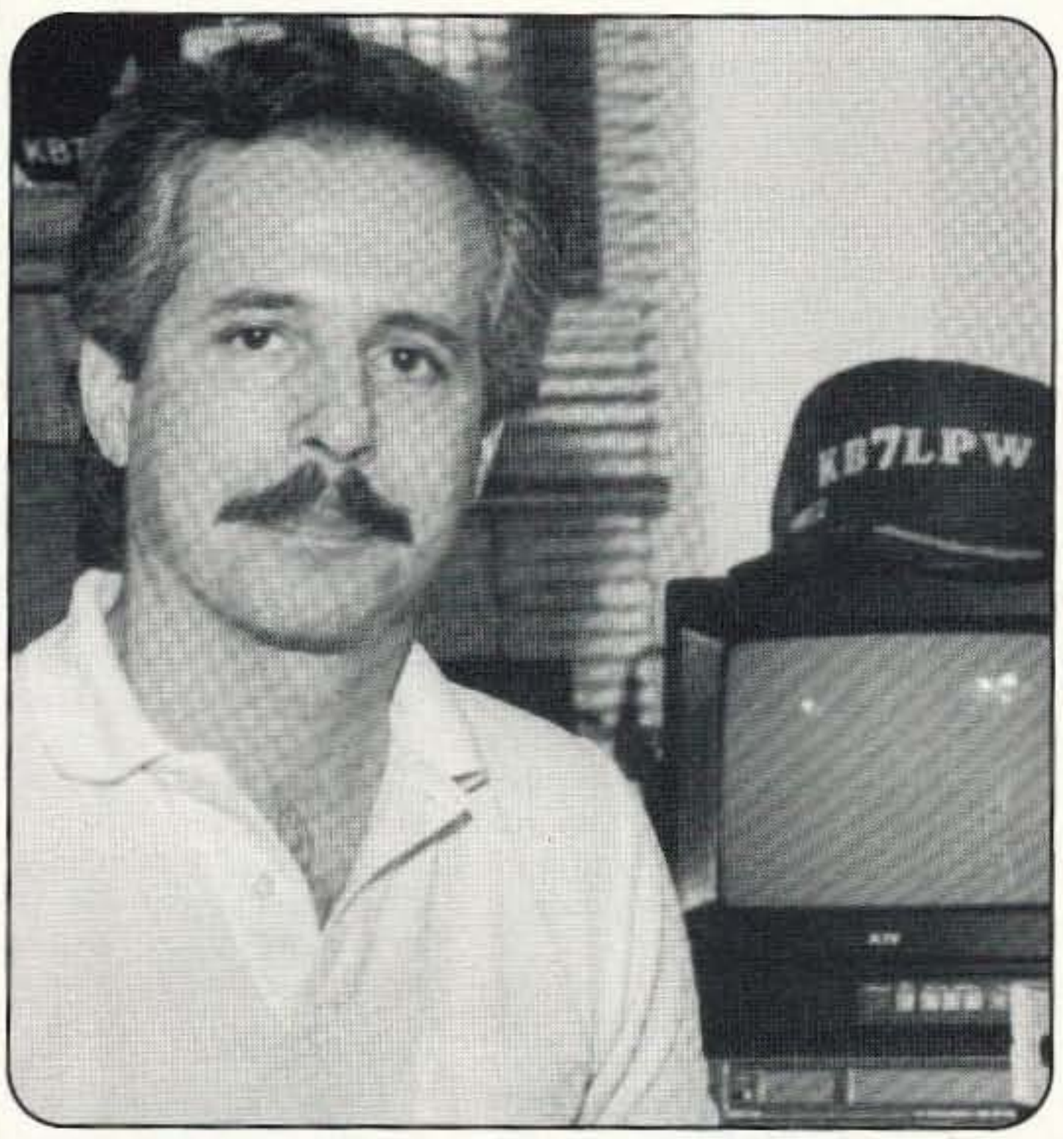

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Troubleshooting Audio Stages

Over my many years of repairing things, I've noticed that, in radio gear, breakdowns don't seem evenly distributed. As with just about everything, power supply failures are at the top of the list. But, unlike with, say, VCRs, RF problems are far outnumbered by audio-stage troubles. Why?

Life Ain't Fair

Like the power supply, audio stages carry a lot of power and load. RF output stages work even harder, but they are built with all kinds of protection systems incorporated into their designs, mostly because RF output transistors and modules are so expensive. Also, with the antenna completely left up to the owner, the chance for disaster is just too great.

Audio amps, however, are cheap and seem simple enough that nobody bothers to protect them. That, of course, is not the case with high-fidelity audio gear. Lots of good stereo components are designed with speaker and output stage protection circuits. They're built in for the same reason RF outputs are protected—repairs can cost a bundle.

In your radios, though, the audio stages often are little more than an afterthought, "OK, we've got a signal, I guess we gotta make it big enough to vibrate the speaker somehow." Or, perhaps, "The microphone's gotta get to the modulator one way or the other." So, little effort is expended because, after all, this isn't a high-fidelity medium to begin with. And, with only a few watts of audio power, not much harm is likely to occur, right?

Wrong

Ah, if only real life could be like that! From what I've seen, *lots* of trouble happens all the time. So, let's take a special look at audio problems: what they are, why they happen and how to fix them.

Coming and Going

As far as the audio is concerned, your transceiver has two ends: the mike and the speaker. Let's start with the output side, because it has the most potential for failures. In order to vibrate a speaker cone hard enough for you to hear the radio under noisy conditions, such as in a car, the average HF or VHF/UHF mobile rig puts out a watt or two of audio. Most walkies put out 200-500 milliwatts. Compared to the typical output power of stereo equipment, these levels are peanuts. So why has your stereo kept working for 20 years when your ham gear has blown its audio amp? Well, when was the last time you ran your stereo at full blast and 10 percent distortion for hours on end? (I certainly hope you're not doing that, especially if you want to be able to hear when you get older!) That's exactly what happens with radios, especially in the car. It's not the absolute level that matters, it's the amount of power relative to the maximum design limit. If your HT is rated at 300 mW and you run it all the way up for a long period, that's as taxing to its amplifier as if it were running higher power but designed for it.

So, it shouldn't be surprising that audio output stages blow up. But, before you crack open the rig, make sure it isn't the *speaker* that's popped! While most of the speakers in mobile rigs, and nearly all of the external "communications" speakers, are rated to take the full audio output power of a typical mobile transceiver, they can blow now and then anyway. Test your speaker with an ohmmeter, or try using another speaker, as your first test; only if the speaker seems fine should you go after the amp. By the way, although it's possible for the speaker's voice coil to short, I've never seen that happen; virtually all the blown speakers I've run across have been open. So, if your ohmmeter test shows anything in the 8-ohm range, you can assume the speaker is good. Unless, of course, yours happens to be a 32-ohm or some other odd-value speaker.

