73 Amateur Radio Today

FEBRUARY 1992
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A WGE Publication
International Edition

What's a Copper Cactus?

Cubical Quad for 10m

Wideband Amp

Plus

73 Reviews

Radio Shack HT

ANLI HT Antenna

Vector Map Display

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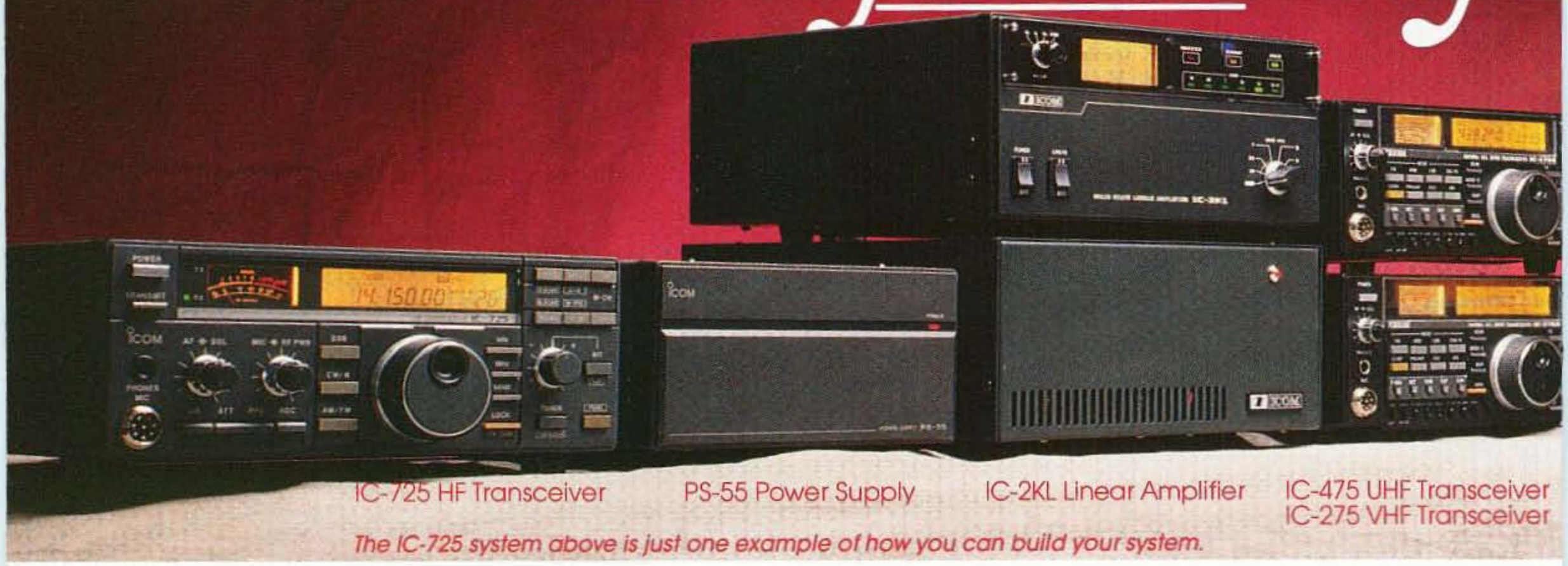
6 Reasons w
build your sys



IC-725 HF Transceiver PS-55 Power Supply IC-2KL Linear Amplifier IC-475 UHF Transceiver IC-275 VHF Transceiver

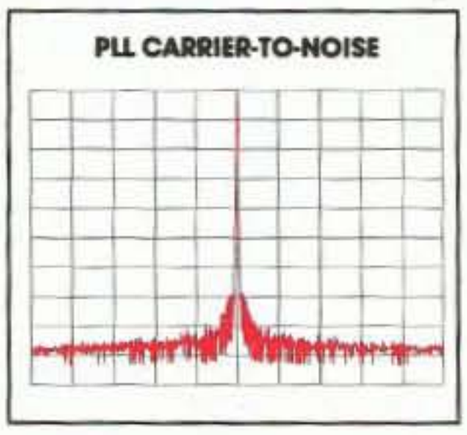
The IC-725 system above is just one example of how you can build your system.

"Don't just buy a radio. Build a system." Experienced ham operators have been giving this advice for a long time. As you build your station, you don't want "stand alone" rigs that cannot integrate with the rest of your equipment. You can avoid serious disappointments in the future by comparing compatibility, performance, reliability and service *before* you purchase each component of your system.

1 A HIGHER LEVEL OF PERFORMANCE

If you have ever made a weak signal QSO, had it fade out, then dialed the same frequency on an ICOM transceiver and found a strong, clear signal... you're already aware of ICOM's superior performance.

We have devoted three decades of research and design to ensure that our transceivers consistently meet or exceed your critical expectations. Our engineers have achieved a balance of dynamic range, selectivity and sensitivity thought unobtainable a few years ago. Their development of the ICOM DDS System, with an extremely low carrier-to-noise ratio, has resulted in loud and clear transmissions and the ultimate in HF receiver performance.



2 DESIGNED FOR COMPATIBILITY

It has been said many times, "Once you learn to operate one ICOM radio, every other ICOM is a snap to pick up." This is especially helpful as you upgrade or when you operate two or more transceivers simultaneously.

Even more important is the interchangeable, system design of ICOM equipment. This allows the integrated operation of your HF, VHF, UHF, antenna tuner, power amplifier, microphone and even your PC.

3 RELIABILITY YOU CAN COUNT ON

Ever wonder why you rarely see an ICOM radio at a swap meet? A remarkable majority of ICOM transceivers made in the last fifteen years are still making contacts in ham shacks around the world.

ICOM's outstanding reputation for reliability is a result of our integrity of construction. We use only the highest quality components and do not skimp on important details (i.e. heavy duty front panels and one-piece heat sinks).

When you compare a transceiver's value over several year's time, it is well worth buying the best.

4 CUSTOMER SERVICE THAT WILL KEEP YOU ON THE AIR

ICOM serves you regionally with four factory service centers. We provide a Customer Service Hotline for technical support and answers to your many

HF SYSTEMS

ny you should tem with Icom.

IC-970 UHF/VHF Transceiver IC-2KL Linear Amplifier IC-765 HF Transceiver

This IC-765 system is another classic combination of ICOM components.

questions. ICOM averages 7 to 10 days turnaround on radio servicing. And we still carry complete lines of parts for radios built years ago. Can other manufacturers compare to ICOM's service?

5 THE LEADING EDGE OF TECHNOLOGY

ICOM continues to be on the leading edge of technology and innovation. We pioneered digital control technology and made history by eliminating the need for manual adjustment in the transmitter final amplifier stage.

ICOM produced the FIRST all-transistorized HF amateur transceiver. We were also the FIRST to use fiber optics to create a truly modular multi-band amateur mobile radio.

6 THE MORE YOU LEARN THE MORE YOU WILL WANT AN ICOM

Ask experienced amateurs what they look for in a transceiver. Learn which features and performance characteristics are essential to quality operation and which are not. Notice which brands are winning all of the contests and DX competitions around the world. The more you learn, the more distinct advantages you will see in ICOM's quality, performance, compatibility and reliability.

CIRCLE 179 ON READER SERVICE CARD

At ICOM, our heritage is built on amateur radio. We are dedicated to its growth and progress. Our company is comprised of over 90% licensed amateurs and we collectively strive to make ICOM equipment the benchmark to which all others are compared. Simply, the best.

10% FACTORY REBATE!

Purchase any ICOM HF transceiver from a participating dealer by **February 28, 1992,** and receive a factory direct **10% Rebate** off any HF accessory.

For more information, call:
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All stated specifications are subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 6R1291

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Number 1 on your Feedback card

LETTERS

From the Hamshack

Pablo Estrada KD4DGT, Prodigy E-mail Hello! I have been reading *73 Magazine* for about one year now. I really enjoy your magazine and editorial. At age 12 I passed the Novice test and received my license. Unfortunately, I haven't been able to get my rig yet. However, I was lucky to win a computer at a hamfest. I am now trying to sell off my old computer to buy the rig (I already have some money saved up). I live close to a major amateur radio dealer, EEB, which you may have heard of. I really enjoy all the construction articles featured in *73*, and the numerous columns packed in it. I also enjoy the occasional stories on a ham's experiences.

Congratulations! When you get on 20m, let's set up a schedule and talk. Also, you might send a picture in. Wayne

G. Eric Ferguson KA6USJ, Concord CA I'm responding to a letter in the November *73 Magazine*. I am pleased to say that the Commodore 64 is anything but an orphan. Hardware, software, repair and support are easily available for this fine machine, and I would share the following with you:

Commodore Hayward User Group (CHUG): Box 404, Fremont CA 94537. The current president is Dale Gittings, and I'm certain he will help you find support for the C-64. Home-Spun Software, Box 1064-BB, Estero FL 33928 has a number of C-64 ham radio programs for reasonable prices. *[Editorial note: The writer includes a directory printout of two disks of C-64 software he has. He says he will provide a double-sided disk for $2.00 postpaid, and answer any questions about applications that he is able to. Be sure to send an SASE for other information. The address is 2402 Carter Ave., Cody WY 82414.]*

Ted Myren VE3OTQ I'm 21 years old and studying to become a police officer. Up until about two years ago, I was what you would call a punk rocker. I've always had an interest in electronics, but the code usually scared me away from any radio activity. Finally, in 1990 the DOC passed the no-code "basic" license. This let me on the air, any mode, above 30 MHz. I passed my test with no help from anyone except books. Ten minutes after I passed, the inspector told me of a ham course that was to start the following Tuesday. Oh, well. I took the course anyway. After all, a little extra knowledge never hurts. That was last April. Now, after dozens of QSOs, I'm ready to move up to the code requirement. Like a friend of mine said, "The basic license is a license to learn."

I like your editorials, not only because they're true, but because they piss off so many people. I love it! People should show courtesy as well as be more active, and you nag at them for it.... I know how you dislike people giving only a weather and signal report. One thing I learned in college is that everybody is an egomaniac to some degree. If all else fails, ask questions about the other person. I have found most hams will talk about themselves all night if you ask the right questions.

Even though I'm fairly new to the game, I'd like to be active with elementary schools. Sault Ste. Marie has some of the friendliest, people who'll do a lot for a cause. Maybe you could publish an article that would aid hams teaching school kids. What do kids like to see and hear—ATV, DX, autopatch phone calls? My ultimate goal would be to launch an ATV balloon and hook it up so the kids could watch it in the classroom.

Another thing for the young and hopelessly wild: new radio design. Talk to your friends at ICOM, Kenwood, etc., and get some camouflage handhelds, or hot pink rubber duckies. Maybe follow the Sony sports line with yellow waterproof portables. Gray and black are nice, but promote brain death. I want a zebra-striped handheld with a ducky that looks like a snake standing out straight! Psychedelic gear I'm afraid would kill most purists. And we'll never see a mobile whip on a surfboard.

Ted, we publish a monthly column with this focus. It's called "Hams with Class."—Ed.

Bill Ewald Just got the latest issue, and the editorial again takes up more space than any other article. Seems to me that my subscription goes to support your soapbox diatribes more than good writing about the hobby. My subscription will not be renewed, if that makes any difference. Your attacks on the ARRL are not credible. Your verbal meanderings are meaningless. Your position can be distilled down to one theme: The world does not conform to Wayne's view. Well, from what I've read in other BBSs and heard on the air, folks have stopped reading "Never Say Die" even for its entertainment value. Do your readers a favor, Wayne, and give up some of that space for some good writing.

Thanks for the minority report. As soon as the reader evaluations of my editorials go down, I'll find better things to do. Meanwhile, the positive letters are outnumbering the negative at around 20:1. It's almost enough to make a person think.

My meanderings are aimed at double-digit IQs and above, so apparently you have a problem. The world has done a fair job of conforming to my views...in cellular radio, microcomputers, and CDs so far. I think I'll keep going.

Be glad you're not in New Hampshire where I've been named by the governor to the Economic Development Commission. I'm going to make some major changes in the state. Wayne

Larry Chrisman K9OXX After many years, I finally decided to take the easy way out, no more hunting parking places and making empty trips to the newsstand to find the latest issue of *73 Magazine*. Please start my subscription.

Wayne is right, guys and gals. We're going to lose our frequencies. If you don't believe me, just look around at the next hamfest you attend. How many youngsters do you see? At the last two I attended, I would guess that approximately 20% were retired, and less than 10% were youngsters at high school age or younger. Since it appears that the majority of us are oldtimers, it looks to me like we are going to die off faster than we are going to be replaced. And as we get fewer and fewer, by what means can we justify keeping our frequencies? About 20 years ago, Wayne stated we would lose 220, and we did. Which will be the next band we lose? Has anyone noticed that the price of cellular phones isn't much more than a 144 or 432 handheld? I would like to see an article on conversion of a unit to our 902 MHz band, or how can we set one of these units up as a cellular repeater system?

I have been reading your editorials almost from the first issue. I haven't read every one, but have read a great many of them. Haven't agreed with all of them either. But keep them coming.

Charles Edward Painter, Oklahoma City OK I have fond memories of my SWLing as a young teen, and recall the many nights I spent listening to hams on my Hallicrafters SX-101A. I felt in those days, approximately 20 years ago, that amateur radio operators epitomized the definition of hobbyist. I recall how courteous and professional the amateurs seemed to me, and I was impressed with their pride in the amateur radio hobby.

In January 1991, I re-entered the SWLing hobby (after an 18-year absence) and thought, at the time, that possibly I would go forward and obtain my Novice ticket. However, the afternoon of November 24, 1991 has diminished my desire, albeit shortly, to obtain my ticket.

As I listened to 14.300 MHz and the Intercontinental Net attempting to assist an individual at sea who was low on fuel, I became totally appalled at the behavior of a few (emphasize few) radio operators. I have *never* heard such language, rudeness, or lack of character by amateur radio operators. The profanity, jamming, and general disrespect for priority communications left me wondering what has happened to the hobbyists whom I used to hold in high regard. Needless to say, the pileup was so bad that the U.S. Navy had to move communications with the sea vessel to another frequency! In addition, this mayhem continued all afternoon!

To all of the amateur radio operators who practice their hobby in a professional, responsible, and dignified manner, I commend you. To all of the amateur radio operators who don't have the courage to use their callsigns when attempting to interfere with others' communications, I deplore you.

All this makes me wonder if everyone should worry a little more about the possible loss of frequency allocations.

Hank KM4PQ, Raleigh NC Ham radio has degenerated to the lowest level I have seen in my almost 40 years as a ham. X-rated radio, jamming, pejorative racial slurs, gay bashing, profanity, and graphical descriptions of sexual acts have become too commonplace.

Our frequencies are loaned to our use as a privilege pursuant to the purpose of ham radio as delineated in FCC rules and regulations, to provide for emergency communications and experimentation.

We cannot allow these miscreants to threaten our privileges. *We need to identify them and get them out of amateur radio.*

Become involved. We must coalesce together to clean up amateur radio. This is not a passive activity. We are all licensed participants. Oppose this deplorable language and conduct in our ham bands. *Ham radio is and must be self-policing.* Only we can really prevent the decline and demise of amateur radio.

Fight back: 1. Read the FCC rules and regulations as it applies to private radio. 2. Document all violations. 3. Send your documentation to the FCC. 4. Send a copy of your documentation to the radio club in the area where the violation has occurred, if known. Ask them to investigate. 5. Send a copy of your documentation to the ARRL and write to journals to express your outrage. Like community watch, we must all look out for the neighborhood or it will become a slum. 6. Once they're identified, it is imperative that we make it clear that these misfits are persona non grata in amateur radio.

If we don't protect our privileges, there won't be any privileges to protect.

See the W5YI Report, Vol. 13, Issue 21, *regarding the FCC's response to David G. Boyd K9MX. Boyd presented two years' worth of evidence "clearly obscene and properly collected" on an obscenity case, and the FCC decided not to pursue the matter because "most of the offenses occurred after 'safe harbor hours.'" Besides trying to determine whether the FCC any longer grants Section 97.113(d), which prohibits obscenity, any validity or not, he is trying to find out which world time zone governs the cutoff ("safe harbor") time. Linda KA1UKM* 73

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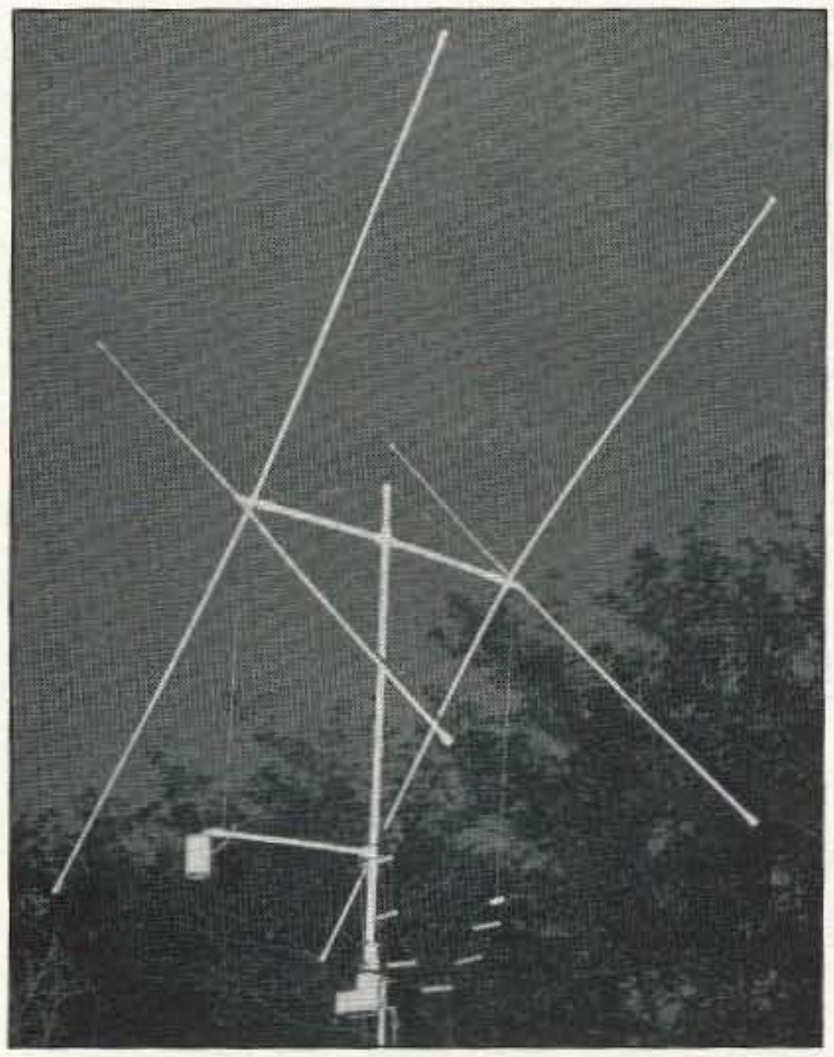

Build this PVC special for 10m . . . see page 38.

Cover: Jim HK3AVR demonstrates amateur radio for students in Murillo, Columbia.

Cover photo by Milton C. Toby KC4VLN.

DEPARTMENTS

FEEDBACK . . . FEEDBACK!

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

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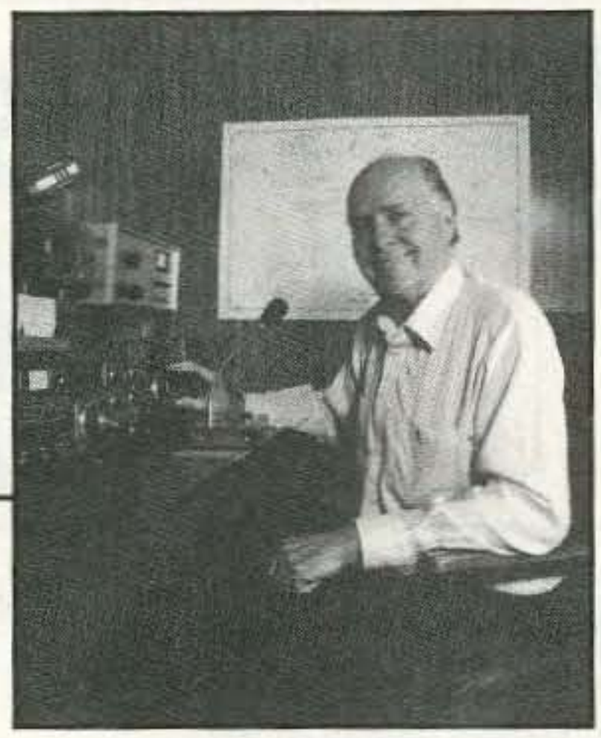
Audit Bureau of Circulations (ABC) membership applied for.

Contract: By reading this fine print, you have become legally obligated to introduce a youngster to amateur radio. Don't just park 'em in a chair to listen to you tell somebody your name, QTH and rig. Show 'em packet. Send their photo over SSTV. Let 'em talk through a satellite. Get 'em excited!

Number 2 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1



Digital Broadcasting?

To give you an idea of how desperately far behind the state of the radio art we are, we've still got hoary old hams who are pushing for AM at a time when the world is getting ready to replace FM broadcasting stations with digital audio broadcasting (DAB).

James ZS1XN sent me a clipping about the recent BBC's tests of DAB in the Birmingham area. Most of the DAB technology has been developed by German firms such as Bosch, Telefunken and Grundig. Both the Germans and the Brits want to start DAB as soon as possible.

In the Birmingham test they compared a 1,000 watt FM signal with an 11 watt DAB signal on 215 MHz. The FM signal dropped out at about six miles from town, while the DAB signal was strong out to 15 miles . . . six times the coverage with about 1/100th the power!

They drove a bus around the city to see how the two modes compared. The FM signal suffered from flutter, pops, drop-outs and interference from computers. The DAB remained absolutely clean.

One more benefit . . . they can get about six times as many DAB channels in the same bandwidth as FM. How long do you think it's going to be before all our FM programs are moved to DAB?

And of course the DAB sound is digital, with it's incredible dynamic range and better frequency response.

So when are we going to start seeing some digital audio repeaters? With time division we could have six or more high fidelity channels on a repeater . . . or perhaps up to 20 voice quality channels. It's almost like comparing spark with CW . . . and we're holding strong for spark, just as we did in the 1920s when it took a law to force hams to stop using spark.

We had the same problem in the late 1940s getting modulated oscillators off our 2m band. Nothing less than a law could force W2KU to upgrade his kilowatt, which wiped out most of the lower megahertz of the band around Brooklyn. Good old Oscar.

If some of you will start trying digital audio and send me some articles on your work to publish, perhaps we can start bringing amateur radio out of the dark ages. Heck, I started publishing *Digital Audio* magazine eight years ago, so the technology isn't exactly new.

As David KB7HO put it in a letter, "When we first became a radio service, we had a clear-cut reason to occupy the frequency spectrum we do. We were to be a pool of trained radio operator/technicians in case of national need. If you were a ham and you were drafted or volunteered, you could go right into the radio or technical end of the service. Having a ham license gave you a very good chance to get a technical job with one of the big companies. Not any more. They don't hire hams any more. The quality that used to be there is now gone. What are we to tell the world governments? What do we have to offer in exchange for our use of the spectrum? Right now, very little. The land mobile and other radio services covet our bands. They're listening. I know personally of at least eight listening posts recording our ham bands right now to assess the use and abuse of our frequencies. These tapes have already shown up at several spectrum management councils and forums."

Thanks, David. You see, our ability to put up with the KV4FZ group on 14.313 and K1MAN on 14.275 are a national problem for us. We're kind of like battered wives who put up with being knocked around rather than fight back.

If we don't clean up our bands and get started experimenting and pioneering again, I could be publishing a ham radio memorial issue of *73* within my lifetime. It's almost something to think of as you meekly re-elect your ARRL directors every two years.

Last Chance For Fun

In my November editorial I asked if you were ready to tackle something new . . . in the music business. Several hundred readers wrote for details and almost all got very excited over what we're doing.

If you're retired or looking for something new to do . . . where you may be able to help people get more enjoyment from music . . . and where we can raise hell with the international megacorporations which have almost total control of the music business . . . read on. If you're looking for a career change . . . for something which will be real fun and can make some money too . . . check this out.

I'm giving my *73* readers the first crack at this because many of you've known me for years and I know you. I tried to get you into the computer field when it was just starting . . . and did succeed in getting quite a few who've done very well. Well, the music business isn't going to grow as fast or as big as the computer industry did, but it's going to be growing and there are some opportunities to grab.

With digital audio broadcasting (DAB) coming, there's going to be a desperate rush for programming material . . . and guess who's going to have it?

The radio industry is in a shambles right now. The recession has hit it like a ton of bricks. They're looking desperately for new formats. The old Top-40 crapola doesn't cut the mustard any more. Talk radio is beginning to be talked out. So what's next?

Ole Doc Green's got his crystal ball tuned into the next decade already. As I write this, I'm on my way back to New Hampshire from the Fresno (CA) Ragtime Festival . . . and it was a corker. I guarantee you that not one of the about 300 people who were there will ever forget the music they heard this last weekend . . . and they'll be telling friends about it for years to come.

No, I'm not trying to sell the world just on ragtime music. But I do think it's the time to start getting the whole world to listen to what our American musical heritage has to offer . . . in ragtime, bluegrass, Dixieland, theater organ, circus music, carousel band organs, Cajun and so on.

So I'm setting up a whole new sales rep organization to help distribute the major music magazines via book, musical instrument, record and hi-fi stores . . . plus as many department and discount stores as we can organize. We'll be selling CDs, cassettes, and samplers. We'll be opening new areas for music sales via restaurants, libraries, radio stations, dance studios, hotels, etc. We're going to help 250 million Americans become music conscious . . . and collectors. Then we'll start working on Europe and Asia.

After the festival, Sherry and I drove my two ragtime proteges up to see Yosemite. I flew Scott Kirby in from New Orleans for the festival and he just blew them away. He'll be up to my Golden Studios in a few weeks to record more Scott Joplin rags . . . plus some of his own . . . and superb rags by other composers.

Also with us was Masanobu Ikemiya. I think I've written about him. He's not only a classical concert pianist, but also loves ragtime music. I've got him doing Louis Gottschalk's music now and he, too, just blew away the festival people. You haven't heard Gottschalk? Oh Lordy! He was the first American composer that Europeans took really seriously. In the right hands his stuff is awesome. Much of it obviously influenced ragtime, which came about 50 years later.

While we were cruising Yosemite, I talked via the 147.03 repeater with several nearby hams and got both Masanobu and Scott all excited about hamming. All I used was a little magmount antenna I picked up at Dayton and my incredibly tiny ICOM 2SAT. It's a real gem and goes with me everywhere in the world.

Ho Hum, Another Coup

A few years ago Bruce Leek, an engineer for Telarc Records, introduced me to Captain Carl Chevallard, the conductor of the USAF Golden Gate Band. We've kept in touch, so when my trip to Fresno came up I detoured via Travis AFB, near San Francisco. It was worth it.

The band, with the help of Bruce, has made several superb CDs. Alas, being a military band, the CDs can't be sold. I'm putting on all the pressure I can in Washington to get this situation changed. It's a crime for the general public not to be able to buy and enjoy the marvelous music this and other military concert bands are producing. Fantastic stuff.

With Scott and Masanobu in tow, Sherry and I visited the band at Travis. They pulled out all the stops to make our visit memorable. They took us all through a C-5B cargo plane. This is the military version of the 747 and it's enormous. They have room to drive four large buses into one of those things.

To give you an idea, during the Desert Storm exercise they moved the equivalent of the population of Washington DC from Travis to Saudi Arabia.

The cockpit looked like a scene from a science thriller. Wall-to-wall controls, switches, dials, and instruments. Having had my own plane a while back, I looked for familiar instruments . . . and found a few.

That evening they'd freed up some simulator time for me. I'd have a chance to do some takeoffs and landings of a C-5B! Is it scary to sit down at a huge console like that, grab the wheel and start taxiing down the runway? Well, how would you feel?

The simulator was as real as it gets. It was exact in every way. You felt every bump on the runway. We felt every turn and dip as we flew. The visual was totally real . . . at night, in daytime, in bright sunlight or dense fog. It's the ultimate computer game.

Continued on page 74

KENWOOD

Mobile Companion!

TM-241A
TM-441A/TM-541A

Compact FM Mobile transceivers

Here are your new mobile companions — at your service whenever you're on the road! Their compact size makes installation a snap, and the remote control options allow you to customize your installation for that "professional" look!

- **Wide band receiver coverage.** The TM-241A receives from 118–173.995 MHz. Transmit range is 144–148 MHz. (Modifiable for MARS and CAP operation, permits required.)
- **TM-441A** covers 438–449.995 MHz, and the **TM-531A** covers 1240–1299.995 MHz.
- **CTCSS encode built-in, selectable from the front panel.**
- **Selectable frequency steps** for quick and easy QSY.
- **TM-241A provides 50 W. TM-441A 35 W, and TM-541A 10 W.** Three power positions, 5, 10, and full. The TM-541A has two power positions, 1 and 10 watts.
- **20 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2m is automatically selected.** There are **four channels** for "odd split" operation.
- **Tone Alert System with Elapsed Time indicator.**
- **Auto-power off function, and time-out timer.**

RC-20 Remote Control Unit
As supplied, one RC-20 will control one transceiver. **Most often-used front panel functions** are controllable from the RC-20. The RC-20 and IF-20 combine to allow control of up to four radios.

- **Selective calling and pager option.** The DTU-2 option enables the Dual Tone Squelch System (DTSS), allowing selective calling and paging using standard DTMF tones.
- **Digital recording system option.** Used in conjunction with the tone alert system, the DRU-1 allows message storage of up to 32 seconds.
- **Multiple scanning functions.** Band and memory scan, with selectable scan stops and memory channel lock-out.
- **Large LCD display with four-step dimmer control.**
- **Automatic Lock Tuning (ALT) for the TM-541A.** Compensates for drift.

- **Supplied accessories.** Mounting bracket, DC cable, fuses, MC-44DM multi-function DTMF mic.

Optional accessories

• **DRU-1** Digital Recording Unit • **DTU-2** DTSS unit • **IF-20** Interface unit, used with the RC-20, allows more than two transceivers to be remotely controlled • **MA-700** 2m/70cm dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mounting bracket • **MC-44** Multi-function hand microphone • **MC-55** (8-pin) Mobile mic. with time-out timer • **MC-60A, MC-80, MC-85** Base station mics. • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **PG-4G** Extra control cable • **PG-4H** Interface connecting cable • **PG-4J** Extension cable kit • **PS-50/PS-430** DC power supplies • **RC-10** Handset remote controller • **RC-20** Remote control head • **SP-41** Compact mobile speaker • **SP-50B** Mobile speaker • **TSU-6** Programmable CTCSS decoder

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- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
- **T-Alert for quiet monitoring.** Tone Alert beeps when squelch is opened.
- **Auto battery saver, auto power off function, and economy power mode extends battery life.**
- **DTMF memory.** The DTMF memory function can be used as an auto-dialer. All characters from the 16-key pad can be stored, allowing repeater control codes to be stored!
- **41 memories.** All channels store receive and transmit separately for "odd split."
- **DC direct in operation.** Allows external DC to be used (7.2 – 16 volts). When external power is used, the batteries are being charged. (PB-13 only.)

- **Automatic offset selection (TH-27A).**
- **Direct keyboard frequency entry.** The rotary dial can also be used to select memory, frequency, frequency step, CTCSS, and scan direction.
- **CTCSS encode/decode built-in.**
- **Supplied accessories:** Rubber flex antenna, battery pack, wall charger, belt hook, wrist strap, dust caps.

Optional accessories:

- **BC-14:** Wall charger for PB-13, 14
- **BC-15:** Rapid charger for PB-13, 14
- **BH-6:** Swivel mount • **BT-8:** Six cell AA Alkaline battery case • **HMC-2:** Headset with VOX and PTT • **PB-13:** 7.2 V, 700 mAh NiCd pack • **PB-14:** 12 V, 300 mAh NiCd pack • **PG-3F:** DC cable with filter and cigarette lighter plug • **PG-2W:** DC cable • **SC-30:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic
- **SMC-33:** Compact speaker mic with controls
- **WR-2:** Water resistant bag.

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Promoting Amateur Radio in Africa

Last December, a new weekly amateur radio news program went on the air to promote amateur radio in developing countries. Part of the International Amateur Radio Union Region 1 plan, "News Focus Africa," is transmitted from Johannesburg, South Africa, under the auspices of the PADC (Promotion of Amateur Radio in Developing Countries) Working Group. The station ID is ZS6NFA.

According to Hans Welens ON6WQ, Chairman of the PADC Working Group, "The program includes up-to-date news, technical discussions, and amateur radio related educational material." He added that the introduction of the scheme will greatly extend the work that is already being done in Lesotho, Swaziland, Mozambique, and other parts of Africa. In these three countries, the PADC Working Group is setting up HF club stations to demonstrate and teach amateur radio. This program is linked to the establishment of active educational groups to technically qualify new amateurs. The Working Group program has already made important contributions, of which the reestablishment of amateur radio in Mozambique is an excellent example.

"News Focus Africa" will be produced and presented by Hans van de Groenendaal ZS6AKV and Gerald Klatzko ZS6BTD with material supplied from all over the world, transmitted on Sundays at 0715 UTC on 14.282 and 21.282 MHz SSB, and on AM on 3660 and 7059 kHz. The program is repeated Monday at 1700 UTC on the same frequencies. *[Ed. Note: The reception was excellent into New Hampshire on 15m during their first 1700 UTC program. WB8ELK.]* Amateur radio can play a positive role in creating an interest in electronics, and can often strongly motivate young people to consider a career in this field. Amateur radio can also make valuable contributions during natural disasters. When normal communications fail or become overloaded, amateur radio can provide an important backup system.

The first programs are 15 minutes long, but will become longer if the response is good. Says van de Groenendaal, "We welcome contributions in text or audio form. Audio cassettes should be mailed to NFA, P.O. Box 807, Houghton 2041, South Africa. Text may be sent by mail or via packet radio to ZS6NFA@ZU8NRC or ON6WQ @ ON7RC." More details about "News Focus Africa" can be obtained from the PADC Working Group, %South African Radio League, P.O. Box 807, Houghton, 2041, South Africa. Tel. (011) 484–2830. CompuServe: 70262,3652; INTERNET: AMSAT@FRD.AC.ZA; T-Mail: HANSV; Sprint TELEMAIL: HANSV. TNX *Westlink Report, Nov. 14.*

RM-7849

The petition of Michael R. Reynolds W0KIE of Tulsa, Oklahoma, seeking secondary status for certain communications over amateur frequencies, was accepted by the FCC for comment last November. RM-7849 requests that the Amateur Radio Service rules be amended to permit incidental music in communications originated by the National Aeronautics and Space Asministration, and to expand the permissible NASA communications. Comments on RM-7849 were closed on November 28.

Reynolds also asked that a previous petition for reconsideration, filed April 23, 1991, be withdrawn. That petition requested reconsideration of the denial, on April 5, of his petition to retransmit NASA public communications and the Voice of America. The FCC granted Reynold's request. TNX *W5YI Report, Vol. 13, Issue #23.*

Two-Ways to Moscow

Motorola's Radius line of two-way radio products are to be distributed in the Soviet Commonwealth (?) this year by Radio Communications International, which has offices in New York and Moscow. These radios will be manufactured in Mt. Pleasant, Iowa, and Basingstoke, England.

Radio Communications International has signed up seven dealers in the Soviet Commonwealth (?) and plans to establish more dealerships by the middle of next year. Dealers will be assigned regional territories. About 98 percent of the Radius product line is geared to the commercial market, and likely prospects in the Commonwealth (?) include oil companies, construction firms, geologists, livery and delivery fleets, and security services.

Sale of the radios will be only in hard currency for starters, but the market may open up if the ruble becomes convertible to other countries' monetary units. TNX Chuck Gysi-N2DUP via *The Pulse,* newsletter of the Quad City Amateur Television Club.

Ham of the Year

Attention! March 15 is the deadline for nominating a young ham to receive the Westlink Report Young Ham of the Year Award. The award, once again to be underwritten by Yaesu, is given annually to a radio amateur 18 years of age or younger who best epitomizes the accomplishments of young people in amateur radio as related to community service on a local, regional, or national level; service to amateur radio itself on a local, regional, or national level; promotion of high ethical and moral values through amateur radio; education through or with amateur radio; or any combination of the foregoing.

To qualify, a candidate must hold a valid FCC Novice class or higher amateur license, be a resident of the U.S., and attend an accredited learning institution. A nominating petition must be filled out detailing accomplishments of the nominee and be received by the above date. Send an SASE to request a nominating petition to 1992 Young Ham of the Year, *Westlink Report,* 28197 Robin Ave., Saugus CA 91350.

The winner receives a plaque from the *Westlink Report,* an expense-paid trip to the 1992 Dayton Hamvention to receive the plaque, and a surprise from Yaesu, as well as items from several industry leaders for the winner and the winner's school or club. TNX *Westlink Report, No. 614.*

DARA Scholarships

The Dayton Amateur Radio Association is now accepting applications for its annual $1,500 scholarships. Licensed amateurs graduating from high school in 1991 are eligible. For further information and application forms, write DARA Scholarships, 317 Ernst Ave., Dayton OH 45405. TNX *W5YI Report, Vol. 13, Issue #23.*

Earthwinds Update

The Earthwinds around-the-world manned balloon flight is currently scheduled for anytime after January 15. Thanks to the efforts of Bob Rau N8IYD, Jud Nichols and Bill Brown WB8ELK, a voice telemetry system has been developed to relay the balloon's position via the gondola's GPS location system (High Technology Flight MCM4 microcontroller and voice ID [see the Nov. issue of *73,* p. 9]). During the mission, listen for the Earthwinds signal at 15, 30, 45 and 55 minutes past each hour on 28.303 MHz (USB). Each transmission will be in the following format: "KB7JGM Earthwinds, XX XX.XX North, YY YY.YY West (or East) ZZZ" where XX XX.XX is the latitude in degrees, minutes and hundredths of minutes; YY YY.YY is the longitude in degrees, minutes and hundredths of minutes, and ZZZ is the ground speed in knots.

For recent updates on the Earthwinds status as well as other amateur radio balloon experiments, check into the 73 BBS at (603) 525–4438. Select the "Message" section and go to 'Area 13' (the Balloon SIG).

TNX . . .

. . . to all our contributors! You can reach us by phone at (603) 525–4201, or by mail at *73 Magazine,* Forest Rd., Hancock NH 03449. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 525–4438 (300–2400 bps), 8 data bits, no parity, one stop bit. FAX: (603) 525-4423. 73

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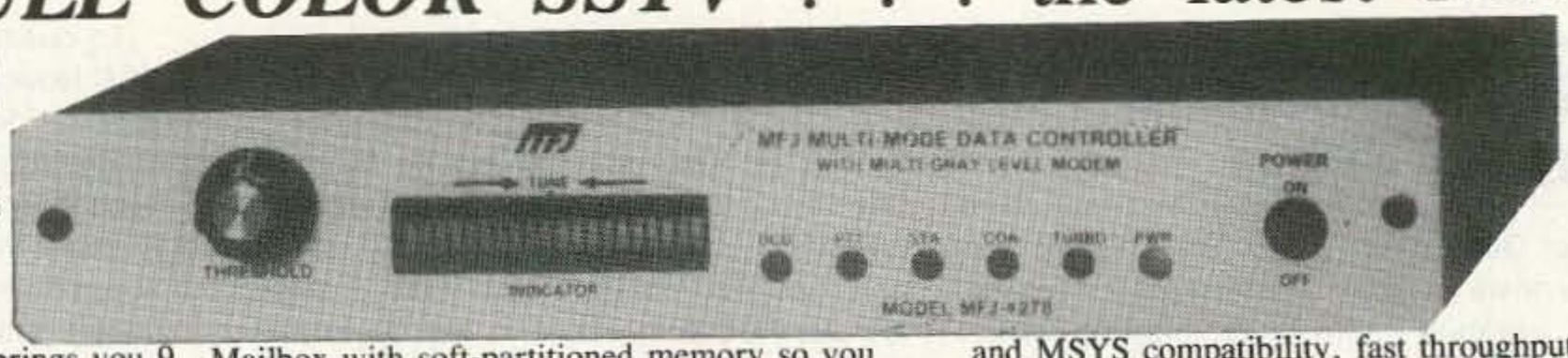

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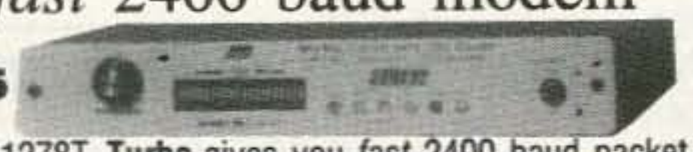

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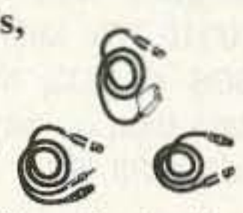
MFJ-5086, **Kenwood and Alinco 8 pin rigs**



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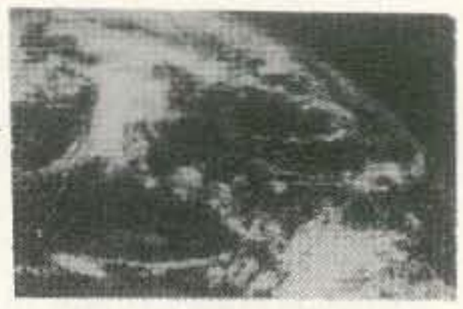

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The Copper Cactus J-Pole

For 2m and 70cm.

by John Post KE7AX

Remember those Novice days when you ran your 40 meter dipole on 15 meters? Have you had your eye on one of the fancy new dual-band radios? Does the idea of putting up two separate antennas and running two feedlines pour cold water on your enthusiasm? Well, if you enjoy home-brewing, this may be your cup of tea!

This probably makes you think of using one antenna, cut for a particular frequency, on a multiple of that frequency. Fifteen meter frequencies consist of roughly the third multiple of frequencies in the 40 meter band, just as amateur frequencies in the 70cm band (440 MHz) are roughly the third multiple of frequencies on the 2 meter band, our most popular amateur band.

Since I was making a J-pole antenna for the 2 meter band, I decided to try the antenna on 440. I was pleasantly surprised to find that it worked reasonably well. However, I was concerned because the SWR curves didn't bottom out. After making several changes, I plotted new SWR curves, and decided on the dimensions shown in this article. You can change the dimensions slightly, but be careful! Changing the dimensions will change both bands.