HT speakers represent a special case. Unlike those in mobile rigs, many HT speakers are actually rated for power levels far below what the little radios' amps can deliver! I don't know whether the manufacturers do it to save cost or size, but using an underrated speaker is a bad idea, to say the least. I guess they figure that you won't be playing the rig at top volume for long periods, so the *average* output power will stay safely below what the speaker can handle. In car use, though, it just doesn't happen that way. Especially if you accidentally leave your squelch open with the volume all the way up, you may come back to find a dead speaker. Why would you ever do that? I've seen hams deliberately leave the radio with open squelch in order to run the battery down all the way before charging it. Heck, I've done it myself. If you do that, be sure not to set the volume more than about halfway up.

If the speaker is OK, it's time to open up the rig. Before you get to the amp, take a look at the earphone jack. Now and then, a bad connection or a bent piece of metal in the jack can prevent the signal from making it to the speaker. With PC-mounted jacks, the solder joints or PC foils can break from the stress of inserting and removing the plug. If all seems well, scope the line coming to the jack from the audio amp. If it shows a signal, you still have a connection problem. If it's dead (the more likely case), the amp isn't working. If you don't have a scope, you can test with a small speaker. Just connect one end to the common side of the existing speaker (usually chassis ground, but occasionally one of the power supply rails) and the other to the amp's output line, after any coupling capacitors or transformers. No sound means a dead amp.

Only Resting

When is a "dead" amp not really dead? When it's resting! Remember, this is a radio, not a stereo. So, it has a squelch circuit, right? You'd be surprised at how many seemingly dead amps are sitting there in perfect health, waiting to spring into action. To see if your problem is in the amp or the squelch circuit, test for voltages on the audio output stage. Except for a few older radios, just about all HTs, and many mobiles, completely remove the DC power to the audio amp when there's no signal. It really saves power, and it eliminates any annoying, residual noise from distracting the listener. If the whole thing seems dead, with no DC voltage present, you almost certainly don't have an amp problem, and changing the output transistors or IC won't do you any good. Now's the time to work backwards, heading for the squelch circuit.

The Gatekeeper

Many VHF/UHF radios, both HT and mobile, use the Motorola MC3357 or another similar IF/detector chip. This IC has a squelch output which consists of a rising and falling DC voltage. If you go from the audio amp's DC input point and follow it back toward the chip, you'll run into a transistor. This transistor acts as a gatekeeper, allowing the command from the chip to control the substantial current required for the audio output. Failures in this stage are extremely common, so take measurements on the transistor's base. If it rises and falls as you turn the squelch knob back and forth through its threshold, the chip is doing its job, indicating almost certainly that the transistor is open. If, though, you see no action, either the chip or the transistor could be bad. To find out, pull the transistor's base leg and measure the line coming from the chip. If it now works, the transistor is likely bad. If you still get nothing, the chip is suspect. Remember, though, that it could have been blown by a short in the transistor, so they may both need replacement. Before you change that chip, though, be sure both its oscillator inputs have their required signals, and that the IF input is there, too. Naturally, that squelch line will never become active unless the chip is seeing proper signals.

Types of Amps

Once you've decided that the problem is definitely in the audio amp, it's time to start narrowing the problem down. If the radio uses an IC for its audio power output stage, you don't have far to look; the chip either is or isn't bad. But, if it is, you might save yourself a few bucks down the line by thinking about why it blew. Heat buildup from turning the volume control very high certainly can do it, but there are other reasons. One of the most often overlooked is a leaky output coupling capacitor. The amp will still work, but it'll be putting DC power through the very low resistance of the speaker's voice coil, and that will make both the chip and the speaker run hot. The speaker may survive while the chip goes to that great silicon factory in the sky. It can be hard to determine a leaky output cap, so I recommend simply replacing it whenever you have an unexplained failure in a cap-coupled audio power amp. Otherwise, you could replace the chip, only to have it fail again a few weeks later.

If the amp is discrete, you've got a job ahead of you. Discrete amps are almost always of the push-pull variety, and their problems can be tricky to pin down. Usually, the parts carrying the most current go first, so check the output transistors. If there's a coupling cap, suspect it. If there's an output transformer, though, chances are it'll be OK.

Well, we've more to cover, but I'm running out of room. So, let's finish this up next month. Before we go, though, let's look at a letter:

Dear Kaboom,

I have an 80-meter folded dipole on top of a four-story apartment building. My problem is that, whenever I transmit, touch lamps all over the complex go on and off. The neighbors don't appreciate it, and I don't blame them. Is there any way to stop this?

Signed,
Blinky

Dear Blinky,

Ah, there is some justice in this world! Touch lamps have been QRMing hams as long as the little buggers (the lamps, that is) have been around. I've never heard of QRM *to* touch lamps, but it makes sense that it might happen. If the RF is getting in through the lamps' sensing antennas, I don't know how you could stop it without killing the touch action. But, if it's getting in through the AC line cord, which is what I suspect, any decent RF line filter ought to stop the problem. You mentioned in your letter that a ham friend once knew how to fix this but has since lost the instructions. If another reader can send a definitive fix, I'll be glad to put it in the column. Good luck!

Until next time, 73 from KB1UM.

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NEVER SAY DIE

Continued from page 4

needed. Well, we're a little behind on that one. I remember HB9RF doing that in Zurich over 20 years ago as we were driving to visit his moonbounce station.

I've replaced what was only 10 years ago a state-of-the-art $500,000 computerized publishing production system with a new Macintosh $50,000 desktop system. It does it better and faster.

Are you still writing by hand? You're two generations behind. I changed to typewriters as soon as I could, carrying portables with me on my trips 35 years ago. Then I changed to word processors, moving to a laptop system 15 years ago, as soon as the first one was available. I moved from CW to voice in 1939 . . . and from voice to RTTY in 1949. I put up my first voice repeater in 1969. Our pioneering ham HTs and repeaters of 1970 are now used worldwide as cellular telephone systems.

And look what's happened to those crude microcomputer kits we were playing with in 1975! Now we're using micros to replace million-dollar typesetting systems. One of the first ads for the MITS Altair 8800, the first practical microcomputer, appeared in *73*, by the way.

Are you keeping up with technology? As a ham you're expected by the public to be knowledgeable about high-tech. Can you see where technology is taking us? All you have to do to get ahead of the game is know something like that before others do. Joe Sugarman W9IQO figured out that there would be a market for electronic gadgets, so he started selling them by mail as JS&A and made millions. Steve Jobs figured there was a market for a single-board microcomputer, and didn't do badly. Bill Gates figured these micros would need operating systems and parlayed that idea into a few bil.

If you really want to feel bad you can dig out some old issues of *73* and read where I told anyone paying attention about those opportunities at the time. There are just as many opportunities today, if you think in those terms. Steve Jobs started out with nothing but a prototype built by Steve Wozniak. Bill Gates dropped out of Harvard to work for MITS, in Albuquerque, where the action was.

Communications, computers, information and transportation systems . . . all are changing. These changes, in turn, are changing businesses and industry. They're wiping out the need for so many management layers. They're making it possible (and that translates as necessary) to move manufacturing to lower-wage countries.

We're in need of and ready for a major change in education which I expect will generate a few more billionaires. Ditto health care, which is a trillion-dollar industry, and growing fast. How close are you to the change? Close enough to benefit?

Of course this means that you're going to have to actually *do* something. You're going to have to spend time learning and perhaps experimenting. It is pathetically easy to become an expert in a new technology. It just takes an interest and some dedication.

When I heard the first RTTY signal on my 2m receiver I wondered what on earth that was and started asking questions. That lead me to John Williams W2BFD, the grandfather of ham RTTY. I built the circuit he'd developed, bought an old Model 12 Teletype machine from him, and was on my way. I read all I could find, asked endless questions, and experimented. The next thing I knew *I* was the expert and writing the first book on the subject.

In my editorials I'm endlessly pointing out new areas of technology that are wide open for development and which offer great promise for building new businesses. I've been writing recently about cold fusion. I expect this to turn into a trillion-dollar industry within a few years, sweeping some of the pioneers along into billionaires. It'll not only wipe out established businesses that ignore it, but many of the pioneers who don't keep their eyes open to how the field is developing.

Many of the microcomputer pioneers went under because they stopped keeping their eyes on the future and thus weren't sensitive to changes. I tried hard to convince John Roach, the president of Tandy, that the future of personal computers lay in making them with open systems so that third-party firms could support them with software and accessories. Roach wouldn't listen and this cost Tandy tens of billions. It was Roach who was far more responsible for the success of IBM and their PC than IBM was. IBM should give him a medal.

The opportunities are there. They are sitting there just waiting for anyone with the interest to pioneer and reap the rewards. It does take work. It means learning. One thing it doesn't take is much money. Bill Gates didn't have any money when he approached Ed Roberts at MITS with the BASIC interpreter he'd quickly cobbled together. Steve Jobs didn't have the airfare to fly to the Atlantic City computer show with his Apple I prototype in 1976. The two guys who started Electro-Voice started in a garage, just like Jobs and Wozniak.

The question then is: Are you willing to learn? Are you willing to work? Or are you too busy watching ball games on TV or swapping signal reports for QSL cards so you can end up a Silent Key on the ARRL Honor Roll? Instead you could be learning about spread-spectrum communications, data compacting algorithms, or maybe how to load hydrogen into nickel to generate heat, and then start working on ways to control the process and use it for heating systems and to generate electricity.

Presumably, since amateur radio is supposed to be a technical hobby, you have some grounding in electronics. That's a good start, but why stop there? Oh well, it's your life. If you're already making enough money, don't have any interest in helping civilization progress, and don't get fun and excitement from pioneering, then sit back with a beer and pretzels and enjoy. Let others develop better foxhunting receivers. Let others put up crossband repeaters. Let others run your local radio club. Let others elmer newcomers. Let others develop better, faster packet systems. Let others write the articles you're reading.

Speed Reading

One of the better moves I've made in life was in taking a speed reading course at the local high school. Before that I was bumbling along at a crummy 300 words per minute, reading word by word, just as they taught me in school. At that speed there would be no way I could handle the homework that I need to do to keep up these days. As it is I zip through over a hundred magazines a month, lord knows how many letters and submitted articles for my magazines, plus two or three books a week. Very few novels, either. Well, I *do* read each new Tom Clancy book when it comes out. There goes Wayne, bragging again, right? No, my point is that I haven't done anything you couldn't do . . . if you'd just *do* it.

There are undoubtedly some fine computer programs to help you speed up your reading, but you don't need 'em. The process is really simple. It's like learning the code in that no amount of slow reading is going to speed up your ability to read. If you want to read faster, what you have to do is start pushing yourself. If you don't want to read faster, why not? There's no downside, and the upside can be amazing. It's easy to triple or quadruple your reading speed. And the surprising part is that the faster you read, the more you retain. That's right, comprehension improves!

Instead of reading one word at a time, push yourself to read two and three. Push harder. Then go to four and five. Pretty soon your eyes will be seeing a whole line at a time and you'll be reading by running your eyes down the middle of a column of text. You'll be able to whip through fiction like a breeze. Technical stuff is slower, of course.

Before you start pushing, measure your current reading speed, so you'll know how well you're doing. Pick a full page of text and time yourself. After you've been pushing to read faster for a few days, pick another page and test again to see how much speed you've picked up. I think you'll be pleased. Keep right on pushing and let me know how you're doing.

Make Some Money

I recently got one of these new-fangled HTs with multiple-use buttons. Now, I'm no newcomer to HTs. I started out with an HT-220 Motorola unit back in 1969. That was a very nice, rugged, and compact HT. It had one frequency and was crystal-controlled. It was on 34-94 and worked like a champ. It had a squelch control with the on-off switch on it, a volume control, and a simplex-duplex switch. Period. I had no problem at all using it.

So here I am with this new two-band HT. It's got 24 buttons, two concentric control knobs, a tuning dial, and a 60-page instruction manual. Then there's the fuction display with 25 different areas for information. It's got 64 programmable channels and I know I'm going to need to be retrained after every coffee break.

Sure, I'll probably be able to sweat my way through the 60 page book and figure out how to do the simple things, but the lesser-used functions will go the old use-it-or-lose-it route in what's left of my memory. Heck, this HT has a better memory than I have. Maybe I need a crib sheet. That's what I've cooked up to help me cope with my Mac PowerBook laptop computer. But then it's got about a 500-page instruction book, plus another 500 pages for Word, the word-processing program I use.

Both of those books are so complicated to deal with that several publishers are selling simplified instructions for the computer and the program, and those books run at least 500 pages. I've been buying more and more books to help me cope with this tiny monster, and I've over six feet of bookshelves filled so far, with no end in sight. My wife Sherry, who's been Macintoshing it several years longer than I, has over 50 feet of software and books.

I hate to think what I'll have to do if I move from Word to Quark for page design. Sure, I'll be able to do a lot more, but at what cost in time and aggravation to beat my way through instruction books which are not user-friendly? It's no wonder they're selling video tape instructions for these programs. And I get ads in the mail for one-day courses in Quark for a couple hundred dollars.

One major problem is that most of these books have been written by hardware or software engineers, not writers. One of the great charms of the original TRS-80 Radio Shack computer was that the instruction manual was easily understandable. I just wonder if there might not be a market for simplified ham gear instructions. I know I'd buy 'em in a flash.

Many ham manufacturers are still letting their engineers write their instruction manuals, despite my warnings in past editorials about never letting an engineer get close to such a project. Just as they shouldn't be let near any advertisment writing. Engineers have their function . . . to design equipment. Technicians fix it. But when you need writing done, get a writer. Engineers have their own language, often not recognizable as English. Many seem to almost completely lose their ability to communicate in English through disuse.

If you know how to write, and you've conquered some popular piece of ham gear, you might try your hand at writing a simplified instruction manual for it. If I'm able to understand it, I can offer photocopies via Uncle Wayne's Bookshelf

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MFJ's lighted Cross-Needle Meter shows you SWR, forward and reflected power *simultaneously*. It reads both *peak* and average power on 300 or 30 watt ranges.

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Tunes *any* Antenna

The MFJ-949E tunes out SWR on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . nearly anything!