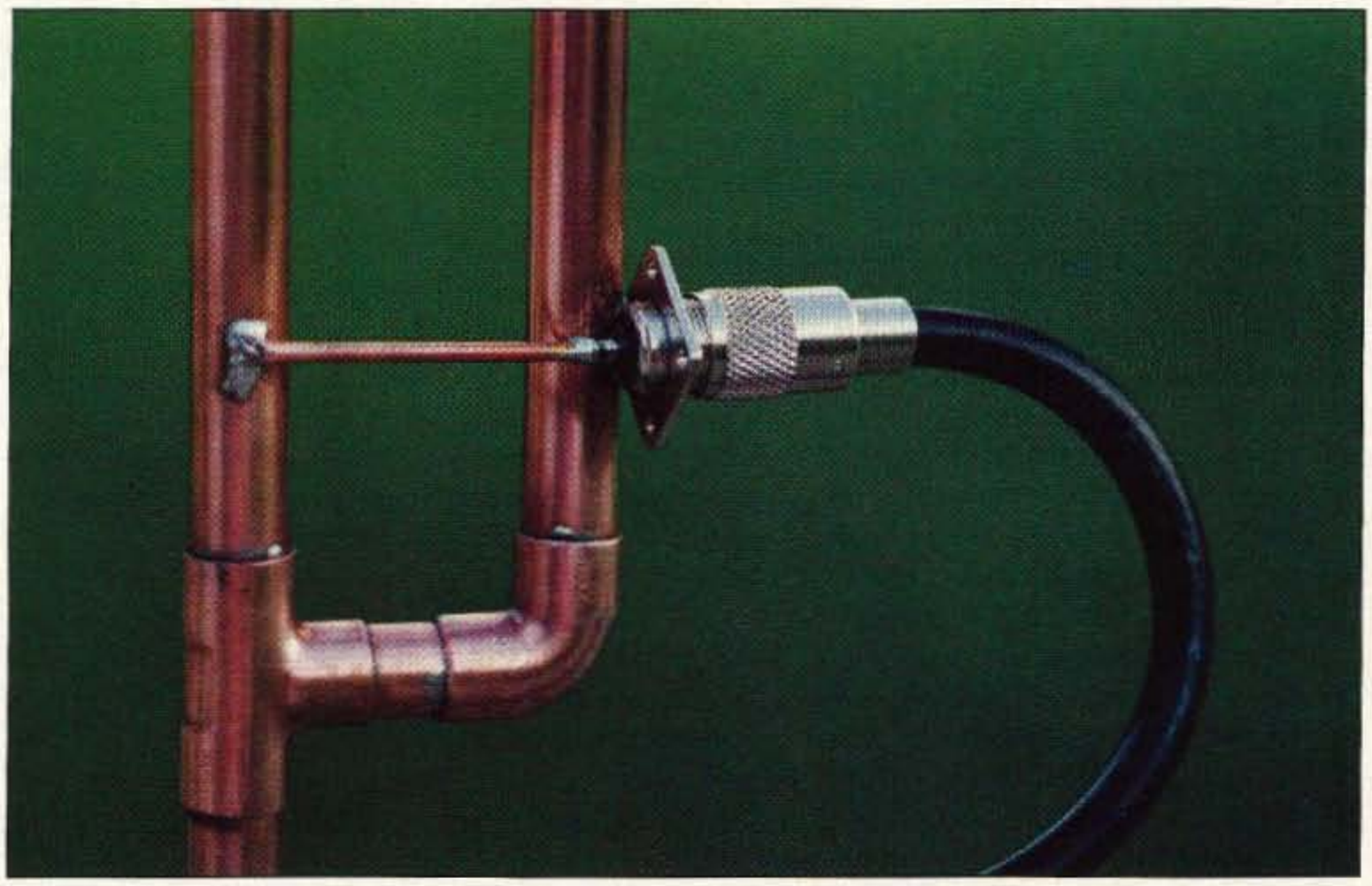

Photo A. Details of the feedpoint. Rivet one corner of the SO-239 connector to the short section of the Copper Cactus. Run a #12 wire from the center pin of the connector and solder it to the long section of the antenna. Make sure the center conductor doesn't touch the short section.

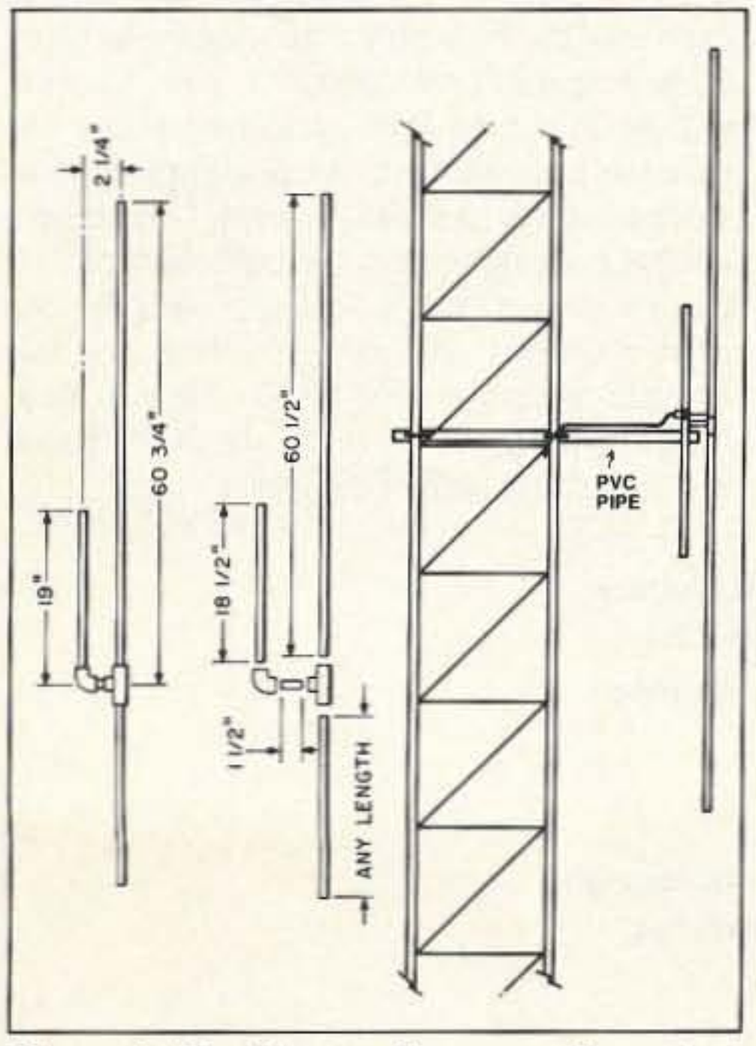

Figure 1. The Copper Cactus, and a typical Double Cactus installation.

Before you construct this antenna, I want to emphasize that I designed it primarily for use on 2 meters, and it will radiate most efficiently on that band. But you can get on the 440 band quickly and enjoy your dual-bander right away. It does LISTEN very well on 440. It is employed locally as a single antenna for a crossband repeater system. In this system, it listens on 440 and transmits on 2 meters.

One thing is certain: It's hard to beat the cost and fun you will have building the Copper Cactus!

Construction

1. Cut a 10-foot piece of 1/2" copper water pipe into the following sizes: 60-1/2", 18-3/4", and 1-1/2". The mounting tube may be any length. (You will have a section about 3 1/2 feet long to cut the mounting piece from.) See Figures 1 and 2. Special thanks go to Gary Rogers WR7L for assistance with the technical drawing.

2. Clean all the pieces where they will be inserted into the T and elbow fittings. Assemble the antenna and check your dimensions.

3. Disassemble the sections, flux the ends

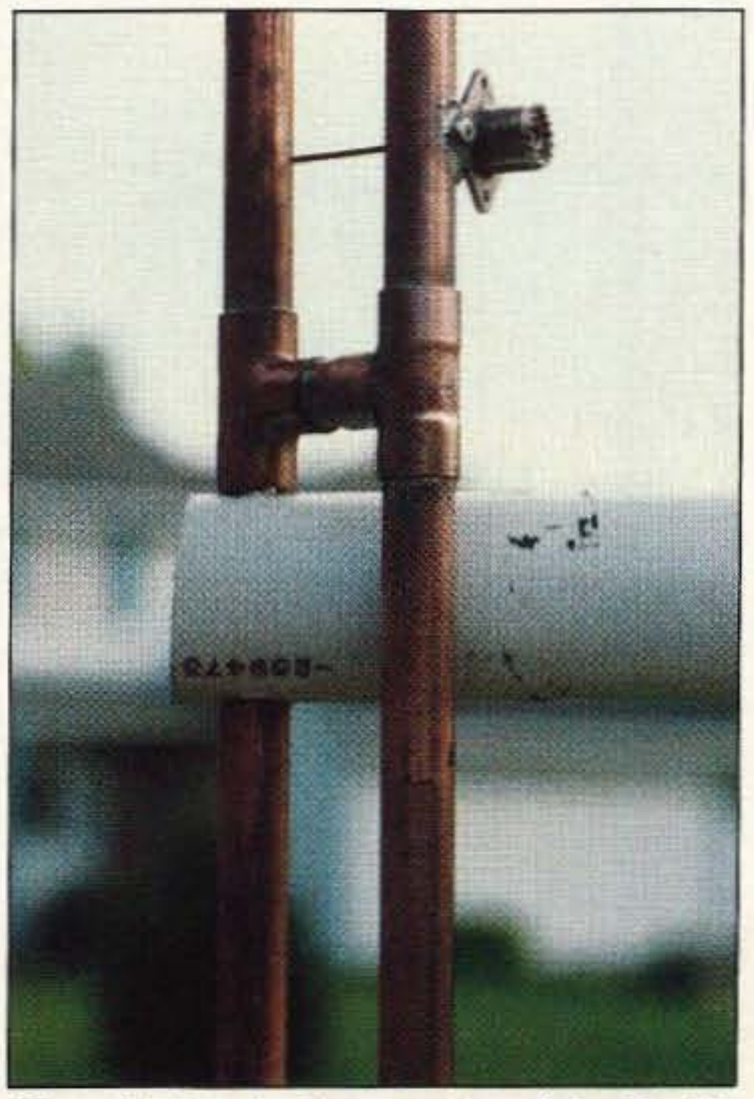

Photo B. Run the long section of the Double Cactus through the PVC pipe to secure it to the tower side mount.

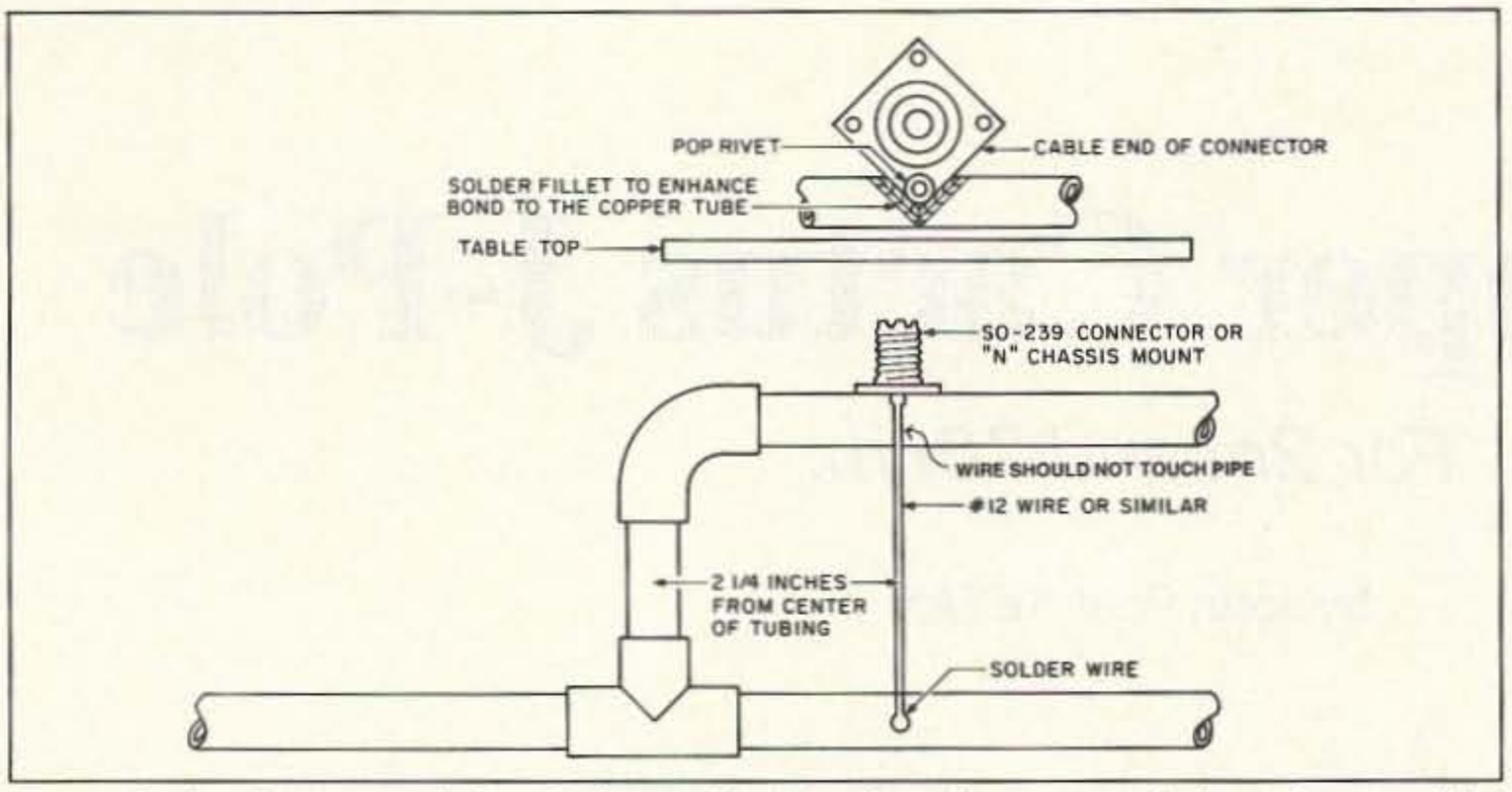

Figure 2. See the materials list. Before soldering, clean the joints and place the assembled antenna on a flat, noninflammable surface. Practice on some scraps of tubing and extra pipe joints if you're new to this. All dimensions are center-to-center.

that will be reinserted into the fittings, and reassemble the antenna, taking care to recheck the dimensions before soldering.

4. Carefully solder your antenna together. Make sure the matching stub and radiator element are parallel. You will need to turn the antenna over to solder the fittings on the other side. Use the minimum amount of solder, but make sure the antenna is stout!

5. After the initial soldering is done and the antenna is cool, measure the spot where the feedpoint will be located. Also, clean and mark the spot on the long radiating element where you will solder the wire from the center of the chassis mount.

6. Now you get to make a decision! You will need to drill a hole in the short section for either a pop rivet or machine screw. This will help secure the chassis mount to the antenna. If you use a machine screw, choose one that is long enough to allow a nut to be placed on the other side of the short section. Approximately one inch should do it. Also, you will need to drill out the hole in the chassis mount that will accommodate the screw/rivet. Make sure it isn't too fat, or you'll find yourself with too large a hole in the chassis mount. I use 1/8″ aircraft-grade pop rivets, but I have made several antennas with machine screws. They all work fine. If you have any qualms about the quality of your rivets, go with the machine screw.

7. Place the chassis mount where it will be located, and mark the spot. Carefully drill the hole in the short matching section. If you are using a rivet, just drill in the outside wall. If you chose the machine screw, drill it all the way through.

8. After drilling the hole to match in the chassis mount, secure it to the matching stub with either the rivet or machine screw. Make sure the threads face away from the radiating element! Your chassis mount should be very secure to the matching stub.

9. Now, go find an old connector to use as a heat sink while you place a bit of solder on the spot where the chassis connector meets the matching stub. Solder this area carefully. Apply the heat to the copper pipe, and the chassis connector will be warm enough for the solder to adhere to. This will make a good electrical connection and enhance the mechanical one as well. Remove the old connector from the chassis mount and check the insulation for distortion/melting. It should be fine. (Unless you applied the flame directly to the chassis mount.) I also use an extra T-connector for a head sink; you can do whatever you want.

10. With the torch, heat the spot where the feed wire will attach on the radiating element. Place a small bead of solder on the spot. It should be directly across from the center of the chassis mount.

11. Cut and strip the ends of the wire that will go from the center of the chassis mount to the feedpoint. Solder one end to the chassis mount, using a soldering iron, NOT the torch! Tin the opposite end where it will attach to the radiator, and try to attach it with your iron. If you can't get the feedpoint hot enough with the iron, use the torch carefully and secure the wire that way.

12. Let the antenna cool, then check all fittings for security. They should be very strong. Clean up the antenna with some steel wool, taking care not to leave any small "hairs" behind. Check the SWR on both bands and paint the antenna as desired. Enjoy your new dual-band Copper Cactus!

Now—the Double Cactus

This one is for those of you who love BIG antennas. It is built using the same basic procedure as above. However, instead of a 90-degree connector, buy two T-fittings. Also, cut the matching sections 1/2″ longer. Buy two 10-foot sections of copper pipe and build a mirror image of the standard Cactus below itself.

I use a 5-foot section of 1-1/2″ PVC pipe to suspend the Double Cactus from the side of my tower. This seems like the best way to do it. Just drill a 5/8″ hole about one inch in from the end of the PVC pipe, and slide the long leg of the antenna down through it. The feedpoint will be above the PVC, allowing you to secure the feedline to it. When comparing this antenna to the standard J design, we found a stronger signal report on both bands. The reports weren't much stronger—maybe one or two S-units—but you may find that this antenna meets the need better. I have a standard J on the top of my mast, and the extended version off the side of the tower.

Continued on page 27

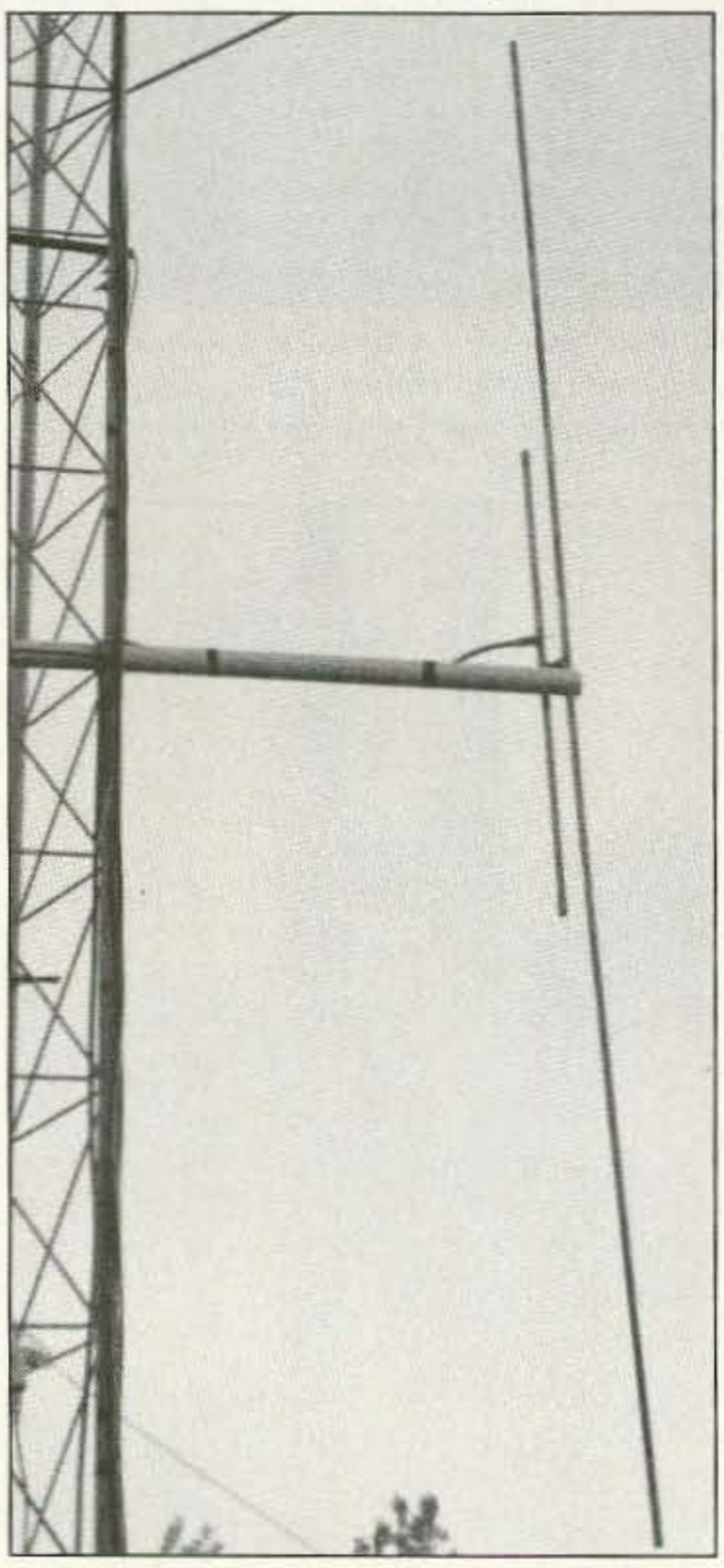

Photo C. Use PVC pipe to mount the Cactus to the side of your tower. The Double Cactus is shown here.

The Copper Cactus
Materials List

1	10-foot section of 1/2″ copper water pipe
1	T-section
1	90-degree elbow
1	SO-239 or N-type chassis mount
1	2-1/2″ piece of no. 12 or similar copper wire
1	machine screw, about 1″ long, with nut; or pop rivet 1/8″ dia. x 1/2″ long

Other: Propane torch, solder for copper pipe, and flux.

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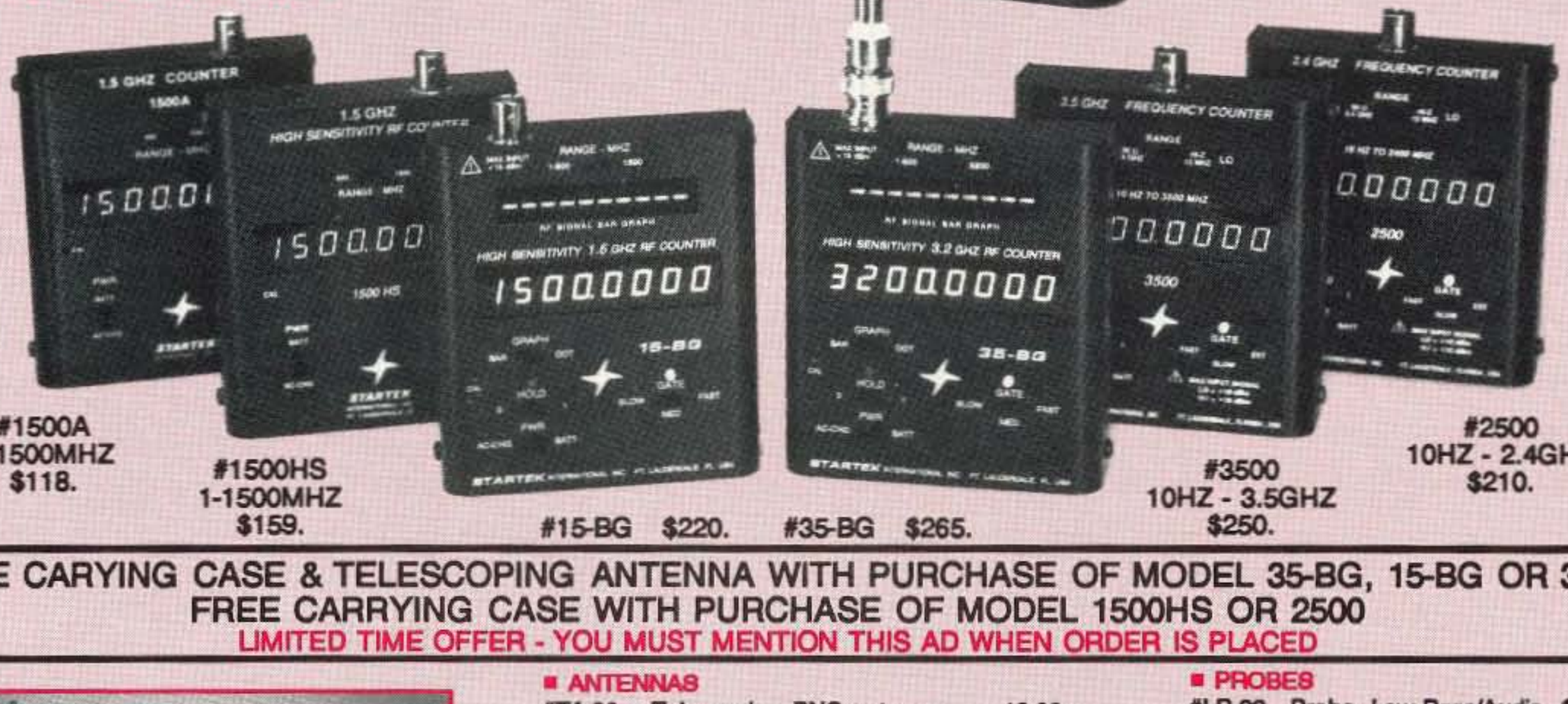

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CIRCLE 247 ON READER SERVICE CARD

A Five-Component Wideband Amplifier for Your Receiver

Give your VHF receiver a boost!

by J.S. "Stu" Gurske K9EYY

Imagine a very wideband amplifier which covers a range of from about 100 MHz to 2,000 MHz, and requires only four other components to make it work. The Mini Circuits catalog lists just such a device, called a MAR-8. It is extremely small, measuring about 0.078 (5/64) inch in diameter by about 0.62 (1/16) inch thick. It has a gain of about 33 dB at 100 MHz, pretty impressive for such a small device.

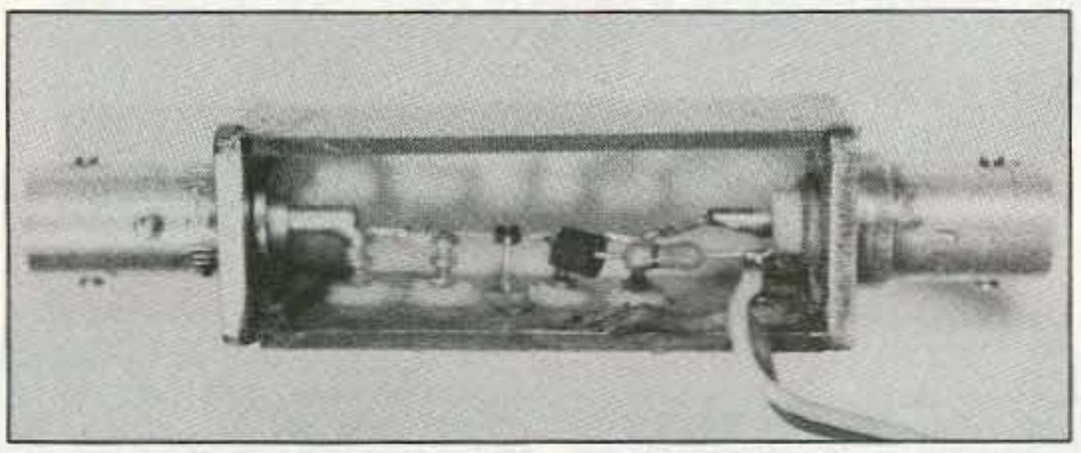


Photo A. Close-up of the finished amplifier: MAR-8 (center), chip caps, resistor, stand-off insulator bead on the resistor lead, BNC connectors and 12 volt wires.

Getting It Together

I needed a preamplifier for one of my VHF receivers and decided to try this device. I obtained a MAR-8, two 100 pF chip capacitors, a 120 ohm 1/4 watt resistor, and a ferrite bead and hooked it all up. The amplifier worked very well. I heard signals which I had never heard before. The old marginal signals were now fully quiet. This amplifier makes a nice weekend project.

The amplifier uses chip capacitors so, while some care must be taken when soldering them into the circuit, constructing the amplifier was easy. Here is how I did it.

It's easy to make a printed circuit board, but I chose to hard wire the device instead. I mounted five small standoff insulators on a piece of copper-clad board (i.e. double-sided printed circuit board material) as shown in Figure 2. The circuit board material measured approximately 1/2" wide by 1-1/2" long. After mounting BNC connec-

Continued on page 49

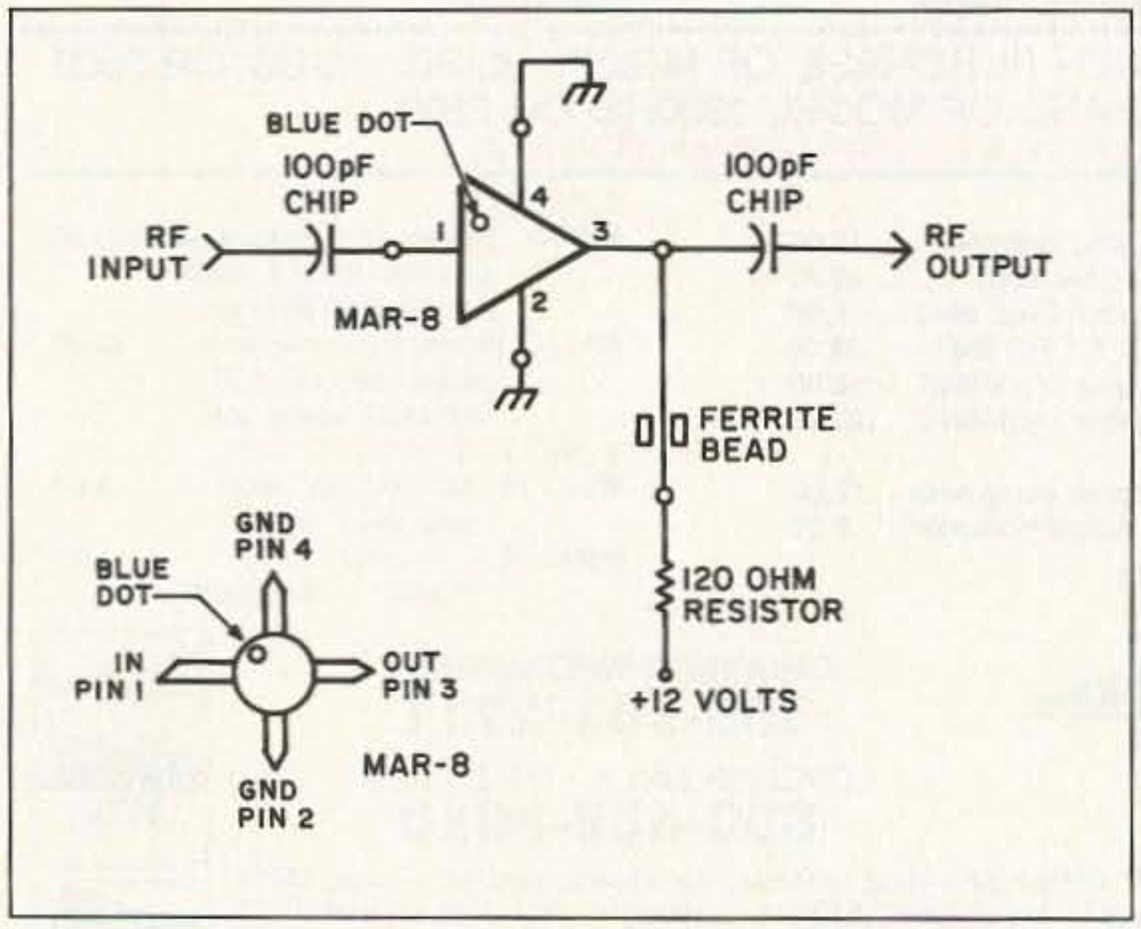


Figure 1. Schematic for the 5-component RF amplifier.

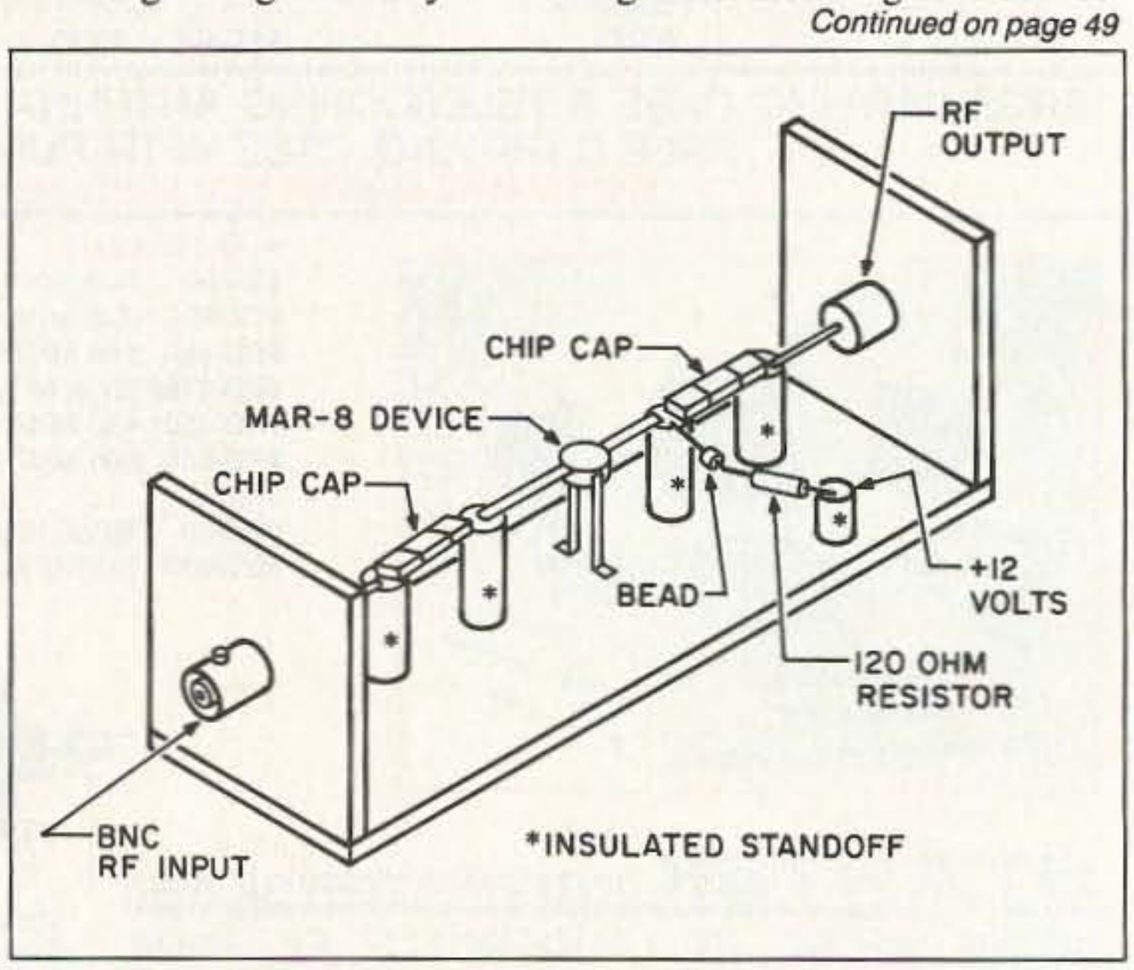
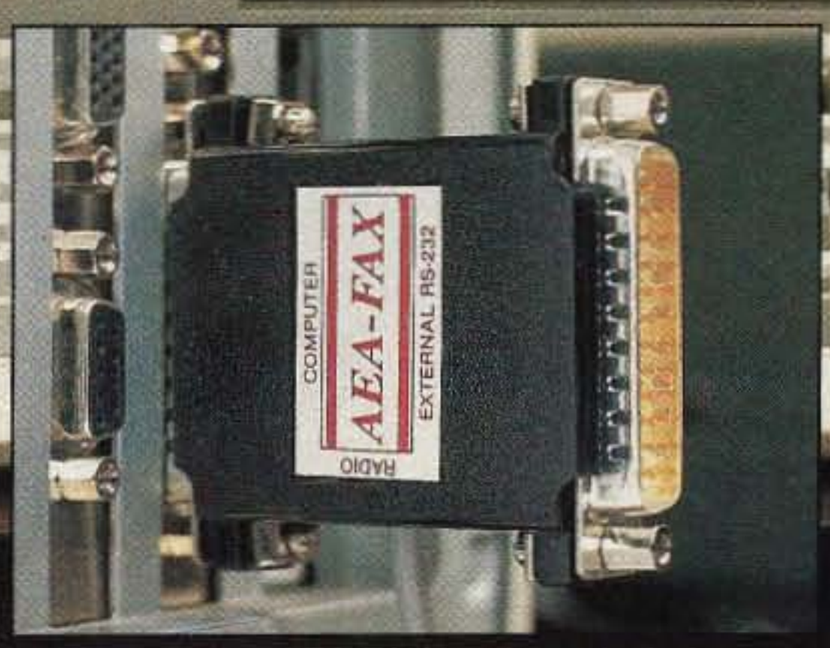


Figure 2. Parts placement for the RF amplifier assembly.

Weather FAX

AEA-FAX is menu-driven and mouse compatible for ease of use.



The compact AEA-FAX hardware includes a "daisy-chain" RS-232 input.

AEA-FAX is all you need to interface with your HF receiver and PC-compatible computer to pick up great looking, information packed weather maps, photos and charts.

Its features include an on-screen Miniscope tuning display, unattended image capture, slide show mode for showing multiple images, disk and printer interface, 16 grey levels (VGA) or false-color separations (EGA), and much more.

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73 Review *by Dick Goodman WA3USG*

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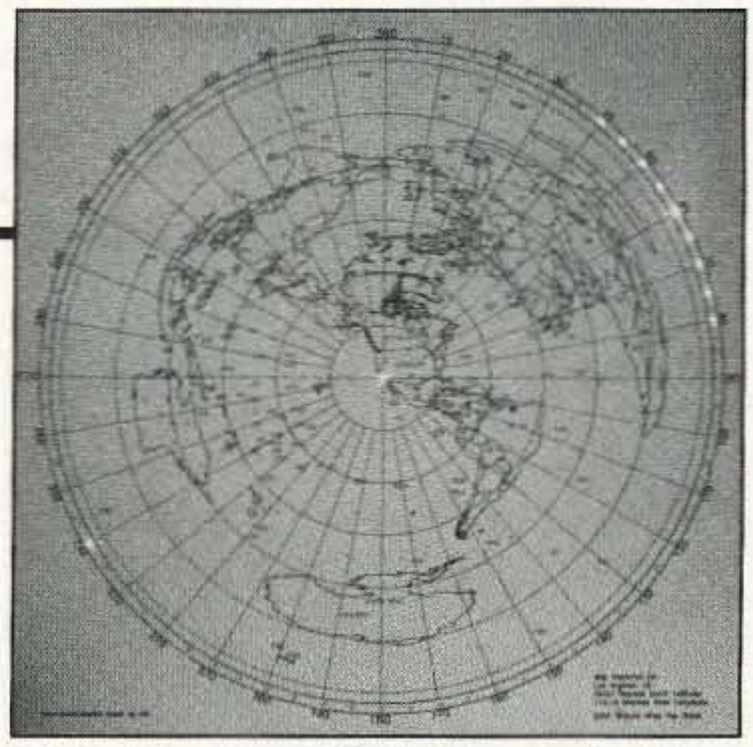

Photo. The Great Circle Map Vector Beam Indicator is attractive as well as functional.

Knowing precisely where to point an HF beam has always been a problem for amateur radio operators. Since radio waves propagate along the shortest path between two points, and the earth is a sphere, using an ordinary map (known as a Mercator projection) to determine antenna-pointing requirements can be very misleading.

Using a Globe

One effective way to resolve this problem is to obtain a globe and mark your location on it. Then, using a compass, draw lines of bearing outwards from your location, like the spokes of a wheel. Drawing a radial for at least every 10 degrees of azimuth will result in a highly accurate method of aiming the antenna. Path determination simply entails locating the radial closest to the target location and following it back to its origin (your QTH). Target locations not positioned exactly on a radial may be estimated within a few degrees.

The advantages to this method are: 1. Globes are cheap. 2. A globe, like the earth, is round, which virtually eliminates errors. 3. The shape of the continents and land masses are recognizable to anyone with a rudimentary knowledge of geography.

I have used the globe method and it works quite well! In addition to determining antenna direction, it gives you a unique perspective of the earth as seen from your QTH.

The Circle Map Method

For those not so artistically inclined, there is an easier way. A flat projection of the spherical earth, known as a "Great Circle Map," will work as well. The disadvantages are: 1. In order to be useful for bearing determination, it must be customized by having the user QTH drawn at the center. 2. Converting a spherical surface to a flat map distorts the appearance of many of the continents. But these disadvantages are not major. With computerized cartography, it's easy to generate customized Great Circle Maps for any point on the earth.

In the past, several mechanically proficient amateurs have built beam direction indicators based on the Great Circle Map. Many of these systems were almost works of art, and provided accurate antenna aiming requirements quite well. Unfortunately, these projects also used quite a few mechanical components and servo system techniques beyond the capabilities of the average ham. What was needed was a way to create an equivalent system electronically, and to eliminate all expensive mechanical components.

The VBI-360

Vector Control Systems of Upland, California, has created an attractive, solid-state (no moving parts) beam indicator known as the Model VBI-360. The 16″ x 16″ x 1″ unit consists of a Great Circle Map with your location in the center. There are 72 high-brightness LEDs around the map's periphery to indicate your beam pattern. There is also a single LED identifying your QTH, and an LED marking the long path direction.

The map is professionally plotted on a heavy "parchment" type plastic material. Coastlines are in black, country boundaries in green, call-sign prefixes in red, and radial lines and distance circles in blue. Your location and corresponding latitude and longitude are printed in the lower right-hand corner of the map. The unit is enclosed in an attractive aluminum frame and the map is protected under glass. Designed to be hung on the wall like a picture, the VBI-360 is controlled and powered by a single cable, and will function with virtually any rotor that uses a potentiometer to feedback analog position information.

Documentation provided with the VBI-360 is excellent. The users manual consists of 14 pages of considerable detail on installation, calibration, and troubleshooting. A complete schematic is also provided.

Physical Connections

To say that the VBI-360 is easy to connect and use is an understatement. The '360 comes with approximately 10 feet of cable with a modular phone type connector installed. There is no need to do any wiring to the indicator itself. Also included is a modular phone type connector box which is designed to be fastened to the back of the rotator control box. A 12 VDC wall power supply is provided, and comes connected to this modular connector box.

The only physical wiring that has to be done is to three wires coming from the connector box. These wires are: BLACK, to the rotor control box ground; YELLOW, to the wiper of the position feedback pot in the rotor; and BLUE, to the top of the rotor position feedback pot (+ voltage). These wires are only about four inches long. I used Radio Shack shielded cable (with two inner conductors) to extend these wires 10 feet to my rotor control box.

It should be noted that the blue wire only has to be hooked up if you desire the indicator to be automatically energized when the rotor control box is turned on. If the this wire is not connected, the indicator will always be energized, and may be switched on and off from the outlet. Grounding this wire will unconditionally de-energize the indicator.

Connection of the VBI-360 to my Yaesu G1000SDX took all of 10 minutes. For most rotor control boxes it will not be necessary to open the case. Connection of the three wires may be made to the terminal strip, or to the connector on the rear of the control box. The following rotors will work with the VBI-360: the Alliance HD-73; HAM-M Series I, II, III; HAM-II, III, IV; CD44, 45, Tail-Twister; HDR-300; ORION 2300; EMOTO 105TSX; and Yaesu models G-400, 600, 800, 1000, G800SDX, and G1000SDX.

Other rotors that use a potentiometer for position reporting should also work. The rotor end-points, adjustable over 360 degrees, allows the rotor to be mounted with its physical stops in any position. Finally, the VBI-360 works with rotors that rotate either clockwise or counterclockwise to achieve a more positive voltage on the position feedback pot wiper.

Configuration and Calibration

Calibration and setup of the VBI-360 is simple and straightforward. The VBI-360 will work with rotors that use a range of positioning voltages from 0.5 to 30 VDC.

Switch configuration on the rear of the VBI-360 is then set to match this voltage value. Insert the modular plug from the indicator unit into the connector box, and apply power to the rotor control box. Several LEDs should illuminate. Adjust the "Span" and "End Limit" pots on the VBI-360 in accordance with the documentation. Finally, the beamwidth of your antenna should also be set via four switches on the rear of the VBI-360.