Use coax feed, random wire or balanced lines. Has oversized *heavy duty* 4:1 balun.

Super Antenna Switch

MFJ's 8 position *super* antenna switch lets you select two coax fed antennas, random wire/balanced line or built-in dummy load for use through your MFJ-949E or direct to your transceiver.

MFJ's Cross-Needle SWR/Wattmeter is always active for monitoring forward and reflected power and SWR.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-949E off-the-air into a built-in dummy load without causing QRM.

Pre-tuning into a dummy load makes tuning your actual antenna faster and easier.

Full Size Dummy Load

MFJ's 300 watt 50 ohm dummy load makes tuning up your transceiver and pre-tuning your antenna easy. It reduces needless QRM and saves your finals.

You'll find it handy for testing and repairing your rig, setting power level, adjusting your mic gain and more.

The MFJ-949E has a *full size* non-inductive dummy load measuring 3/4 inch diameter by 5 inches. It *easily* handles 300 watts of abusive tune-up power.

Watchout for cheap midget size dummy loads that changes resistance as it heats up -- marginal ones could burn up your rig.

Custom Inductor Switch

The inductor switch is the most likely component to burn up in *any* antenna tuner.

The inductor switch in the MFJ-949E was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner -- it's not a flimsy *plastic* switch made for small signals and wired with *tiny* gauge wire.

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Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

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and see how it sells. Who knows, you might be able to generate enough cash to buy more equipment and then provide understandable instructions for that.

Legacy

In a hundred years what will there be around to show that you've been here? Probably the only thing will be your grandchildren and their children. So much for your life's work . . . all the money you've made, and your lifestyle. Sure, a few people leave noticeable things behind. Music, or some sort of art . . . maybe a bridge or a building they designed. But for most of us it's our children that are a record of our having been here.

Nature has gone to a lot of trouble to make sure that we generate children, so it's an almost sure thing that we will. But since this will probably be the only long-term reminder that you ever existed . . . except perhaps for a gravestone, which I doubt will get a lot of attention a hundred years from now . . . shouldn't you maybe spend some time and effort making sure that your progeny are the best that you can turn out? And no, this is not a trivial project. However, considering its importance, perhaps it's worth investing some time and effort in it. Or is it already too late for you?

No, I'm not going to go into detail here on how to have the best possible children. There's nothing simple about it, and our present customs and life styles are so destructive as far as this goal is concerned, that you may not even want to know. We're permanently lousing up our children even before conception. Then we're doing another number on them during the nine prenatal months. That's followed by an even worse approach during their first year, followed by (ugh) pre-school. The products of these botches are then fed into one of the worst school systems in the developed world. Is that what you want to leave as your legacy? It's no wonder we're up to here in lawsuits, crooked politicians, crime, drugs, welfare, and other such scams.

Yes, I'll try to make time to start writing a book on how to give your children the best send-off in life you can . . . preconception, prenatal, birth, the first year, pre-school, K-12, and then college. If it's too late to help you with your children, maybe it isn't too late for your grandchildren.

If there is such a book I haven't seen it, so I'll have to go into detail on each step, ending up with a "How To Have and Raise An Outstanding Child" manual, complete with repair instructions when mistakes are made.

Most of the information I've gotten has been the result of my research into education and health care for the New Hampshire Economic Development Commission. I sure wish I'd known about all this when I was getting my children started.

Anomalies: The Awesome Power of the Mind

How well have you been keeping up with technology? Science has been moving along at an ever-increasing rate. Has this been leaving you behind? How well do you understand quantum theory? How about Chaos theory and fractals? How about DNA, genetics and the genome project? How about the Big Bang, plate tectonics, and the Omega Point? How about bioelectrics and bioelectromagnetism? How about cold fusion? As a licensed radio amateur . . . someone supposedly educated in electronics and communications . . . shouldn't you be keeping up with the world of science?

And how do all of these recent theoretical developments tie in with ineffables such as precognition, ESP, psychokinisis, faith healing, placebos, ghosts, reincarnation, past lives, UFOs, auras, psychic surgery, near death experiences (NDEs), out of body experiences (OBEs), and so on? Are all of these the "swamp gas" the professional debunkers (aka skeptics) claim? It seems logical to me that when the same phenomenon is reported by many people who have had no way of knowing that others have reported these experiences, that it's worthy of serious investigation and calls for an explanation . . . no matter how unusual the experiences.

If you've been keeping up, as scientists have delved deeper into quantum theory, they've been faced with some very serious problems. Matter no longer behaves rationally when you get down below the atomic level. Physicists have been struggling with a nightmare of ever more particles, often with conflicting behaviors, depending on the group working with them. Newtonian physics doesn't hold any more.

We have some very basic problems we've been ignoring. For instance, we don't know what fields are or how they happen. Oh, we can measure them and predict their effects, but that doesn't mean we know *what* they are. We have electrostatic, magnetic, gravitic, and electromagnetic fields (EMFs) over a wide range of frequencies. We know now that very low frequency EMFs can interfere with cellular growth and communication in living things . . . including people. We can measure gravity fields, but we really don't know what they are. We suspect there may even be more fields which we haven't yet detected.

We know that what we perceive as matter is really energy fields oscillating at certain frequencies. What we don't know is if there might be other forms of "matter" oscillating at different frequencies, and thus might be completely invisible to us, even though we might be right in the middle of it. We can hear a small range of audio frequencies. We can see a very narrow range of light frequencies. We can detect those in be-

tween and use many for communication. But those are electromagnetic waves. Detecting gravity "waves" is much more difficult.

We tend to be arrogant about what we know. You've probably read about the head of the Patent Office who proposed closing it down about 90 years ago on the basis that everything fundamental had already been discovered. The patent office today has refused to issue any cold fusion patents because there are a few well-placed scientists stopping the process.

From my point of view anomalies . . . those things which are reported by people in many parts of the world, but which are not yet explainable in scientific terms . . . indicate that we've still a long way to go before we really understand our world.

I've editorialized in the past about memory. I've mentioned that under hypnosis people can be regressed to any instant of their lives and recall in total detail what was being sensed at the time. Every face in a crowd is recorded in some way. Every word on every page we've ever glanced at. Unfortunately we're programmed by our parents from early childhood not to be able to access most of these memories.

But we run into a physical problem. How can so much material be stored just in the brain? No mechanism has yet been discovered which can handle the sheer bulk of information we're able to store. I've suggested that perhaps it isn't stored on a molecular basis like a computer, but in some other kind of medium entirely. A controversial new theory has been proposed which is in line with this concept, plus it ties together many anomalies which have been bothering me, into one completely new paradigm.

Scientists have been at a loss to explain why people who've had large parts of their brains destroyed or removed can still have all of their memories. How can 90% of the brain be removed without a loss of memory? It doesn't make any sense. Well, not if you insist that the brain is the mind and that it's wholly a physical, molecular thing, much like a computer. And that gets worse when you find another person with a different 90% of the brain removed, and still without a loss of memory. Whoops!

And what about the thousands of people who can see auras around people? What about people who can accurately diagnose illnesses just by looking at these auras? At times we get hints of some amazing latent potentials we all seem to have. We have people who have demonstrated abilities under strict scientific controls which suggest that, if we only knew how they did these things, we might be able to learn how to do them too.

Perhaps, instead of spending millions on disease research we might invest in learning how the mind works and prevent disease from that end. We know that there is a psychological component to every illness. We also know that our current medical approach is to completely ignore this key factor and try to treat the resulting illness symptoms . . . preferably with drugs.

Our pharmaceutical companies spend an average of $230 million for every new drug they bring to the market. I suspect that if there was some way to channel the cost of one new drug into mind research we might not have much use for drugs any more. And that's the real problem with this approach. The pharmaceutical industry is making hundreds of billions selling drugs . . . which is why they don't mind investing a couple hundred million bringing a new drug to market, or even spending over a billion dollars a year on advertising. But if removing the psychological component which has triggered the illness is possible, these businesses could quickly dry up and blow away. It's worth a few billion to make sure that doesn't happen, so the possibility of either a commercial firm or the government venturing into this field of research is much less than even remote.

The so-called health care industry has too much at stake to even chance this approach working. It's actually a sickness-care industry and it's one of our largest American industries. What would happen if someone discovered how to remove the psychological triggers making people sick? That would put most of our doctors, nurses, hospitals and so on out of business. It probably would even prolong life, working a severe hardship on our death industry too.

I've explained how the mind works. I explained that painful experiences set up neuron networks dedicated to helping you avoid repeating the pain in the future. I also explained that these subconscious forces have an incredible effect on our daily lives. And I explained that it's not just possible, but fairly easy to dissolve these networks. I've had a few letters asking for further information on doing that, but not enough demand to get me to sit down and tackle the project.

Getting back to a new approach to eliminating illness, you've probably read about how successful many non-medical doctors have been. Witch doctors, shammans, medicine men, Christian Scientists, and so on have been doing remarkably well, some for thousands of years. If they didn't have a fair percentage of successes they wouldn't have lasted.

When we look at people with multiple personalities we find some fascinating things going on. Most multiples have six or more personalities, each quite different. These seem to be a survival reaction to very painful childhoods. The interesting thing is that some of the

personalities may have diabetes, while others don't. Some personalities may have epilepsy. Often different personalities require different eyeglass prescriptions . . . and some don't need glasses at all. As I say, it's almost enough to make a person think!

Then we get into the power of placebos and realize that many people have demonstrated the ability to recover . . . or die . . . from cancer just on the basis of a belief in some therapy. There are many fantastic cases to prove this.

OK, we already know that every illness has a psychological component. And we know that medicine men have been surprisingly successful without the benefit of "modern" medicine. And we know that voodoo and witchcraft can cure or kill, as can placebos. I've mentioned that when I was working professionally as a psychologist I found it fairly easy to discover these illness-triggering factors. The next logical step seems to me to untie the hands of our research people and urge them to go after curing illness via erasing the psychological component of the illness rather than bigger and better medical electronic diagnostic equipment and $230 million each for new drugs to treat the symptoms, but not the causes. Would you say this is so ridiculous an approach that we shouldn't even consider it?

Of course the problem with this is that we have the fox guarding the henhouse. What commercial company is going to spend money trying to discover something that might well put our pharmaceutical companies out of business, yet probably wouldn't bring money in? And perhaps put most hospitals, clinics, doctors and nurses out of business too? There's enough money to be made by bringing a new drug to market to warrant a $230m research investment, but how could anyone make money from a simple instant cure for illnesses? Maybe even for almost every illness?

We've got the teacher's NEA spending tens of millions of dollars on Congress and state legislatures to vigorously guard one of the worst educational systems in the developed world against change. We've got the power utilities guarding against truth in the damage their magnetic radiation is doing to us. The government-subsidized tobacco industry is still denying that there's any real proof that cigarettes cause illness. Imagine what resistance our trillion-dollar "health care" industry would put up if someone suggested there might be a way for us not to get sick.

We know the government isn't going to finance research into an omnibus cure for illnesses. Nor will private companies. So it looks as if we're going to have to live with ever-escalating sickness costs and much shorter, unhealthier lives than are possible. Pity, because I suspect that the solution wouldn't take long to develop.

Maybe you've noticed that virtually every major problem we have in America seems to stem from some action or inaction of Congress. My solution to that impasse is simple: NRA . . . Never Re-elect Anyone. If we can get rid of career politicians we're going to benefit. For every good politician (a contraction of terms?) we might lose, we'd evict a hundred bummers. My NRA could be the National Recovery Act of the '90s.

What have you to gain? Better and cheaper health care, infinitely better education, no more welfare, taxes reduced by at least 50%, a far smaller bureaucracy, a 90% reduction in crime, and things like that. It's up to you to choose which you prefer.

The Helicobacter Pylori Syndrome

If you don't read *The New Yorker* you are missing out on a lot of good stuff. Oh, not in every issue, but enough to make a subscription well worth while. For instance, last year they ran a great article in their "Annals of Medicine" series on a doctor who suspected that ulcers weren't caused by stress, but by a germ called Helicobacter Pylori, and not by emotional problems or stress.

Despite enormous pressures from the medical establishment, which did all it could to prevent him from doing research, and then from publishing his findings, he eventually prevailed. Now most doctors accept his work.

And *The New Yorker* also was the first to publish Paul Brodeur's material on power line fields and their effect on people, which to many people who have not bothered to read much about this, is still controversial. Of course, to the cigarette companies, the harm their product does is still "controversial." But, as they themselves have been quoted as saying, their product is used by the young, the blacks and the stupid. Or did you skip watching that well-done TV report on smoking?

All too often we've seen this happen in many scientific fields. If you can get away for a few days, see what you can do to attend the Tesla Society Extraordinary Science conference in Colorado Springs. I went last year and I'll be going again next. Sure, they have some absolute crackpots presenting papers there. But they also have some well-researched papers that might just get you to thinking. Check with the International Tesla Society, Box 5636, Colorado Springs, CO 80931. Quite a few hams attended last year, and they even had a conference ham station set up and running . . . and leaking sideband into their public address system.

The Subtle Energies conference (ISSSEEM) is another conference worth attending. They are much more picky about the papers presented than the Tesla group. I attended their conference last year and found the presentations well researched. But you'll have to be prepared to hear papers on energy medicine, auras, and so on. I was particularly impressed by a video of a psychic healer influencing a cloud chamber on cue from several hundred miles away. And also changing the surface tension of water remotely. This is where you'll learn more about light therapies, bioelectromagnetics, and so on. You can get more info on this from ISSSEEM (the International Society for the Study of Subtle Energies and Energy Medicine), 356 Goldco Circle, Golden CO 80401. Tell 'em Uncle Wayne sent you. If you're there next time we can sit together and discuss what we're hearing. I was the only ham there last year. Tsk.

As I've mentioned, we still have an enormous number of things to learn about our world. We're still blundering around trying to understand how atoms work. We haven't a good understanding of any fields yet, including magnetic and gravity. We don't understand how electricity flows, or what electrons are. We're still trying to understand inertia and time. Sure we have equations for all these things, but we just know how they work, not why.