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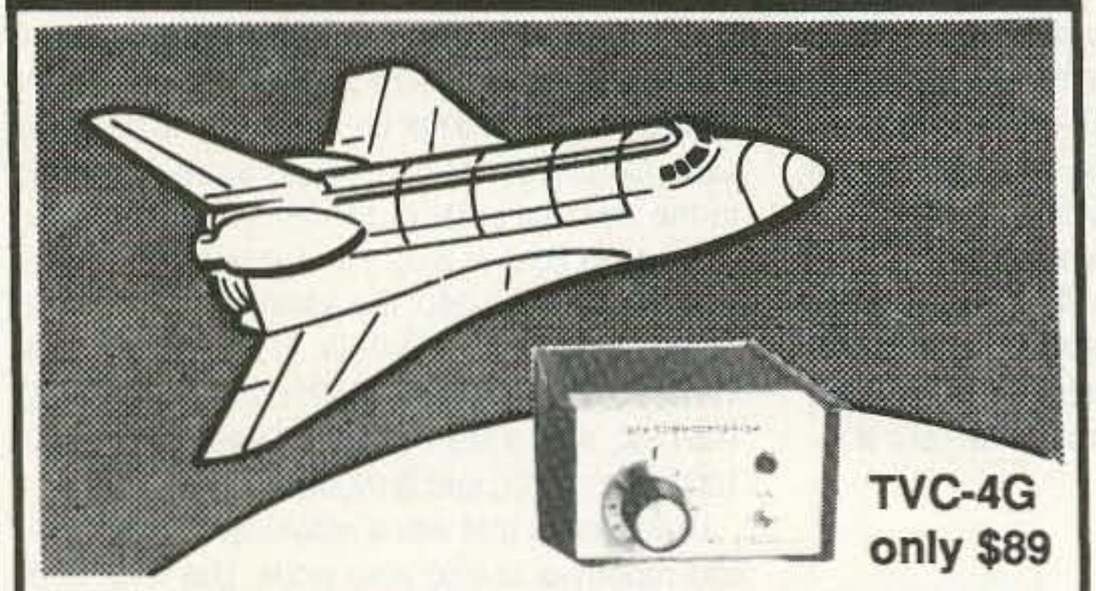

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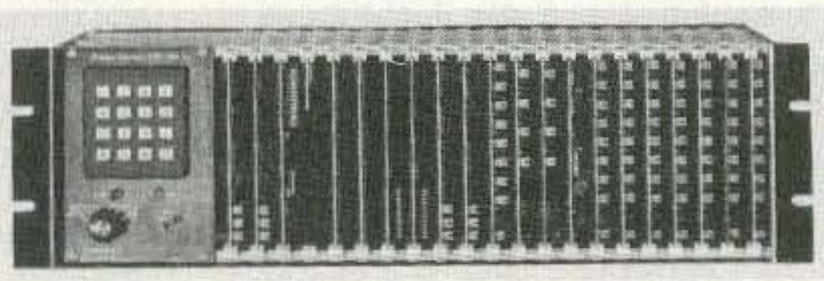

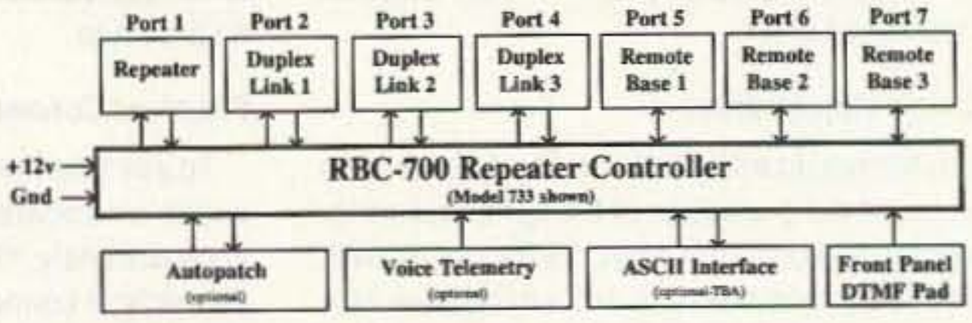

The RBC-700 Repeater Controller is designed to support Repeater systems that require multiple radios connected together at a site. The RBC-700 utilizes a true 7 x 7 audio matrix switch which allows several conversations between ports at the same time. In the illustration above the 733 model is supporting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

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

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Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

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1 Never Say Die
2 QRX
3 Letters
4 The Copper Cactus J-Pole
5 A Five-Component Wideband Amplifier for Your Receiver
6 Review:VBI-360 Beam Indicator
7 Review:AL800 High Gain HT Antenna
8 An NE-602 RF Signal Generator
9 Review:Radio Shack HTX-202 2 Meter FM Transceiver
10 Colombian Expedition
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This entire process took me five minutes, and resulted in perfect calibration.

If you have a non-standard rotor or one that's not on Vector's list, the map display can be calibrated by the following procedure: Prior to connecting the modular plug from the indicator assembly to the connector block, energize the rotor control box, rotate your beam to its maximum clockwise position, and measure the position feedback pot wiper arm voltage with respect to ground.

Rotate the antenna until this voltage is the maximum positive obtainable. It should be noted that some rotors require full counter clockwise rotation to obtain the max positive voltage.

Operation and Use

Once the VBI-360 is calibrated, rotating your antenna will result in an arc of LEDs moving along the periphery of the Great Circle Map. The size of this arc is proportional to the beamwidth of your antenna. The center LED in the arc is noticeably brighter than the others, and marks the exact heading of your beam on a compass rose surrounding the map with a resolution of 5 degrees. A single LED at 180 degrees from beam center indicates the long path. This may be turned off if desired. Finally, a single LED illuminates your own QTH at the center of the map.

The effect of this is quite striking! It is instantly apparent where your beam is pointed, and what coverage it is providing.

Pointing your antenna at Australia is as simple as rotating your beam until the arc of LEDs is adjacent to that continent. If a call is heard from another location, moving your antenna is a snap!

Comments and Kudos

A very important aspect of any accessory found in a ham shack is RF filtering. The circuit for the VBI-360 is on a Mil-Spec quality double-sided board with an extensive ground plane. The circuit and board layout have been designed to eliminate the effects of high RF fields. In addition to RF filtering, an active 3-pole low pass filter is used at the front end to reduce the effects of superimposed AC on the DC signal that occurs with rotors that use a wire common to both the pot and motor. I noticed absolutely no effect on the display with high power HF (2 kW on 75–15 meters) and VHF/UHF (150 watts on 2 meters and 70cm) operation.

The VBI-360 is a very attractive addition to any ham shack. High quality materials and construction are used throughout. Silver, black or custom frame colors are available. I was especially impressed with the quality of the Great Circle map. It is actually customized right down to your town, which must be specified when you place your order. The map is easy to remove and replace, which will make it nice if you ever decide to move.

Finally, the indicator could be truly customized to a local area by "rolling you own" map. For example, VHF operators may want coverage over only a single state, or a two- or three-state area. The folks at Vector Control Systems might want to consider this as a future option.

The VBI-360 is an attention-grabber and quite a conversation piece. Another very nice attribute is that it is the type of accessory that may be safely bought by a non-ham spouse for the OM of the family. IT MAKES A GREAT BELATED CHRISTMAS OR BIRTHDAY GIFT . . . hint, hint! 73

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MAXON, MOTOROLA,
YAESU: FTH 2008/7008
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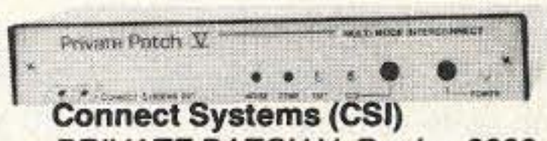

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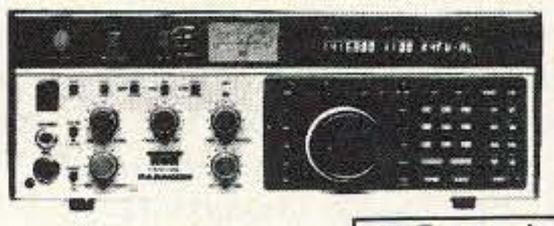

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CIRCLE 41 ON READER SERVICE CARD

73 Review

by David Cassidy N1GPH

The AL800 High Gain HT Antenna

Improve your dual-band portable punch.

ANLI International Corp.
15344 E. Valley Blvd., Unit C
City of Industry CA 91746
(800) 666-ANLI
Price Class: $40

ANLI is a company that has been around for quite a long time—about 30 years. Their extensive line of amateur and commercial products is well known in Asian countries, but is essentially unknown in North America. With the introduction of the AL800, as well as other HT accessories, ANLI is dipping a cautious toe into the U.S. ham market.

The AL800

The AL800 is actually two antennas. The first is a thin, flexible rubber whip which gives you about the same performance as the rubber ducky that came with your HT. Most stock HT antennas are not very flexible and will jab you in your side all day if you walk around with the HT on your belt. After an hour or two of walking around with the short ANLI antenna, you will appreciate its flexibility.

The second antenna that comprises the AL800 is a stiff telescoping whip. When fully closed, it is about the same size as a stock dual-band HT antenna. When extended to its full length, the AL800 gives remarkably improved performance in both transmit and receive on both 2 meters and 70cm.

The two antennas screw into a common base, so switching between the convenient and comfortable rubber whip to the better performing but larger collapsible element requires no more than a few twists of the wrist. Both elements are small enough to fit in a breast or coat pocket, so carrying both while operating public service or around the hamfest is no problem.

Real World Tests

ANLI claims a gain of 3 dB for 2 meters and 5.2 dB on 70cm. They don't state what their reference antenna is, but we all know that manufacturers' claims of gain don't mean much. What counts is how the thing works in real-world situations.

One of my favorite places for testing HT antennas is hotel rooms. With concrete walls and miles of parasitic wiring around you, it provides a real performance test, when compared to a stock HT antenna. If an HT antenna can get a signal out of a hotel room, it will probably work well anywhere.

I found the short, flexible whip of the AL800 to give identical performance to a stock HT rubber ducky. The same S-meter readings were also obtained with the collapsible whip in the fully closed position.

When you extend the collapsible whip to its full length, the difference is immediate and amazing. Repeaters received at an S-3 gave a full meter reading with absolutely no noise. On transmit, I received "full quieting" reports on repeaters that I couldn't even key up with the shorter antennas.

I received the exact same results with two different HTs, in many different operating locations. SWR was measured as less than 1.5:1 across the repeater sections of both 2m and 70cm.

Construction

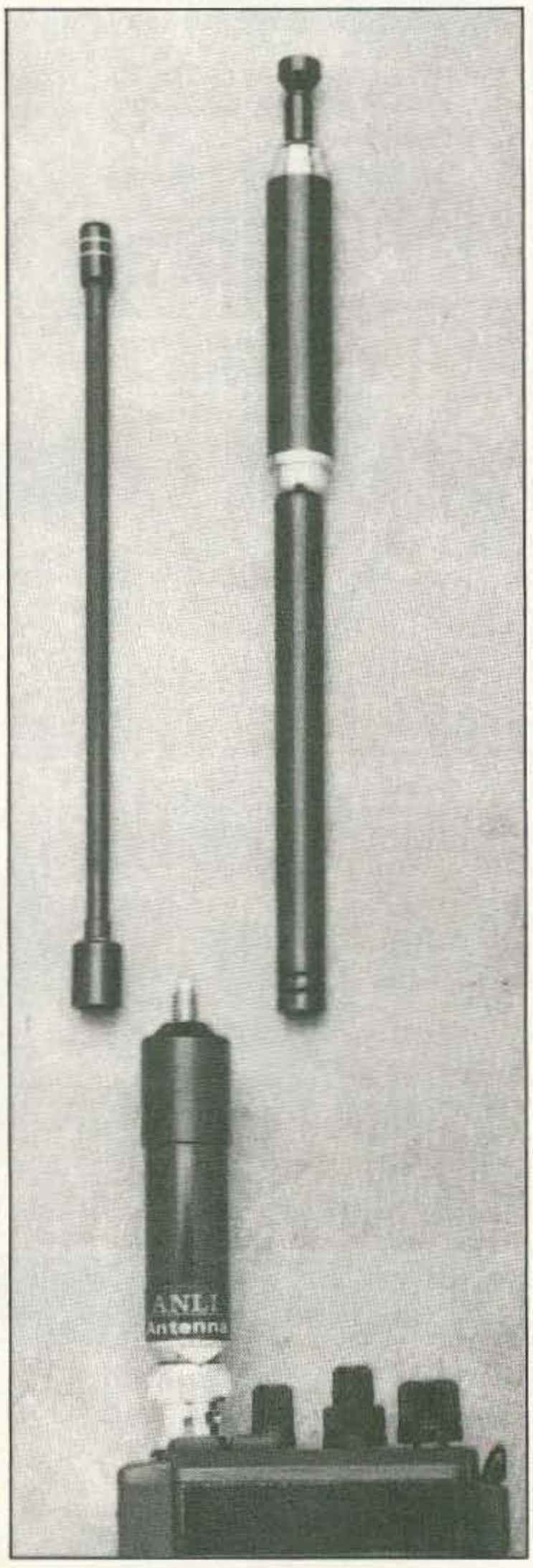
The ANLI AL800 is an attractive antenna. The elements are flat black, with gold-tone connectors. The extendible whip feels solid, with no slippage. The two antenna elements screw in very firmly, and I never experienced any problems with this arrangement.

Final Thoughts

If you are in the market for a high gain HT antenna, the ANLI AL800 would be a good choice. The price is a little higher than similar products from other manufacturers, but remember that the ANLI AL800 really gives you two antennas.

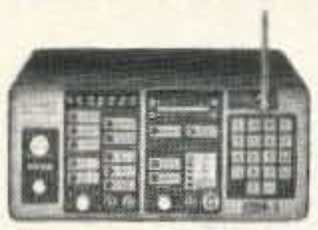
It is always good news when a new company enters the amateur radio market. While ANLI is by no means a new company, it is a new name to the U.S. ham market, so the result is the same.

Representatives of ANLI International Corp. tell me they have over 100 products for the amateur market. I found the AL800 to be a quality product, and I look forward to seeing more ANLI products in the U.S. 73



The ANLI AL800 antenna.

RAMSEY ELECTRONICS



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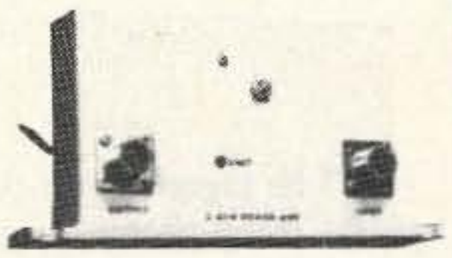

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An NE-602 RF Signal Generator

Useful test equipment from a versatile IC.

by Julian Kerr

The Signetics NE-602 chip has intrigued many people, partly because it is versatile and partly because it is well behaved. What does "well behaved" mean? It means that the chip does what it's supposed to do with little effort on your part. It is an RF device, so you have to be careful with matters such as component selection and layout, but it will work well for you if you just follow a few simple rules. I experienced no problems in a weekend of experimentation in preparation for this article.

Another of the NE-602's attractions is that it is easy to get. As an electronics hobbyist, I am frequently distressed at published circuits that work wonders, but require chips that aren't available through most distributors. Furthermore, major industrial distributors will normally deal with individuals on a cash-up-front basis only (some will do COD), and have a minimum order of $50 or $100. Fortunately, the NE-602 is available by mail from Digi-Key at P.O. Box 677, Thief River Falls MN 56701-0677; (800) 344-4539.

The NE-602 is an 8-pin mini-DIP integrated circuit double-balanced mixer with a built-in oscillator (see Figure 1a). The mixer works up to 500 MHz, while the oscillator works up to 200 MHz. There are two balanced inputs (labeled "Input-A" and "Input-B") and two balanced outputs (labeled "Output-A" and "Output-B"). Both the inputs and the outputs can be used in a single-ended, rather than balanced, configuration. The pinouts of the NE-602 (see Figure 1b) are listed in Table 1.

Much of what has been written thus far about the NE-602 has centered around its uses as a receiver or a frequency converter. Indeed, the NE-602 makes a dandy little single-chip RF front end and will provide a high degree of sensitivity and a low noise figure in that application. In addition, because it is a double-balanced mixer, the LO and RF signals are suppressed in the outputs, so only the sum and difference IF frequencies (LO ± RF) exist in the output. In this article we are going to examine the largely-overlooked oscillator function of the NE-602.

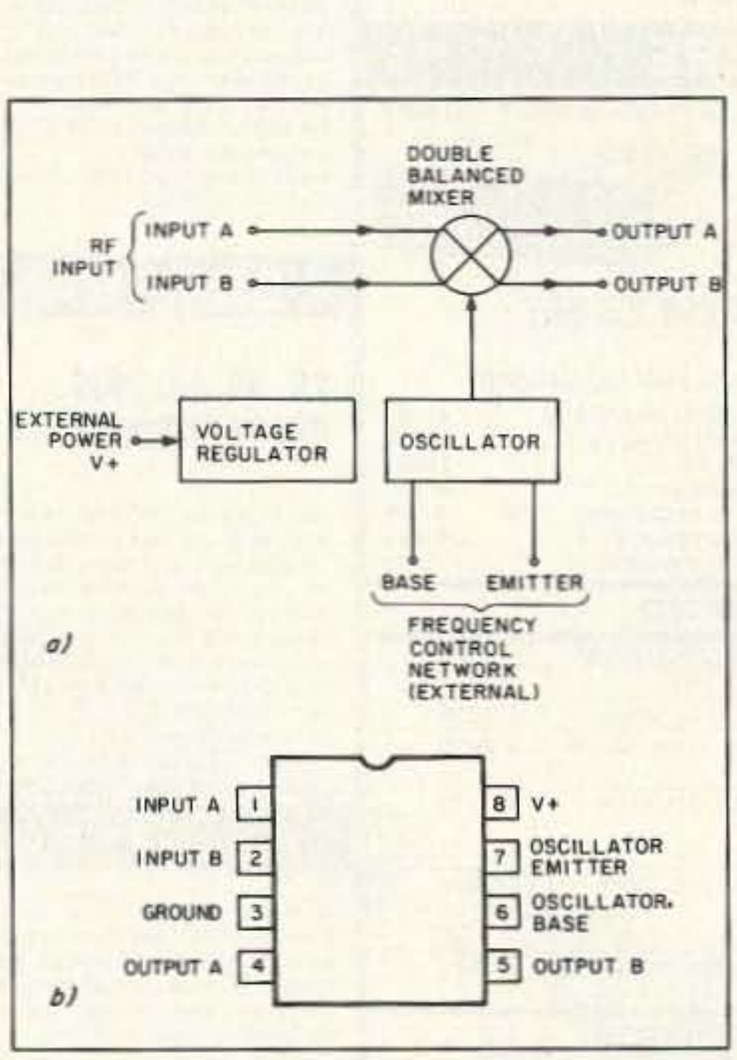

Figure 1. a) Internal circuit of NE-602 in block form; b) pinouts of the NE-602.

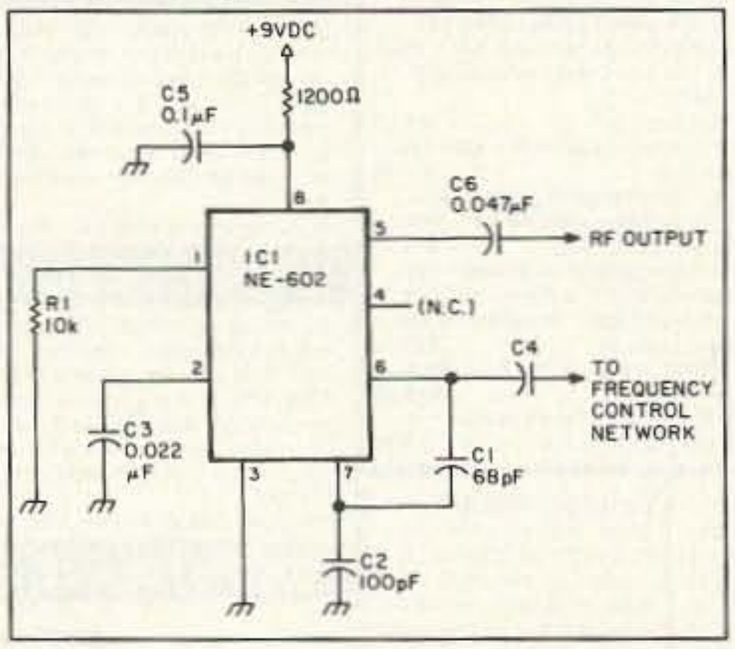

Figure 2. Generic NE-602 oscillator circuit.

NE-602 Oscillator Circuits

In normal receiver or frequency converter applications, the local oscillator signal generated inside the NE-602 is suppressed in the output. This is an excellent feature to have in a receiver front-end, accounting for the use of double-balanced mixer circuits in high priced communications receivers. But if we unbalance the RF input (pins 1 and 2), then the LO signal will appear on the two output terminals of the NE-602 (pins 4 and 5).

Figure 2 shows the basic configuration of the NE-602 in oscillator mode. Input-A is grounded through a 10k ohm resistor, while Input-B is bypassed to ground for RF signals through a capacitor (C3). The value of this capacitor is dependent on the operating frequency. The value shown will work nicely in the HF and low VHF range, but for lower frequencies use a higher value. In general, the capacitor should be 0.001 µF to 0.01 µF for VHF, 0.01 µF to 0.05 µF for HF, and 0.05 µF to 0.33 µF for VLF through low HF frequencies.

As is true for all bypass capacitors, mount C3 as close to the body of the NE-602 as possible. Use disk ceramic, mica or other capacitor types that work well at the frequency of operation. Not all capacitor types that work well in audio or other low frequency circuits will work at RF. The catalog description of the capacitor will tell you its intended uses.

The NE-602 works from DC power supplies in the +4.5 to +8 volt range, and draws 2.4 to 2.7 mA of current. If higher voltage operation is required, then you must use one of two tactics. For +9 volt DC power supplies (meaning battery operation is possible), insert a 1000 to 1500 ohm resistor in series between the V+ power supply and the V+ terminal (pin no. 8) on the NE-602. For even higher voltages, use a three-terminal IC voltage regulator that drops the voltage to 5, 6 or 9 volts. In the latter case, use the 1000 ohm series resistor as well.

The V+ pin is bypassed to ground for RF by a capacitor (C5). The same approximate value ranges described above for C3 are also valuable for this application. Again, mount the capacitor as close as possible to the body of the NE-602.

The output signal can be taken from either pin no. 4 or pin no. 5. I used pin no. 5 because of layout considerations on the perforated board that I used.

The NE-602 oscillator circuit contains an NPN transistor and supporting circuitry, and can be used in all of the normal oscillator configurations that don't require access to the collector terminal. Two examples are the Colpitts oscillator and the Hartley oscillator. For the purposes of illustrating NE-602 oscillator circuits, all but one example will be of the Colpitts oscillator configuration because the Colpitts oscillator uses a tapped capacitor voltage divider (C1/C2) for feedback, while the Hartley configuration uses a tapped inductor. The latter is a little harder to build; the Colpitts works well for most applications.

The values of C1 and C2 determine the stability of the oscillator, and indeed whether or not the circuit will oscillate at all. The approximate values are as follows:

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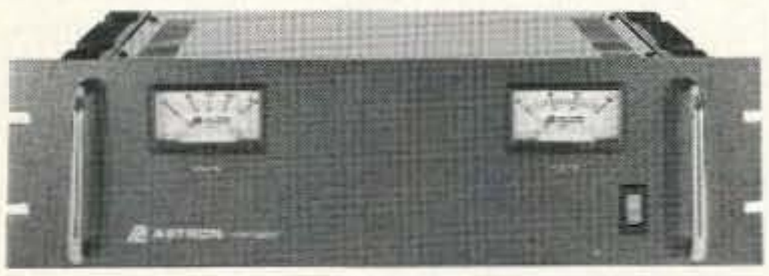
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7



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RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

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

RS-M SERIES

MODEL RS-35M

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

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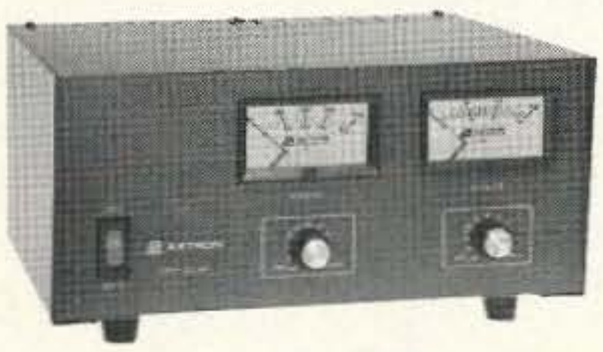

MODEL VS-35M

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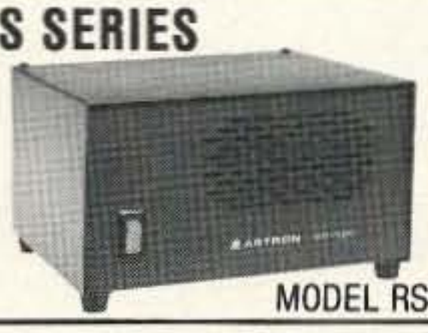
MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35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

RS-S SERIES



MODEL RS-12S

• Built in speaker

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

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

CIRCLE 16 ON READER SERVICE CARD

Equation 1: $C1 = \frac{100\ pF}{\sqrt{F_{MHz}}}$

Equation 2: $C2 = \frac{1000\ pF}{F_{MHz}}$

In terms of standard capacitor values, these equations translate to the approximate values shown in Table 2. These values are not absolute, and I found it possible to make good oscillator circuits with values different from these, including the project at the end of this article.

An example of the output signal from the circuit of Figure 2 is shown in Photo A. This signal is from a 10 MHz crystal oscillator (see below), and appeared on both pins 4 and 5. It had an amplitude of about 180 mV, which is more than is normally needed for a signal generator.

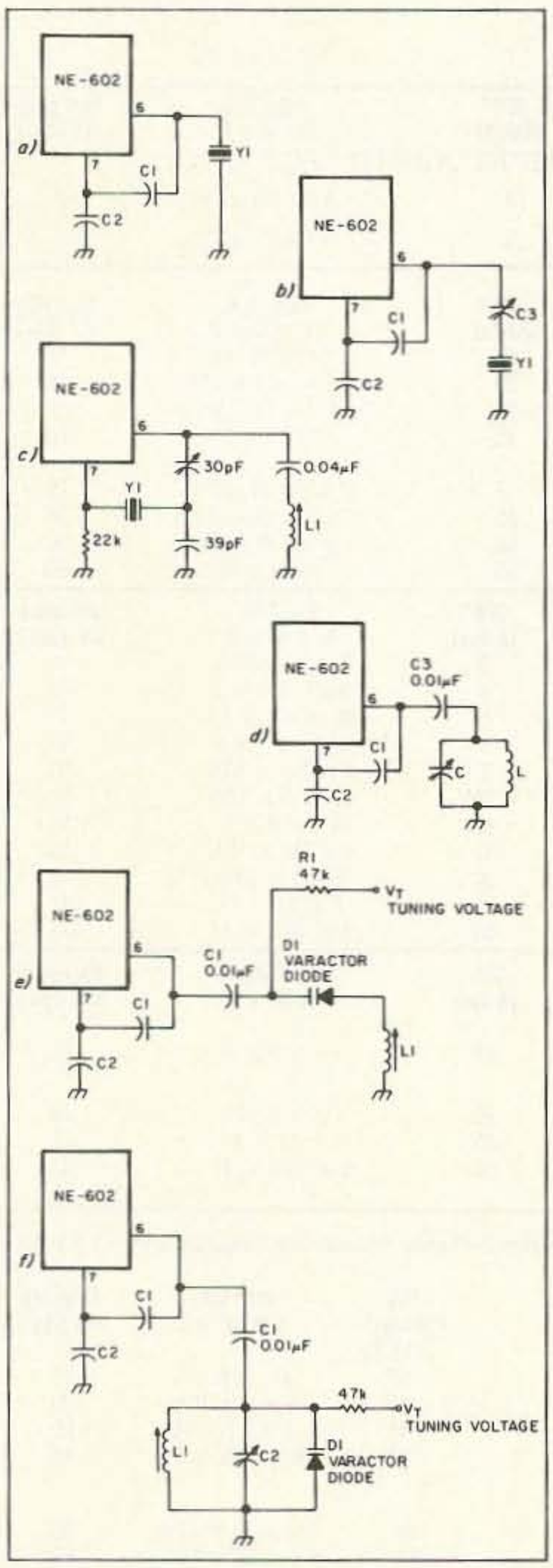


Figure 3. Oscillator frequency control networks: a) simple fundamental mode crystal oscillator; b) adjustable fundamental mode crystal oscillator; c) Butler third overtone oscillator; d) LC tuned VFO; e) series tuned voltage variable VFO; f) parallel tuned voltage variable VFO.

NE-602 Oscillator Frequency Control Networks

The rest of the oscillator circuit consists of the frequency control network (not shown in Figure 2). This network can be a piezoelectrical quartz crystal resonator, a ceramic crystal resonator, or an inductor-capacitor (LC) network. Figure 3 shows several possible variations on the frequency control network.

Figure 3a shows a crystal oscillator circuit. The piezoelectric quartz crystal (Y1) is operated in the parallel fundamental mode, so it is connected in parallel with the oscillator circuit. Because a crystal has an extremely high resistance to DC, there is no need for a DC blocking capacitor between the NE-602 and the crystal.

One problem with the circuit of Figure 3a is that the frequency is not adjustable. The frequency of any crystal resonator is a function of, among other things, the capacitance of the load seen by the crystal (most crystals are calibrated for 20 or 32 pF loads). Because of tolerances in the crystal manufacture, and the values of the external capacitor network (plus stray capacitance, which is significant in RF circuits), the actual frequency and the marked frequency might be different. By placing a variable trimmer capacitor in series or parallel with the crystal (Figure 3b), we can make the actual oscillating frequency adjustable. You can use an insulating tuning wand (a.k.a. "diddle stick") to adjust C3 for the correct operating frequency.

The non-Colpitts oscillator circuit referred to above is the Butler overtone crystal oscillator shown in Figure 3c. The previous two crystal oscillators operate in the fundamental mode, while in Figure 3c the crystal oscillates in the third overtone (similar to harmonic) mode. A fundamental mode crystal is only good to about 20 MHz because the crystal slab becomes too thin above that frequency and is therefore likely to fracture. But, in the overtone mode we can accommodate high HF and VHF frequencies without making the crystal too thin for safe operation.

A variable frequency oscillator (VFO) circuit is shown in Figure 3d. In this circuit the resonator is replaced with an inductor-capacitor (LC) network that tunes the oscillator. Because the inductor has a low resistance and is connected to ground, a DC block capacitor (C3) is used between the LC network and the NE-602. A variation on this theme is the Clapp oscillator in which the inductor and capacitor are in series rather than parallel.

Figures 3e and 3f show voltage-tunable oscillator circuits. The series-tuned version is shown in Figure 3e; Figure 3f shows the parallel-tuned version. In both cases, the tuning element is a voltage-variable capacitance diode (varactor). In these diodes, the junction capacitance of the diode changes as a function of the applied reverse bias voltage (Vt). In this configuration, Vt is a positive voltage between 0.5 and some maximum limit (+9, +18, +30 or +40 volts depending on the diode).

The voltage-tunable oscillators can be used to make signal generators in which the operating frequency is set by a DC power supply and a potentiometer. Alternatively, the same circuit can be used to make a sweep generator or FM generator, or be used to generate the FM signal in a transmitter.

Signal Generator Project

The signal generator that I needed was a crystal-controlled circuit that would operate on the HF ham bands as well as 10 MHz (for use as a frequency standard). Although I selected an adjustable fundamental mode crystal oscillator similar to Figure 3b, you can use any of the standard oscillator configurations, depending on your own needs. Another requirement for my own signal generator was

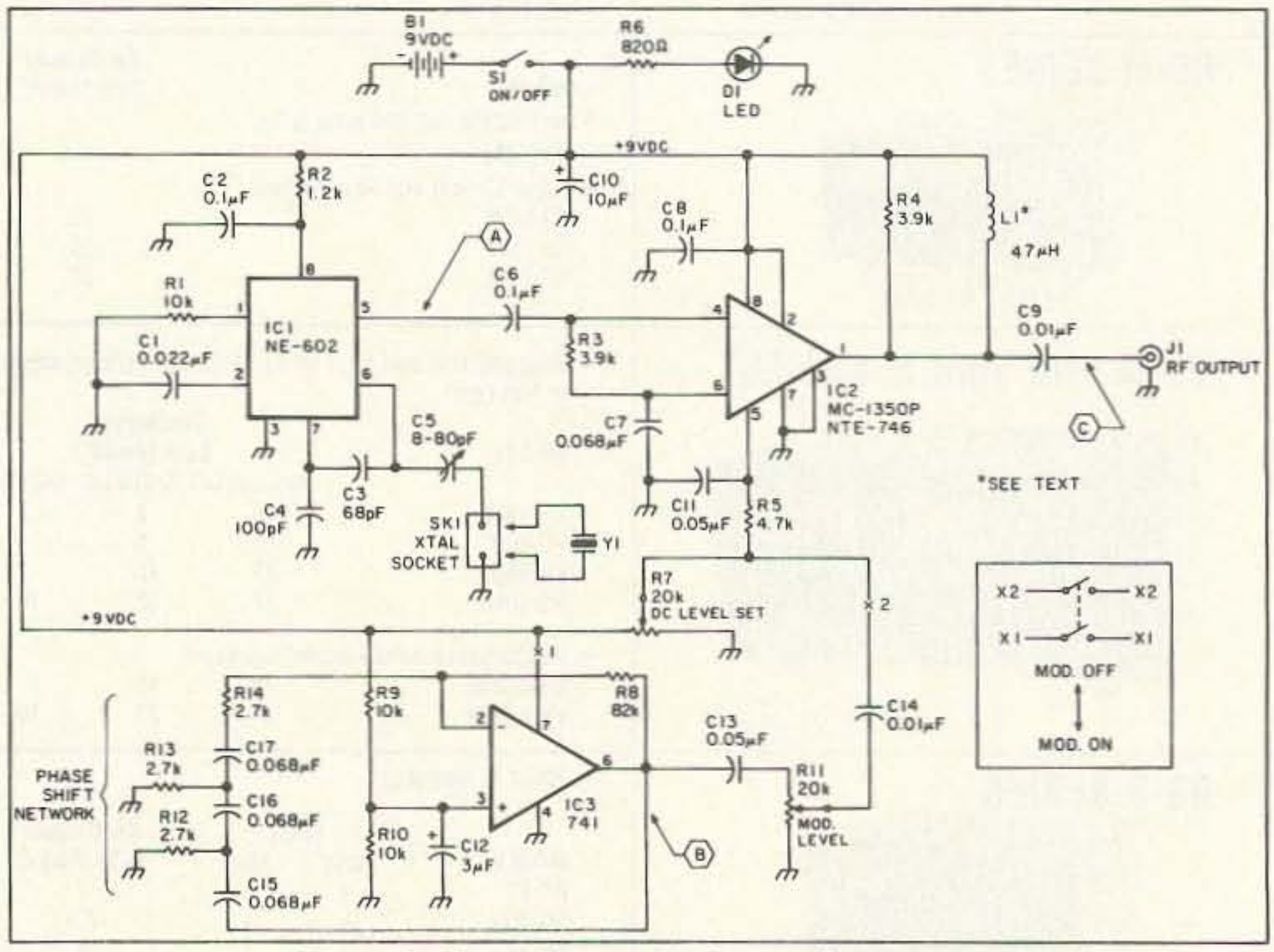


Figure 4. Circuit diagram for the signal generator.

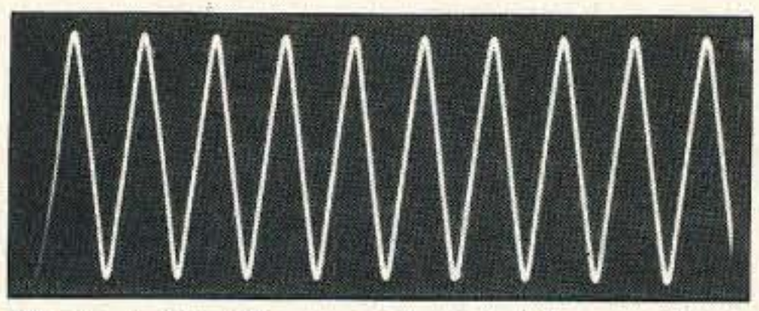


Photo A. Oscilloscope photo of the waveform from the output signal at pin no. 5 (see the circuit shown in Figure 2).

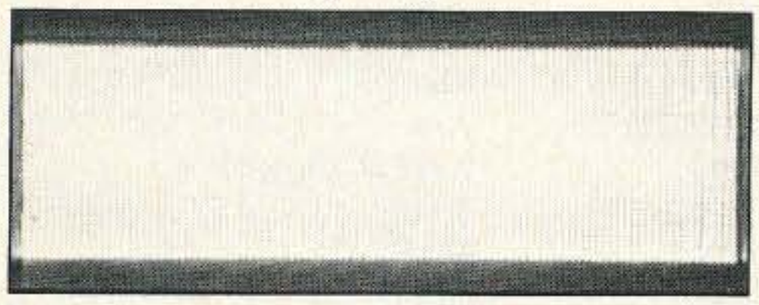


Photo B. Output waveform: RF from NE-602.

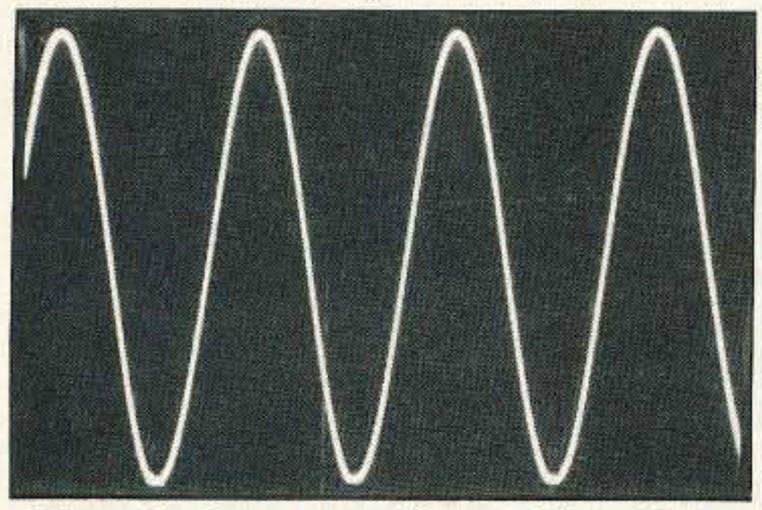


Photo C. Output waveform: AF from 741.

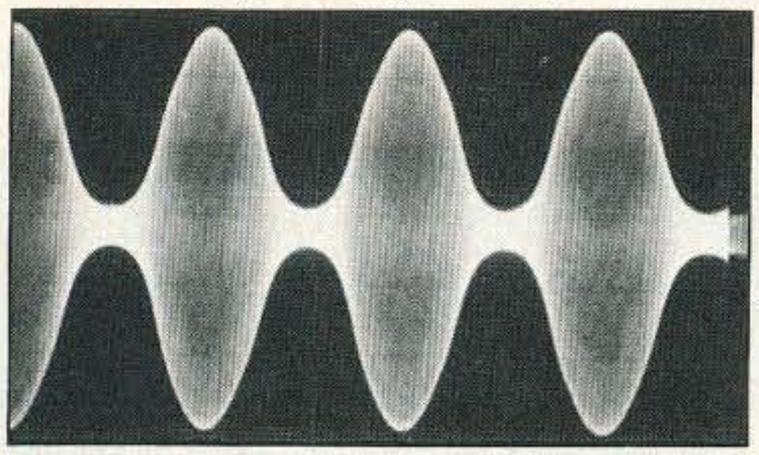


Photo D. Output waveform: modulated RF from MC-1350P.

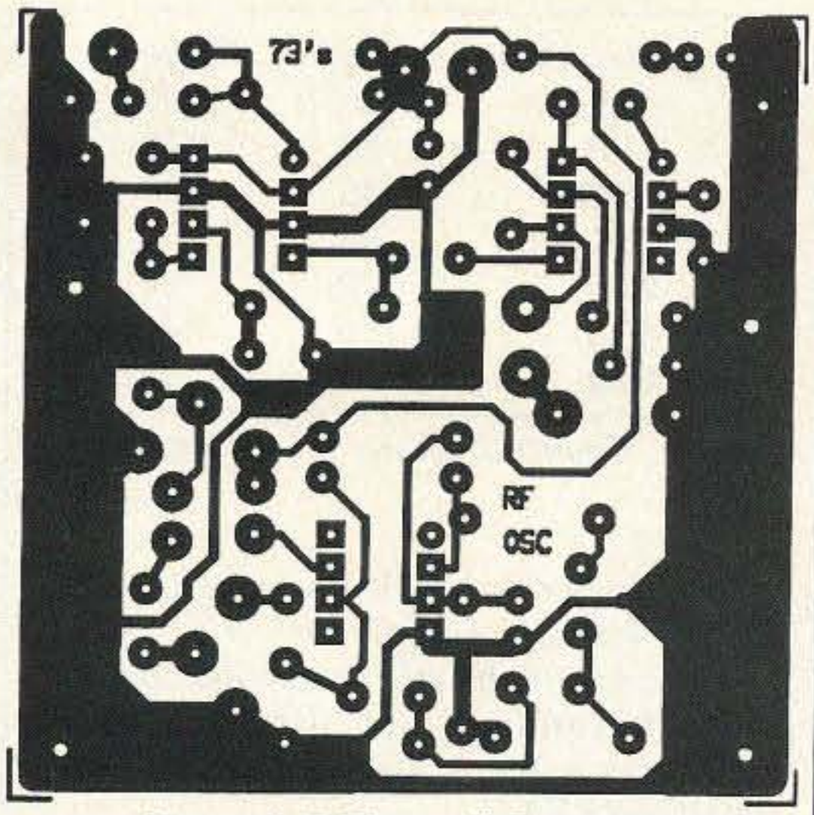


Figure 5. PC board foil pattern.

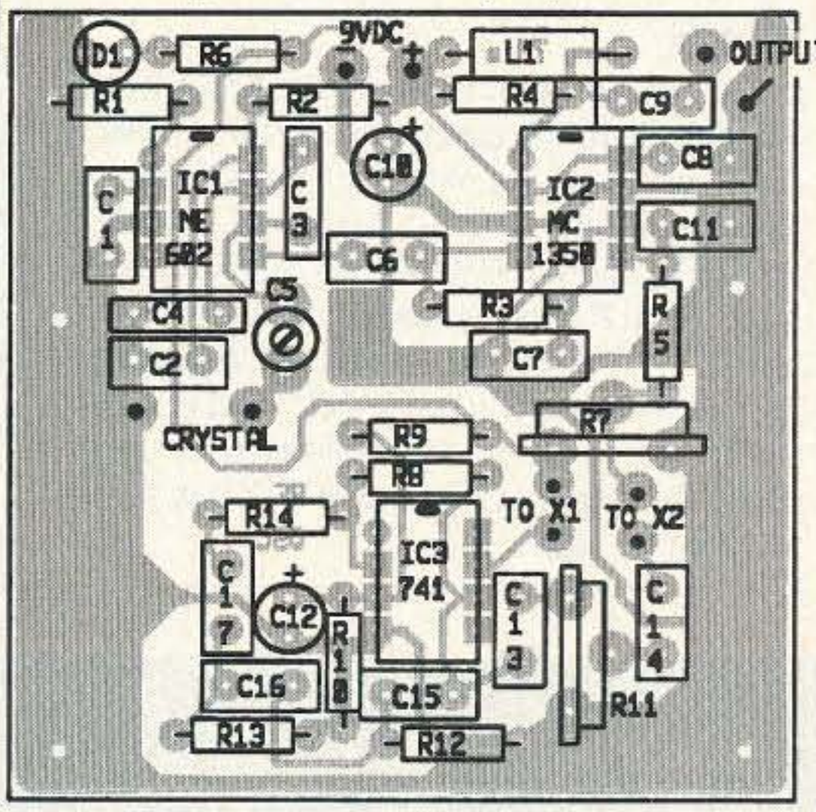


Figure 6. Parts placement.

that it be amplitude-modulated at some frequency between 300 and 1500 Hz (the exact AF frequency was not important). The final circuit is shown in Figure 4.