I suppose you were too busy watching some stupid sitcom instead of the wonderful PBS series on psychology. I don't know, you discourage me sometimes.

And then I get letters from readers who've been reading the books I've recommended, and I am encouraged. Quite a few have sent me wonderful letters telling me how much they've gotten from Becker's *Cross Currents*. While I try to answer any questions readers ask, I generally don't write back unless there are questions, so I'd like to take this opportunity to thank the many readers who've bought my *Declare War* book and enjoyed it.

Now, what will it take to get you involved in doing some research and development? Wait'll you see what happens when you plant a row of seeds which have been treated in different ways before planting! I got a call from a reader the other day who has been treating seeds so they turn out humongous plants, vegetables and fruits. Forty-foot corn plants with 12" diameter corn cobs? Well, that's what he said. But then he's a big believer in Wilhelm Reich's orgone. Yes, I've read Reich's book, *The Discovery of the Orgone*. It came close to making me a believer. That close.

So what happens to seeds germinating over the north or south poles of magnets? Or over positive or negative electrostatic fields? In different colors of light? In magnetic fields of different frequencies?

Knowing how badly the scientific establishment has treated new discoveries in the past, I wasn't surprised at the shabby treatment Pons and Fleischmann got when they announced their discovery of the cold fusion phenomenon. Well, as they say, "Time wounds all heels."

So, have you read about Heliocobacter Pylori? If not, you aren't doing your basic homework. 73

An 80/40/30m Tripole

Continued from page 40

might expect, but gives me really quite good coverage N-S as well! I tend to run between QRP and low power most of the time, and have no trouble with Michigan and Canada to the North, the Gulf states, the Caribbean, and South America to the south. East and west to the coasts is about it so far in the eight months or so the latest model has been up, but I have a good feeling that Europe, Africa, Asia are not in any "dead zone" for the antenna—I am just not on enough hours, or the right hours, to have worked them. Remember, propagation either gets or helps you to the N-S, but time zones alone can kill you to the E-W. California to Europe on the 40 & 80 meter bands must be murder. By the time those bands come alive at night in California (terminator passes into darkness), Europeans are sound asleep! Life just is not fair (well—not easy, anyway).

A friend has come up with the possible reason that the antenna works so well on 160m, even without the tuner: The 86' of coax feeding it works out to be right at 1/2 wavelength at the 160m frequencies I have been using! Since I ran directly into the antenna with no balun or any kind of ferrite beads or rolled up coax to form a choke at the antenna input, the odds are quite good that the feedline is making up a portion of the radiating antenna. If that were the entire case, I would buy it in a minute, but the contacts so far seem to indicate that 160m use favors E-W, and if the coax were radiating (remember, it runs from ham shack East to antenna) I would think N-S would be favored on 160m. Whatever, it works really well and somewhat omnidirectionally on the three bands I built it for, and it sure is not too shabby on the extra 160m band!

It would not be fair to tell you that from the FT-990 into the antenna on *all* four bands, the SWR is absolutely FLAT, with very little work by the built-in antenna tuner in the radio; were it not for the fact of so many radios now having the tuner built in, and/or so many fine tuners being available at very reasonable prices. I never favored letting the tuner do the work we should do when building the antenna, if for no better reason than that even with a tuner you are *not* getting best antenna efficiency if the tuner does the work. The ideal is to have the antenna *flat*, a good 50 ohm match, and look good *before* the tuner is ever used. Tuners are good guardians for radios when we *have* to tune and load into wet noodles like Field Day or during emergencies.

Finishing Touchs

I'll leave you with a few tidbits for those of you diehard antenna types like me. I did all the cutting, trying, and measuring with very reasonably-priced MFJ antenna gear. I used the MFJ Antenna Bridge 204B in developing the antenna, and the MFJ SWR Bridge 249 in trying to grade and classify it. Both served me well I think, considering the very good results (contacts) I have been able to make. It is *not* a full-size yagi or quad on any of those bands, but it *is* a classy set of dipoles that build up easily and work well.

One thing that may help you that came as part of the directions for the MFJ gear is an approximation formula that should work well for any type of accurate SWR bridge. You use the idea by first noting the design center frequency (desired). If you are using an SWR bridge *please* use very low power while doing these tests—for the rig's sake, and for the sake of the others on the bands as well. Once everything is up in the air (mine is right at 24' at both the apex and the ends—*not* terribly high), then take SWR readings over a spread of a band (starting with 80M). If you are unlucky enough to be off as to where you want the SWR to be best (design center frequency), then the following can save you a lot of time. Enter the formula and use from the MFJ book. 73

Credits:

Ideas for multiband dipoles with common feeds came from "Short 80 through 10 Meter Band Ham Antenna," by Richard A. Yommus W2DMK, *Popular Electronics* magazine, April, 1973.

Simple Novice and wire antenna ideas came from "Novice Antenna Specials," by William E. Hood W2FEZ, *73 Magazine,* date unknown.

Some ideas about cages, spacers, band-sharing common feedlines came from "The Extreme Basics of Antennas," by Robert M. May II WA4DBG, *73 Magazine,* date unknown.

Number 25 on your Feedback card

NEW PRODUCTS

Compiled by Charles Warrington WA1RZW

ARRL

The American Radio Relay League has announced publication of the 1995 *ARRL Handbook for Radio Amateurs*. Now in its 72nd edition, the *Handbook* is considered an authority on technical matters for amateurs and others interested in communications technology. More than 6 million copies have been sold since 1926.

The 1995 edition has been entirely rewritten and contains material superseding all previous editions. New chapters provide a snapshot of amateur radio in the '90s.

The *Handbook* is available at your favorite dealer or bookseller, including "Uncle Wayne's Bookshelf" on pages 86-87. Or contact *The Amateur Radio Relay League, Inc., 225 Main Street, Newington, CT 06111; (203) 666-1541.* Or circle Reader Service No. 202.

PLANNED PRODUCTS

Planned Products has introduced two new greases developed for applications requiring electrical conductivity, lubrication, and protection. Available in silver and carbon formulations, the new Circuit Works Conductive Greases protect assemblies from wear and from environmental hazards while providing excellent electrical and thermal conductivity.

When used at low to medium speeds, the 7100 Circuit Works Silver Conductive Grease, and 7200 Circuit Works Carbon Conductive Grease lubricate and protect assemblies while forming conductive pathways, contacts, connections, static drains and grounding. Based on advanced silicone lubricants these new greases are chemically inert, thermally stable and nonflammable. Assemblies are protected from moisture, oxidation, radiation, corrosion, and corrosive atmospheres with a single application.

For more information or to order contact *Planned Products, 303 Potrero Street, Suite 53, Santa Cruz, CA 95060-2760; (408) 459-8088, FAX (408) 459-0426.* Or circle Reader service No. 203.

MFJ

MFJ Enterprises has introduced the MFJ-452 Super CW Keyboard, including a two-line LCD display and RFI Supressed Keyboard. This product includes plenty of features and accessories you may not expect to see.