The crystal oscillator is an NE-602 (IC1) connected in a fundamental mode circuit with a trimmer capacitor for varying the oscillating frequency of the crystals. Because a number of different crystals will be used, and I didn't want to switch them in and out of the circuit (too complex), I used a panel-mounted crystal socket (SK1).

The crystal should be a fundamental mode crystal cut for 3 to 18 MHz operation, and calibrated for 32 pF. Suitable crystals, as well as sockets, can be ordered from a number of sources. Limited selections (with predetermined frequencies) can be found at mail order computer dealers, or the parts houses that support them. But custom (as well as standard) crystals can be ordered from Jan Crystals at P.O.B. 06017, Fort Myers FL 33906; (800) JAN-XTAL; or in Florida, (813) 936-2397.

Integrated circuit IC2 serves as both an output buffer amplifier for the oscillator and an amplitude modulator. It is the MC-1350P (also available as the NTE-746 from replacement part dealers), and is billed as an IF/RF gain block. It is frequently used in the IF amplifier stages of FM and communications receivers. It is an 8-pin mini-DIP IC.

This chip is especially useful for three reasons. First, it will operate at the desired frequencies. Second, it is also fairly well behaved, although it seems a little more touchy than the NE-602 device in the circuits that I've tried. This touchiness is probably due to the very high gain that is possible when the output terminal (pin no. 1) is tuned to the input frequency. Third, it has a single terminal that makes it really useful as an amplitude modulator: the AGC terminal (pin no. 5).

The AGC terminal on the MC-1350P is intended for gain control applications. A DC potential applied to this pin will change the gain of the circuit. Two voltages are applied to the AGC terminal in this project: a DC level set by potentiometer R7, and the modulating audio signal. The latter signal is set by potentiometer R11. The DC voltage is normally supposed to be between 3 and 9 volts, so the DC level control is used to set the value at some midpoint that will allow the audio signal to go through positive and negative excursions without exceeding either limit.

The modulating signal is produced by IC3, a 741 operational amplifier connected in the RC phase shift oscillator configuration. Because only a single DC power supply is used, the 741 is operated with a bias voltage applied

Pin. No.	Function
1	Input-A
2	Input-B
3	Ground
4	Output-A
5	Output-B
6	Oscillator Base
7	Oscillator Emitter
8	V+

Table 1. The NE-602's pinouts.

to the noninverting input (+IN) through a voltage divider (R9/R10).

The oscillating frequency of the 741 is set by a 180 degree phase shift network consisting of C15, C16, C17, R12, T13 and R14. When combined with the 180 degree phase shift caused by connecting the 741 in the inverting follower manner, the network will produce the 360 degrees needed for oscillation. The oscillating frequency is set by:

$$\text{Equation 3:}\quad F_{Hz} = \frac{1}{2\pi\sqrt{6}\,RC}$$

where R = R12 = R13 = R14, and C = C15 = C16 = C17. With the values shown in Figure 4, the circuit oscillates at a frequency just under 400 Hz. The feedback resistor (R8) should have a value that is at least 29 times the value of R used in Equation 3.

If you want to be able to turn the modulation on and off, then insert the switch shown in the inset to Figure 4 at the points marked "X1" and "X2."

Frequency (MHz)	C1 (pF)	C2 (pF)
0.5	150	2000
1.0	68	470
5.0	45	220
10.0	32	100
20.0	22	50
30.0	18	47
50.0	14	22

Table 2. Capacitor values for oscillator circuits.

Results

As the old proverb says, the proof of the pudding is in the eating. Photos B, C and D show oscilloscope photos of the waveforms in this circuit. The 10 MHz RF carrier is shown in Photo B (although at a different time base than Figure 2); this signal appears at point "A" in Figure 4. The audio modulating signal appears at point "B," and is shown in Photo C. Finally, the modulated RF signal from the output of IC2 (point "C") is shown in Photo D. 73

Parts List

IC1	NE-602
IC2	MC-1350P (or NTE-746)
D1	Red LED
Y1	Crystal frequency of your choice
R1,R9,R10	10k resistor
R2	1.2k
R3,R4	3.9k
R5	4.7k
R6	820 ohm
R7,R11	20k potentiometer
R8	82k
R12,R13	2.7k
C1	0.022 µF capacitor
C2,C8	0.1 µF
C3	68 pF
C4	100 pF
C5	8-80 pF variable
C6,C9,C14	0.01 µF
C7,C15,C16,C17	0.068 µF
C10	10 µF/35V electrolytic
C11,C13	0.05 µF
C12	3.3 µF electrolytic
S1	SPST switch
L1	47 µH Digi-Key TK-3922
SK1	Crystal socket
B1	9-volt battery

Misc: Battery clip, case, PC board. A blank PC board is available for $4.50 + $1.50 shipping from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

The Copper Cactus

Continued from page 10

With the help of Bob Post N7KUC, preliminary tests were run in the field. Tom Ring WA2PHW, my friend, just had to try his new MININEC program (written by Brian Beezley K6STI) on the Cactus. Tom is a real pro at building antennas, and the eternal skeptic when it comes to antenna gain claims. He found the patterns pretty close to those described in other tests of similar antennas. That is, a large lobe near the horizon and several radiating at higher angles, on 2 meters. Unfortunately, Tom couldn't get the specs on 440, so we had to rely on field tests. I'm sure the radiation angle is fairly high with the "standard" Cactus, and the gain over a quarter-wave is nil on 440 MHz.

The Double Cactus seems to have a flatter angle of radiation when compared to the standard J design. The SWR curves are fairly flat, usually less than 1.5 to 1 across the band from 145 to 148 and 440 to 450. I have been running both versions of the Cactus J-pole for over two years, and I haven't seen a change in the SWR curves. You should enjoy many years of happy dual-banding with the Copper Cactus. 73

You may write John Post KE7AX at 13263 Europa Ct., Apple Valley MN 55124. Please enclose an SASE if you request information.
He gives special thanks to Russ Prince NØDAI, of The Consulting Mac, *and to Bob Post N7KUC and Gary Rogers WR7L.*

73 Review

by Gordon West WB6NOA

The Radio Shack HTX-202 2 Meter FM Transceiver

This full-featured HT is ideal for beginners, as well as for experienced hams.

Radio Shack
700 One Tandy Center
Fort Worth TX 76102
(817) 390–3011
Price Class: $260

More than 7,000 Radio Shack stores nationwide now carry the new Realistic HTX-202 2 meter hand-held transceiver. Priced under $260, sales are expected to be booming for this full-featured, easy-to-operate HT. Radio Shack has been an excellent source for up-to-date study guides for the ham license, as well as offering their popular 10 meter SSB rig. With this new addition to their growing ham radio lineup, Radio Shack now focuses on the no-code Technician Class operators and their need for a quality 2-meter HT.

Photo B. The LCD screen is easy-to-read in daylight, but too poorly back-lit for nighttime viewing. The big keyboard makes it easy to push the buttons.

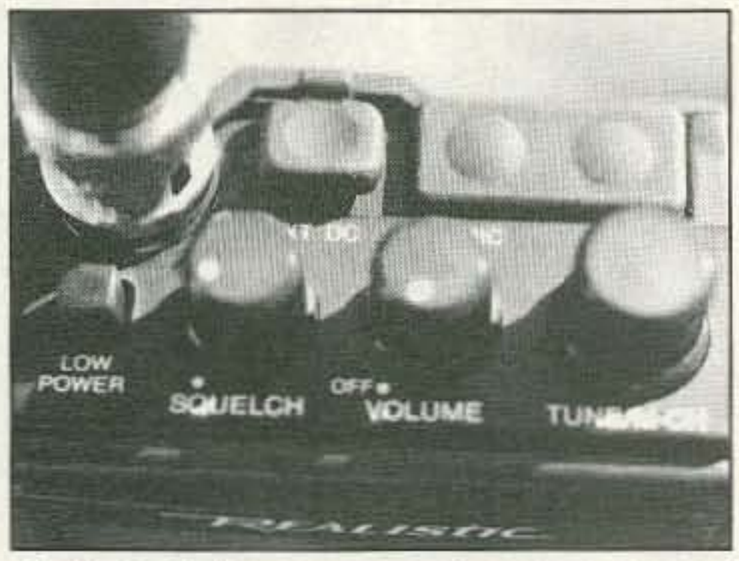


Photo C. Rubber stoppers keep out dirt and moisture.

A Complete Package

The Radio Shack HTX-202 2 meter handheld comes packaged in a colorful blue display box. On the outside of the box, in big print, is printed: "ATTENTION! IT IS ILLEGAL TO TRANSMIT WITH THIS TRANSCEIVER WITHOUT HAVING A VALID FCC AMATEUR RADIO LICENSE OF APPROPRIATE CLASS."

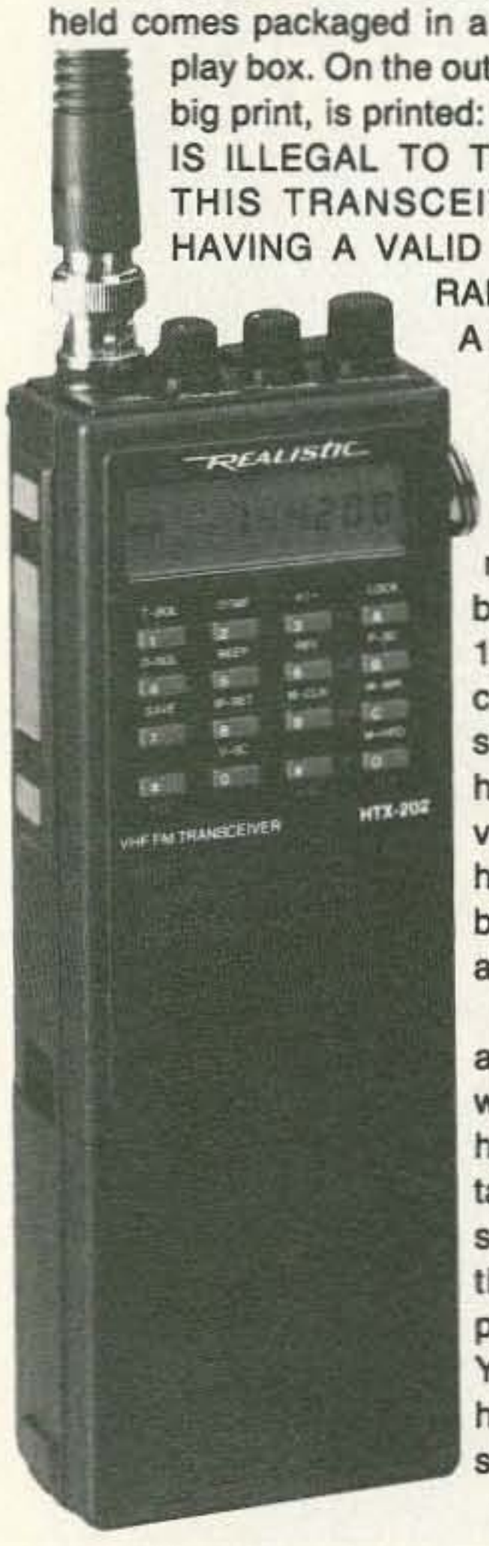


Photo A. The Radio Shack Realistic HTX-202.

The unit is shipped with a rechargeable nickel cadmium battery, a 100 mA 12-volt DC wall charger, and a snap-open alkaline holder for six 1.25 volt AA cells. The holder is included, but the dry cells are an option.

Also included is a metal belt clip which doubles as a heat sink. It is attached by two tiny screws, held in their own plastic protective pouch. You also get a handy carrying strap which attaches easily to the right side of the transceiver.

You will need to charge up the nickel cadmium battery pack before you begin learning to use this new set. The supplied rechargeable pack is rated at 7.2 VDC, with 600 mAh capacity.

On the back of the Radio Shack battery is a little red LED that illuminates when the battery is charging up.

This battery setup is almost identical to the batteries found on the big ICOM HTs, like the IC-2GAT series, and the older IC-02 and IC-2 series. In fact, I found that the BP-2–BP-8 series fit right onto the Radio Shack set, and will power up the Radio Shack unit just as if it had its own battery on. But these batteries are not absolutely interchangeable—the Radio Shack supplied NiCd battery firmly snaps and locks on; the ICOM batteries simply slide on, without actually locking. However, the ICOM base rapid charger will not fast-charge the similar style Radio Shack battery because the pack has no indentations on the bottom. It's best to stick with the wall charger that is supplied with each Radio Shack HT. Even though the ICOM packs fit, they would require their own charger for a quick re-charge.

Power On

When you turn on this 2 meter handheld, you can't help but notice the powerful audio output. The relatively large speaker and good acoustic design make the HTX-202 one of the loudest ones I've ever tested. With a big 12-volt pack on the bottom, we registered over 1 watt of audio output available at the speaker/earphone jack, with two percent distortion. The audio circuit also rolls off any CTCSS tone

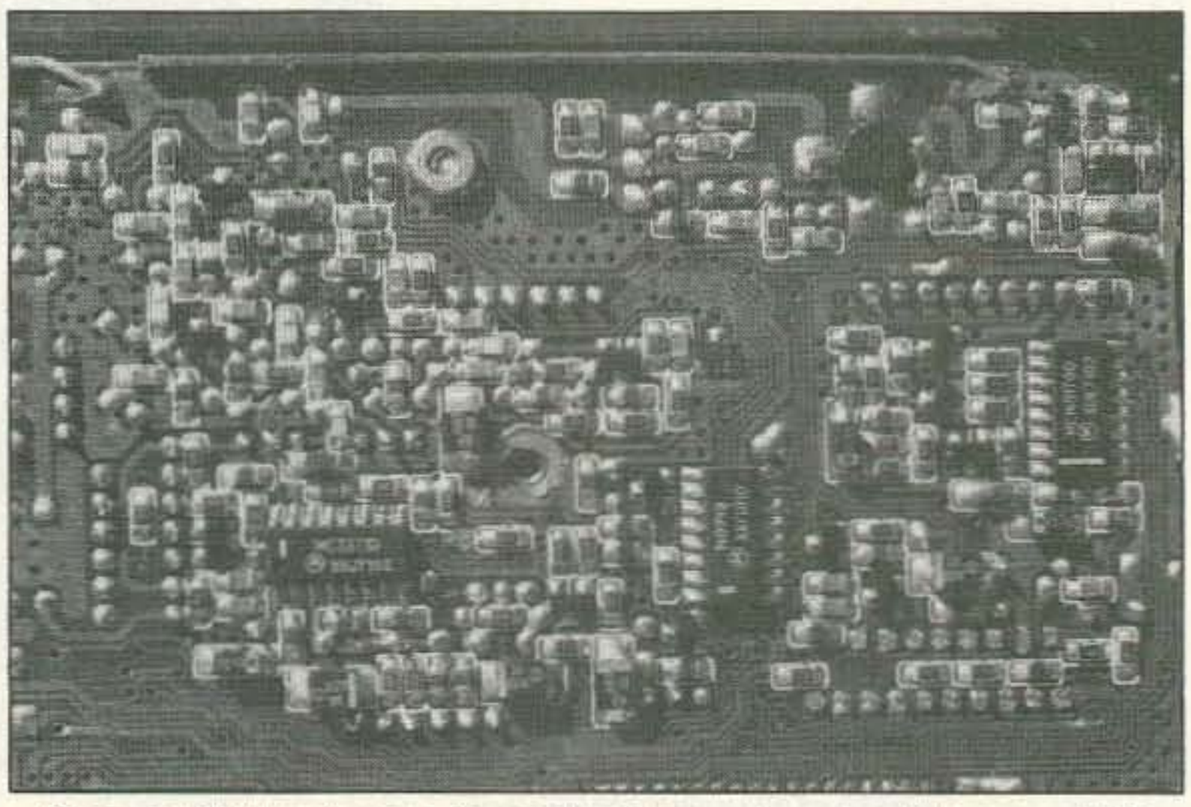


Photo D. SMT technology is used to fit a great receiver into a small HT.

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CIRCLE 28 ON READER SERVICE CARD

that may ride along with the 2 meter signal. This allows the unit to drive a relatively large speaker without the recovery of PL hum.

The unit powers up from a complete reset on 144.200. This frequency also comes up out of the first memory on a cold start. I'm not sure how the weak-signal gang will appreciate this—an FM power-up smack dab on the national SSB calling frequency. Most sets reset to 146.000 on turn-on. Of course, you can always write over the memorized Channel 1 at 144.200 and the set will come back on to the channel you left it on after an initial power up and QSY. But since the set is going to be sold to beginners, I would hope that they don't think that the memorized Channel 1 at 144.200 is their "home channel," and start using it for simplex operation.

I reconfirmed this by following the reset procedure outlined in the manual: "Press and hold down the function key and the clear key, and then power up the transceiver. It beeps twice, and you're on 144.200, simplex, FM."

Selecting a new frequency is easy with the HTX-202. You can electronically scan up to a higher frequency from 144.200 via the scan up or down buttons. You could also punch in a particular frequency by entering the last MHz number and the remaining numbers. For 146.940, simply press 6-9-4-0 and you are there. You can also manually rotate the tuning knob on the top of the radio to get up to another frequency.

The tuning knob defaults at 20 kHz steps. That's fine for some parts of the country, but out here on the West Coast some of our repeaters are spaced every 15 kHz. No problem with the HTX-202—a simple keystroke gets you into the main menu for presets, and the following defaults are all changeable: duplex offset; TX CTCSS tone; RX CTCSS tone, plus decode off; frequency step; scan resume time; scan delay time; lower scan range limit; upper scan range limit; vacant channel scan direction; power save duty cycle; transmit inhibit; transmit time-out; priority frequency channel look-back time; touch-tone auto reply.

Some pretty interesting stuff here—you can run separate TX and RX CTCSS frequencies, and included in the package is the full encode/decode capability. Be sure to read their addendum sheet that describes how to turn off the decode mute because when you push the tone squelch button on the front, your receiver instantly mutes for full decode. Most folks won't want full duplex or simplex decode, so I suggest you shut down that default option so you can listen with your regular squelch control.

I also liked the capabilities of the four different power save duty cycle sets, and depending how active or inactive your local repeater group is, you can tailor your sample rate just the way you like it. And a transmit time-out timer—great idea in case you should accidentally sit on the remote mike.

Measurements

TX/RX range	144.000 MHz to 148.000 MHz, with no modification available for out-of-band reception due to extremely tight band-pass filtering for superior out-of-band interference rejection.	
Microphone input condenser	1.2K ohms	
Size	2-1/2″ wide, 4-1/2″ high, 2″ deep	
Weight	1 pound, 3 ounces	
Receiver	First IF	21.4 MHz
	Second IF	455 kHz
Sensitivity (12 dB sinad)	0.085 µV	
Squelch sensitivity	0.094 µV threshold, 9.7 dB tight above threshold.	
Spurious response attenuation	81 dB	
Intermodulation attenuation	74 dB	
Adjacent channel rejection	25 kHz, 72 dB	
Audio output power, 10% THD, supplied rechargeable battery		0.39W
Audio output, external 12 VDC		1.2W
Current consumption, stand-by, power save		23 mA
Current drain, stand-by, no power save		35 mA
Transmitter RF output, supplied rechargeable battery		2.8W
Transmitter power output, 9V alkaline batteries		4.6W
Transmitter power output, 12 V DC external		5.6W
Transmitter power output, running car at 13.8 volts DC		6.4W
Low power		1.5W
Deviation measured		4.7 kHz
Frequency error measured		87 Hz high
CTCSS tone deviation		0.49 kHz
DTMF tone deviation		3.94 kHz
TX current drain, supplied rechargeable battery		0.87 amps
Current drain, external 12 V DC source, high power		1.17 amps
Current drain, low power		1/2 amps
Distribution	All Radio Shack stores	
Ease of operation	Friendly, but no auto offsets and buried sub-functions requiring book reading.	
Weather resistance	Rubber stoppers on top, and neoprene O-ring around back heat-sink lip.	
Internal construction	Surface mount technology.	
Memory keep-alive circuit	Lithium battery, minimum 5-year battery, depending on use.	
Accessories	Available at Radio Shack, and some compatibility to ICOM products.	
Most needed improvement	Smooth out PLL performance to eliminate annoying "thunks" in reception.	
Best feature	Extremely hot receiver, with no found birdies or intermodulation or out-of-band interference.	

Scanning and Setting the Offset

When you first get this set, you will probably want to begin memorizing some active repeater frequencies. You can either look them up in a book, and start punching away at the key pad, or scan up and down for activity. You can set your scan limits, and just push the "up" or "down" scan buttons, and away it goes. If you don't change the presets, the scanning receiver will lock onto an active channel, and hold on that channel as you set it up in the menu. It could hold up to 10 seconds, and then go on scanning regardless of absence or presence of the carrier. You can also resume scanning after the carrier drops, and the scan delay time which you preset expires. Or, you can go to the main menu, and go to a scanning stop mode where the unit seeks out a signal, and then locks on and holds, even though the signal disappears.

I found that scanning in 5 kHz steps could sometimes have the unit stop on a repeater prematurely. This is why it's best to set your tuning step range to agree with the local repeater band plan and simplex plan in your particular area. This way, when the scanning stops, you are on channel.

Once you have found a popular repeater, your next step is to access that repeater with the right offset and a subaudible tone. The ARRL repeater directory, or locally published directories, are a handy way to find those favorite repeaters in your local area.

An offset of 600 kHz is the default on this 2 meter unit, so you don't need to go to any trouble to dial this in—it's already there. Just hit the "±" button to come up with the right direction of the offset. The "minus 600" offset is most common in the U.S. on frequencies below 147 MHz, but your first push of the "±" button brings up a plus offset. There are some repeaters above 147 that do take a plus offset, but I was surprised to find that this was the first offset to come up when I pushed the button. Most other handhelds normally start off with a minus offset, the more common offset. If you need an oddball split, you can easily dial in any split of your choice from the menu.

At this point you have a frequency in the VFO, such as 146.940, and you have punched the offset button a second time to get to a minus offset. So far so good. Briefly transmit, giving your callsign, to make sure the unit drops down 600 kHz. Now it's time for the CTCSS tone.

The Radio Shack manual has a nice section on how to program CTCSS for both encode and decode. You input the tone by the exact tone frequency in hertz. This is nice. No more of this business of the number 21 standing for 136.5, etc. If you want tone 4Z, use the book to find out the actual frequency in hertz, get over to the menu for setting different operating parameters, and then cycle over to CTCSS transmit. Next, rotate the top knob for the right encode tone, then cycle to the CTCSS decode function and rotate the top knob so it reads "off." Many repeaters don't output a CTCSS tone so, unless you want your handheld to stay strangely silent, follow the addendum and keep your decode turned "off."

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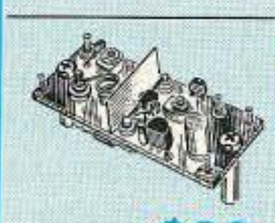

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LNS-(*) IN-LINE PREAMP

ONLY **$89** kit, **$119** wired/tested

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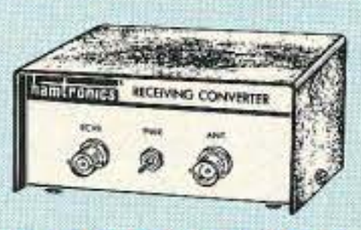

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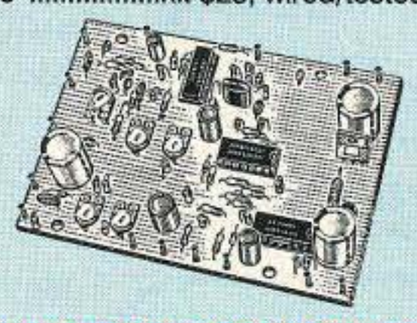
ACCESSORIES

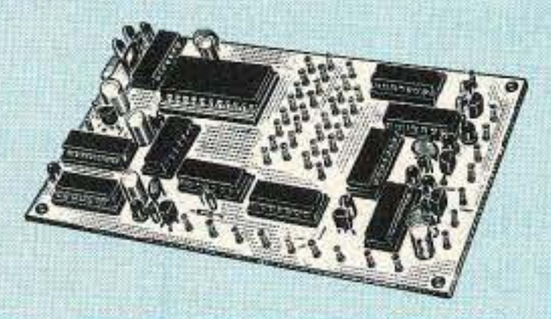
TD-3 SUBAUDIBLE TONE DECODER/ ENCODER. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions .....kit $29, wired/tested $69



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

CWID. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 .....kit $59

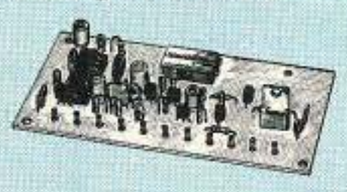
COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call kit $99 , w/t $159



TD-2 TOUCH-TONE DECODER/CONTROLLER kit. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired/tested $149

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

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



MO-202 FSK DATA MODULATOR kit. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. .....kit $49, w/t $79

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Other models available:

REP-200V Economy Repeater Kit. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795.**

REP-200N Repeater with no controller. For use with external controller, such as those made by ACC. **Kit only $695, w/t $995.**

- Available for the 143-174, 213-233, 420-475, 902-928 MHz bands. ***FCC type accepted for commercial service*** *(vhf and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 15W (25W option)143-174 MHz; 15W 213-233; 10W uhf or 902-928MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
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- **AUTOPATCH**: either **open or closed** access, **toll-call restrict**, auto-disconnect.
- **Reverse Autopatch:** two types, auto-answer or ring tone on the air.
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- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts hold covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.

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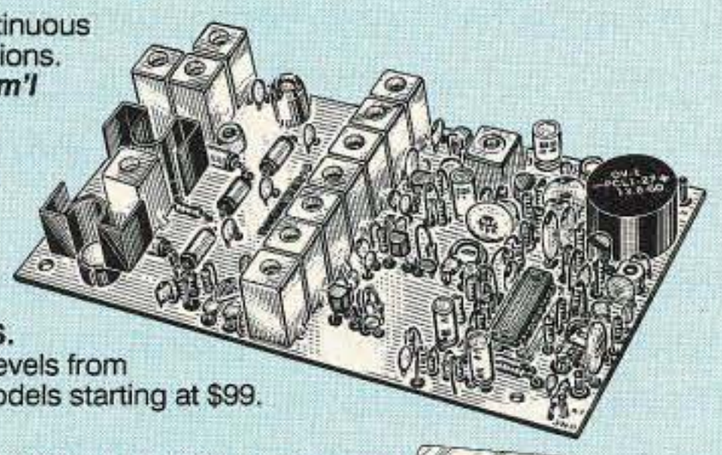

- **TA51**: 143-174, 213-233 MHz ...kit $109, w/t $189.
- **TA451**: 420-475 MHz ...kit $109, w/t $189.
- **TA901**: 902-928 MHz, (0.5W out); w/t $219.
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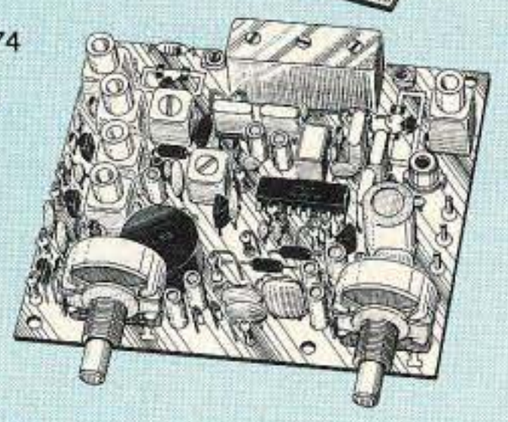
FM RECEIVERS:



- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift. ...kit $149, w/t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w/t $219.
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion, GaAs FET front end. ...$169, w/t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w/t $219.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w/t $219.

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CIRCLE 57 ON READER SERVICE CARD

A little "function button" in the upper left-hand corner lets you get at the subfunctions behind the numerical and ABCD keypad. You really have to push hard on it, and this is probably a good thing—you don't want to get into the sub-set mode accidentally.

Now you have the receive frequency, the proper offset, and the proper encode tone; and you have decode turned off and you've selected tone squelch for transmitting the tone. You push the transmit button and sure enough, the repeater comes up and IDs. Give your callsign on the air, and then get ready to store this in your first memory. You want to write over that first memory so you don't ever accidentally transmit FM on 144.200.

Memory Channels

The HTX-202 has 16 memory channels, in three groups. You have one channel for your call frequency, three priority channels, and then 12 additional channels. You can mix and match almost everything within these channels. Unlike older handhelds, what you put in Channel 1 doesn't necessarily lock you into tones or offsets in the other channels.

Memory input is easy—press and hold the function button, and rotate the big knob to the memory channel you want to store. Continuing to hold the function button, go to the channel you want to write into, or write over, and simply press the "C" button, which is the "M-WR" or memory write button. Hold it in long enough for a double beep, and then release the works and push "C" by itself to get into the memory recall mode. Presto—everything you had in the VFO as a repeater "package" is now in your selected memory channel. The only thing that might trip up the newcomer is not holding the memory write button long enough—if you don't hold the button for the double beep the channel won't be written in.

After programming several memory channels, I double-checked to see how everything was going and noticed something very interesting on those memory channels with CTCSS tone on encode. After pushing the PTT button, the transmitter would hang on for approximately a second before cycling off to receive. Same thing on simplex with the tone squelch encode turned on. Possibly the extra hang time gives the operator a little bit more time to start punching in DTMF tone numbers without having to continuously push the PTT button. As soon as I turned off the tone squelch function, the PTT cycle time was identical to PTT pushing time. It almost goes unnoticed, but if you're communicating through a repeater that requires CTCSS, you'll begin to see that your transmit hang time is about a second longer than when you release the push-to-talk button.

In addition to the 12 channels of fully-programmable memory, the Radio Shack HTX-202 transceiver has three additional priority-frequency memories. To get into these memories you push the "B" button instead of the "C" button. A nice feature is the priority check mode. You can set it up so you are operating on a VFO setting for a particular simplex or repeater channel and automatically have the scanner check the priority frequen-

cy memories every four seconds. You can even change the scan time, too.

There is no way to lock a particular memory channel out of the scanning program. Same with priority—once there is a frequency memorized in one of your scan slots, the only way to skip over it is to completely erase it from the memorized lineup. But if your local repeater outputs its PL, you can customize your scanning by turning on your full decode function so that the unit stops only when it detects the right PL outbound tone.

I tried the power saver mode, and it helps conserve the battery if you are monitoring a frequency that has little activity. You can set the power-save setting to four different sample rates during its 1/20 second frequency activity check.

DTMF Capabilities

During transmit, the 16-key pad sends out DTMF tones. The A, B, C, D buttons are also active for control operator functions on certain repeaters. To manually send out the dual tones, push the PTT button, and then punch away at the key pad. You will hear the encoded tones come out of the speaker, too.

"In the pager mode, your unit is absolutely silent until someone dials up your specific five-digit code."

There are five DTMF memory positions to store up to 15 digits. This is handy if you regularly use your local repeater for autopatch capabilities. Position 1 might be the autopatch turn-on tones, Position 2 might then send out your spouse's phone number, position 3 might be your mother-in-law's phone number, position 4 your Mom and Dad, and position 5 remain available for a friend. Remember, *business communications* are forbidden on the 2 meter band, so you would not store any business phone numbers or ever try to call a business.

A nice feature is the "auto-reply" which is a very strange name for a very common function: the capability to begin manually sending tones, and to release the PTT button and keep punching away at the tones while the transmitter stays turned on. After the last tone is entered, the unit stays on for about two seconds and then drops off TX. I checked to see whether or not this added feature had any bearing on the one-second TX hang time encountered when PL encode was turned on, but I found no interaction.

Touch-Tone Pager

This transceiver also uses the DTMF capabilities as a self-contained pager. You can enter up to five digits for your own private pager code. In the pager mode, your unit is absolutely silent until someone dials up your specific five-digit code. Your unit then jumps up on receive and beeps. You can even set this unit to automatically transmit the dual-tone digit "#," a wild-card universal function, to let the other transceiver know it has successfully triggered your five-digit DTMF code.

Using any 2 meter transceiver as a pager for individual or group calling requires plenty of fun and games with some friends to fully understand the advanced features that more and more 2 meter sets have in this configuration. Run your sets on low power and figure out all the neat things you can do to signal an individual, or a group of friends, using the wild-card function, and getting their sets to transmit back a confirmation tone. You won't find all the details on how to actually do this in anyone's instruction manual—I have read them all, and it's a complex set of keystrokes until you finally get the hang of it. But once you do, your 2 meter set from Radio Shack will easily join in on a system that is already set up using DTMF paging tones.

Overall Impressions

While this is not an over-complicated radio for beginners, it will allow the new Technician class operator to grow into some of the advanced functions found behind the menu setting. Trial and error, plus rereading the instruction manual, will help.

The instruction manual is short, concise and well-written, and contains only a few errors. (It talks about reversing an offset, referring to the frequency of 146.94, with the input at 146.14. Wrong. It should have read "146.34," as listed properly a few pages later in the duplex separation default section.)

"The ARRL staff helped us prepare this section of the owner's manual, and they would

Continued on page 44

Colombian Expedition

Adventure in the Andes.

by Milton C. Toby KC4VLN

Operating mobile anywhere can be tricky, and most hams are familiar with the usual technical and logistical problems and solutions. In Colombia, South America, mobile operation presents some unique hazards as well: police roadblocks, guerilla warfare, and having your identity and intentions suspect. The deserted gravel road turns out to be deserted because one of Colombia's alphabet soup guerrilla groups is using it. The antennas sprouting from the roofs of your two-car caravan arouse suspicion that you are "narcotraficantes."

There are also unique rewards in operating from this exotic location. During one four-day trip we were able to share the magic of amateur radio with students at two rural schools high in the Andes Mountains. At another time we chatted with a small but dedicated group of amateurs in the United States who were tracking our progress.

Making Quality Contacts

The trip to Colombia was not a DXpedition in the classic sense of the word. At the time, everyone in our group—Phil KI6SA/HK3, Jim HK3AVR, Roy N7KLH/HK3, and Milt KC4VLN—was living in Colombia. Also, Colombia is not really a rare DX country, and we did not set out to make hundreds or thousands of contacts. Instead, we wanted to have a few quality QSOs, longer chats that would give us the opportunity to share with other amateur operators a little bit of Colombia. The country has much more to offer than drugs and violence, and our trip was an excuse to tell that to people whose perceptions of the country might have been formed solely by Miami Vice reruns.

We also wanted to shrink the world a little for some Colombian school children, giving them the chance to talk with kids in the States. We wanted to operate from the ruins of Armero, then climb Nevado del Ruiz, the volcano that erupted and buried the town in 1985. We wanted to transmit from as near the summit as we could get, and we wanted to try operating with a kite-borne antenna system sometimes used by the Colombian Red Cross.

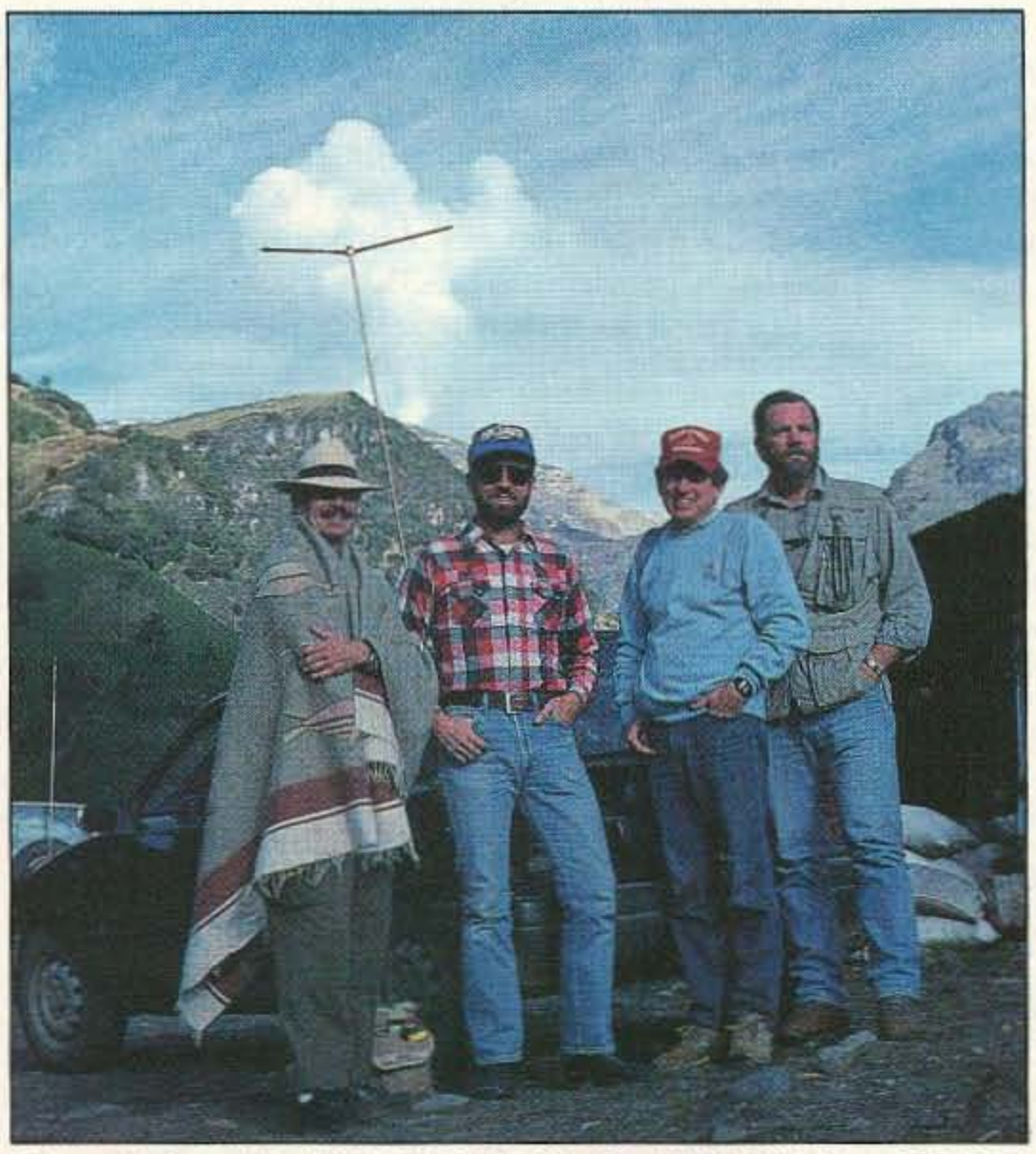

Photo A. L. to R.: Phil KI6SA/HK3, Jim HK3AVR, Roy N7KLH/HK3, and Milt KC4VLN, with Nevado del Ruiz volcano in the background.

Photo B. L. to R.: Bishop Jose Luis Serna, a new amateur radio operator; a student at the Murrillo school, the Colegio Francisco Jose de Caldas; and Phil. The kids at Murrillo chatted with the kids at Longwood Middle School in New York for almost an hour.

Overall, we did pretty well. The kite project literally never got off the ground, but everything else worked more or less as planned. We negotiated the roadblocks with no problems, avoided the guerrillas, and were able to make a number of the kinds of contacts we were hoping for.

Murrillo

Our first stop was in Murrillo, a town of some 1,500 people high in the rich coffee country several hours' drive west of Bogota, the capital of Colombia. Murrillo's school, the Colegio Francisco Jose de Caldas, has 200 students of all ages, and they all seemed to be waiting in the schoolyard for our arrival. During a QSO with Len WA2LLG the day before, he had sugested we try to contact the Longwood Middle School in New York, where there is an active radio club operating on 10 meters most days.

Len handled the advance work for us through his contacts at the Longwood School, and the students there were ready with questions when we established contact. The first question for the Colombian kids, predictably, was about Juan Valdez and his burro. But the successful ad campaign to promote Colombian coffee in the United States is not seen in Colombia; they did not know of Juan Valdez. Their experience with coffee was more immediate. While they talked to the States, two groups of coffee-laden burros led by the real-life counterparts of Juan Valdez passed the schoolyard.

With several different people acting as translators, the kids in Murrillo chatted with the kids in New York for almost an hour. They exchanged information about their schools, geography, and respective hometowns. For a while the Andes and Long Island were a lot closer than a map might suggest.

In the afternoon we drove farther up into the mountains, to the Escuela Rural Mixto "Santa Barbara" at 11,100 feet. A tiny school with perhaps 30 students, the Escuela "Santa Barbara" was closed the day we were there, but 15 students showed up anyway for our radio demonstration. With a dipole in the schoolyard we made a brief contact with Spain, then worked Marty HH5MV in Haiti for more than a half hour. Fluent in Spanish and English, Marty was a perfect contact for the few kids who were brave enough to talk. Pedro Valencia, a ruddy-faced four-and-a-half-year-old, was the least intimidated, and after just a little prodding, he worked Haiti like a pro.

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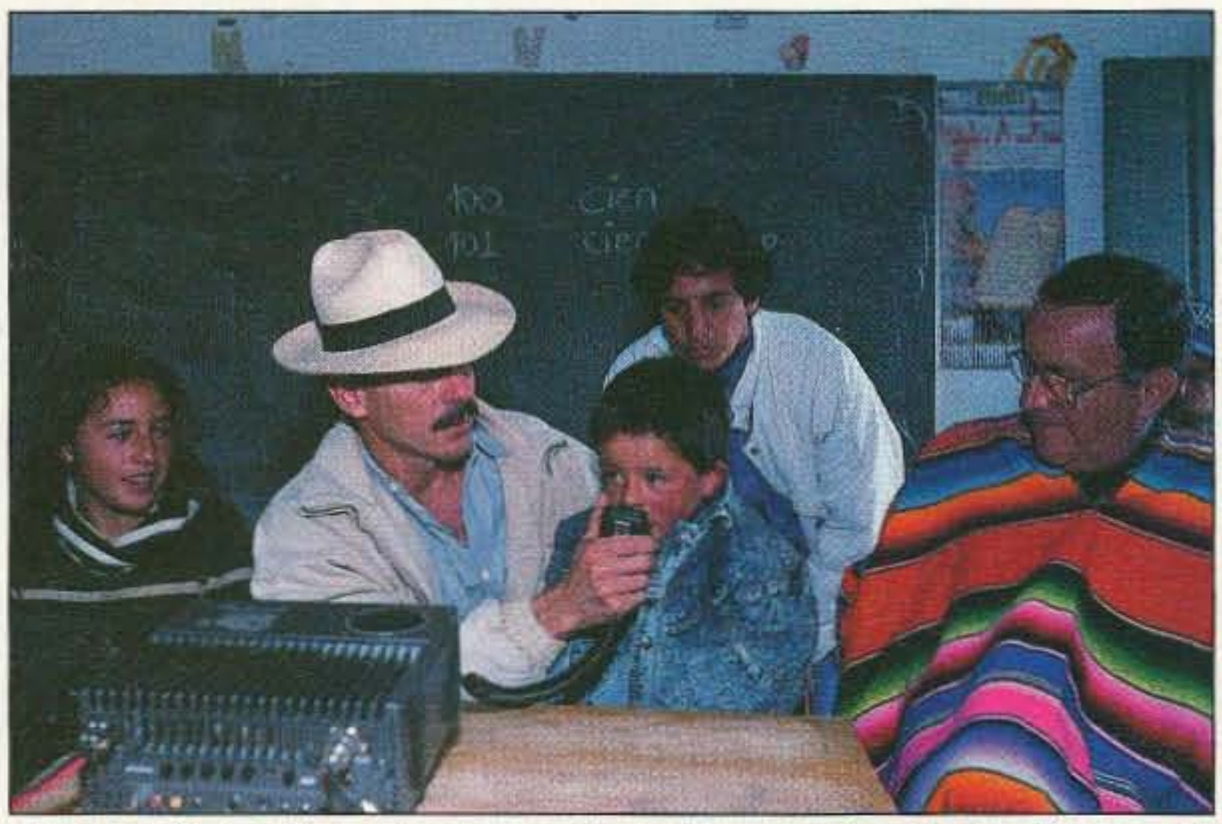

Photo C. Pedro Valencia, four and a half year-old student at the Escuela Rural Mixto "Santa Barbara," talks to Marty HH5MV in Haiti.

The visits to the two schools were arranged for us by Bishop Jose Luis Serna, head of the Catholic Church in Tolima Department, and a brand new amateur radio operator. We spent two nights at the bishop's house—a renovated hospital in Libano where, during an earlier trip, Phil had helped the Bishop get his modest shack operational.

The equator bisects Colombia a little south of Bogota, but the country is not always the tropical paradise geography might suggest. Three chains of the Andes Mountains run through Colombia, and the weather is more a factor of altitude than latitude. Several volcanos are in the 5,000 meter (16,000-plus feet) range and it was one of those snow-covered volcanos, Nevado del Ruiz, that a few years ago erupted and caused one of the worst disasters in Colombia's history.

Armero

On the night of November 5, 1985, after most of Armero's 50,000 residents had gone to bed, Ruiz erupted. It was not a major eruption, but the hot gases melted most of the volcano's snow cap, and a swollen river of mud and rocks roared down into a valley on the mountain's eastern slope. Twenty miles away, at the foot of the mountains, the valley opened onto Armero. The town vanished under a sea of mud, and 20,000 people lost their lives.

Today, Armero is deserted. The second floors of a few wrecked buildings jut out through the dried gray mud, and hundreds of white crosses dot the landscape, silent reminders of the people who died there almost six years ago.

We arrived in Armero in the afternoon, with the temperature and humidity both in the 90s. We managed to make a few contacts, mostly on 10 meters, before fleeing the heat. A few of the people we spoke with had some vague recollection of the disaster, usually through photographs on the covers of news magazines, but no one realized the extent of the damage or the number of lives lost.

Nevado de Ruiz

We left for Ruiz early the next morning, and our first glimpse of the volcano was one of spectacular beauty. Climbing into the mountains, we rounded a sharp bend in the road, and in front of our cars was Ruiz. Its snow-covered peak was bathed in warm morning light, a glowing jewel among the shadows. As we climbed higher and got closer to Ruiz, we crossed the valley where six years earlier a churning wall of water had destroyed everything in its path. Some vegetation was starting to grow again, but for all practical purposes the valley was dead, just like Armero.

Ruiz lies in a national park that for several months had been closed to the public because of fear of another eruption. As we approached the park, we could see clouds of smoke and steam rising from Ruiz' crater, and we wondered how close we would get. We planned to operate from as near the top as we could, which meant driving in as far as possible, then proceeding on foot. But first we had to get into the park.

Colombia's bureaucracy is average by Latin American standards, but maddeningly inefficient when seen through the eyes of a group of gringos. We had started the paperwork needed to get park permits weeks in advance, and we had been assured that everything was in order, but when we arrived at the lone park gate, the guards had absolutely no idea who we were.

A radio call to the park authority offices in Manizales, a day's drive away, yielded little. But there was one peson who thought he remembered hearing something about someone who wanted to take some radios into the park. It was not much to go on, but it was enough for the guards. The responsibility for our visit was not theirs anymore, and they sent us on with their blessings.

We were still in two vehicles, a Mitsubishi Montero four wheel drive that was well-suited to the ever-worsening road, and a tiny Chevrolet Sprint that was bottoming out on every rut and struggling in the thin air. We abandoned the Sprint at 14,200 feet, piled as much radio gear as possible into the Montero, and pressed on to 15,400 feet and the end of the road.

We continued operating on the ride up the mountain, making contact with several hams who had been following our trip since the start. Thin air and occasional bouts of car sickness reduced our efficiency, and when we started mixing up our own callsigns during the QSOs, a couple of people asked if we had supplementary oxygen. In retrospect, that might not have been a bad idea.

We established a base camp of sorts at the remains of a lodge at 15,500 feet that had been destroyed by the 1985 eruption. Then three of us decided to climb higher while Phil tried to get our portable rig, an HR-2510, up and running. Roy and I stopped at 16,000 feet, while Jim made it to the edge of a glacier at around 16,500 feet. The summit of Ruiz was in sight, but out of reach at nearly 17,180 feet. We turned back when a small eruption showered us with fine ash and sulfur fumes.

We never were able to get the HR-2510 working. With clouds rolling in and the temperature dropping below freezing, we abandoned the ruined lodge and started back to the cars. We reestablished contact with the States again from the car's radios, and although the HR-2510 failure was a disappointment, we were able to make several contacts from nearly three miles high on the volcano's slopes.

We could have tried flying our kite antenna from Ruiz—there certainly was enough wind—but the bad weather and thin air dampened our enthusiasm. The next day, during the drive back to Bogota, we tried to get the kite in the air. The experiment turned into a kite fiasco, with the kite repeatedly crashing to the ground after a few seconds of flight.

It is a safe bet that few of the Colombian school children we visited ever will have the chance to visit the New York kids they talked to, and most of the amateurs from the States who tracked our progress up the volcano will probably never visit Colombia. But because of the magic of amateur radio, they won't have to. In a very real sense, they have already made those trips. 73

Milton C. Toby KC4VLN, 712 Lebanon Avenue, Campbellsville KY 42718.

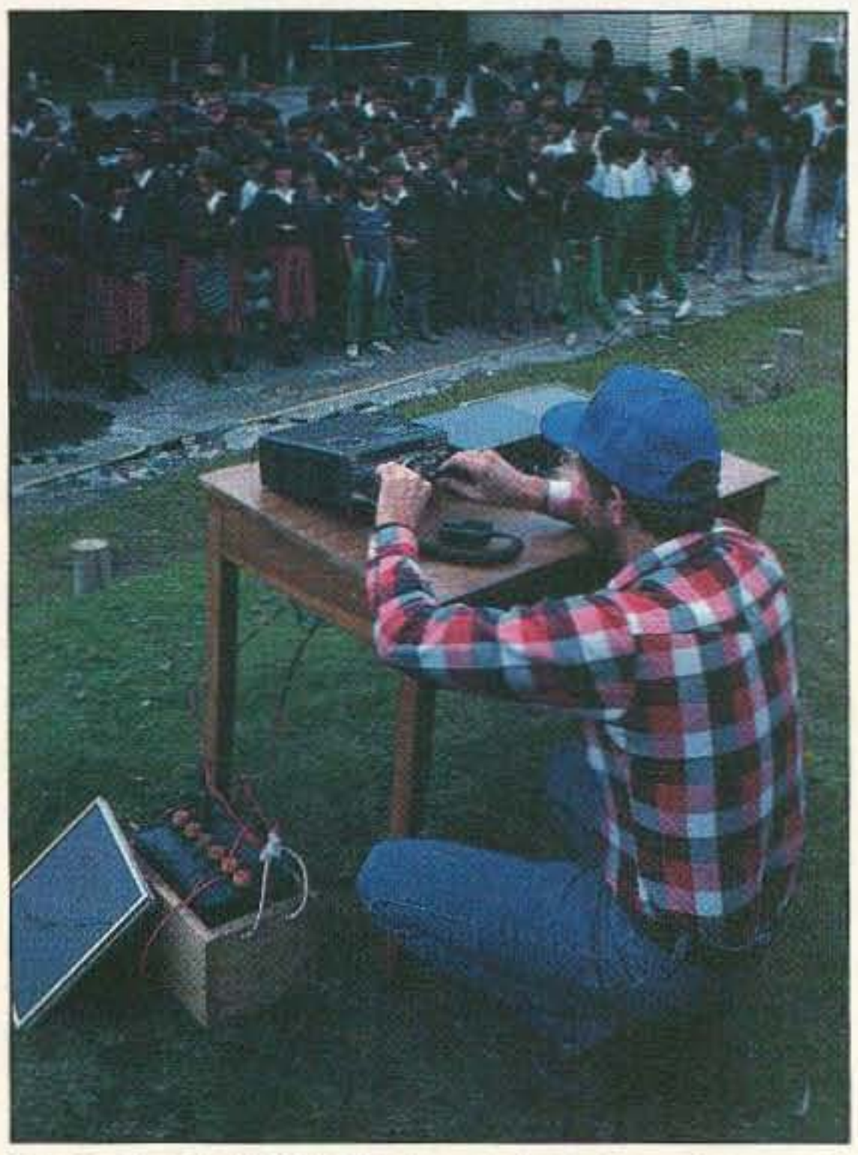

Photo D. Jim HK3AVR demonstrates amateur radio to the students at the Murrillo School.

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PVC Cubical Quad for 10 Meters

Build this $30 plumber's special!

by Wayne Mishler KG5BI

The station calling "CQ" at 28.375 MHz from Yugoslavia was out in the open and coming in S-5. I keyed the mike and called him. There was a moment of silence. Then, in broken English, he said, "Q R Zed. Station calling. You are very weak. Please try again."

I complied. No response.

Then I heard another local ham call him, and the YU came back to that guy with a 5-9 report.

For a moment, I sat staring at my transmitter, wondering what was wrong. Then I heard my competition say that he was using a directional antenna. Mine was a dipole. I felt an antenna project coming on.

In the past, I had experimented with quad antennas for 2 meters. I still had the data for those antennas, which had produced considerable gain with good front-to-back ratio and workable standing wave ratio (SWR) at the feedpoint. So I put pencil to paper and came up with the dimensions for a monobander for 28 MHz.

Much of the data came from the *ARRL Antenna Book*, 14th edition, and the book *All About Cubical Quad Antennas*, coauthored by William Orr W6SAI and Stuart Cowan W2LX.

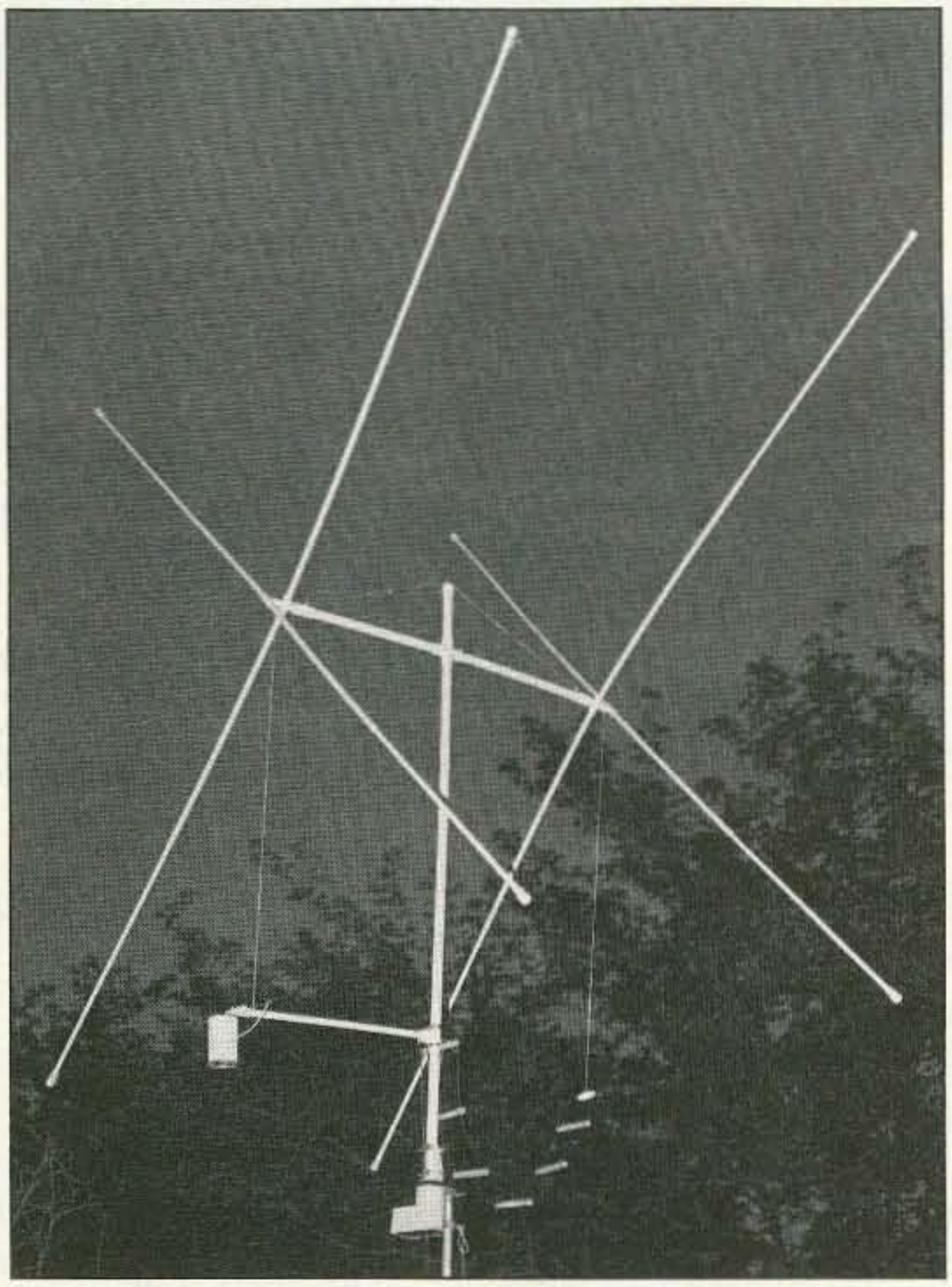

Photo A. The flexible PVC cubical quad has withstood thunderstorms and 60 mph winds.

Construction

For several reasons, I decided to use Schedule 40 PVC and wood dowels in constructing the antenna. These materials are readily available at hardware stores. They are transparent to RF, easy to work with, and resistant to weathering. (I gave the dowels that would be exposed to weather three coats of an oil-based enamel.) And the price was right. All of the materials, including antenna wire for the elements, cost about $30.

I made the boom and mast from a single 10-foot length of 1-inch PVC cut into three pieces (see Photo A and Figure 1): 1-foot, 3-feet, and 6-feet long. To make the boom, I cut the 3-foot piece in half. Using PVC cement, I glued the resulting two 18-inch pieces into opposite ends of a 1-inch PVC four-way cross fitting.

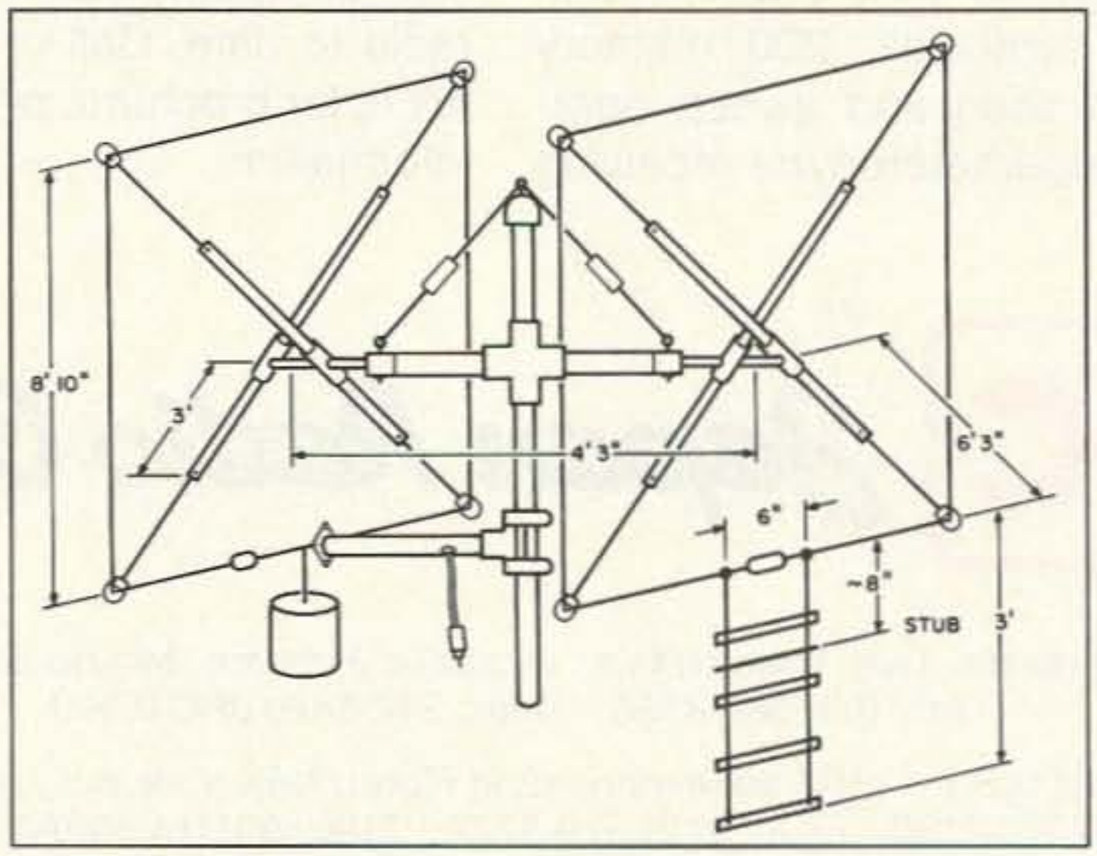

Figure 1. Layout and dimensions of the cubical quad.

I made the mast by gluing the 1-foot and 6-foot pieces into the remaining ends of the cross fitting. The purpose of the 1-foot length of PVC at the top of the mast is to provide support for the boom. Nylon string connected from the top of that piece to the spreaders helps keep the boom from bending downward.

To keep the bottom of the PVC mast from collapsing when clamped into a rotor, and to provide vertical rigidity for the mast, I inserted 1-inch dowels all the way through the mast, cross fitting, and top support piece.

At first, the dowels were slightly too big to go into the PVC. A power sander solved this problem.

Next, I drilled a hole in the center of the top of a 1-inch PVC cap fitting and installed a 3/16" x 2-1/2" eyebolt to serve as a tie-point for the nylon string that would support the ends of the boom. I then glued this cap onto the 1-foot support piece at the top of the mast.

Spreader Supports

PVC fittings hold the spreader arms (see Photo B). Both spreader supports are made the same way. Begin with a 1-inch PVC coupler fitting. Using PVC cement, glue a reduction adapter for 1/2-inch PVC pipe into the coupler. Then glue a short (1-1/2-inch) length of pipe into the adapter. Glue a cross fitting onto the exposed end of this pipe. Next, glue another short length of pipe into the opposite end of the cross fitting. Finally, glue the base of a "T" fitting onto the exposed end of this pipe and *immediately* rotate the "T" fitting until it is at right angles with the cross fitting when viewed from the end. With this last step, you'll have to work fast, because the glue sets up quick-

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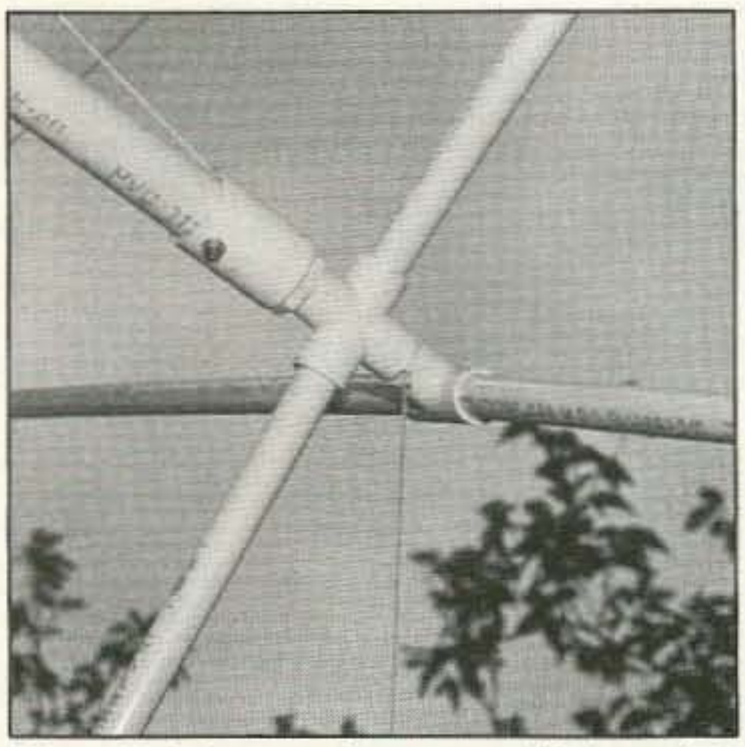

Photo B. The spreader arms, which are half PVC pipe and half wood dowels, fit into PVC fittings. The fittings are linked together with short lengths of 1/2-inch PVC pipe and glued with PVC cement. A "T" fitting is connected to a cross fitting which is connected to a 1-inch coupler fitting by way of a 1/2-inch adapter. The coupler fitting slips over the end of the boom, and is held in place with an eye bolt.

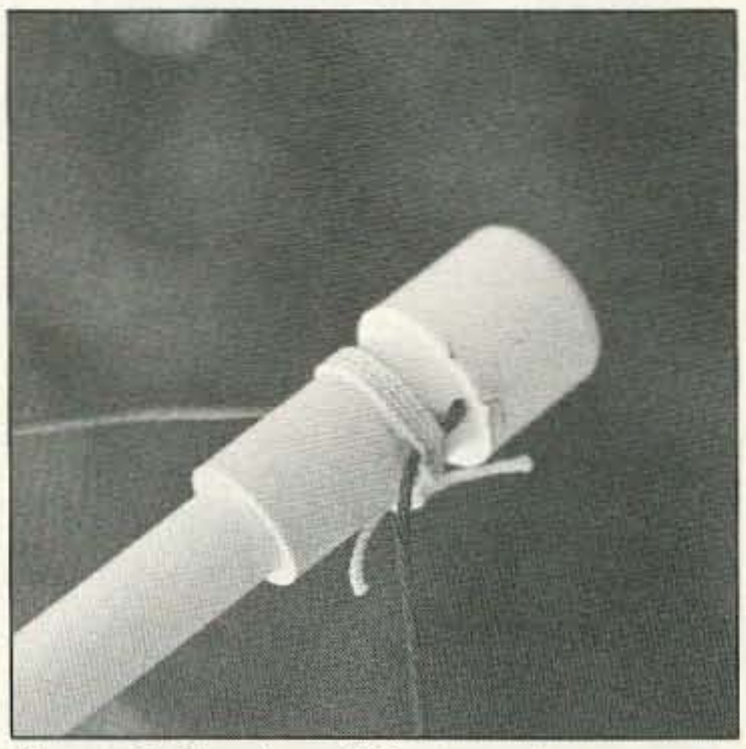

Photo C. The tips of the spreader arms are made of 1/2-inch PVC pipe, capped and drilled to accept the wire elements. The nylon string keeps the wire from slipping.

ly. Repeat the process to make the other support.

Adding Spreaders

To simplify construction, I made both elements the same size and lowered the frequency of the reflector with a tuning stub.

Begin by cutting eight 3-foot long pieces of 1/2-inch Schedule 40 PVC pipe. Insert and glue these into the fittings of the two spreader support assemblies, so they form an "X" when viewed from the end.

Select eight 4-feet long, 5/8-inch hardwood dowels, and paint them with a quality oil-base enamel. Give each dowel three coats, allowing each coat to dry at least overnight.

When the last coat of paint has dried, insert a dowel into one of the PVC spreaders until the total length, from the tip of the dowel to the center of the spreader support assembly (axis of the boom), measures exactly 6'3". Anchor the dowel to the PVC by drilling a 1/16-inch hole through the PVC into the wood, and screwing into this hole a #6 1/2-inch sheet metal screw. Repeat this process for the remaining seven spreaders.

To make tips for the spreaders, which hold the wire elements in place, cut eight pieces of 1/2-inch Schedule 40 PVC, each three inches long. Glue 1/2-inch PVC caps over one end of each piece. Next, using a 1/8-inch drill bit, drill at right angles through each pipe at the base of the cap.

Assembling the Elements

To assemble the reflector element, lay one of the completed spreader assemblies flat and place the tips on the ends of the dowels. Thread antenna wire through the holes in the tips. Each loop has a circumference of about 36 feet, so plan accordingly. After you have threaded the wire through all four tips, bring the wire together in the center of the bottom side of the loop, pull it snug, make sure that the spreaders are straight, and connect the two ends with an egg insulator. The ends of the reflector loop must be insulated from each other. Finally, wrap nylon string around the

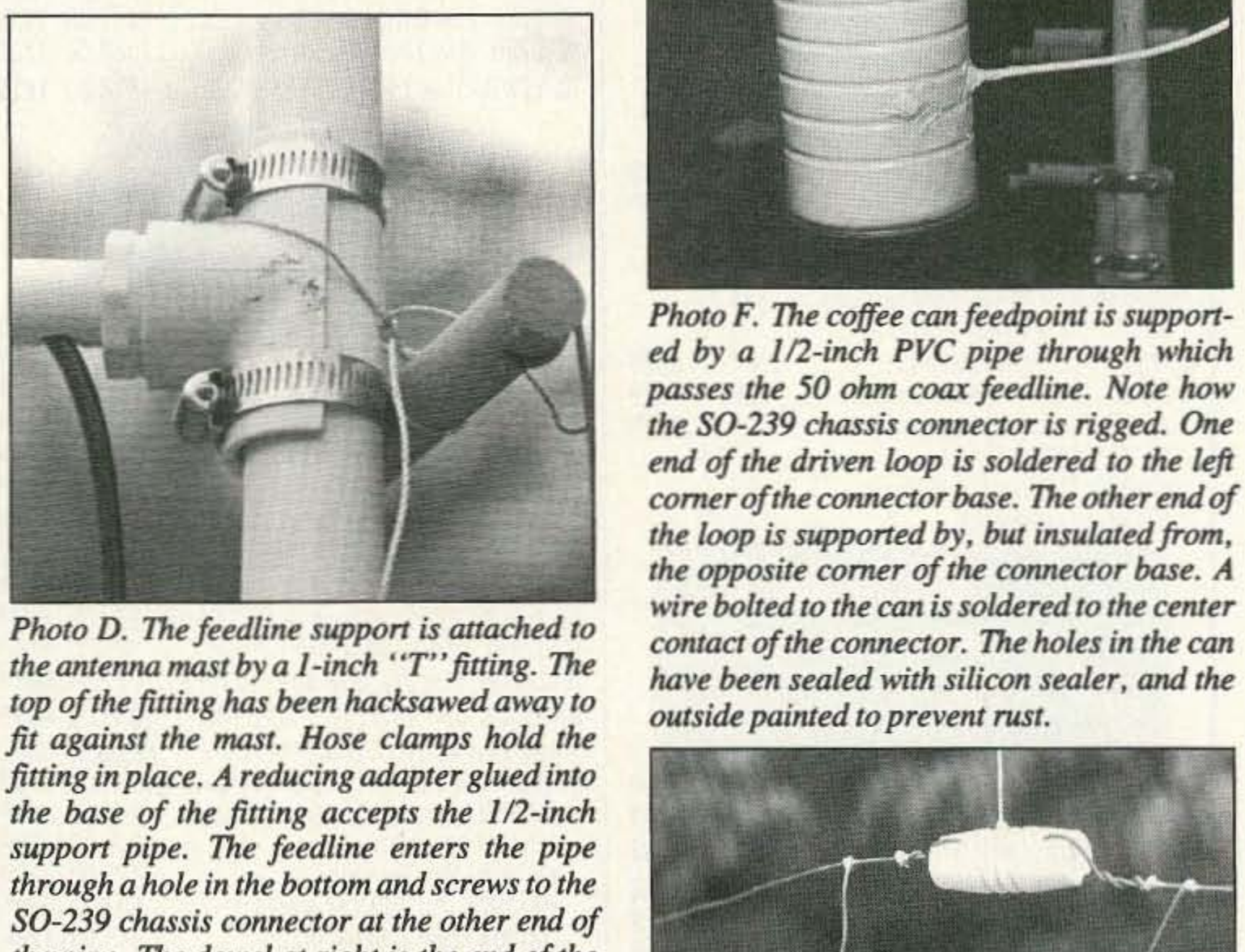

Photo D. The feedline support is attached to the antenna mast by a 1-inch "T" fitting. The top of the fitting has been hacksawed away to fit against the mast. Hose clamps hold the fitting in place. A reducing adapter glued into the base of the fitting accepts the 1/2-inch support pipe. The feedline enters the pipe through a hole in the bottom and screws to the SO-239 chassis connector at the other end of the pipe. The dowel at right is the end of the tuning stub, tied to the mast.

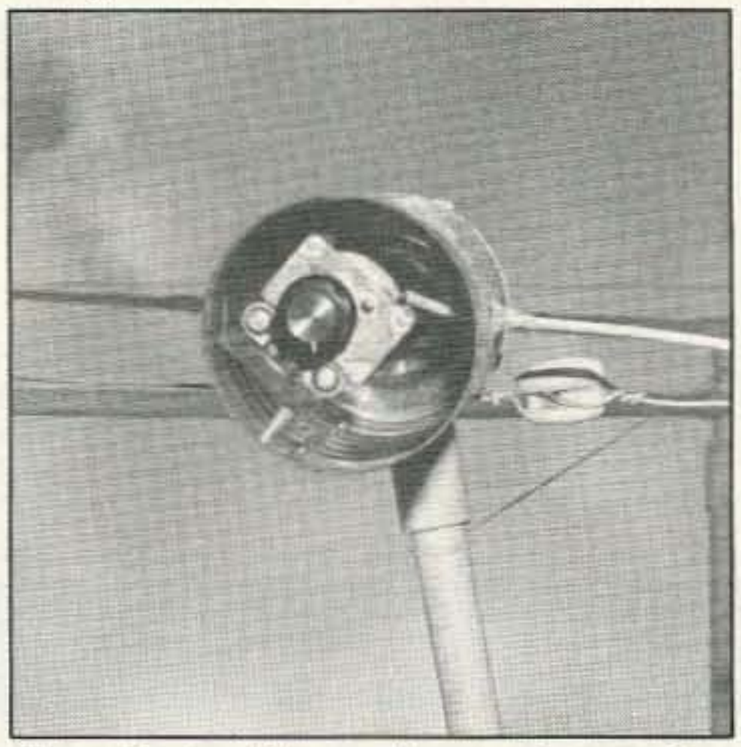

Photo E. A coffee can houses the matching capacitor. One side of the capacitor is electrically connected to the can; the other side to the driven element by an insulated wire through a grommeted hole in the can. A bare solid wire bolted to the top of the can is soldered to the center contact of an SO-239 chassis connector (out of view). A plastic lid that came with the can normally covers the opening, sealing out weather and insects.

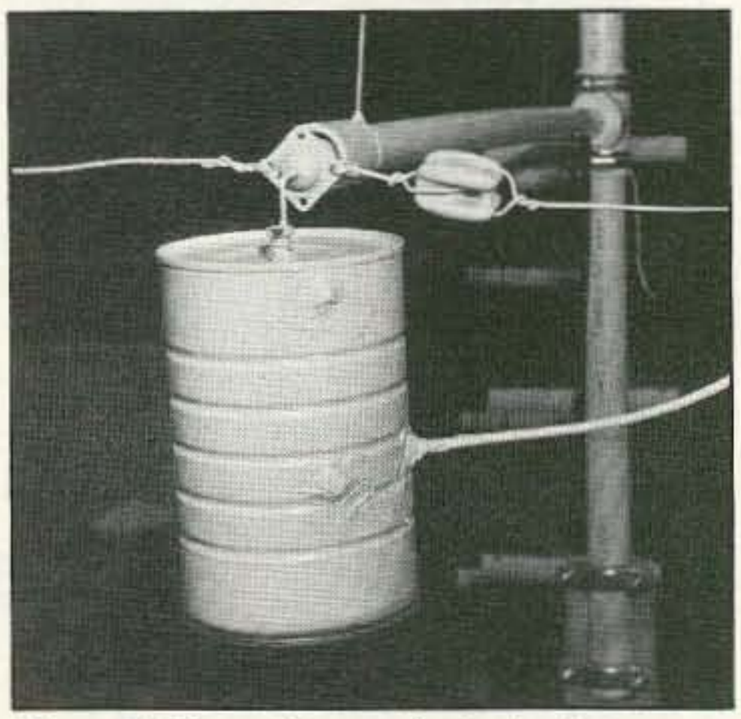

Photo F. The coffee can feedpoint is supported by a 1/2-inch PVC pipe through which passes the 50 ohm coax feedline. Note how the SO-239 chassis connector is rigged. One end of the driven loop is soldered to the left corner of the connector base. The other end of the loop is supported by, but insulated from, the opposite corner of the connector base. A wire bolted to the can is soldered to the center contact of the connector. The holes in the can have been sealed with silicon sealer, and the outside painted to prevent rust.

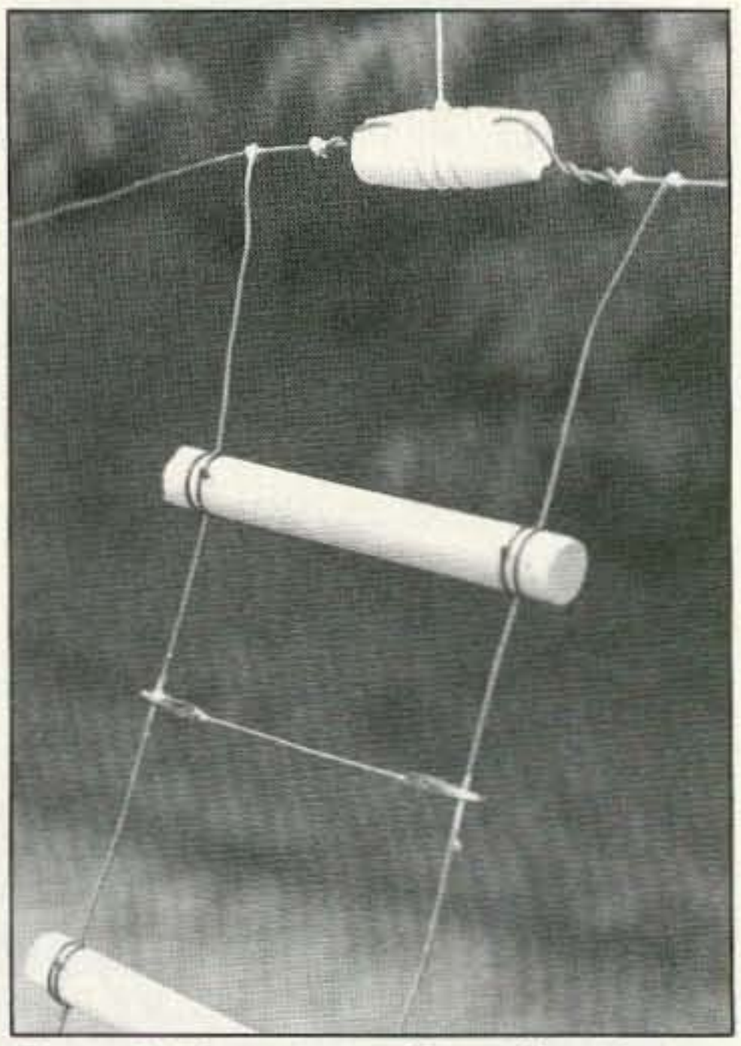

Photo G. The tuning stub is soldered across the insulator in the reflector loop. The wires of the stub are held 6 inches apart by wood dowels with holes drilled in the ends. The wires are tied to the stubs to keep them from slipping. Note the shorting bar, which is a length of solid wire with copper alligator clips soldered to the ends. After being adjusted, the bar is soldered to the stub wires. The string tied to the insulator keeps the bottom of the reflector loop from sagging.

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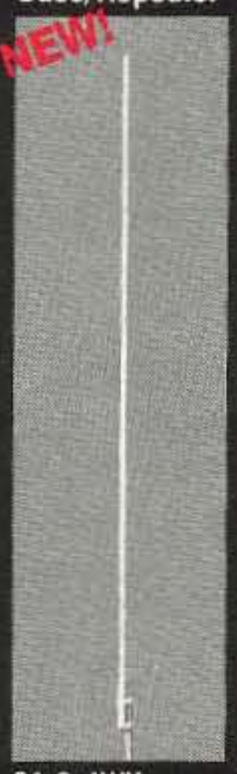

CA-2x4WX
Gain & Wave:
146MHz 6.5dB
5/8 wave x 2
446 MHz 9.0dB
5/8 wave x 5
Max Power: 200 watts
Length: 10' 2"
Connector:
UHF (SO-239)

CA-2x4FX
Gain & Wave:
146MHz 4.5dB
7/8 wave
446MHz 7.2dB
5/8 wave x 3
Max Power: 200 watts
Length: 5' 11"
Connector:
UHF (SO-239)

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7/8 wave
446MHz 7.6dB
5/8 wave x 3
Max Power: 120 watts
Length: 5'
Connector:
UHF (PL-259)

CPR-5400
Gain & Wave:
146MHz 3.5dB
1/2 wave
446MHz 6.0dB
5/8 wave x 2
Max Power: 120 watts
Length: 3' 2"
Connector:
UHF (PL-259)

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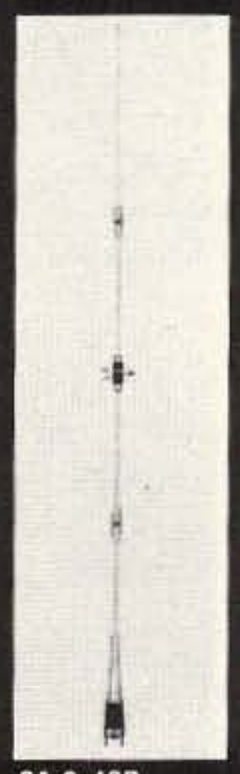
7/8 wave
446MHz 7.0dB
5/8 wave x 3
Max Power:
150 watts FM
Length: 4' 10"
Connector:
UHF (PL-259)



CA-2x4SR
Gain & Wave:
146MHz 3.8dB
5/8 wave
446MHz 6.2dB
5/8 wave x 2
Max Power:
150 watts FM
Length: 3' 4"
Connector:
UHF (PL-259)

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B-20
Gain & Wave:
146MHz 2.15dB
1/2 wave
446MHz 5dB
5/8 wave x 2
Max Power: 50 watts
Length: 30"
Connector:
UHF (PL-259), OR
NMO (B-20 NMO)

B-10
Gain & Wave:
146MHz 0dB
1/4 wave
446MHz 2.15dB
1/2 wave
Max Power: 50 watts
Length: 12"
Connector:
UHF (PL-259), OR
NMO (B-10 NMO)

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tips of the spreaders and the wire, to keep the wire from slipping (see Photo C).

The completed element will seem floppy. Don't be concerned. Mine held its shape nicely after I raised the antenna to a vertical position.

The process for making the driven element is identical, except for the insulator. Instead of installing an egg insulator at the bottom of the loop, temporarily connect the ends of the wire together. You will add a feeder assembly at this point after erecting the antenna.

Final Assembly and Installation

Suggestion: Get a buddy to help you with this step. I didn't, and ended up doing a dance and balancing act that would have made an acrobat proud.

First, make sure that there are no power lines within reach! Place the elements on the boom. Adjust them until they are square with the mast, with the bottoms of the loops positioned so they will be toward the ground when the antenna is raised.

Fasten the elements to the boom with 3/16" x 2-1/2" eye bolts instead of glue (you may need to disassemble the elements later). Drill holes for the bolts through the coupler fittings and the boom. Install the bolts with the eyes at the top. They will serve as tie-points for the nylon string boom supports.

Rig two nylon strings from these eye bolts to the one in the top of the mast. Two small turnbuckles installed in the center of each string will make it easier to adjust the tension.

Prepare to mount the antenna in the rotor. Yes, you will need to rotate this antenna; it is very directional. I used a Radio Shack television rotor mounted on a section of steel television mast, because this is what I happened to have in the junk box.

Make sure the rotor is low enough for you to reach the bottoms of the element loops after the antenna is erected. Then, preferably with the help of a friend, hoist the antenna and clamp the base of the mast into the top of the rotor. Make sure everything is straight, and that the antenna is correctly oriented with the direction of the rotor at the time of installation. Tighten snugly.

Feeder Assembly

In order to achieve a workable SWR, you will need to feed the driven element through a capacitor. This is easy to do, using an air variable capacitor, a coffee can, and an SO-239 chassis connector.

First, make a support to attach the feeder assembly to the antenna mast. Start by cutting the top off a 1-inch PVC "T" fitting. Glue a 1/2-inch adapter into the base (uncut) end. Place the altered fitting on the mast, with the adapter pointing at the center of the bottom of the driven element loop, and fasten in place with hose clamps (see Photo D).

Cut a piece of 1/2-inch PVC pipe about 30 inches long, and glue one end into the fitting. Loosen the clamps and slide the fitting up or down so that the pipe touches the bottom of the loop at the center. Cut the pipe 1 inch short of where it touches the wire, and glue a 1/2-inch PVC coupler fitting over the cut end. Bore a 3/8-inch hole in the *bottom* of the pipe at the point where it enters the "T" fitting near the mast, to accommodate coax.

Next install an SO-239 *chassis connector* in the loop where the two ends of the wire come together. Cut both wires where they meet. Insert one of the wires through one of the holes in the base of the chassis connector (the ground part), and secure by twisting the wire around itself. Solder this connection. Connect an egg insulator to the opposite corner of the connector, then fasten the other end of the loop to this insulator. Thus, one end of the loop connects directly to the base of the chassis connector, the other to the insulator. The ends of the loop must be insulated from each other.

Cut a piece of 50 ohm coax 4 feet long and install an PL-259 plug to one end. Screw the installed plug onto the chassis connector. Thread the other end of the coax through the PVC pipe support and out of the hole near the mast. Install a PL-259 plug on this end of the coax.

Drill a hole for a 6-32 x 1/2" machine screw in the center of the bottom of a coffee can. Be sure to save the can's plastic cover. Using a lock washer, insert the screw from inside the can, so the threads protrude outward. Turn a nut onto the screw and tighten firmly.

Cut a piece of bare, solid 14-gauge copper wire 3 inches long. Form one end into a loop just big enough to slip over the screw. Bend the wire 90 degrees about 1 inch from the loop. Slip the loop over the screw. Place a washer and nut over the loop and tighten securely. Bend the opposite end of the wire 90 degrees, about 1 inch from the end.