The MFJ-452 features eight 250-character nonvolatile message memories, a 150-character type-ahead buffer, an iambic keyer, and a powerful Morse Code Trainer. Simply turn this unit on and you're sending effortless CW—no computer to boot-up, no program to load. The Perpetual Memory means you can save messages and settings for 20-years without power or batteries.

The MFJ-452 includes a speaker, sidetone, volume control, and jack for external speaker or earphones. The MFJ-452 is priced at $129.95; the MFJ-452X is the exact same model without the keyboard, priced at $99.95. For more information or to order contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State,MS 39762; (601) 323-5869, FAX (601) 323-6551, (orders) (800) 647-1800.* Or circle Reader Service No. 206.

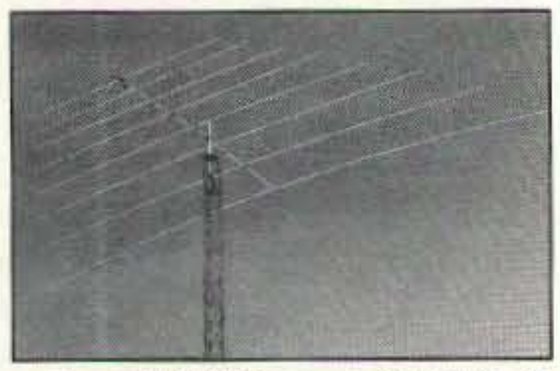
CAIG LABORATORIES

Caig has introduced an environmentally safe aerosol for its ProGold product. ProGold is a high performance contact cleaner, enhancer, and lubricant that needs no carrier solvents for dilution or cleaning surfaces. The spray container provides short bursts of 100% concentrate via a precision metered valve.

The unique properties of ProGold allow it to deoxidize, clean surface contamination, and penetrate plated surfaces to molecularly bond to base metals—no other product does this. It fills the gaps in the contact surfaces to increase the effective contact area and prevent current concentration at surface peaks.

The result is current is distributed more evenly across the contact surfaces. This increases conductivity and contact surface area and reduces arcing, RFI, wear, and abrasion (the major cause of intermittent signals, distortion, and signal loss). For more information contact *Caig Laboratories, Inc., 16744 West Bernardo Drive, San Diego, CA 92127; (619) 451-1799, (800) CAIG-123, FAX (619) 451-2799.* Or circle Reader Service No. 201.

CUSHCRAFT



The new Cushcraft ASL-2010 Skylog Log Periodic antenna is the answer for hams who would like to have a single antenna that covers 10 meters through 20 meters (actually 13.5 through 32 MHz). This design eliminates the need for two Yagis to cover the traditional bands and 12 and 17 meters.

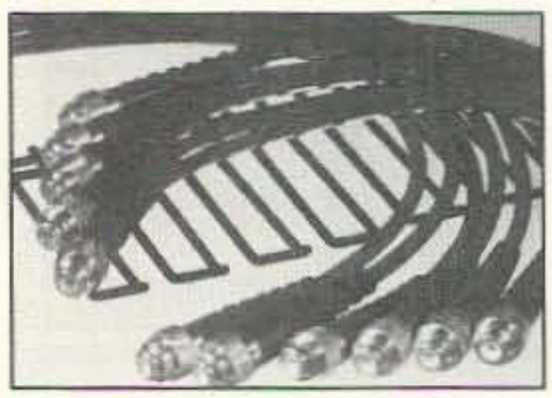
It uses single feed line (balun included) and thus there is no need to switch antennas when changing bands. This design does not use any traps of any type thus the wind load is reduced significantly (10.1 sq. ft.). The antenna is not power limited and will easily operate at full legal limit continuously.

The ASL-2010 boom is 18 feet (5.48 meters) long. The gain of the antenna is 6.4 dBd. Construction is of weatherproof aluminum and stainless steel. List price is $800. For more information contact *Ken Albertson, Cushcraft Corporation, P.O. Box 2680, Manchester, NH 03108; (603) 627-7877, FAX (603) 627-1764.* Or circle Reader Service No. 204.

RAYMOND SARRIO

Hams interested in generating community awareness will be excited by these new T-shirts from Ramond Sarrio Company. These eye-catching shirts feature a 4-color design that clearly communicates that amateur radio provides an essential public service when disaster strikes. There is also a circular 2-color logo on the left chest that states, "Amateur Radio—Dedicated to Public Safety." The sweatshirts have the 4-color "WHEN ALL ELSE FAILS" design on the front.

To help amateur radio clubs, a special fund raising program has been implemented: Clubs, without stocking any inventory, can earn up to $6 on each T-shirt and up to $8 on each sweatshirt they sell. ARCs can also have their club name or logo printed onto these shirts. All shirts come with a 30-day no questions asked guarantee. T-shirts are priced at $14.95, sweatshirts $26.95 plus S&H (CA residents add 7.75% sales tax). For more information or to order contact *Raymond Sarrio WB6SIV, 6147 Via Serena St., Cucamonga, CA 91701; (orders) (800) 413-1129, (info) (909) 987-1020.* Or circle Reader Service No. 205.



RF INDUSTRIES

With RF Industries' new Unicable Kit, you can now mix and match any combination of connectors or adapters to the ends of a 48" cable assembly. Covered in a soft PVC matte blue jacket with matching molded strain reliefs, these cable assemblies are flexible and easy to handle. This extra flexible RF-58A/U type 50 ohm cable with 95% double shielding (tinned copper braid over aluminum foil) is 48" long. Unidapt universal connectors at each end feature machined brass, silver plated bodies, gold plated contact, and Teflon dielectric insulators.

Frequency range is DC to 1 GHz; impedance is 50 ohms; insertion loss is less than .2 dB; and VSWR max is 1.2:1 from DC to 1.5 GHz. For more information visit your local dealer or contact *RF Industries, 7620 Miramar Rd., San Diego, CA 92126; (619) 549-6340, (800) 233-1728, FAX (619) 549-6345.* Or circle Reader Service No. 207.

Number 26 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

Well, three out of four weekends ought to be pretty good this month, while the only one expected to be POOR is the 21st and 22nd (third weekend). Weekdays ought to be FAIR to GOOD *except* the 11th through 13th. Really GOOD days ought to be the 4th, 5th and 6th, as well as the 29th, 30th and 31st. Of course, that's not a promise, but pretty close to it! Look at the daily forecast for your planning, and enjoy the holidays.

If the pundits are correct, 1995 could well be the year in which Cycle 22 bottoms out, and if so I expect the low conditions to extend for almost a year . . . sort of a low plateau of sunspot numbers. Naturally, I hope I'm wrong. Tune WWV at 18 minutes after any hour for up-dates on propagation.

10 and 12 Meters

Only occasional F2 openings to the tropics on GOOD days during daylight hours. Not much sporadic E or short skip propagation can be expected. Skip is where you find it, so keep looking and hoping. Sometimes results are spectacular on a supposedly "dead" band. Really good "gain" antennas can help a lot this month. A good local band.