Mount an air variable capacitor (use a capacitor with at least 1.16" plate spacing and a 100 to 400 pF maximum value) inside the can, with the rotor shaft pointing outward (so you can reach it). See Photo E for details. Make sure the rotor shaft and insulated knob are completely inside the can, so the plastic cover will not touch them. Set the capacitor in a fully meshed position (maximum capacitance). Electrically connect one side of the capacitor to the metal can. Solder an *insulated* wire 12 inches long to the other side of the capacitor. Pass this wire through a grommeted hole in the side of the can.

Solder the wire that is bolted to the top of

Table 1. SWR Curve

Frequency	SWR
28.0	2.0:1
28.1	1.6:1
28.2	1.3:1
28.3	1.3:1
28.4	1.6:1
28.5	1.8:1
28.6	2.1:1

Table 2. Parameters for the 10M PVC Cubical Quad

Operating frequency (in MHz)	28.40
Element spacing (in feet)	4.16
Circumference of element loops (in feet)	35.39
Dimension of one side of loop (in feet)	8.85
Length of one spreader arm from tip to boom axis (in feet)	6.26
Length of mast to boom axis (in feet)	6.00

Parts List

Quantity	Item	Source
1	1" x 10' PVC pipe	Hardware store
3	1/2" x 10' PVC pipe	Hardware store
1	1" PVC cross fitting	Hardware store
1	1" PVC "T" fitting	Hardware store
2	1" PVC coupler fitting	Hardware store
3	1" to 1/2" PVC adapter	Hardware store
1	1" PVC cap fitting	Hardware store
8	1/2" PVC cap fitting	Hardware store
2	1/2" PVC cross fitting	Hardware store
2	1/2" PVC "T" fitting	Hardware store
1	1" x 4' dowel	Hardware store
1	1" x 3' dowel	Hardware store
8	5/8" x 4' dowel	Hardware store
2	Small turnbuckles	Hardware store
8	#6 x 1/2" sheet metal screws	Hardware store
3	#6 x 1/2" machine screws	Hardware store
1	#6 lock washer	Hardware store
6	#6 washers	Hardware store
6	#6 nuts	Hardware store
3	3/16" x 2-1/2" eye bolts	Hardware store
1	Tube silicon sealant	Hardware store
1	Roll nylon string	Hardware store
1	Can spray paint	Hardware store
1	Can oil-base enamel	Hardware store
80'	Antenna wire	Radio Shack
2	Egg insulators	Radio Shack
1	SO-239 chassis socket	Radio Shack
2	PL-259 coax plugs	Radio Shack
4'	50 ohm coax	Radio Shack
1	Large air variable capacitor, 100 to 400 pF maximum.	Radiokit #21140 or 284130 are possible candidates.

Contact Radiokit at (603) 635–2235 or write P.O. Box 973, Pelham NH 03076.

the can to the center point of the chassis connector. Then solder the loose end of the insulated wire from the capacitor to the end of the driven element loop near the insulator. Put the plastic lid over the bottom of the can, seal all holes, and spray paint the outside of the can to prevent rust (see Photo F). *[Ed. Note: You can eliminate this capacitor feed arrangement and hook your coax directly to the driven element. However, if you are unable to obtain a very good SWR reading, you should use an antenna tuner in the shack or use the antenna mounted capacitor as described above]*

Tuning The Antenna

The tuning stub consists of two pieces of bare, solid 14-gauge copper wire 3 feet long, held 6 inches apart by dowel spacers (see Photo G). The shorting bar is a piece of bare solid wire with copper alligator clips soldered to the ends. Temporarily clip the bar to the stub about 6 inches from the reflector element.

Adjust the shorting bar on the tuning stub for maximum front-to-back ratio on receive, by moving it toward or away from the reflector element. Then adjust the capacitor for minimum SWR, using low power, with the SWR-meter placed at the input of the antenna. When finished tuning, solder the shorting bar in place.

My minimum SWR at maximum front-to-back ratio was 1.3:1 at 28.250 MHz. By moving the shorting bar closer to the reflector loop, I was able to achieve a 1:1 SWR, but with equal front-to-back signal strengths. I adjusted the stub for maximum difference between front and back, and then adjusted the capacitor for lowest SWR at the optimum stub setting. At this setting, the band width between SWR 2:1 was 600 kHz.

Operation

On the air, I couldn't believe my ears. I tuned in a California station calling "CQ." He was S-9 plus 10 off the front of my quad; only S-3 on my dipole. I gave him a call. He gave me an S-9 report. I rotated the antenna to the east. He dropped to S-5 and verified that my signal did likewise. I turned the antenna back to the west, and he went back to S-9 plus. When I switched to the dipole and transmitted, he could barely hear me.

But Will It Survive?

The next day, we had 45 mph winds. The flexible PVC bent and swayed, but did not break. There was no noticeable change of SWR in the wind. To date, the antenna has survived several thunderstorms and winds of 60 mph with no damage.

From my QTH in north Texas, the quad has enabled me to work with ease Australia, Columbia, Ireland, Hungary, Italy, Japan, Venezuela, Russia, Costa Rica, Argentina, and Germany. Since putting it on the air, I've yet to hear "Q R Zed" on 10 meters. But if I do, you can bet I'll be able to work him. 73

Contact Wayne Mishler KG5BI at 2812 Olympia Drive, Arlington TX 76013.

Radio Shack HTX

Continued from page 33

be glad to hear from you if you need more information, or if you would like to join," is the comment in the first part of the book. A page and a half is devoted to the legalities of running this unit with the proper Technician Class license or higher. The League official who wrote this section did a nice job of making it absolutely clear that there is no problem with owning a set and using it on receive without a license, but to transmit you must have a current Technician Class license or higher.

For the beginner operator, the little rough spots in the operation of the set will probably go unnoticed. However, to the seasoned 2 meter ham, the most noticeable "bump" in the relatively smooth-operating receiver is the "thunk" every time a keystroke is entered for frequency selection, and the unmistakable quick-drop of the PLL circuit every time you manually rotate the top knob up or down the band. In fact, the receiver drops out completely—even on open squelch—if you rotate the top knob too quickly searching for signal activity. I like to manually spin through the frequencies, looking for activity, but on the HTX-202 if you do this too rapidly you'll zip right by someone transmitting just feet away. It's also annoying to have the receiver gate each time you are homing in on a signal in the 5 kHz step mode. Every time you rotate the top knob the receiver goes "thunk." This is confirmed visually by the drop-out of the signal strength indication and the busy LCD prompt each time you rotate one click on the top knob.

But what a receiver! I took the HTX-202 to several areas of intense high-band RF saturation and it outperformed every other handheld receiver around for sensitivity, selectivity and out-of-band rejection. I couldn't believe I was listening to the audio out of a handheld! Ed Juge W5TOO of Radio Shack is absolutely correct: This receiver, on a big outside antenna or a little rubber ducky, may outperform much larger mobile units for out-of-band signal rejection.

The little green illumination behind the LCD screen was not good enough for easy viewing of the center of the display at night. Two little grain-of-wheat bulbs at each end of the screen are just not enough for a screen this large. During the daylight, the LCD numbers and prompts were adequately clear.

On the top of the unit are jacks for a speaker, mike, and 12-volt DC input. My ICOM and Yaesu hand-held remote microphones plugged right in and worked great with the HTX-202. I plugged the unit into my TNC, and the levels were fine. Switch time was just like my other handhelds until I engaged CTCSS encode. This caused the transmitter to hang for that one additional second.

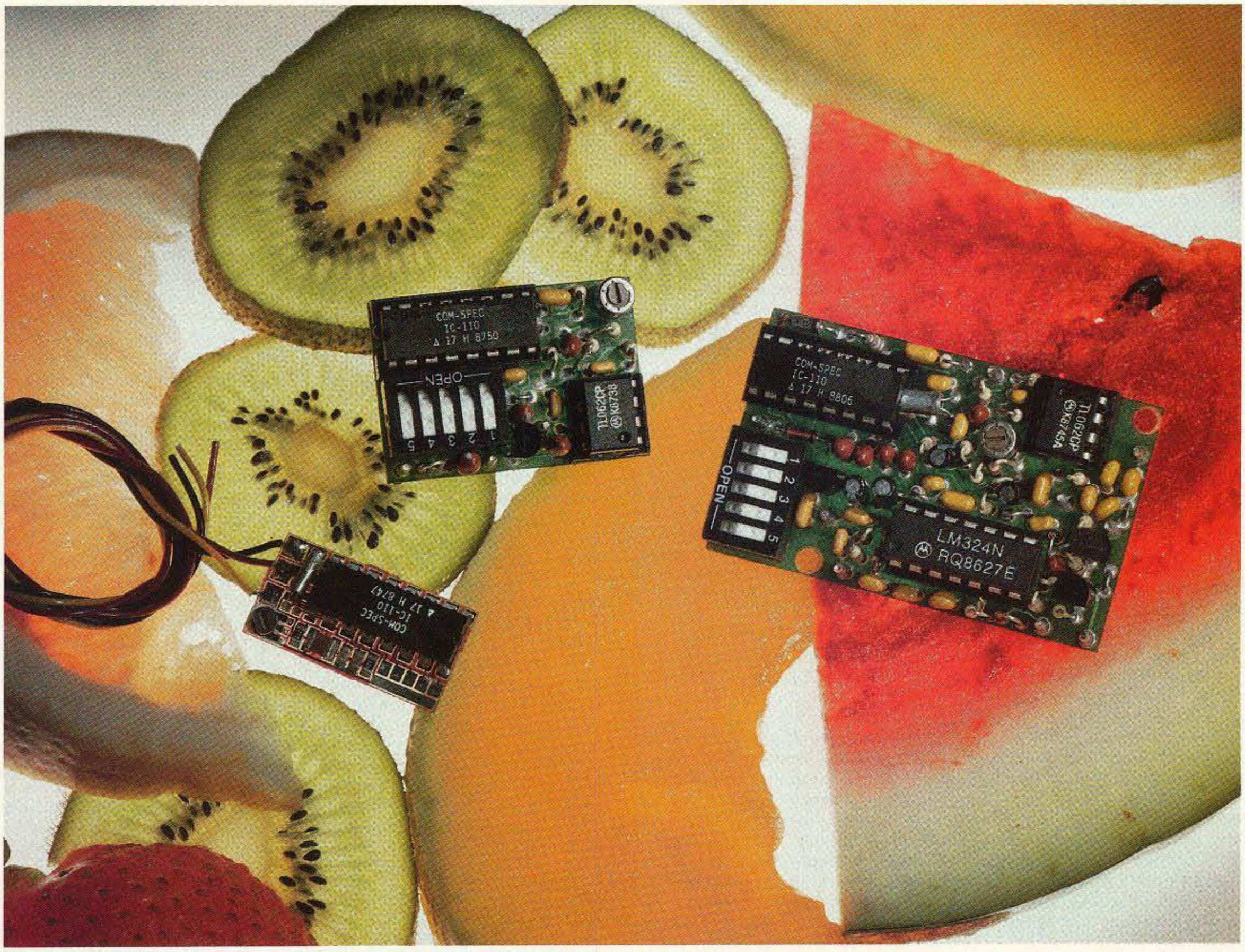
The 12-volt plug uses the more-common positive center connection. There is a little diagram on the top of the unit, too. I am glad Radio Shack stayed with the center positive because the recessed center receptacle keeps your 12-volt DC cord from accidentally shorting out when it bangs against something metal on your vehicle. And, as with all handhelds, if you have an aggressive alternator you may need to install a series alternator line filter to keep the noise out of your transmitted and received signals.

A little rubber plug assembly keeps everything covered up when you are not using the accessory jacks on the top. It also gives the traditional BNC-type rubber ducky a nice tight fit when you screw it on top of the HT.

The published specifications agree with the performance of the transceiver. In some cases, the transceiver did a little bit better than the specs. And, while it's important to review published specs, there is no better test of a 2 meter walkie than to take it up close to a repeater site and see whether or not the receiver continues to perform. On this set, receiver performance was excellent except for the "thunk" of the PLL circuit and the typical low-cost squelch circuit that either chops on, chops off, or chatters at a marginal signal.

For the beginner or seasoned ham, the HTX-202 is a terrific value in performance and included encode/decode/pager features. Its straightforward operation can be figured out easily, even without the instruction book, for basic frequency entry. It takes some time to get into the menu to find the encode capabilities, and to turn off the decode function that immediately clamps the receiver when you engage tone squelch, but a few seconds of reading the book gets you on the air quickly.

This is Radio Shack's first 2 meter handheld, and they did a remarkable job to get it out in the marketplace for under $260, an almost unheard of price for a full-featured 2 meter hand-held transceiver.



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Kids Are Talking

One day, three years ago, Gordon West WB6NOA and I were on 10 meters discussing ways to get more youngsters on the air. We found ourselves in a pile-up with other hams who agreed it would be a great idea to get schools across the country all linked up on 10.

So began the CQ All Schools Net every Tuesday and Thursday. Gordon and I are always encouraging teachers to get their students on the air with other kids all over the world. It's simply one of the most exciting ways to spark children's interest in their world. Please remember to join us at 17:30 UTC on 28.303 MHz.

Gordon West WB6NOA Guest Editorial

Hand the mike over to a student and hear the excitement as they say their name and QTH over the airwaves. It is this type of live amateur radio demonstration that makes for a very lasting positive impression of what ham radio is all about. Remember the first time you talked over the ham radio mike?

You can see the excitement in every one of Carole Perry's students when she hooks up with a new station on the CQ All Schools Net and puts another young student on the air for the first time. "You should see their faces light up when it's their turn to talk!" she says.

You should *hear* the excitement of those students on the air at the other end of the circuit! And thanks to over 400 10 meter transceivers donated by Uniden in a "Schools on 10 Meters" program inaugurated by Don Stoner of National Amateur Radio Association, kids all over the country are catching the excitement of what ham radio is all about.

But whether you're teaching a class for kids or adults, you will need plenty of "props and gags" to keep your teaching program *exciting*.

There is nothing worse than watching a video with "talking heads." Wouldn't it be boring to watch the news and never see any live reports from the scene? And wouldn't it be dull to teach an evening ham radio class and never give your students anything more than talk, talk, talk?

As an example of "ham radio demos and gags" that students always seem to remember, here are some of my best demonstrations as they relate to the nine FCC topic areas of amateur radio licensing. These can work in any grade class—from Novice to Extra!

Rules, Regulations, and Operating Procedures

I play a tape recording of an actual amateur radio emergency call from a sinking boat. I have students tune into the airwaves and identify CW, RTTY, and packet. I have students operate third party. I show them an actual Notice of Violation and have them look up FCC rules after I give them an FCC Part 97 section number.

I tune a radio into signals, and have everyone write down the Q codes they hear, and the meaning of those Q codes. I let students rate RST signal reports from transmissions they hear over the air. I tune into a repeater and make a call. I run a low power laser beam down through some tables to illustrate VHF signal blocking and reflections. Finally, I make an autopatch call.

Radio Wave Propagation

I use the laser beam to bounce signals off of a mirror on the ceiling to demonstrate the ionosphere. I bounce Smurf balls off the ceiling to further demo skip. I use a prism to illustrate the refraction of different wavelengths. I tune into WWV for the solar activity report and let students write down the figures they hear.

Amateur Radio Practice

I pass around equipment destroyed by lightning. I illustrate ground foil and braid by letting students actually feel the materials. We examine a ground rod. We spark a charged capacitor to illustrate the importance of staying away from capacitors in power supplies. We pass around a nylon safety belt, and an old leather safety belt, and caution students to stay away from brittle leather belts. I pull sparks off of an HF antenna to illustrate the hazards of RF burns. I transmit and receive interference on my PA system, illustrating overload. A simple oscilloscope can illustrate harmonics.

Electrical Principles

I short-circuit a #18 jumper lead to illustrate the necessity of fuses, and light a small, 12 volt light bulb to illustrate the tough topic of frequency, wavelengths, and bands, I unroll a 30-foot, cut-up chart from the Government Printing Office illustrating the electromagnetic spectrum. I use fluorescent yarn which attaches the wall chart to various pieces of ham radio and home electronic equipment on the demonstration table. Finally, I sweep the audio spectrum with my code oscillator to allow students to hear audio frequencies.

Components, Signals, and Circuits

I pass around resistors, capacitors, and demonstrate the one-way continuity of diodes. I have students identify various switches, transistors, and tubes which I also pass around. The whole idea here is to ensure that students actually touch and feel of every single component we talk about in class.

I bring in stripped down radios and have students identify different sections within the radio. They identify the transmitter, receiver, TR switching, IF, filters, and so on.

Students hold a fluorescent light tube near a 100 watt energized mobile antenna. They see how quickly RF travels through the air. They watch the tubes flicker as we modulate SSB, and stay solid during double sideband with carrier. They watch it flash on and off with CW, and see it remain solid with HF FSK. We also tune into signals with key clicks, hum, and instability problems.

Antennas and Feedlines

We bring in dipoles, yagis, quads, and loops. We demonstrate an antenna tuner by hooking up to a trash can sitting on a chair outside, and running it against a sewer pipe ground. We further demonstrate the tuner's capability by loading into a Schwinn bicycle, a crutch, and even a juicy pickle, showing that even the latter will radiate a 2 meter signal.

Next, we put the pickle onto closely-spaced pins hooked up to 110 VAC through a code keyer. Depress the keyer, and the pickle instantly lights up yellow and orange, and fizzles and smokes, demonstrating what an old spark-gap transmitter may have sounded like, and maybe even smelled like.

Finally, we illustrate coaxial cable, parallel conductor feedlines, and twin-lead, and talk about their advantages and disadvantages by actually lighting up light bulbs at the opposite end of the circuit.

For every hour of classroom instruction, I schedule at least one live demonstration. Both the young and old appreciate any crazy demo, and the more bizarre you get (like roasting a pickle on 110 volts), the better they will remember the particular relationship you were illustrating.

Always observe safety precautions when doing any type of demo that uses any amount of voltage or RF. Always ask if there is someone in the ground that has a pacemaker, and caution them to stay away from any transmitting mobile antenna. Have students wear protective eye gear when snapping off a charged capacitor or energizing something as simple as an automobile 12 volt light bulb.

Always have plenty of props at every class session. Even overhead transparencies and color slides can be effective, coupled with "the real thing" to further illustrate the transparencies. Incidentally, the ARRL has a terrific collection of color slides in their educational library, and you should contact Rosalie White at the ARRL to become a registered instructor to qualify for a loan of these excellent slides describing circuits, emissions, antenna, and other electrical principles.

Classic Ham Class Demos

Do you have a classic ham class demo that students talk about for days and weeks after class is over? If so, write us here at *73 Magazine*, and we'll share your show-and-tells with fellow instructors.

Finally, have as much fun as we do in teaching ham radio to new students. Laugh along with the kids when a demo goes up in smoke, or doesn't work at all. The class will have fun just helping you try to get it off the ground.

Giving your students more than just talk, talk, talk will make your upcoming ham class an outstanding success. Be sure to tune us in on 28.303 on Tuesdays at 17:30 hours Zulu. We hope to hear your class on the air soon.

Photo A. Gordon West WB6NOA assists Kenny, a student, during the CQ All Schools Net from I.S. 72.

Photo B. Left to right: Ed KA2TXL, Carole and Gordon, during Gordon's visit to Carole's class.

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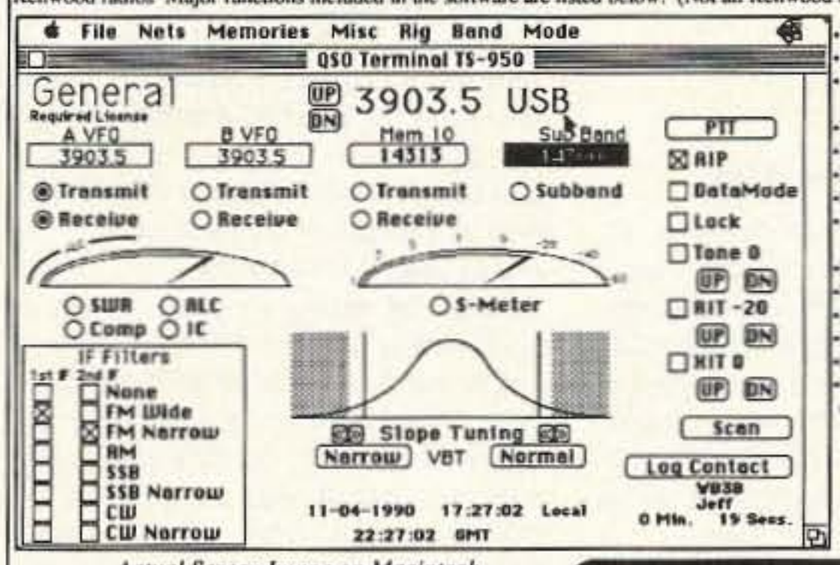

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Michael Geier KB1UM
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Receivers: What Makes Them Tick

In the very early days of radio, all participants were hams in the truest sense. They were experimenting to develop a new and very exciting technology which promised to make worldwide communications a reality. And humans love nothing more than to yack with each other (except perhaps to kill each other, but that's a different story!).

Even in those first experiments, it was clear that it was easier to generate a radio signal than it was to detect one! The signal's existence had already been predicted in Maxwell's and others' theories, and Hertz had shown the invisible waves to be real by wirelessly generating sparks in resonant gaps separated by the distance of a room. But how to do anything useful with them? That was a much greater challenge.

It soon became obvious that the signals got very weak very fast as one moved the detecting apparatus away from the transmitter. You could generate plenty of power with a spark transmitter and be unable to hear it a block away! Clearly, the key to radio lay in the receiver, and it was this facet which subsequently underwent the most evolution. In this multipart series, we'll look at the development of radio receivers and at what makes a receiver good, bad or ugly. Let's start with a little history:

Being Detected

Radio reception consists of two processes: First you must detect the presence of the signal, and then you must decode the intelligence impressed upon it. In the earliest modulation mode, Morse code, both elements were performed by the same component: the detector. (Notice I don't say "CW" here, because that term specifically refers to the generation of code by a continuous wave transmitter, and the early spark sets did not generate continuous carriers. In fact, they produced "Damped Wave," and it was not until radio frequency alternators were invented that CW was heard in the ether.)

The construction of the detector varied from the coherer, which basically was some metal filings in a tube, to the semiconductor diode. (Yup, semiconductors actually predate tubes! When the first chunks of galena crystal were employed as radio detectors, the Audion amplifying tube was not yet a gleam in DeForrest's eye.) The diode detector was vastly superior in sensitivity to the coherer, and the latter was quickly relegated to the attic, and so to history.

In conjunction with a "good" antenna, typically some wire strung in a tree, a crystal detector made a pretty sensitive receiver by the standards of the day. You could make your sparks on an automotive coil and hear them perhaps a mile away. Heck, that was farther than you could yell, so it began to look like a useful thing. But pretty soon a new problem arose: there were lots of sparks on the air, and they were beginning to interfere with each other. That was caused by two things.

First, the nature of spark transmissions was wideband. Plenty of energy was being distributed all over the spectrum. In fact, although it was not recognized at the time, spark's inefficient, wideband nature was a big part of the reason it was so hard to hear at great distances; not much of the energy produced was anywhere near your receiver's frequency.

Getting Selective

The second reason was that receivers had very little ability to separate stations by frequency. That essential characteristic, called selectivity, turned out to be the most difficult to achieve. Early crystal sets, with their single tuned circuits at the antenna connection, gave way to "tuned RF" (TRF) designs when the amplifying tube came along. The tube alone had dramatically increased sensitivity, but that only made the selectivity problem more pressing—now you could hear even more signals, and thus more interference! The TRF sets had several stages of amplification, each with its own knob for tuning it to frequency. It wasn't a bad system, but it required tuning three or more knobs every time you wanted to change the station; it was hardly what we'd want to call "user friendly." And it still wasn't great.

Around and Around

Even the TRF had its sensitivity limits. By the time of its development, broadcasting of music and voice had begun, and people were hungry for something to listen to. Believe it or not, DXing was a very popular pursuit in those days. Most localities had no stations, so people wanted the most "powerful" (sensitive) receiving setups they could get, in order to hear distant stations. Enter Edwin Armstrong.

This very important radio pioneer reasoned that, if the signal could be used to reinforce itself right in the radio, it would make the receiver far more sensitive than the TRF. He developed a circuit called the "superregenerative." In this design, the output of the first tuned RF amp was fed in phase, via a two-coil transformer arrangement, back to the amp's input. Sounds like an oscillator, doesn't it? Well, if you fed back enough signal, it was! But if you cut the amount of regenerated signal back to the point just below oscillation, you had one *heck* of a sensitive receiver! The improvement over the TRF was startling. Signals which were completely inaudible became painfully loud.

The superregen was widely accepted, but the technique had big drawbacks. Some of that regenerated signal went back out the antenna, so every receiver was also a transmitter! And a wideband transmitter at that. The amount of interference superregens generated was tremendous. Also, that phenomenal increase in sensitivity was not accompanied by a similar increase in selectivity, so once again you had a very sensitive radio which picked up lots of garbage.

Finally, the regenerative process caused a loud "whoosh" noise when signal levels were low, not unlike the sound of a modern FM receiver with its squelch open on a vacant channel. It was enough to give you quite a headache. And to top it all off, you had to play with the touchy regeneration control to get the whole thing to work well. Despite these serious shortcomings, the superregen was an important step in receiver evolution. Today, it is largely forgotten except for its use in some very low-priced kiddie walkie talkies and toys. Even in those applications, it is becoming obsolete.

Testing Your Reflexes

As the amplifying tube began to be applied to the audio stages as well as the RF "front end" stage, loudspeaker operation became practical. This had the obvious advantage that the whole family could listen at the same time. The only disadvantage was that it made the radio much more expensive, and somewhat more difficult to build if you were inclined to roll your own, which many people were. Remember, components, and especially tubes, were not cheap in those days. Circuit designers strived to create as much radio from as few parts as possible. One clever arrangement was the reflex receiver.

In this design, the RF amp tube was made to do two jobs at once. Through the use of a few resistors and caps, it was frequency multiplexed (although the term would have been alien to those who conceived the idea). The RF was fed through it and then detected. The detected audio was then fed *back* through the same tube via a low pass filter. Because of the wide separation in frequency of the RF and audio, and the filtering, the two signals didn't interfere with each other. The result was a receiver which could drive a speaker, yet had very few expensive parts. It was cheap, so it was popular.

Unfortunately, it was functionally just a TRF, so it wasn't the greatest performer. It still had lousy selectivity, but now the whole house could enjoy the interference! Occasionally, I see transistor-based reflex receiver projects in hobby magazines. They sure do a lot with very few parts.

Edwin Again

Later in his career, after radio evolution had had time to progress and the problems had been well defined, Edwin Armstrong had the opportunity to assess them point by point and formulate a plan to overcome them. The result was one of his two masterpieces, the superheterodyne receiver. (The other was FM.) The superhet receiver is used in virtually all modern radio and television systems. Though there are many variations on it, the basic scheme remains the same, whether the set is a "walkperson" stereo or a satellite receiver. In the remainder of this series, we'll examine the different points of the superhet in some detail and explore the tradeoffs required in their designs. But for now, let's take a look at the structure of the design and its reason for being.

The Antenna Bone's Connected to The . . .

Like all receivers, the superhet starts with a tuned circuit at the antenna. Actually, in some modern, frequency-synthesized designs, that isn't true anymore. But most radios do have some kind of LC tank circuit at their inputs. In manually tuned sets, it is likely to be a high-Q resonant circuit which you tune to the frequency you are trying to receive. In electronically tuned rigs, it's probably a low-Q bandpass filter which permits the entire band to pass while rejecting other bands.

Following the tuned circuit may or may not be an RF amp. The advantage of an amp is obvious: more sensitivity. The disadvantage is not so obvious: less dynamic range. By that I mean the biggest signal the radio can handle before it overloads. An overloading front end causes far more trouble than simple audio distortion; the amp becomes a mixer and lots of unwanted signals and garbage wind up getting heard. Most HF ham rigs have RF amps and front panel switches to disable them when the signals are strong.

Depending on whether there is a high-Q tuned circuit at the input, the output of the first stage can consist of one of two things: Either you have a lot of the signal you want and little else, or you have a broad range of signals from the entire band. It really doesn't matter, because most of the selectivity is achieved later on down the signal path.

Mixing It Up

Back when Armstrong employed it, the concept of a mixer must have been novel. A mixer has an important characteristic: It must be nonlinear. If you pass two signals together through a linear stage, their waveforms will add and subtract algebraically, resulting in one composite signal at the output. But the two signals will not actually modulate, or interfere with, each other, and they will still be separable. That is *not* mixing.

If, however, the stage is nonlinear, one signal will modulate the other, causing true mixing. The easiest way to visualize it is the way it happens in an audio amp. If you have a high note and a low note, they can both pass through the amplifier without bothering each other. But let's say you increase the low note's volume until it makes the amplifier clip. Now, the high note gets clipped off, too, because at the moment of clipping *both* signals get cut off. Thus, the low note has interfered with the high one, causing true mixing. It sounds terrible in a stereo, but it's exactly what we want in an RF mixer, because it creates byproducts, and those are what we are after.

We'll continue this radio anatomy lesson next month. Till then, 73 de KB1UM. 73

Five-component wideband amplifier

Continued from page 12

tors at each end of the board, I installed the standoff insulators. I then soldered the chip capacitors in place with great care—they are small.

Next, I mounted the MAR-8. First I bent pins 2 and 4 down so they touched the copper-clad board (ground), then I soldered them to the board. Pins 1 and 3 were bent straight out to span between the standoff insulators which support the input and output capacitors. Then they were soldered in place.

After this, I slipped the ferrite (or powdered iron) bead over the resistor lead nearest to pin 3 of the MAR-8. I soldered this lead to the standoff insulator connected to pin 3 of the MAR-8. The other end of this resistor was connected to another standoff insulator and became the attachment point for the +12 volt supply. Incidentally, the size of the resistor is chosen to provide approximately 36 mA to the MAR-8. The data sheets recommend 111 ohms, but I used 120 ohms because that is what I had on hand. The data sheets also recommend a 1 µF capacitor from the +12 volt point to ground if erratic behavior is experienced. My amplifier did not need this capacitor.

Figure 1 shows the schematic for the amplifier. Figure 2 gives a pictorial representation of how the amplifier was assembled.

Photo A is a close-up picture of the device. The length of the little enclosure is about 1-1/2″ inside of the box. It is about 1/2″ wide and about 5/8″ deep. In this view the sides of the box have been removed to show the components. MAR-8 can be seen in the center.

After I tested the amplifier, I cut three more pieces of copper-clad board and enclosed the device by soldering the three pieces together to form a box. I have used the amplifier for about six months now with good results. 73

Parts List

Qty.	Device
1	MAR-8
2	100 pF chip capacitors
1	120 ohm resistor
1	ferrite bead
2	chassis mount female BNC connectors
5	insulated standoffs
Misc:	Box (made out of PC board material).

Parts Sources

MAR-8: Mini-Circuits, Box 350166, Brooklyn NY 11235-0003; phone (718) 332–4661.

100 pF chip capacitors & resistor: Mini Circuits, or Digi-Key, 701 Brooks Ave. South, P.O. Box 677, Thief River Falls MN; (800) 344–4539.

RF Bead: Amidon Associates, P.O. Box 956, Torrance CA 90508; phone (213) 763–5770.

BNC connectors: Radio Shack stores.

Number 14 on your Feedback card

SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the January issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Special Event. Check SPECIAL EVENTS (Area 11) on our BBS (603–525–4438) for listings that were too late to get into publication.

FEB 1

ST. CATHARINES, ONT., CANADA The Niagara Peninsula ARC Inc. will hold its 14th Annual Big Event Hamfest/Dinner-dance, at the C.A.W. Hall, 124 Bunting Rd. Admission is $4. Tables $12 commercial; $5 non-commercial. Talk-in on 147.24/.84. Dinner-dance tickets are available **only** in advance. Contact ***N.P.A.R.C. Inc., PO Box 692, St. Catharines, Ontario L2R 6Y3, Canada. (416) 934–3231*** or ***VE3KLM @ VE3SNP.***

KNOXVILLE, TN The Shriners of the Kerbela ARC, Kerbela Shrine Temple, will sponsor the SEVIERVILLE HAMFEST at their Temple in Knoxville from 8 AM–4 PM. Tables $5 plus a $2 admission ticket per person. Tailgating $3 plus $2 admission ticket. Dealer set-up at 4 PM–9 PM Jan. 31, and 5 AM–8 AM Feb. 1. No crafts allowed. Talk-in on 146.34/.94. For table info contact ***Paul Baird KY4A, 1500 Coulter Shoals Cir., Lenoir City, TN 37771, (615) 986–9562.*** FCC Exams by Western Carolina ARS/VEC, Inc. at 9:30 AM, no walk-ins. Mail completed 610 along with your check for $5.25 made payable to ***WCARS/VEC, 5833 Clinton Hwy., Suite 203, Knoxville TN 37912-2545. (615) 688–7771.*** Registration deadline is Jan. 30, 1992.

FEB 8

BLAINE (MINNEAPOLIS), MN The 11th Annual Midwinter Madness Hobby Electronics Show, sponsored by the Robbinsdale ARC, will take place from 8 AM–2:30 PM at the National Sports Center, 1700 105th Ave. NE. Free parking. Indoor Flea Market tables. 76 Commercial booths. Advance tickets $4; $6 at the show. VE Exams on Feb. 7 at 6 PM. Talk-in on 147.66/.06. Contact ***Midwinter Madness Hobby Electronics Show, P.O. Box 22613, Robbinsdale MN 55422. (612) 537–1722.***

FEB 9

MANSFIELD, OH The Mansfield Mid•Winter Hamfest/Computer Show will be held at the Richland County Fairgrounds beginning at 7 AM. Indoor Flea Market. Advance tickets $4, $5 at the door. Tables $9 in advance, $12 at the door, if available. Talk-in, call W8WE on 146.34/.94. Reservation deadline Feb 1, 1992. Send SASE and payment to ***Dean Wrasse KB8MG, 1094 Beal Rd., Mansfield OH 44905;*** or phone ***(419) 589–2415*** after 4 PM EST.

MELVILLE, NY The Long Island Mobile ARC will hold a Hamfest from 9 AM–4 PM at Electrician's Hall, 41 Pinelawn Rd. VHF tune-up clinic. Admission $5 at the gate; exhibitors $20 in advance. Talk-in on 146.25/.85. Contact ***Neil Hartman WE2V, (516) 462–5549,*** or ***Mark Nadel NK2T, (516) 796–2366.***

FEB 14–15

SARASOTA, FL The 13th Annual Sarasota Hamfest/Computer Show, sponsored by Sarasota Hamfest, Inc., will be held at Robarts Sports Arena, 3000 Ringling Blvd. from 1 PM–8 PM Fri.; 9 AM–3 PM Sat. VE Exams at 9:30 AM Sat. Free parking; RV parking $15 per night (pre-registered). Admission tickets $5 in advance, $7 at the door; children under 12 free with an adult. Tables $15 each; booths $20 per table. For more info contact ***Sarasota Hamfest, Inc., c/o Gene Marino W1IDH, 4858 Tivoli Ct., Sarasota FL 34235,*** or call ***(813) 355–0675 from 9 AM–9 PM.*** Informal banquet 7 PM Sat. at Shrine Temple; $15/single, $25/couple.

FEB 16

GOLDEN, CO The Aurora Repeater Assn. will hold its 10th Annual Swapfest at the Jefferson County Fairgrounds, 15200 W. 6th Ave., from 8:30 AM–2 PM. Contact ***Judi WDØHNP, (303) 450–6910,*** or ***Jan KA7TYU, (303) 680–8857;*** or write ***Aurora Repeater Assn., P.O. Box 39666, Denver CO 80239.***

FEB 22–23

CINCINNATI, OH The Ohio State ARRL Convention 1992 will be held at the Cincinnati Gardens Exhibition Center, Langdon Farm Rd. and 2250 Seymour Ave., (State Route 561) 8 AM–5 PM both days. Flea Market admission $6 in advance, $8 at the door. Free parking. Flea Market table charge is $15 per table, prepaid prior to Feb. 16. Late reservations are $17.50 per table. Make checks payable to ***ARRL Ohio State convention 1992*** and mail with application to ***Stan Cohen WD8QDQ, 2301 Royal Oak Ct., Cincinnati OH 45237. (513) 531–1011.*** For info contact ***Joe Halpin W8JDU, 11615 Geneva Rd., Forest Park OH 45240; (513) 851–1056 nites.***

FEB 23

LIVONIA, MI The Livonia ARC will hold its 22nd Annual Swap'n Shop from 8 AM–4 PM at Dearborn Civic Center, Dearborn MI. VEC Exams. Talk-in on 144.75/145.35. For info, send 4 x 9 SASE to ***Neil Coffin WA8GWL, Livonia ARC, P.O. Box 2111, Livonia MI 48151. (313) 427–3905.***

MILFORD, CT All Class Exams by the Coastline Amateur ARA, will be held at the Fowler Bldg., 145 Bridgeport Ave., at 12 noon. Walk-ins. Contact ***Gary NB1M, (203) 933–5125,*** or ***Dick WA1YQE, (203) 874–1014.***

ROCK ISLAND, IL The 21st Annual Davenport (Iowa) ARC Hamfest will be at the QCCA Expo Center in Rock Island IL beginning at 8 AM. Wheelchair accessible. Flea Market, Commercial exhibits, VE Exams. Talk-in on the WØBXR 146.28/.88 repeater. Tickets $3 in advance, $4 at the door. Tables are $8 each paid in advance by Feb. 15; $10 after the 15th. Commercial booths and AC hook-ups are extra. Hamfest contact is ***Dave Johannsen WBØFBP, 2131 Myrtle St., Davenport IA 52804.*** For ARRL/VEC Exam info, contact ***Al Broendel N9OK, 2712 38th St., Rock Island IL 61201.***

CUYAHOGA FALLS, OH The Cuyahoga Falls ARC will hold its 38th Annual Hamfest at the ST. V. Center, 3479 State Rd., from 7 AM–3 PM. Wheelchair accessible. Tickets $3 in advance, $4 at the door. Tables $5 (sellers may bring their own tables). SASE for ticket orders and table reservations to ***Bill Sovinsky K8JSL, 2305 24th St., Cuyahoga Falls OH 44223. (216) 923–3830.***

NEW STRAWN, KS The Neosho Valley ARC will sponsor an Electronics Hobbyist Auction at the Strawn school bldg. beginning at 10 AM. No entry fee will be charged, but a 10 percent consignment fee will be charged on all items sold. Set-up at 8 AM. Talk-in on 146.52 MHz. Contact ***Bob, (316) 364–5446,*** or write to ***N.V.A.R.C., P.O. Box 931, Burlington KS 66839.***

FEB 29

BISMARCK, ND A Hamfest sponsored by Central Dakota ARC, will be held at the Comfort Inn, 1030 Interstate Ave., from 8 AM–3 PM. Advance tickets $2, $3 at the door. Tables $4. Contact ***CDARC, P.O. Box 7162, Bismarck ND 58507. Dee KBØCGK, (701) 224–9139.***

BROOKSVILLE, FL The Hernando County ARA will hold its 10th Annual Hamfest at the Hernando County Fairgrounds; located about two miles south of Brooksville on U.S. Hwy. 41. Doors open at 8 AM and close shortly after 3 PM. Free parking. Overnight parking will be permitted, but there are no facilities. Indoor swap areas. Advance tickets $4, $5 at the door. Send SASE and check to ***Hamfest Chairman, 205 N. Alpine Circle, Brooksville FL 34601.*** Ticket requests received after Feb. 20 will be held at the gate. Tables $10; Tailgate space $5. Everyone, including dealers, must purchase a ticket. Talk-in on 146.115/.715 (club frequency). For info call ***(904) 796–4840 after 7 PM.***

ORANGE, TX The Orange ARC will sponsor their 7th Annual Hamfest-Flea Market at the V.F.W. Hall on Hwy. 87, one mile north of IH 10, in Orange TX, from 8 AM–4 PM. Free admission. Paved parking. Set-up at 7 AM. Tables $5 for individuals, $15 for dealers—no limit. Pre-registrations must be postmarked by Feb. 9. No refunds on unclaimed tables. VE Exams at 9 AM; send 610 Form, with a copy of your current license and any C.S.C.E., with a check for $5.25, to ***Orange ARC, P.O. Box 232, Orange TX 77630.*** Bring original documents. Walk-ins accepted, but preference will be given to pre-registrations. For info call ***Sherwood Buckalew KA5VOT, (409) 883–6111*** or ***Dan Killough WB4GYS, (409) 769–8436.***

MAR 1

YORK, PA The 5th Annual York Springfest (Ham/Computer) will be held indoors at the Dover Firehall beginning at 8 AM. Blacktop parking. Tables $4; tailgating $2 per space. Admission $4. Unlicensed spouse and children under 12 free. VE Exams. Talk-in on 146.37/.97. For info and registration call ***(301) 239–3878,*** or write ***York Springfest, P.O. Box 316, New Freedom PA 17349–0316.***

YONKERS, NY The Westchester Emergency Communications Assn. will sponsor their 8th Annual ARRL sanctioned Hamfest/Computer Show from 9 AM–2 PM at Yonkers Raceway, Intersection of I-87, Central and Yonkers Ave. Admission $5; children under 14 free with adult. Tailgating. Handicap entrance and parking. Walk-in FCC Exams. Preregistration required of all vendors (including tailgating). Contact ***Sarah Wilson N2EYX, 3478 Russell Place, Yorktown Heights NY 10598. (914) 962–7279.*** Talk-in on 147.060.

MAR 7

CAVE CITY, KY The 16th Annual Glasgow Swapfest will be held by the Mammoth Cave ARC, at the Cave City Convention Center, beginning at 8 AM Central time. Admission $4 per person. Tables $5 each. VE Exams, walk-ins welcome. Be sure to bring your original license and a copy if you are upgrading. Talk-in on 146.34/.94. For info and reservations, write to ***N4HCO, 1379 Whites Chapel Rd., Glasgow KY 42141.***

ABSECON, NJ The Shore Points ARC will sponsor its 10th annual hamfest "Springfest '92", at Holy Spirit High School on Route 9, ½ mile south of Route 30. Doors open to the public at 9 AM. Set-up at 7 AM. Outdoor tailgating space will be available on the day of the hamfest, weather permitting. Limited AC is available indoors. Sellers: $5 per 8' table; buyers: $4. (XYL's and children free.) Free parking. Talk-in on 146.385/.985. For info write to ***SPARC, P.O. Box 142, Absecon NJ 08201.***

MAR 8

INDIANAPOLIS, IN The Morgan County Repeater Assn. will sponsor the INDIANA HAMFEST at the Indiana State Fairgrounds Pavilion Bldg., beginning at 8 AM. Admission $7 at the door. 8' Flea Market tables (including space) $12 each. No space will be sold without a table. Set-up Sat. Mar. 7 from 3 PM–9 PM. Security provided overnight. Set-up Sun. Mar. 8 from 6 AM–8 AM. All vehicles must be out of the building by 7:45 AM. Free parking. Talk-in on 145.25. For info/reservations, send SASE before Feb. 22 to ***Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47403. (812) 339–4446.***

SPECIAL EVENT STATIONS

FEB 1–2

VERMONT QSO PARTY The Central Vermont ARC will host the Vermont QSO Party from Feb. 1 at 0000Z–2400Z Feb. 2. Stations may be worked on CW, Phone, RTTY, Packet, or AMTOR, up to 5 times on each band. Exchange signal report and QTH (county for VT stations; state/province/county for others). Frequencies: Phone–lower 25 kHz of the 80-15 General bands and 28.3–28.5 MHz; CW–40 kHz up from bottom edge of 80-15 meter band and in Novice bands; other modes in the usual area of all bands. Count 1 point for phone QSO, 2 points for other mode QSOs. Multiply by number of counties or states/provinces/countries. Work W1BD for an extra multiplier. Log sheets and scoring sheets available for SASE from QSO Party Manager ***Bob DeForge K1HKI, RR #1 Box 271, Brookfield VT 05036.*** Entries must be mailed by March 1st. For results send an SASE.

CADILLAC, MI The Wexaukee ARA will operate Station WD8KUS from the North American Snowmobile Festival from Feb. 1 at 1400 UTC–0400 UTC Feb. 2. Frequencies: 7.245 MHz ± QRM, 28.345 MHz ± QRM, and 146.98 MHz (−600) repeater. For a certificate, send a QSL with a 9 x 12 SASE to ***Wexaukee ARA, P.O. Box 163, Cadillac MI 49601.***

FEB 1–29

VOICE OF AMERICA QSO PARTY The Voice of America will celebrate its 50th Anniversary by holding a QSO contest from Feb. 1 at 0000 UTC–2359 UTC Feb. 29, to help promote worldwide awareness of the many amateur radio stations that are affiliated with VOA. The object is to log as many VOA related stations around the world as possible within the given time frame. All VOA amateur stations will add the suffix /VOA, "slash VOA" when they sign their call. Stations outside the U.S. will announce that they are "VOA 50th Anniversary" stations. Frequencies ±QRM; Phone–3920, 7260, 14316, 21416 and 28416 kHz. All other modes–3550, 3725, 7050, 7125, 14050, 21050, 21150, 28050 and 28150 kHz. SWL entries are encouraged. Logs must be received at VOA Headquarters no later than Apr. 30, 1992. Contact ***Voice of America Amateur Radio Club K3EKA, Attn: Contest Committee, 330 Independence Ave., SW, VOA Mail Room–Code 73, Washington DC 20547.***

FEB 7–16

VERNON, BC, CANADA The North Okanagan RAC will operate Station VE7NOR during the 32nd Annual Vernon Winter Carnival. Frequencies: 28.575, 14.275, 7.175 and 3.775. The "Winter Carnival Award Certificate" is free with a QSL card or QSO log info, but we request that amateurs please send $1 or 2 IRCs to cover postage to ***Winter Carnival Award–VE7NOR, Box 1706, Vernon BC, Canada V1T 8C3.***

FEB 15–16

PHOENIX, AZ The Motorola ARC of Arizona will operate KG7RS on Feb. 15, 1500Z–0100Z Feb. 16, to commemorate Arizona's 80th Birthday. Operation will be in the lower portions of the 40, 20 and 15 meter General phone subbands and the 10 meter Novice subband; CW in the General and Novice CW subbands. For unfolded certificate, send QSL and 9 x 12 SASE to ***KG7RS, 2802 N. 34th St., Phoenix AZ 85008.***

FEB 21–23

MARQUETTE, MI The Hiawatha ARA will operate a Special Event Station honoring the UP 200 Sled Dog Championship. The station will run from Feb. 21 at 7 PM–1 PM Feb. 23. Frequencies: 28300–28500, 21300–21450 and 14225–14350. For a certificate, send QSL and SASE to ***N8GBA, 21 Smith Lane, Marquette MI 49855.***

FEB 27–MAR 1

DELANO, CA The Kern County Central Valley ARC will operate W6LIE from the transmitter site of "Voice of America" short wave station. Frequencies: SSB–3.855, 7.235, 14.245, 21.335, 28.335 and 28.535; CW–3.535, 7.035. 14.035, 21.035, 28.035; Digital–3.065, 7.065, 14.065, 21.065, 28.145. For special QSL card send SASE to ***W6LIE Special Event, P.O. Box 743, Bakersfield CA 93302, U.S.A.***

MAR 1–2

WISCONSIN QSO PARTY The West Allis RAC will host the Wisconsin QSO Party from Mar. 1 at 1800Z–0100Z Mar. 2. Modes CW and Phone. Work all stations once per mode on each band. Frequencies: CW–3550, 3705, 7050, 7125, 14050, 21150; Phone–3890, 7230, 14290, 28400. Entries must be postmarked by Apr. 15 and sent to ***Wisconsin QSO Party, West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee WI 53201.***

Random Output

Continued from page 84

you do to pay the rent?") If that goes nowhere, ask him what he does in his spare time. ("Do you have any hobbies other than ham radio?") Find a common interest, and don't be afraid to talk a little about yourself. ("I've got to keep an eye on the clock. My wife and I have tickets to a Motley Crue Concert.") If you're excited about something, you should be able to interest someone else in it.

Current Events

Talking about recent news stories is a good way to get the conversation rolling. A simple question like, "Did you hear the latest from the Soviet Union?" might open up all kinds of topics from Marxist doctrine to an ol'-timer's WWII stories. With the map of Europe changing on an almost weekly basis, the upcoming presidential election, and whatever scandal the press has seen fit to sell soap with this week, great conversation starters are always as close as your newspaper.

The Second Time Around

If the first QSO with someone was anything close to a real conversation, you should honestly listen for that callsign again. Second QSOs are usually much more easygoing than the first.

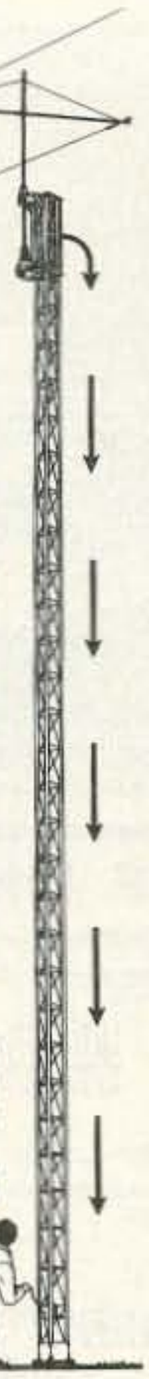
Make reference to something you discussed during your first contact ("So, how was that Motley Crue concert?"), or go off on a new tangent. Answering a CQ with, "Hi, Joe...it's Dave, N1GPH. How ya' doin'?" immediately starts things off on friendly footing.

It Takes Effort

It's not easy to get to know someone over the radio. It takes a real effort to drag some people out of their shells and get them to open up about themselves.

Keep at it. If we all strive to be better conversationalists, it will make us all better communicators. 73

Enjoy NEVER CLIMBING YOUR TOWER AGAIN



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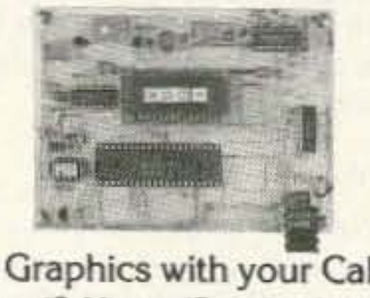

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Space Symposium and More

The 1991 AMSAT Annual Meeting and Space Symposium was held at the Los Angeles Airport Holiday Inn from November 8–10. Over 200 satellite enthusiasts from around the world attended. A thousand miles to the east, the Houston Ham Convention hosted *Mir* cosmonaut Musa Manarov U2MIR/UV3AM, Boris Stepanov UW3AX and several American astronauts. For participants in both locations, it was a great weekend.

The Russians Were Here

Thanks to the efforts of Jim Carmody NN5O, the Texas DX Society, and past AMSAT President Vern "Rip" Riportella WA2LQQ, arrangements were made to bring Musa and Boris to Houston for the yearly convention. Musa has spent more time in space than most cosmonauts and has logged many hours on 2 meters talking and running packet from the Soviet *Mir* space station. He has been involved with the aircraft and space communications business for nine years, and is currently involved with space station simulations at the Baikonur Cosmodrome to help with any situations that may occur onboard *Mir* during day-to-day operations. When not in space or pursuing other activities, he is active on packet and 2 meter voice in Moscow.

During Musa's time in *Mir*, the United Nations requested that he observe and record pollution caused by the oil-well fires in Kuwait. He brought these videos and more to Houston.

Musa came to Houston on the Wednesday before the ham convention. On Thursday evening he had a chance to meet with Payload Specialists Ron Parise WA4SIR and Sam Durrance of STS-35, along with Marti Laine OH2BH,the Project Coordinator of the recent ZA1A DXpedition to Albania, and several NASA hams and Texas DX Society members. Musa, eight astronauts, and Boris (who was delayed in Paris) got a VIP tour of the Johnson Space Flight Center on Friday.

Starting on Saturday, a joint program at the Houston Ham Convention with astronauts Ken Cameron KB5AWP and Steve Nagle N5RAW went very well. Ken and Musa talked about their attempted QSO between STS-37 and *Mir*. While Musa was striving to make radio contact with the astronauts on 2 meters, the shuttle crew was watching through the window as *Mir* passed by. Unfortunately this was the same window that normally was home to the astronauts' VHF antenna. Although STS-37 was heard on *Mir*, and *Mir* was heard by the astronauts, the complete two-way contact was not quite successful. Future attempts will undoubtedly occur when the next Shuttle/*Mir* opportunity comes along. STS-45 this spring might be a good possibility.

The Houston gathering eagerly watched Musa's video tapes of activities on *Mir* and the Kuwait fires. There were also opportunities to get autographs from Musa before his departure for Newington and a visit to the ARRL.

Back in L.A.

The AMSAT activities in Los Angeles began at high noon Friday, November 8th. Two concurrent seminar sessions were held that afternoon. One was the AMSAT and ARRL Education Workshop, chaired by Rosalie White WA1STO of the ARRL. Several topics were covered, all with the common theme of satellites in education.

The parallel program started with the presentation of a paper by Peter Goldman and Brent Helleckson on the efforts of the Deep Space Exploration Society (DSES). Approaching DSES from an amateur point of view, they discussed using 18 meter dish antennas located in Colorado for deep space craft data reception and radio astronomy.

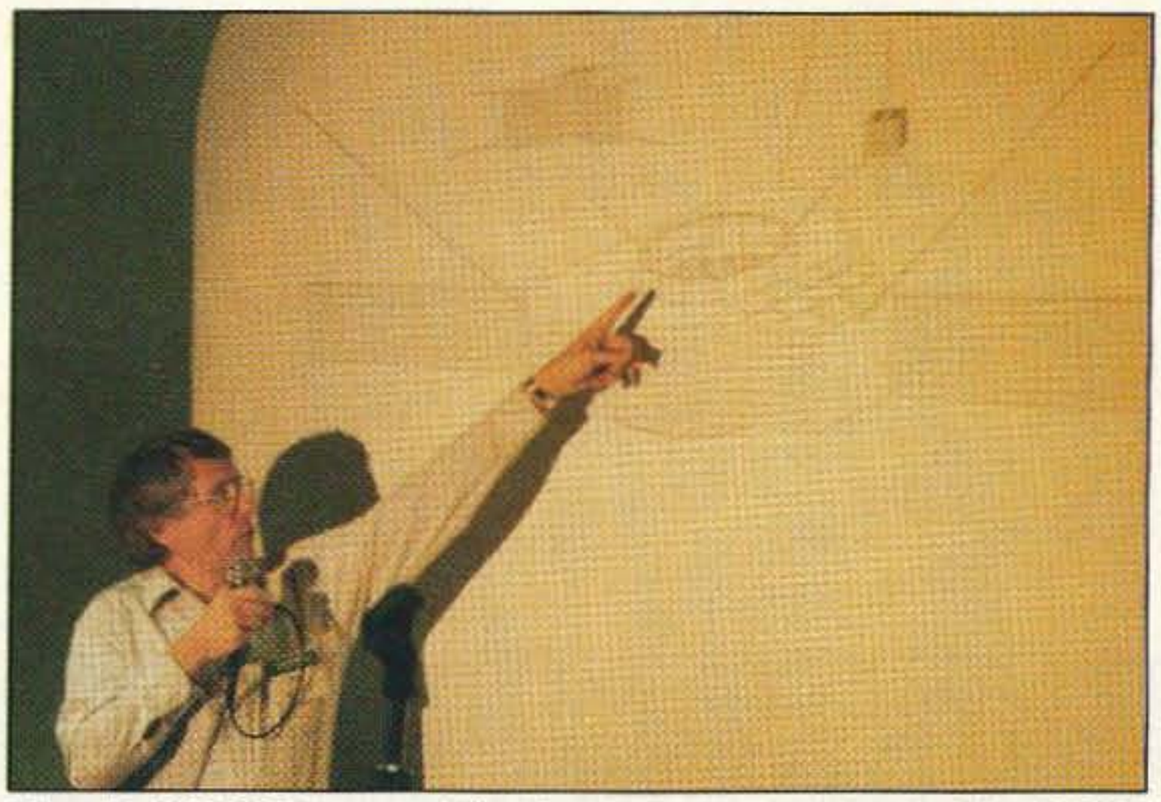


Photo B. AMSAT Director and Vice President of Engineering Jan King W3GEY compared features of the proposed Phase-3-D spacecraft with previous hamsats.

Photo C. AMSAT Director Dr. John Champa K8OCL showed a development board produced by the Detroit OSCAR Users Group for the SEDSAT Project.

Then AMSAT Director Dr. John Champa K8OCL discussed the Solar Sail program of the World Space Foundation. The World Space Foundation would like to see spacecraft developed to travel between the planets, powered by giant sails using the pressure of photons from the sun. For more information on this program, refer to *Project Solar Sail*, edited by Arthur C. Clark.

Dennis Wingo KD4ETA and Cheryl Bankston KD4FPH provided an update on SEDSAT 1, a microsat-class satellite potentially flying as a secondary payload as part of NASA's Small Expendable Deployer System (SEDS) flight demonstration project. SEDSAT 1 would be placed in a circular orbit with a mean altitude of 730 km at 39 degrees inclination. Several amateur radio systems for analog and digital communications would be included with an array of scientific experiments to study orbital mechanics, the dynamics of tethered satellites, and remote sensing.

Joe Kasser W3/G3ZCZ discussed the use of gateways between terrestrial amateur radio operators and satellite-based communication systems in the 21st century. Representatives of Weber State University presented information on recent Weber-OSCAR-18 efforts and told of the proposed Astronaut-Deployable Satellite (ADSAT) program. Dan Schultz N8FGV proposed a radio astronomy experiment for the new Phase-3-D satellite or the solar sail.

In the hotel lounge, videos of the new "Amateur Radio in Space" production (available from the ARRL) were shown, along with John Fail (KL7GRF)'s tapes of the CE0ZZZ (Juan Fernandez Island) and XF4L (Revilla Gigedo Island) satellite DXpeditions.

Saturday morning started with a welcome from AMSAT Executive Director and Chairman of the Board of Directors Doug Loughmiller KO5I. He was followed by Brooks Van Pelt KB2CST with a description of the development of applications for the DSP-12 Terminal Node Controller (TNC).

AMSAT Director Dr. Bob McGwier

Photo A. STS-35 Astronauts Ron Parise WA4SIR and Sam Durrance flank veteran Mir *Cosmonaut Musa Manarov U2MIR in Houston, Texas.*

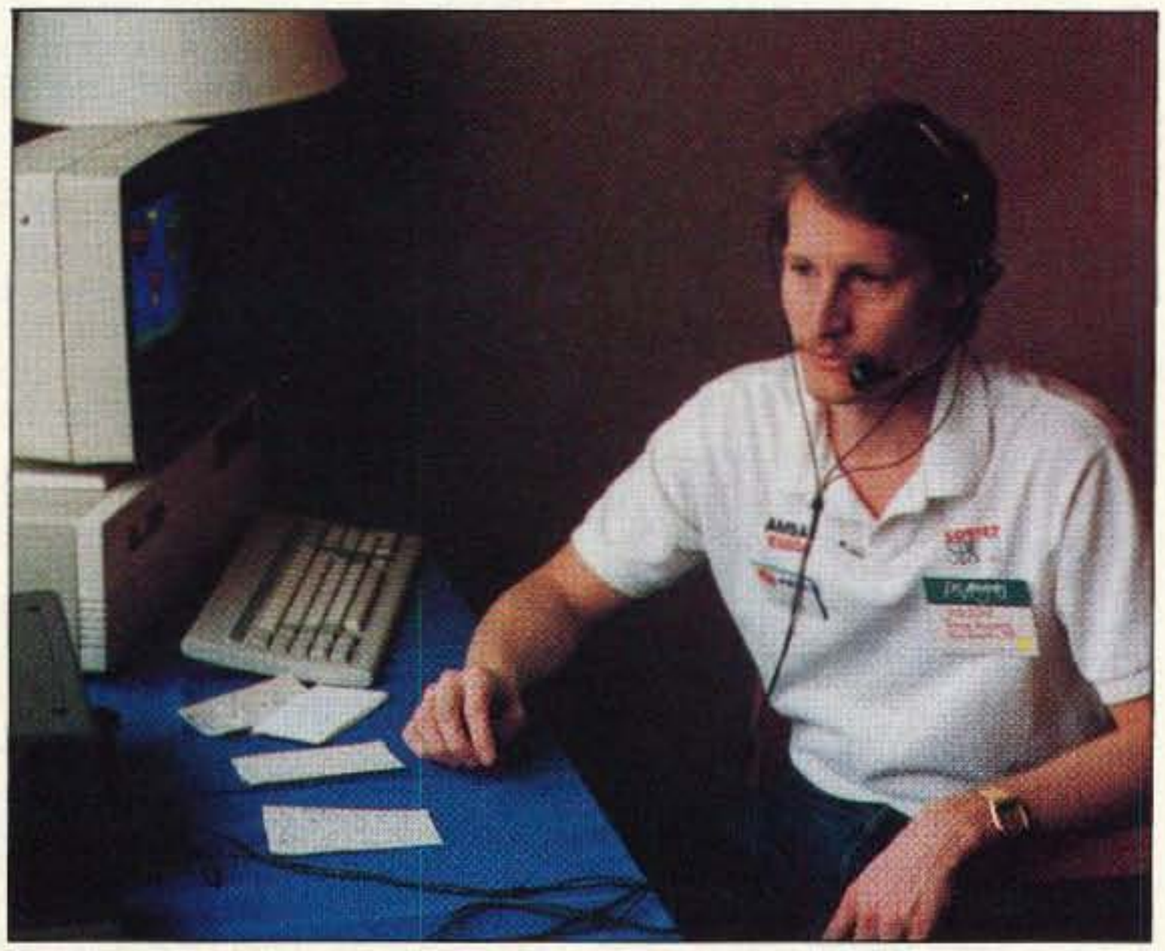


Photo D. AMSAT Area Coordinator Doug Howard KG5OA took a turn at the Space Symposium earth station.

N4HY continued with an in-depth description of the myriad difficulties encountered by ground control stations working with DOVE-OSCAR-17 and its digital voice system. Problems controlling DOVE have been compounded by the apparent failure of a capacitor in the satellite's S-band (2.4 GHz) transmitter, making these signals unusable by stations attempting software uploads—even those employing advanced digital signal processing systems. Efforts continue and optimism is high since most of the satellite's subsystems are performing quite well.

AMSAT President Bill Tynan W3XO presented findings on the successes of the Shuttle Amateur Radio Experiments (SAREX) in 1991. With STS-35 and the all-ham crew efforts of STS-37 now history, he provided insight into future efforts with the voice-only proposals for STS-45 and more elaborate configurations later.

AMSAT Director and Vice President of Engineering Jan King W3GEY began the discussions of the Phase-3-D satellite program. This remarkable hamsat will measure 10 feet across, not including the solar panel "wings." A full-scale model was on display at the hotel. The program will be the most ambitious amateur radio activity to date. Organizations from over 12 nations are involved in the funding, planning and building. The cost of the program will be several million dollars. Launch is scheduled for the latter half of this decade on an Ariane 5 rocket from French Guiana.

Jan discussed some of the possible physical and electronic configurations that have been studied by the international group of satellite designers. He also provided details on the potential coverage and expected uplink signal levels needed to access the satellite. Using a matrix of several uplink bands coupled to different downlink frequencies, operation will be possible from HF through the microwaves. The available power levels on the spacecraft will be sufficient to allow mobile stations to make easy two-way contacts when conditions are good. The orbit will be elliptical like OSCARSs 10 and 13, but will be fine-tuned to avoid the difficulties inherent with elliptical orbits (like the coverage pattern of OSCAR 10 and the predicted demise of OSCAR 13 in 1996 due to solar and lunar forces).

Photo E. The Phase-3-D full-size hamsat model was on display at the space symposium.

Ed Krome KA9LNV described his low-cost Mode-S equipment for OSCAR 13 operation. Mode S uses a 70 cm uplink coupled with a 2.4 GHz downlink. Although this combination may seem difficult to use, Ed's efforts and results have been exceptional. He uses a simple loop yagi connected to a downconverter from Down East Microwave, and a 2 meter multi-mode receiver. This arrangement is cheaper than a Mode-L (23 cm up and 70 cm down) ground station which needs power or high gain antennas on 1269 MHz. Mode S promises to become a primary mode on future hamsats.

John Champa K8OCL gave a talk on motion and color video via Phase-3-D. His proposal is to use Amateur Digital Video (ADV) instead of standard Amateur Television (ATV) on the future satellite. A few years ago this idea was considered beyond the scope of amateur activities. Today it is quite possible due to the advent of new video compression techniques and high-speed modems. John showed tapes depicting the results of different compression methods on moving video scenes and pointed out the potential bandwidth savings encompassed by these systems. Data speeds as low as 19.2 kbps can be utilized for video, although higher speeds like 56–64 kbps provide better results with current technology. Hundreds of hams are active on UoSAT's 14 and 22 at 9600 bps today. It is not difficult to imagine relatively inexpensive equipment available for higher speeds when Phase-3-D is launched five years from now.

AMSAT Director Dr. Tom Clark W3IWI told of "Chaos, The Eccentricities of Eccentric Orbits." A few years ago, it was noted that OSCAR 13 was coming out of orbit. Since the satellite's perigee, or low point of its elliptical orbit, is far above any atmospheric influence, the situation seemed impossible. Further studies showed that the satellite was headed for reentry due to forces of the sun and moon. Tom's presentation described the reasons for the decline and discussed circumstances that would have given different results. The timing of the launch and the kick motor firing played parts in the current condition. Early calculations predicted the satellite's demise in late 1992, but further studies with better orbital models showed an end to OSCAR 13 in late 1996. Today, OSCAR 13's perigee is holding steady around 600 km. Later in the year it will be on a definite upswing and back to 800 km by January 1994. Sometime in November or December 1996 it should become a shooting star across the sky. By then Phase-3-D should be up or nearing launch.

Harold Price NK6K gave an update on microsat operations. His presentation focused on the heavy use of AMSAT-OSCAR-16 and LUSAT-OSCAR-19, and the need for higher data speeds and more digital satellites. A-O-16 and L-O-19 have been active at 1200 bps since launch but are capable of 4800 bps. Efforts are underway to test the higher-speed capabilities and to develop more spacecraft with 9600 bps like UoSATs 14 and 22.

Martin Davidoff K2UBC, author of *The Satellite Experimenter's Handbook*, provided insight to the proposed AMSAT MARS-A Experiment. While Phase-3-D is shown to be 10 feet across, the space in the center of the satellite, where the adapter cone for other payloads on its flight is located, is vacant. The MARS-A program proposes to build an amateur radio interplanetary probe that will fit in the center of the adapter cone and ultimately send the probe into an orbit around the planet Mars. Martin pointed out that the mission is possible, but there are some serious questions concerning its feasibility. They include designing, constructing and controlling an interplanetary spacecraft. Power for the onboard systems and a viable propulsion system are other key considerations. The program is an exciting one, but the pool of amateur radio satellite builders around the world is limited and the efforts toward Phase-3-D could easily require all their time and energy.

Talks on weather satellite imaging (by Jeff Wallach N5ITU), Volunteers in Technical Assistance (VITA) operations via U-O-22 (by Mark Oppenheim KD6KQ), satellite telemetry considerations (by Joe Kasser W3/G3ZCZ), activities with the Soviet Space Exhibit in Fort Worth, Texas (by Keith Pugh W5IU), and a description of the University of Surrey satellite program (by Martin G7DQE) completed the Saturday symposium agenda. The day finished with the AMSAT Annual Meeting, the President's report to the membership, a gourmet buffet dinner, awards presentations, and the prize drawings.

Sunday morning began with a beginner's satellite primer and forum hosted by AMSAT Vice President of Field Operations Mike Crisler N4IFD. A tour of the Jet Propulsion Lab followed for those who did not wish to attend the Board of Directors' meeting. Most participants took off for home on Sunday while the Board meeting participants went back on Monday. Symposium Committee Chairman Gene Davies AA6NP and his crew did a fantastic job of preparing and running the weekend events. Next year's symposium will be held at the Intelsat headquarters in Washington, DC. Make plans now to attend!

Copies of the *Proceedings of the AMSAT-NA Ninth Space Symposium* are available from AMSAT or the ARRL. The book is 8-1/2" x 11", 260 pages long and softbound. It's well worth the cover price of $12. For details on shipping charges, contact AMSAT at (213) 589–6062.

73 INTERNATIONAL

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

Notes from FN42

I'm very happy to know that Rod Hallen will continue to report about ham activity when he makes his move to Pakistan from Kenya. Hopefully, he can also get a ham license and operate from there even though he has been told not to hold his breath.

Milen Postadshieff LZ2MP has sent us the first of hopefully many bits of news from Bulgaria. I think you will agree with me that his first is a good start.

73 has been receiving quite a bit of mail from hams in the USSR who are listing QSL services. I have a feeling that they will become too numerous for inclusion in this column so I will include them in the 73 International area on the 73 BBS for those who wish to use these services.

I received an interesting phone call from John Young in the Washington, D.C., area. He used to be a ham but let his license lapse. It appears that he is an SWLer now. He was listening to some CW on 8880 kHz and heard three amateur callsigns, two from the USSR and one from Yugoslavia (of course they could be bootleggers). As far as I know, that frequency is outside the international amateur allotment. I guess that there are many hams that get their kicks by operating outside the authorized frequencies. It must be the excitement of getting away with something that is against the rules. But have these people really thought about what will happen to them if they are caught? I have to assume that they have not, or if they have, the risk of getting caught is worth it.

Maybe I'm getting fuddy-duddy in my old age but I value my ham license and the hours of fun that it provides me. I have made many friends via the airwaves, some that I have met and some that I will probably never meet face-to-face. That is one thing in amateur radio that I will never get tired of, the ability to meet new friends around our world.

—Arnie N1BAC

Roundup

Brazil *From Nubio Nunes Revoredo for Ari Carstens:* Amateurs of Rio de Janeiro are planning an amateur radio contest during the 1992 World Conference on Ecology (ECO/92). The conference is sponsored by the United Nations. Further information may be received by contacting Mr. Ari Carstens, Unser Nest PO Box 97.109, Nova Friburgo 28.601, Rio de Janeiro, Brasil, or FAX to PY1RMS/Renate (55)21.709.1104 PY1RMS/Renate, or Mr. Nubio Nunes Revoredo, Rua Carlos Pereira Leal, 238, 26285 Nova Iguacu, RJ, Brasil. *[We will publish the dates in this column when we receive them. The rules will be published on the 73 BBS.—Arnie]*

Japan *From the JARL News:*

7K2 to 7N4 Prefixes

Japanese callsigns usually begin with "J" but, as of April last year, all such signs allocated to the Kanto area (the area around Tokyo) were used up, and as an exception, new callsigns beginning with "7" (7K1 to 7N1) were introduced in the area.

However, as of August this year the allocation of callsigns with the prefix "7N1" is all but full. To cope with this situation, on July 23 the callsign designation standard for identification of amateur radio stations was partially amended, and the new prefixes of "7K" to "7N4" have now been allocated to the Kanto area. (NOTE: The number of amateur radio stations in Japan came to 1,124,018 as of the end of June 1991).

Radio Communications Area Opened

On August 1, a ceremony to mark the opening of the Radio Communications Section took place at the Communications Museum, Tokyo, in the presence of Mr. K. Sekiya JA5FHB, Minister of Posts and Telecommunications, Mr. S. Hara JA1AN, President of JARL, an audience of ministerial officials, and the press. Following a congratulatory speech by the Minister, the tape was cut, and Mr. Suzuki, Chairman of the Kanto Postal Services Bureau Amateur Radio Club, JM1YPK, made a commemorative QSO with JARL's Sugamo station, JA1YAA.

The new Radio Communications Section will be a permanent exhibit, designed especially for young people to learn correct amateur radio communications procedures.

JARL Youth Visits Shanghai

A JARL youth team comprised of 11 members, seven of whom were boys and girls aged between 11 and 13 and possessing ham licenses, traveled to Shanghai from August 8th through the 13th.

Led by chief advisor Mrs. Tenkoko Sonoda, wife of the late Mr. Sonoda, former Minister of Foreign Affairs, the team visited a variety of interesting places, the foremost being stations BY4AA and BY4ALC. The youngsters made friends and exchanged greetings with young Chinese people by means of amateur radio whenever possible. It is hoped that the new spirit of friendship developed there will be a lasting one.

Japan Amateur Radio Development Association

On August 22, a ministerial sanction was accorded and the Japan Amateur Radio Development Association (JARD) was established. The Association is currently making necessary preparations to officially assume responsibility for the technical standard qualification of amateur radio equipment.

The purpose of this association is to contribute to sound development and utilization of radio waves, and to promote amateur radio through technical standard qualification of amateur equipment under the Wireless Telegraphy Act, handling of applications for amateur radio licenses, training of amateur radio operators and cooperation and supervision to maintain orderly use of amateur radio.

The address of the organization is Kojima Building, 1-24-3, Sugamo, Toshimaku, Tokyo, 170 Japan.

Also from Japan via Tom KA8ZE: I am in the USAF and I have been at Misawa for one-and-a-half years. My call has confused many a DXer!! I was issued this call by the USFJ/AMRS (Far East military command) in Yokota, Japan, to use while I'm on an air base. Thanks and good luck, Tom KA8ZE. *[It appears that this can be true of KA2–KA8 prefixes. Any 2 x 2 callsigns with the prefix KA2–KA8 indicates a U.S. military call in Japan. The card is so nice that I'm including it in the column.—Arnie]*

USSR *From Oleg Y. Latyshev, UA6HPR:* The High Mountain DX Club (HMDXC) has an award program. Some of the awards include: WARO (Worked All Russian Oblasts), 5BWARO (five-band WARO), WHMS (Worked with High-Mountain Station), HMAC (Highest Mountains All Continents), 5BHMAC (five-band HMAC), and HMDXCA (High-Mountain DX-Club Award). A special streamer "North Kavkaz-91" is given for one contact with R6E—high mountain DXpedition of HMDXC. QSL cards for R6E go to UA6HPR, PO Box 999, Stavropol, 355044, USSR.

For more information or to become a member of HMDXC, write to: Oleg Zhukov, PO Box 410, Kaliningrad-10, Moskow obl, 141070, USSR. *[A description of the awards will be placed on the 73 BBS under HMDXC Award Program.—Arnie]*

AUSTRALIA

David Horsfall VK2KFU
PO Box 257
Wahroonga NSW 2076
Australia

Many thanks to those who commented on my "maiden" contribution in the December issue. It feels odd writing this in November *[to be in the February issue]*, after already having seen the December issue, but I'm sure I'll get used to this "time warp."

Photo A. QSL card from Tom KA8ZE.

By the time you read this, the "Ross Hull VHF/UHF Contest" will be over, and preparations will have started for the "John Moyle Memorial Field Day Contest" this March. There are only about half a dozen national contests, and interest in them seems to be dropping.

There is a growing amount of interest in the use of spread-spectrum techniques for amateur communications, if the attendance at a recent lecture was any indication. A careful reading of the regulations indicates that frequency hopping and direct-sequence emissions are NOT prohibited modes for Australian amateurs, as no restrictions are placed on modes above 30 MHz, except for the usual conditions (fast-scan ATV above 420 MHz, etc.). Of course, we won't even contemplate getting an official ruling on this. Progress is made by doing it first, then finding out whether or not it was legal.

Finally, Australia looks like it's going to get a new licence class—the Code-Free Novice. When Novices gained 2m FM privileges recently (voice only, not packet), this was a great success, with 2m FM band providing a "common" band for all classes of licences. If WIA proposals are accepted by the Department of Transportation and Communications, this will see Novices permitted operation on 70cm as well as 2m, with packet radio operation, and the 5 wpm CW requirement dropped for Novice VHF/UHF access only. I'll have more news on this in a future column, but it certainly looks like encouraging more people (especially computer affectionados) to join the diminishing ranks of amateur radio.

Cheers for now. Those with access to Internet or packet can contact me as "daveips.OZ.AU" and "VK2KFU @ VK2RWI.NSW.AUS.OC" respectively.

BULGARIA

Milen Postadshieff LZ2MP
PO Box 237
7000 Russe
Bulgaria

Packet: LZ2MP @ HB9AK.CHE.EU
LZ2MP @ DKØMTV.DEU.EU

It will be really a great pleasure for me to send you some ham radio information from Bulgaria from time to time. The mail from the USA to Bulgaria usually takes between two weeks and one month, but from Bulgaria to the USA it takes even two months, regardless of whether the letter was sent by surface mail or by airmail. Any who wish to contact me should probably use the packet BBSs listed. I check them on a daily basis.

Since last July, in addition to 1.8/3.5/7/14/21/28 MHz, two other bands have been opened for the hams in Bulgaria: 18 and 24 MHz. The permission is valid until 31 December 1995 and we are allowed to use the bands as follows: 18068–18100 CW, 18100–18110 RTTY + CW, 18110–18168 SSB + CW, 24890–24920 CW, 24920–24930 RTTY + CW, 24930–24990 SSB + CW.

Most of the hams here are running home-brew transceivers and haven't used these new bands. But about seven years ago the Central Radio Club of Bulgaria imported some Kenwood TS-830s from Japan. The transceivers have been paid for by the government and spread all over the country amongst the most active LZ Radio Clubs. One can recognize the club stations from the three-letter suffix starting with K for Club, for example: LZ2KIM. There are about 50 clubs here operational on the WARC bands so I guess there will be some activity on the new bands.

With the recent changes in this part of the world, from time to time we have foreign hams visiting Bulgaria. For those of them who would like to operate from Bulgaria, the following info might be of some interest and use. Until now there are no reciprocal licensing agreements and therefore no guest licenses. BUT, aliens who hold a valid amateur radio license issued by their government may operate any club or private LZ ham radio station in the presence of the manager or the owner, transmitting the callsign of the station, accompanied by stroke and their own home callsign using one of the following languages: Bulgarian, English, German, French, or Russian. So no government permit is needed, only your license and the consent of the station manager or owner.

Wishing you all the best. 73, Milen.

KENYA

Rod Hallen 5Z4BH
Box 55A
APO New York 09675

Well, my tour in Kenya is almost over. We leave here 14 December for home leave. After a month in Arizona we will be off to Karachi in January. As I said in my last letter, the license situation in Pakistan is uncertain but I will do what I can to get on the air.

I've made two DXpeditions to the Comoros as D68RH and have given a new country to thousands of DXers. That was my final big blast in Africa. After six years on the continent I'm ready for something new. I have only traveled in the Middle East once so it will almost all be new for me.

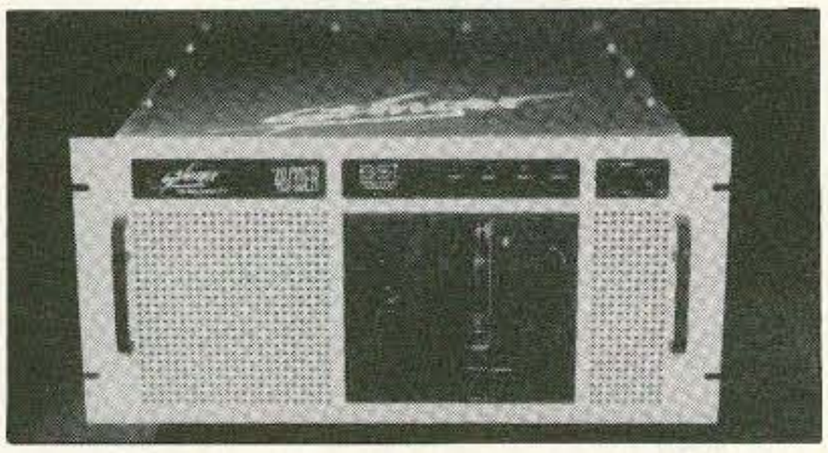
That's about all to report from here. The next time you hear from me will be from AP2. My new address will be Rod Hallen, AMCONGEN-RIMC, Unit 62400 Box 124, APO AE 09814-2400.

Number 17 on your Feedback card

NEW PRODUCTS

Compiled by Hope Currier

BESTWAY SYSTEMS



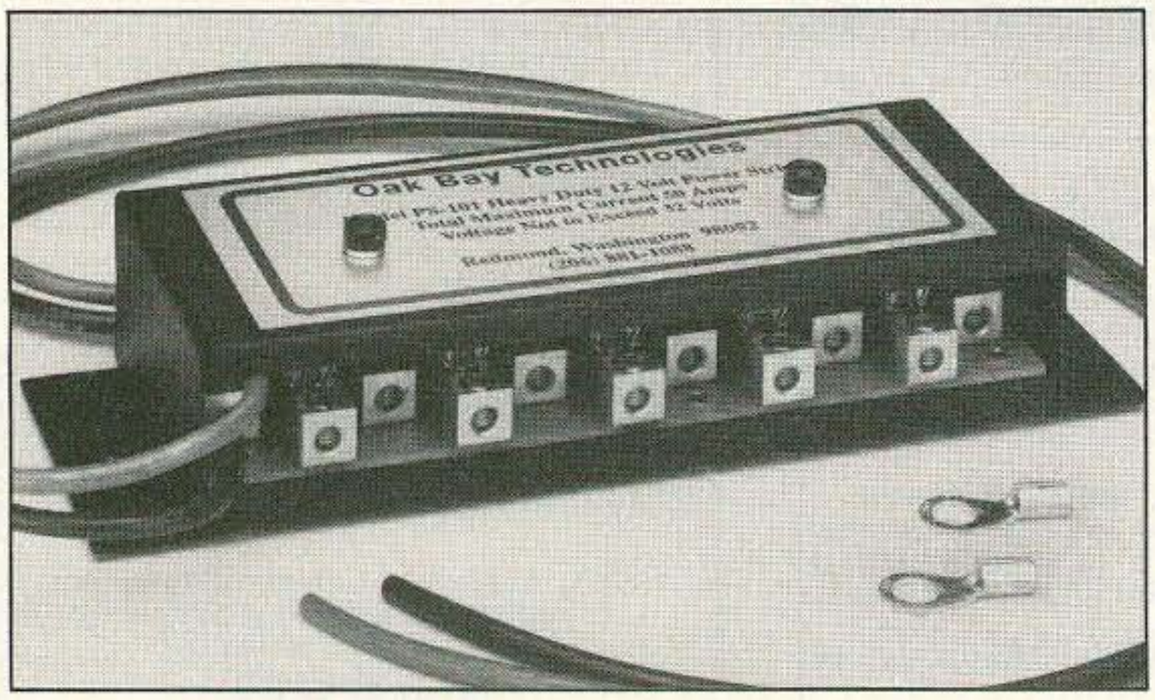
Bestway Systems is now offering the heavy-duty, rack-mounted Stinger chassis. The SCA-1 is an industrially-hardened 19″ rack-mount enclosure, capable of housing four full-height internal and four half-height exposed drives. It can accept full- or half-size active/passive main system boards. Constructed of 16-gauge C/R clear zinc plated steel, the chassis allows the user to configure a system to his/her specifications within a state-of-the-art enclosure. The SCA-1 can be used to complement repeaters, telemetry equipment, controllers, power amps and power supplies designed around the standard 19″ form-factor. Receivers/transceivers can be controlled using the appropriate DOS software. Additional SCA-1 features include a Mil-Spec 400W 55A power supply which supports simultaneous power-on by all devices, a 100 CFM cooling fan with a TEMPEST grade EMI/RFI filter, emissions-tuned cooling inlets, power on/off key switch and safety-keyed reset button, top cover lock, modular internal bay assemblies, short/overload/thermal and no-load protection, and mounting rails by Accuride.

For the price and more information, contact *Bestway Systems, Inc., 999 Central Park Ave., P.O. Box 54, Yonkers NY 10704; (800) 477–UNIX, (914) 968–9491, FAX: (914) 968–9523.* Or circle Reader Service No. 202.

COMMUNICATIONS SPECIALISTS

Communications Specialists has added another wire harness for direct plug-in of their TS-32P CTCSS encoder-decoder. These plug-in wiring sets can save you considerable time when adding CTCSS encode-decode. The newest wire harness is for the GE Delta radio (part no. 01-1032), and is priced at $2. It can be added to the TS-32P at the time of purchase, or retrofitted to existing TS-32Ps.

Communications Specialists also offers plug-in adaptations of their tone products for many other popular radios. Contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296; (800) 854–0547, (714) 998–3021, FAX: (714) 974–3420.* Or circle Reader Service No. 204.



OAK BAY TECHNOLOGIES

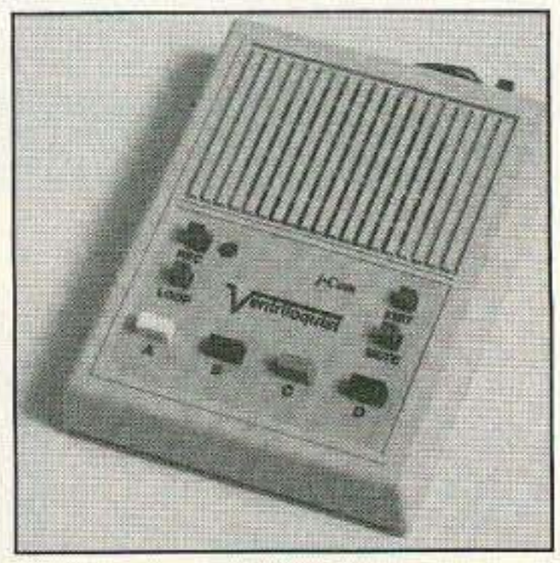
The Model PS-101 12-volt power strip from Oak Bay Technologies features five separate outputs, each individually fused, with the ability to handle 50 amps total (not to exceed 32 volts). It provides a complete, easy, safe interface between external equipment and a single-source power supply, putting an end to cumbersome multiple connections. The strip, 10″ wide by 3.2″ deep by 1.7″ high, contains two 30 amp fuses and three 20 amp fuses, along with five feet of eight-gauge copper wire and two ring lugs for connecting to the power supply. The enclosure is manufactured from rugged 20-gauge steel for exceptional sturdiness and vibration resistance.

The Model PS-101 is available through amateur radio dealers for a suggested list price of $79.95. For more information, contact *Oak Bay Technologies, %Evelyn Garrison & Associates, 21704 S.E. 35th St., Issaquah WA 98027; (206) 557–9611, FAX: (206) 557–9612.* Or circle Reader Service No. 201.

J•COM

The Ventriloquist™ voice keyer and audio memory from j•Com is based on the recently released ISD series of integrated circuits featuring direct storage of analog signals in non-volatile, electrically erasable, programmable memory. Unlike conventional digital voice keyers, Ventriloquist records and reproduces analog signals directly at a rate of 6,400 samples per second, achieving a 2.7 kHz signal bandwidth with less than 2% THD. The use of EEPROM technology means that the memory will retain the signal for up to 10 years without power, unlike RAM-based systems. Unlike EPROM-based systems, Ventriloquist will erase and rerecord directly without the need for sophisticated equipment or manufacturer reprogramming.