15 and 17 Meters

Fairly good DX into the Southern Hemisphere during daylight hours from noon to sunset *local* time, and short skip from sunrise to sunset, but expect the band to close soon after—abruptly!

20 Meters

Daylight hours should be pretty good for DX this month in spite of depressed conditions in general, and you may even find the band open until midnight. Peaks ought to occur just after sunrise and late afternoon *locally*. If the band does stay open after dark, look for openings into South America and even Antarctica. Also, during the day, you will find considerable short skip. All of which means that 20 meters should be your PRIME DX BAND. (See 80 meters, too.)

30 and 40 Meters

Expect late afternoon and evening openings into Europe and Africa swinging south after sundown for a few hours, but the MUF falls below 7 MHz later in the evening. Short skip will occur during most days out to 1,000 miles or so, and to 2,000 miles at night until the band closes.

For you newer operators who have not lived through a complete sunspot cycle, there will be some great surprises in store. Listen and learn.

80 Meters

This will also be a very good DX band after dark, and since QRN is low, signals ought to be very readable . . . even weaker ones. Peak DX occurs around midnight local time and just before sunrise. Insomniacs will *love* 80 meters this month. Short skip at night will occur frequently out to 2,000 miles. Isn't it interesting how two of our "oldest" bands, 80 and 20, are the best in these times? The old-timers knew what they were doing when they "got" these bands for amateurs way back when.

160 Meters

You "top band" operators will love this band in December: DX openings to the east from your locations, peaking around midnight (Europe, etc.), and toward the south and west before sunrise. Nighttime short skip should also be good from dusk to dawn, getting longer later. On this band, use vertical antennas to transmit and horizontal antennas for receiving, preferably Beverage antennas if you have the room. Low noise and minor static will make you happy. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
AGENTINA	20	40	40	40	80	80				20	15	15
AUSTRALIA	20		20		40	40	20	20			15[3]	15[3]
CANAL ZONE	15	20	20	40	40		20	20	15	15	15*	15*
ENGLAND	20	40	80	40	40		20	20	20	20	20	20
HAWAII	20		20		40	40	80	20			15[3]	15[3]
INDIA	20/40					20[3]	40[3]	20[3]				15[3]
JAPAN	20						20	20				20
MEXICO	15	20	20	40	40		20	20	15	15	15*	15*
PHILIPPINES							20					
PUERTO RICO	15	20	20	40	40		20	20	15	15	15*	15*
SOUTH AFRICA			40[3]	40[3]				15	15	15	20	20
U.S.S.R.	40	80	80	40			20	20	20			40
WESTCOAST		80	80	40	40	40	20	20	20			

CENTRAL UNITED STATES TO:

ALASKA						80*	40*	20				
ARGENTINA	20		40	40	40						15	15
AUSTRALIA	15					40	20	20	20			15
CANAL ZONE	20	80	40	40	40	40	20	20	15	15	15	20
ENGLAND	40	40	40	80				20	15	20		40
HAWAII	15	20			40	40	40				15	15
INDIA	15[3]	20[3]	20[3]				40[3]	20[3]	20[3]			
JAPAN						80*	40*	20				
MEXICO	20	80	40	40	40	40	20	20	15	15	15	20
PHILIPPINES								20				
PUERTO RICO	20	80	40	40	40	40	20	20	15	15	15	20
SOUTH AFRICA	20	40*							15	15	20	20
U.S.S.R.	40		40	40				20	20			

WESTERN UNITED STATES TO:

ALASKA	15	20			40	40	40	40	40			20
ARGENTINA	15	20		40	40	40	40	40		15	15	15
AUSTRALIA	15	20	20				40	80*	40	15	15	15
CANAL ZONE	20	20		40	40	40			20	15	15	15
ENGLAND			80*	40					20	20		
HAWAII	15	15			20	20	20	20				15
INDIA		20										
JAPAN	15	20			40	40	40	40	40			20
MEXICO	20	20		40	40	40			20	15	15	15
PHILIPPINES	15	20					40	40		20		20
PUERTO RICO	20	20		40	40	40			20	15	15	15
SOUTH AFRICA	20	40[3]	40[3]							15	15	20
U.S.S.R.		40[3]	40[3]	40[3]	40[3]				20	20		
EAST COAST		80	80	40	40	40	20	20	20			

1=May be open only once or twice during month. *=Try next higher band. G=Good, F=Fair, P=Poor.

JANUARY 1995

SUN	MON	TUE	WED	THU	FRI	SAT
1 G	2 G-F	3 F-G	4 G	5 G	6 G	7 G-F
8 F-G	9 G-F	10 F-P	11 P	12 P	13 P	14 P-F
15 F	16 F-G	17 G	18 G-F	19 F-P	20 P	21 P
22 P	23 P-F	24 F-G	25 F-G	26 G-F	27 F	28 F-G
29 G	30 G	31 G				

Number 27 on your Feedback card

BARTER 'N' BUY

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

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

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

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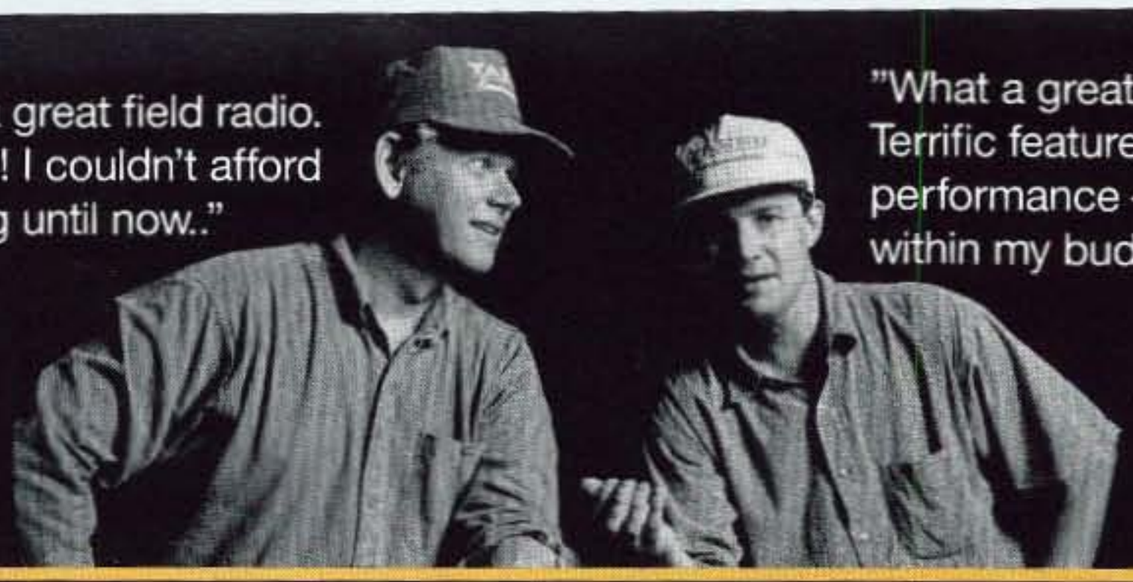

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