Ventriloquist contains a built-in microphone for recording and a speaker for playback. The unit interfaces easily with most modern transceivers. A PTT keying circuit is provided to operate the transmitter automatically when a message is played. It also includes a built-in computer interface which may be connected directly to the printer port of any PC-compatible computer. This interface has been designed to be directly compatible with the ubiquitous CT contest program.



As an assembled and tested PC board, Ventriloquist sells for $124.95; with a high-impact ABS enclosure, $149.95. Prices include U.S. shipping. For more information, contact *j•Com, P.O. Box 194, Ben Lomond CA 95005-0194; (408) 335–9120, FAX:(408) 335–9121.* Or circle Reader Service No. 203.

M.M. NEWMAN

The Antex TCSU-1 from the M.M. Newman Corporation is a temperature-controlled soldering station that can be supplied with a standard size iron or a miniature soldering iron and a selection of precision tips in a variety of shapes. It features a sliding potentiometer with a 1-to-10 setting to maintain the desired soldering tip temperature from 160°F to 815°F, with ±2% accuracy. Offered with a 40W standard size or 30W miniature iron, the tip is positively grounded and zero crossing electronic switching eliminates RF interference and magnetic fields. The Antex TCSU-1 Temperature Control Station is powered by 115 VAC and converts the voltage to 24 VDC. A sponge tray with a stable metal base and spring holder conforming to DOD-STD-2000-1B is provided. Both irons' heating elements are under the tip for optimum thermal efficiency and recovery times.

The Antex TCSU-1 sells for $205.43. For more information, contact *M.M. Newman Corporation, 24 Tioga Way, P.O. Box 615, Marblehead MA 01945; (617) 631–7100, FAX: (617) 631–8887.* Or circle Reader Service No. 207.

LARSEN

Larsen Electronics has announced the new Kūlglass™ KG 2/70 dual-band on-glass antenna designed for mobile radio users who require simultaneous VHF and UHF mobile communications over wide bandwidths. The KG 2/70 operates as a half-wave antenna on VHF and a collinear on UHF, and provides 2.5 dBd and 4 dBd gain respectively. Each antenna is individually factory-tuned to cover the 2 meter (145–148 MHz) and 70 centimeter (442–448 MHz) FM bands at 1.5:1 VSWR. The antenna's patented impedance-matching circuitry is on the outside of the glass to insure the best performance.

For the price and more information, contact *Larsen Electronics, Inc., P.O. Box 1799, Vancouver WA 98668; (206) 944–7551, (800) 426–1656, FAX: (206) 944–7556 or (800) 525–6749.* Or circle Reader Service No. 206.

HAMTRONICS

Hamtronics, Inc. has just printed a new catalog of their popular VHF and UHF modules. The catalog includes both kits and wired/tested modules for FM receivers, exciters, and power amplifiers used for building repeaters and control and telemetry links. Also included are receiver preamps, receive and transmit converters, autopatches, DTMF controllers, and accessories. The new January 1992 issue features new versions of the REP-200 repeater, including economy models in kit form and models with no controller which can be used with external controllers from ACC and others.

For your free copy, contact *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468-9535, FAX: (716) 392–9420.* Or circle Reader Service No. 205.

COMMUNICATIONS ELECTRONICS INC.

Emergency Operations Center

has expanded to our new two acre facility and World Headquarters. Because of our growth, CEI is now your one stop source for emergency response equipment. When you have a command, control or communications need, essential emergency supplies can be rushed to you by CEI. As always, for over twenty three years, we're ready, willing and able to help. For 1992, we're introducing new products from Uniden, Shinwa, Cobra, Ranger Communications, Grundig, Sangean, Magnavox, Icom and RELM.

NEW! Shinwa SR001-B

List price $799.95/CE price $479.95/SPECIAL

Continuous coverage from 25.000 through 999.995 MHz.

If you're looking for an excellent synthesized scanner designed for mobile surveillance use, the new Shinwa SR001 scanner offers features never before offered at such a low price. When you purchase this wide band scanner from CEI, you'll get a free infrared wireless remote control that allows you to control your scanner from over 20 feet away. Selectable frequency steps of 5.0/10.0/12.5/20.0/25.0/50.0 or 100.0 KHz. are available. Dual antenna inputs terminating in an "N-type" and "BNC" connectors are included. Other features include 200 memory channels grouped in 10 banks of 20 channels, easy to read multi color LCD display, lithium battery for memory back-up, 35 channel per second high speed scanning, priority, timer and even an alarm to alert you to transmissions on your choice of one special frequency. We even include a mobile mounting bracket. The SR001 can be used for base station use with the purchase of the ACS-B 12 volt DC power supply for only $34.95 each. A great sounding external speaker #SPE-B is available for only $24.95.

SHINWA POCKET PAGERS

The fire department hazardous materials response teams and police department SWAT crews that need reliable radio alerting systems, stake their lives on Shinwa. We offer a two-tone pocket pager with monitor feature and even a voice storage option at an affordable price. To order, we need your paging frequency as well as tone reed frequencies. For other configurations or two-way radio information, please fax us your specifications to 313-663-8888 or phone 313-996-8888.

NEW! ICOM ICR1-B

List price $799.95/CE price $519.95/SPECIAL

Continuous coverage from 100 kHz through 1.300 GHz.

The ICOM ICR1 keeps you in touch with the world when you're on the go. The palm-size ICR1 is equipped with AM, FM and wide-FM modes to fully answer your monitoring needs. With 100 memory channels and a dual frequency selection system, you get a top-class communications receiver. Not only can you program scan searches only for signals within a specified frequency range, it's also possible to write frequencies of received stations automatically into memory. In addition, unwanted frequencies can be skipped. Order ICBC72-B battery rapid charger for $99.95 and a BP84-B 1,000 ma. battery pack for $74.95.

NEW! ICOM ICR100-B

List price $799.95/CE price $579.95/SPECIAL

Continuous coverage from 100 kHz. through 1856 Mhz.

Now you can bring a wider world of broadcasting, VHF air and marine bands, emergency services and many more communications into your vehicle. Icom's advanced ICR100 fully covers all the stations worth hearing with up to 100 memory channels and a multitude of features.

SCANNERS/CB/RADAR
UNIDEN

PRO310E-B Uniden 40 Ch. Portable/Mobile CB $72.95
PRO330E-B Uniden 40 Ch. Remote mount CB $99.95
GRANT-B Uniden 40 channel SSB CB mobile $152.95
WASHINGTON-B Uniden 40 Ch. SSB CB base $229.95
PC122-B Uniden 40 channel SSB CB mobile $113.95
PC66A-B Uniden 40 channel CB Mobile $78.95
PRO510XL-B Uniden 40 channel CB Mobile $39.95
PRO520XL-B Uniden 40 channel CB Mobile $54.95
PRO535E-B Uniden 40 channel CB Mobile $69.95
PRO538W-B Uniden 40 ch. weather CB Mobile $78.95
PRO810E-B Uniden 40 channel SSB CB Base $174.95

UNIDEN RADAR DETECTORS

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Packet

Did you miss me last month? I'm sorry about the absence, but sometimes the pressures of work (I am a physician in an active medical practice) and family (a wife and four children) get in the way of my hobby! So, having let some issues build up, let's get right to them this month.

Phil Eastman, of Augusta, Georgia, writes:

I'm confused and frustrated!! I'd like to get into packet, and have heard many wild stories concerning equipment "needed" to get started, etc. In fact, I'm not really sure what packet is or does.

I've heard a Commodore 64 does a fine job and is highly recommended—by some—while others insist on an Apple. Is the only way to go with disk drive, printer, mouse, monitor, etc.? The PK-232 does a fine job also—then there is the new MFJ?!?

I'd like to work HF/VHF. My gear is not new, but it does a good job—Kenwood TR-7950 2 meters, Ringo Ranger (non-rotatable), VIC-20 computer with Kantronics interface, Kenwood TS-820 with quad on 40, and a trap vertical on 10-15-20-40-80.

My funds are somewhat limited, but I'd like to have good or middle-of-the-line equipment. I know the VIC-20 is a toy compared to all the new stuff on today's market.

Well, Phil, let's try to address your needs piece by piece. First of all, "packet" is a protocol of transmission, much as SSB or RTTY are other such protocols. The difference is that, unlike most other modes, packet is an interactive, error-correcting method of sending and receiving data which, at its best, allows flawless transfer of information, and at its worst, slows data exchange to a crawl.

A simple way to view the difference is by calling most other amateur transmissions "First I Send Then You Send." Whether on CW, SSB, FM, or conventional RTTY, this FISTYS technique is the same. One station sends information, and the other station replies with information of its own. While a repeat of information may be requested, it is the operator asking for the information. Frequently, small gaps and errors in transmission are filled in by the operator's brain. Thus, "MY QTH IS BJLTIMORE" is readily understood by most folks, without the need for further clarification.

In contrast, packet, and a related mode called AMTOR, might be termed "First I Send Then You Tell Me If It's OK Before You Send." Our new acronym tells us the sequence of activities here. A "packet" of information is sent by one station and received by a receiver. The receiver applies certain rules to the received information, which allows the detection of the presence of, although not the direct correction of, errors in information exchange. If errors are found, a repeat transmission is requested from the sender. Put it all together and, I guess, it spells FISTYTMIIOBYS! (Snappy acronyms are not my forte!)

By the way, you might have noticed that I have referred to the contents of the packets as just digital information. You see, they don't necessarily have to be just text, as with other digital modes. Transfers of programs, graphics, and about anything else that can be digitized is possible. So, you can see the power of this mode!

Next, is there packet activity in your area? Your 2 meter gear should be fine for packet, presuming that you are able to operate in the 145 MHz range of most VHF packet. Why not just tune the receiver to 145.03 or 145.01 (or another local packet frequency discovered by asking around) and let it sit there for an evening? If you hear short "brrrrp" transmissions on frequency, you have discovered a local packet frequency. I, for one, would hesitate to invest money in a station without at least some local activity!

As far as HF activity goes, my standard for equipment from earliest RTTY days has been that if the station is adequate for SSB, it is fine for digital communication as well. Yours certainly seems just fine.

Invest in a Controller

Getting onto packet with the VIC is less of a problem if you are willing to allow a multimode controller to do all of the work. Yes, I know that this will require a capital investment, but with one piece of new gear you might just be able to accomplish all you desire. Now, you knew you were going to have to buy *something*, didn't you?

There are software solutions to packet, including some that require little, if anything, in the way of hardware, but I have not found any that would run on a VIC. If you are going to upgrade, my inclination at this point would be toward an IBM™ PC compatible computer. With the usual complement of hard drive, graphic display, and the vast array of available software, this would seem the logical choice (sorry, I just finished watching Star Trek).

You did ask which controller, and

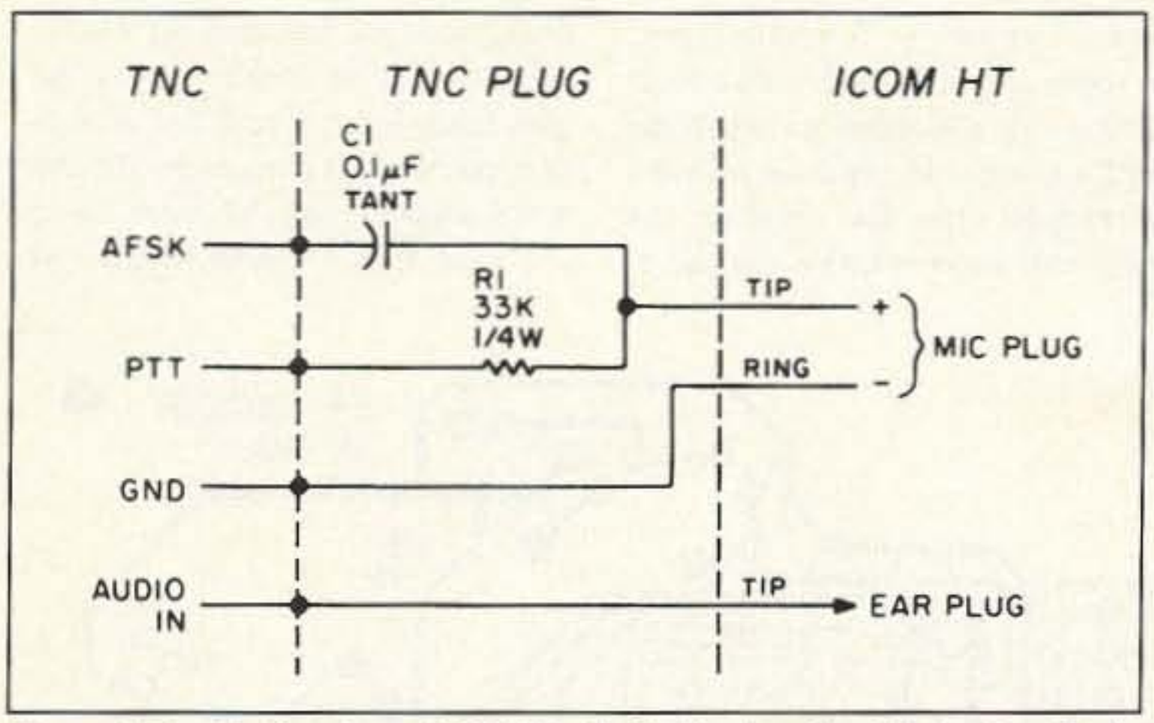

Figure 1. The interface to an ICOM HT with PTT keying, from 73 Amateur Radio Today, *February 1989, page 76 (by Dick Peters WA1PWF).*

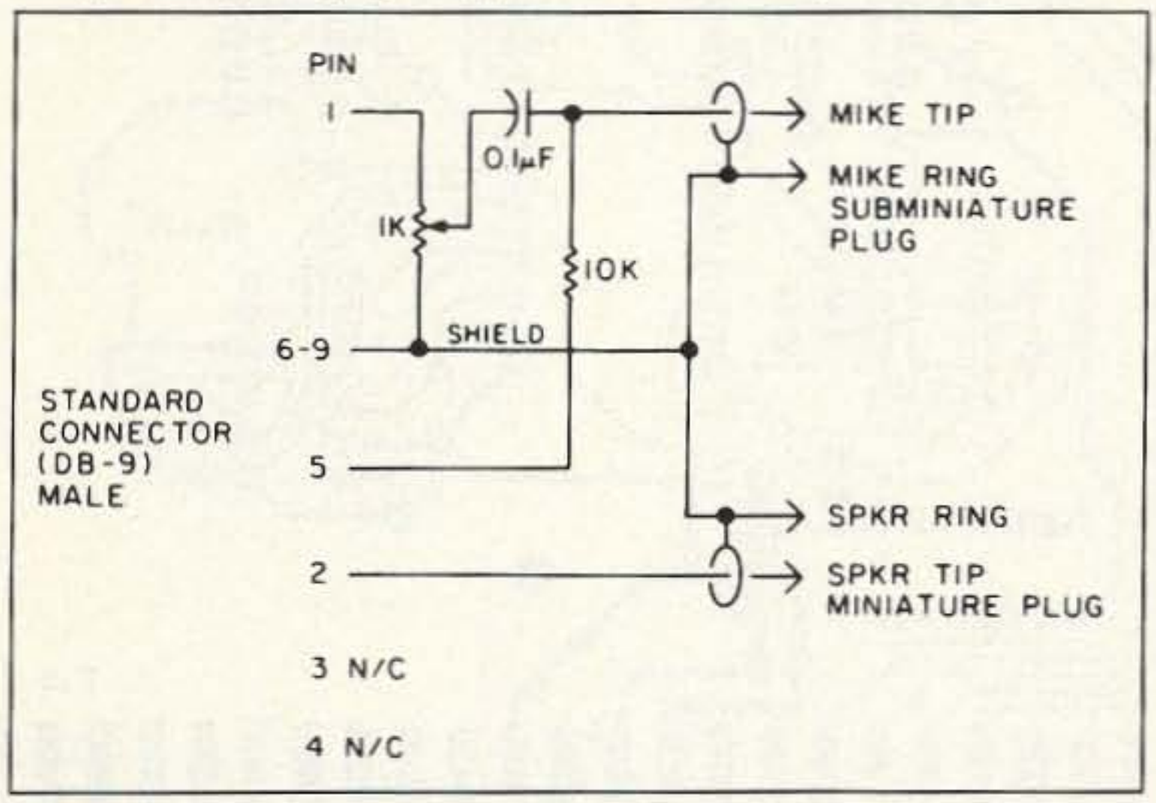

Figure 2. TNC interface to an ICOM HT with PTT keying and volume level control, from 73 Amateur Radio Today, *October 1989, page 41 (by Brian Lloyd WB6RQN).*

here I'm going to have to beg the question. I have only played with a limited assortment of packet controllers, and those with software that was first edition. Much of what I have seen is now obsolete! Things sometimes move so fast in this hobby. Clearly, the two manufacturers mentioned above both make fine equipment, and there are others, as well. My advice is to write for full specs on anything you would consider, and try to find a local source for the equipment, so that you can get some "hands-on" experience before you buy. Lacking a store, ask around to see what others in your area are using, and use that information to aid you in the decision process.

Above all, take your time, and consider your options. With money as tight as it is in all corners these days, shelling out several hundred dollars on something which is not quite right can be painful. Packet is not going to disappear tomorrow. Investigate, cogitate, ruminate, allocate, then get on the air and have a ball.

Another of our readers tried to do just that, and ran into a snag. Herb Raemsch WA3HGT of Montoursville, Pennsylvania:

I had this idea of hooking my IC-2AT handheld up for CW and RTTY. The terminal is an MFJ-1224 with a Commodore C-64 computer. Now, the 2AT has an external jack for audio out and a jack for the mike. I do not know how they key up the transmit side and feed the audio down the two same wires. Is there a circuit for this or do you know anyone who has used this handheld for CW or packet?

Well, Herb, I know that several of these rigs use a capacitor to decouple the audio from the DC keying line. There are several circuits which will accomplish this, as described on page 76 of the February 1989 issue of *73*, page 41 of the October 1989 issue, and page 49 of the August 1987 issue. See Figures 1 and 2 for two possibilities.

We have more on tap for the coming months, including some more RTTY software for the PC crowd, and a new source of amateur radio software for users of several popular computers! Above all, let me hear from you by mail, at the above address, on CompuServe (ppn 75036,2501), Delphi (username MARCWA3AJR), or America On-Line (MarcWA3AJR). E-mail is normally answered a bit quicker than the postal service variety, but I do try to respond when I can. If you desire a written response from me, or any other *73* author or columnist for that matter, a stamped, self-addressed envelope (SASE) is the rule. Thanks, and I'll see you next month in RTTY Loop. 73

ATV

Ham Television

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

Touch-Tone Decoder

Last month we looked at the touch-tone decoder board designed by Bill Kinton NX1D. Thanks to the efforts of Fred Reimers KF9GX of FAR Circuits, you can use the following PC board foil patterns to easily reproduce the decoder board. An etched and drilled board is available for $9.50 + $1.50 shipping per order from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Although the board is designed to plug into a 44-pin edge connector (RS# 276-1551), you can just solder directly to the edge pins if you like. If you modified a TC-70 ATV transceiver as in last month's column, just slide this board directly into the connector and you're ready to go.

Versatile Circuit

The circuit is designed to switch on two different items (such as an ATV exciter and a separate amplifier) as well as switch between two different video and audio sources.

To use the decoder as a standalone circuit, just feed your #1 video source into edge pin 22 and the #1 audio source into pin 18. The #2 video signal goes into edge pin 20 and the #2 audio into pin 16. The selected video comes out on edge pin 21 and the audio signal on edge pin 17.

Edge pins 5 and 7 are open collector outputs which can be used to control low power circuits (don't exceed 200 mA current drain). To control higher current loads, just use these outputs to key a relay.

Edge pins 8 and 9 are extra logic outputs that you can use for expanded control functions.

Corrections

There are two corrections to be noted in last month's schematic diagram. Capacitor C4, the 1 µF tantalum capacitor should have its plus side going towards the audio coming from the control receiver. In addition, the line coming from the 4514 "*" line to IC3A should be labelled (19) instead of (14).

Although the circuit works just fine as shown in the schematic, to route the PC board traces most efficiently a couple of flip-flops and analog switches have been exchanged. The end result on the edge connector remains the same, however. If you've hand-wired your circuit, there's no need to redo it! I'll list the following changes so you can compare the PC board to the schematic: The 4013 gate labelled 2A is now 1A. In addition, some of the pinouts on IC6 (the 4066 analog switch) have been changed. Pins 1, 2 and 13 are now 11, 10 and 12. Pins 10, 11 and 12 are now 1, 2 and 13. Finally, pins 3 and 4 have been swapped.

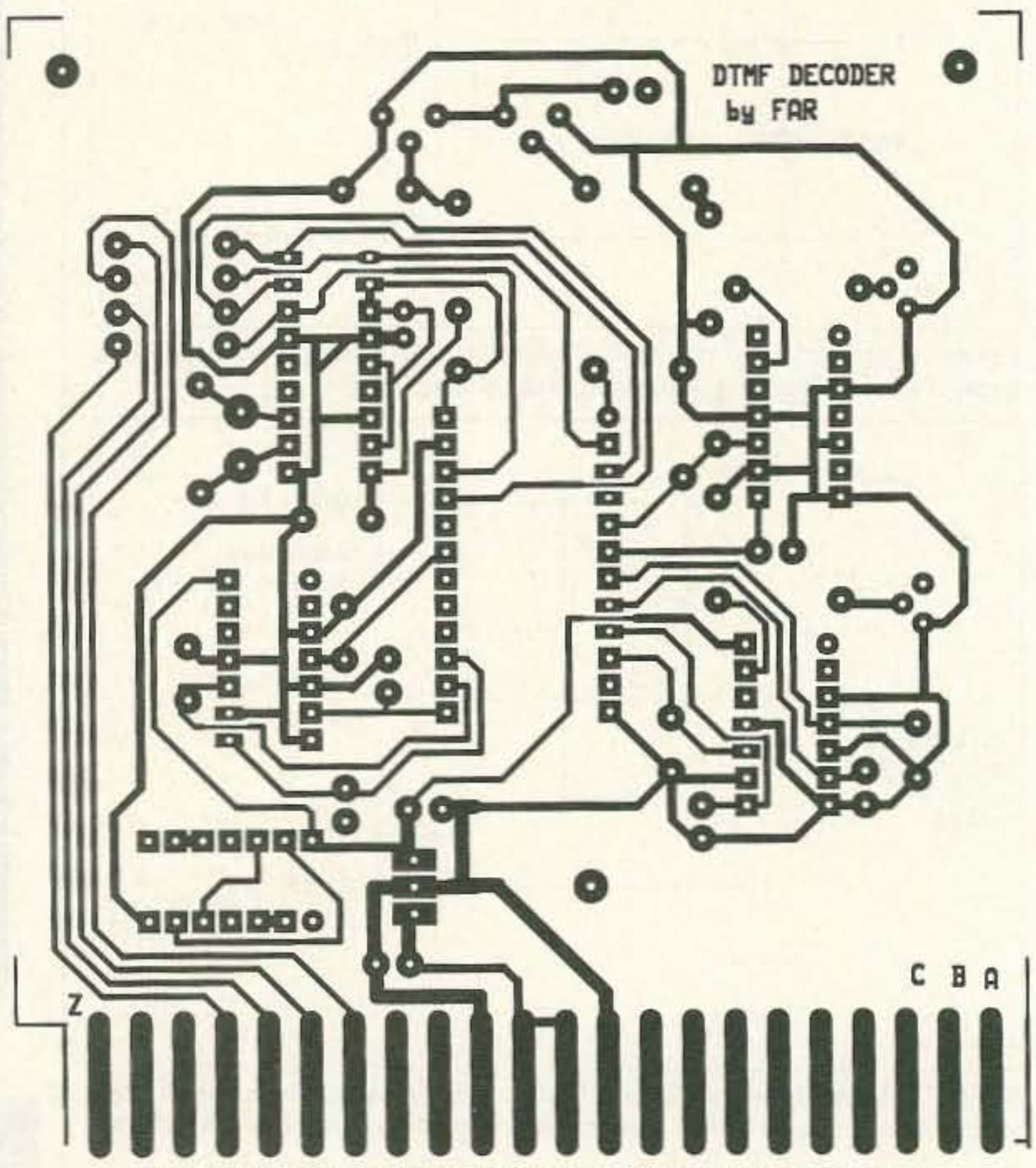

Figure 2. Touch-tone decoder PC board foil pattern (bottom layer).

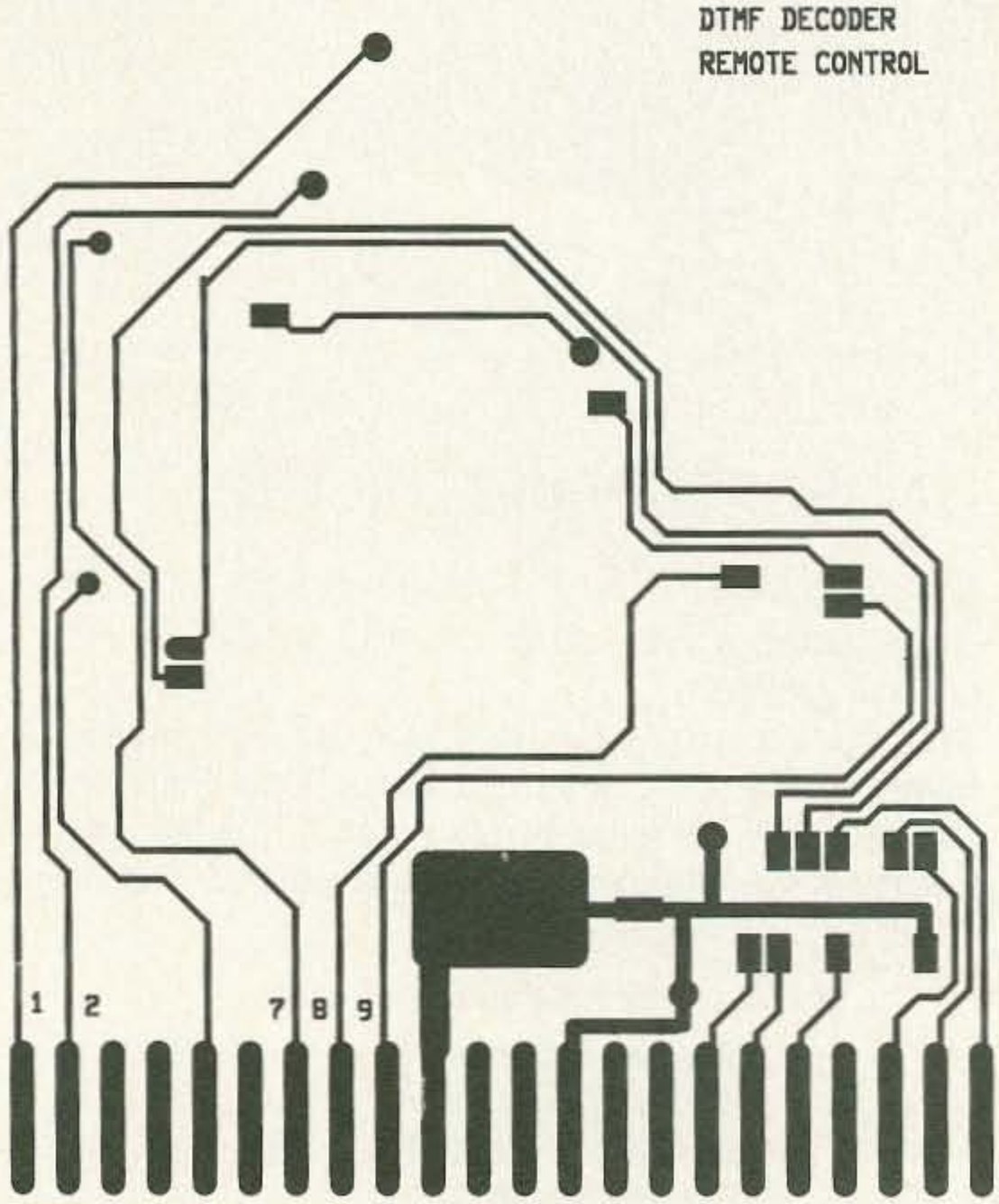

Figure 1. Touch-tone decoder PC board foil pattern (top layer). Solder all pads and pin locations shown on this side.

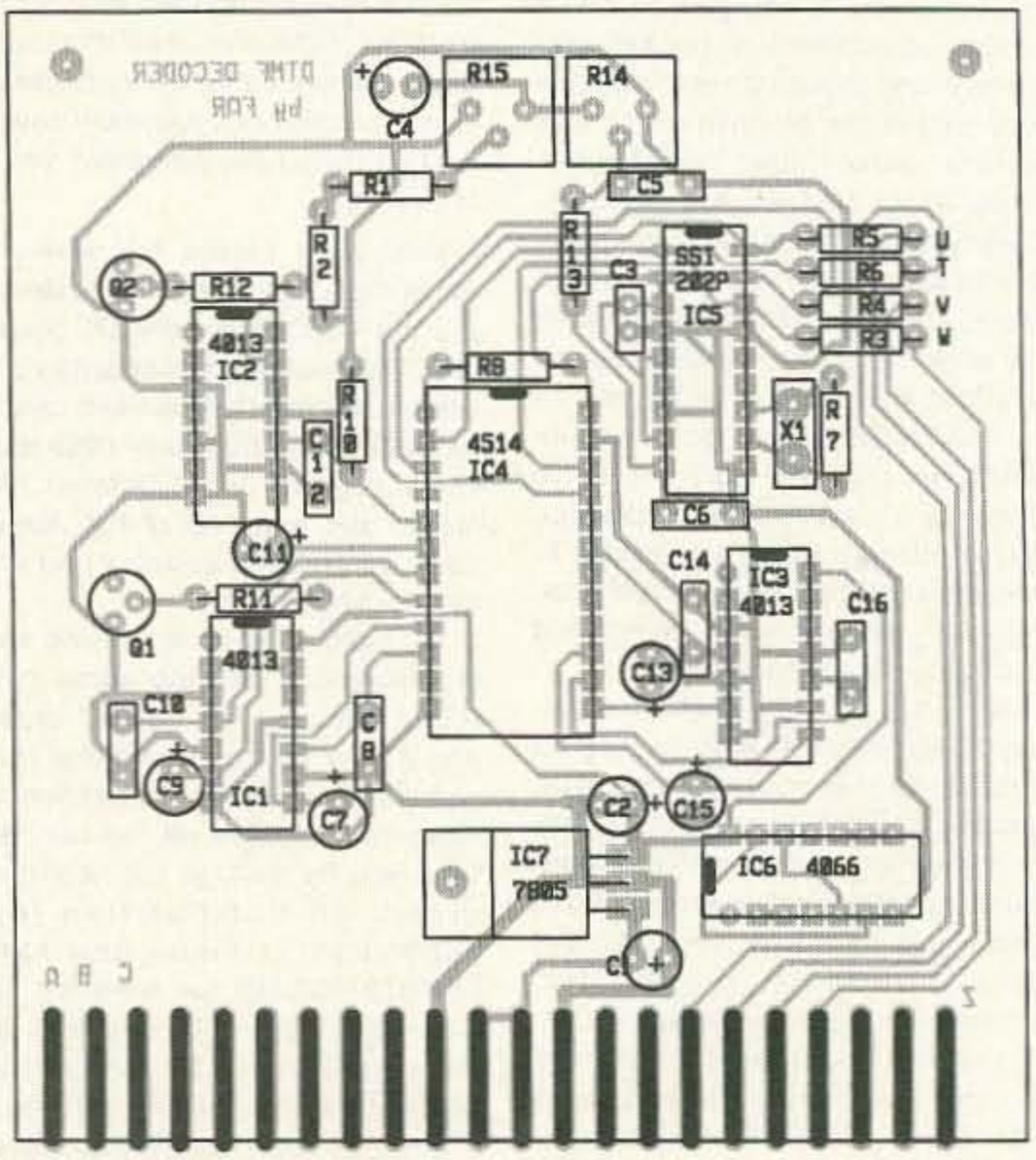

Figure 3. Parts placement.

Assembly Hints

Since this is a double-sided board, wherever there is a pad or pin location on the top layer, it needs to be connected with points on the bottom layer. However, the board doesn't use plated-through holes, so not only will you have to solder the pads on the bottom layer as usual, you will need to solder the pads shown on the top side as well. It's a good idea to use machine-tooled Augat style IC sockets, or leave some room between the bottom of the socket and the board, so you can easily solder the pins on the top and bottom sides.

Operation

After you're finished with the assembly process, just hook up your control receiver and power up the decoder board. Now just set your control receiver to about half volume and adjust R14 for reliable decoding. See the sidebar for the possible ON/OFF command sequences. R15 can be used to route the control audio on to another transmitter or to the ATV transmitter subcarrier. You should now be in complete control! 73

Decoder Command List

TT#	Output
1	Q1 ON (turns on transmitter or relay)
2	Q1 OFF (turns off transmitter or relay)
3	Audio/Video #2 selected
4	Audio/Video #1 selected
5	Q2 ON (turns on amplifier via relay)
6	Q3 OFF (turns off amplifier via relay)
A	Auxiliary output on edge pin 8 high
*	Auxiliary output on edge pin 8 low
C	Auxiliary output on edge pin 9 high
#	Auxiliary output on edge pin 9 low

Number 20 on your Feedback card

ABOVE AND BEYOND

VHF and Above Operation

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

10 GHz Gunn Oscillator Cavity

With more time in these winter evenings to build projects, I thought I would detail a 10 GHz construction project that can be quite useful. It sports a varactor controlled Gunn diode oscillator cavity. I have built several of these units from information provided by Chuck Swedbloom WA6EXV, who worked out the details presented here.

This cavity oscillator is intended for wideband FM. This is compatible to the Solfan burglar alarm units with the exception that the Gunn diode is operated from fixed voltage. The varactor in the cavity is a variable voltage capacitance diode (varicap), and shifts the frequency as the voltage to it is varied from 0 to 10 volts. Construction cost is minimal for the Gunn diode and waveguide parts. The varactor is, however, somewhat expensive if you can't find it surplus.

Construction with Solfan Devices

This cavity can be constructed with a drill press and ordinary hand tools. See Figure 2 for a list of tools (taps and dies needed). One of the items, a 3/48 tap, is not common, but is available in better machine shops. This tap size is standard for a lot of microwave devices, including the varactor and Gunn diodes I used.

Possibly a brief history of 10 GHz units might be in order. Normally, for low cost operation 10 GHz Gunn transceivers were constructed using a Solfan or similar type burglar alarm, or a door opener microwave device. Cost was about $5 to $20 each, with availability in most larger cities. The primary difficulty with the simple Gunn transmitter using one of the Solfan devices was the method of frequency adjustment. You had to vary the voltage of the Gunn oscillator in order to make small changes in frequency.

This Gunn voltage varied from about 7.5 to 9.5 volts, and resulted in a change in frequency of about 5 to 10 MHz or so at 10 GHz. The only other frequency adjustment was mechanical and touchy to adjust in the field. By substituting the varactor controlled cavity for a Solfan device the Gunn oscillator is run at a fixed 10 volts. This improves basic stability and makes fixed mechanical adjustment something to be set in the home station. Modulation and variable voltage is now fed to the varactor instead of to the Gunn device as in Solfan units.

Varactor Diode

Selection of a suitable varactor from surplus is touch and go. You have to try them out and see what happens. Most varactors will work, but the frequency spread per voltage tuning range will differ. If you can locate a varactor that will give you a 50 to 60 MHz tuning range, it will make wideband FM (WBFM) operation a lot smoother.

For example, you can set up two WBFM 10 GHz transceivers for full duplex operation with each other. One station must be 30 MHz different in frequency on transmit from the received station's own transmitter. Frequencies commonly used are 10.220 GHz, 10.250 GHz, and 10.280 GHz. This assumes a 30 MHz IF system in common use. Operation on other IF frequencies are just as possible; 10.7 MHz and 88 MHz have been used.

By having varactor control, you can vary a DC voltage that adjusts the cavity quite accurately, and you do not need to spend lots of time re-calibrating. Instead, you re-set the varactor voltage to a calibrated frequency/voltage reference. In contrast, much time was needed to calibrate the frequency in the single Solfan units, due to the narrow adjust frequency of the Gunn diode. This made mechanical adjustments in the field necessary. Another benefit of the varactor controlled unit is that the Gunn diode is optimized for maximum, as it is now running on a fixed voltage supply.

Varactor control gives a swift method of frequency adjustment in the field. When used in conjunction with a beacon, frequency errors can be almost eliminated on field operations. To calibrate your frequency using a beacon, aim your system at the beacon, and if it does not agree with your previous chart, make a small mechanical adjustment. Thereafter refer to your frequency/voltage chart for operations. In this way the varactor system and beacon confirmation go hand and glove with each other, setting a frequency standard for the area of interest. Many stations that can copy the beacon can use it to set the frequency without expensive test equipment.

Cavity Construction

Construction of the cavity is straightforward. The unit is built on a piece of bar stock that acts as a base and heat sink (see Figure 1). The cavity itself and varactor diodes are mounted in small holders in the bottom of the unit. Electrical connection to the diodes is provided through bias chokes. Frequency operation is determined by two main factors: the physical dimensions of the cavity and the capacitance of the varactor diode. The 6/32 COARSE TUNE screw moves in and out of the cavity, changing the physical dimensions and center frequency.

The voltage on the varactor diode varies its capacitance, giving a frequency spread of upwards of 60 MHz (depending on the diode used). Construction of the cavity is not difficult if the work is taken in steps to ensure proper fitting prior to final assembly and soldering. Care must be taken not to allow any solder to flow into the cavity during assembly. Solder acts as an attenuator and must be removed. Either soft or silver solder may be used, but you'll find soft solder easier to work with if you need to correct a part mounted in error. None of the cavity components are difficult to obtain, and can be found in a well-stocked hardware store.

The quantity and size of the brass needed for this project are such that the possibility of making them out of scrap stock is good. Once the necessary parts and tools are collected, construction can begin. The heat sink is made larger than the waveguide to provide extra capacity for a high power Gunn diode. Use a piece of brass 1" x 1/4" x 2" long. A piece of brass 1/8" to 3/16" serves as the waveguide flange, which will allow mounting to a feed horn.

The very small RF bias chokes can be turned on a lathe (Figure 2) or assembled from pieces of stock as shown in Figure 3, which were constructed on a drill press. Using a hacksaw, I cut

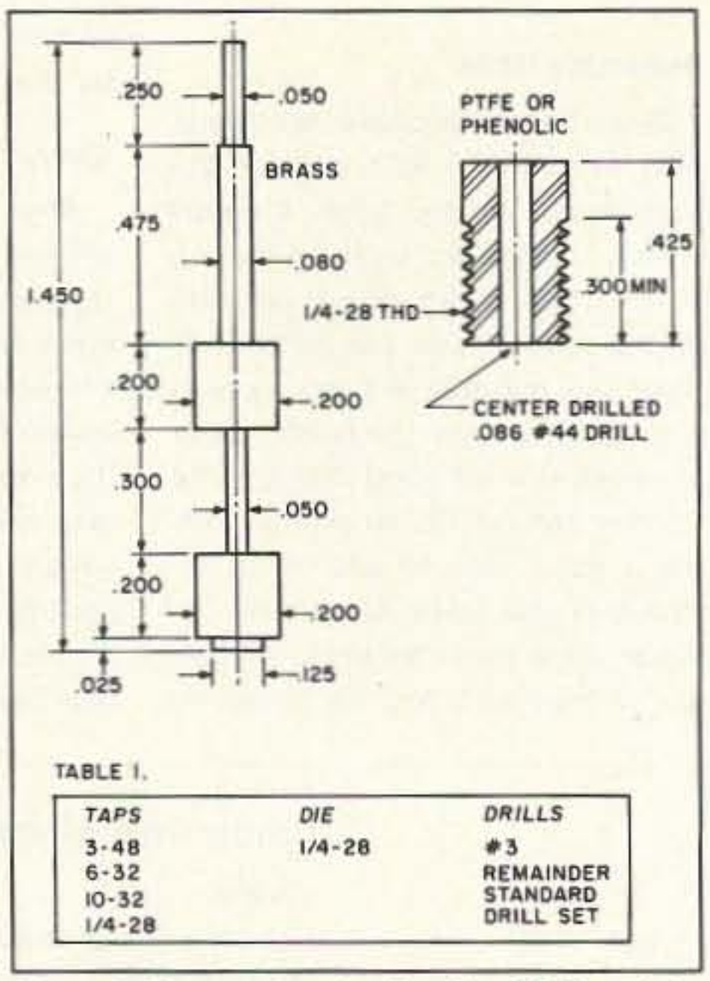

TABLE I.

TAPS	DIE	DRILLS
3-48	1/4-28	#3
6-32		REMAINDER
10-32		STANDARD
1/4-28		DRILL SET

Figure 2. Construction details of the RF bias choke and choke retainer.

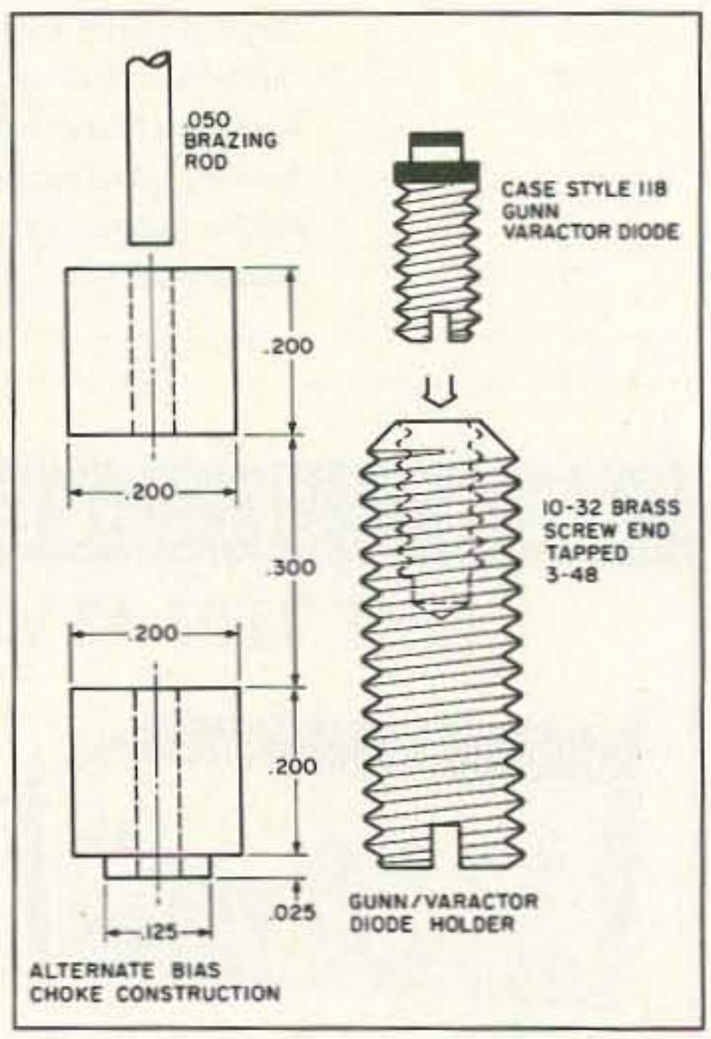

Figure 3. Alternate construction method of the bias choke. Drill out the center of some 0.200" stock to fit 0.050" brazing rod and solder as shown. A diode holder can be built as shown.

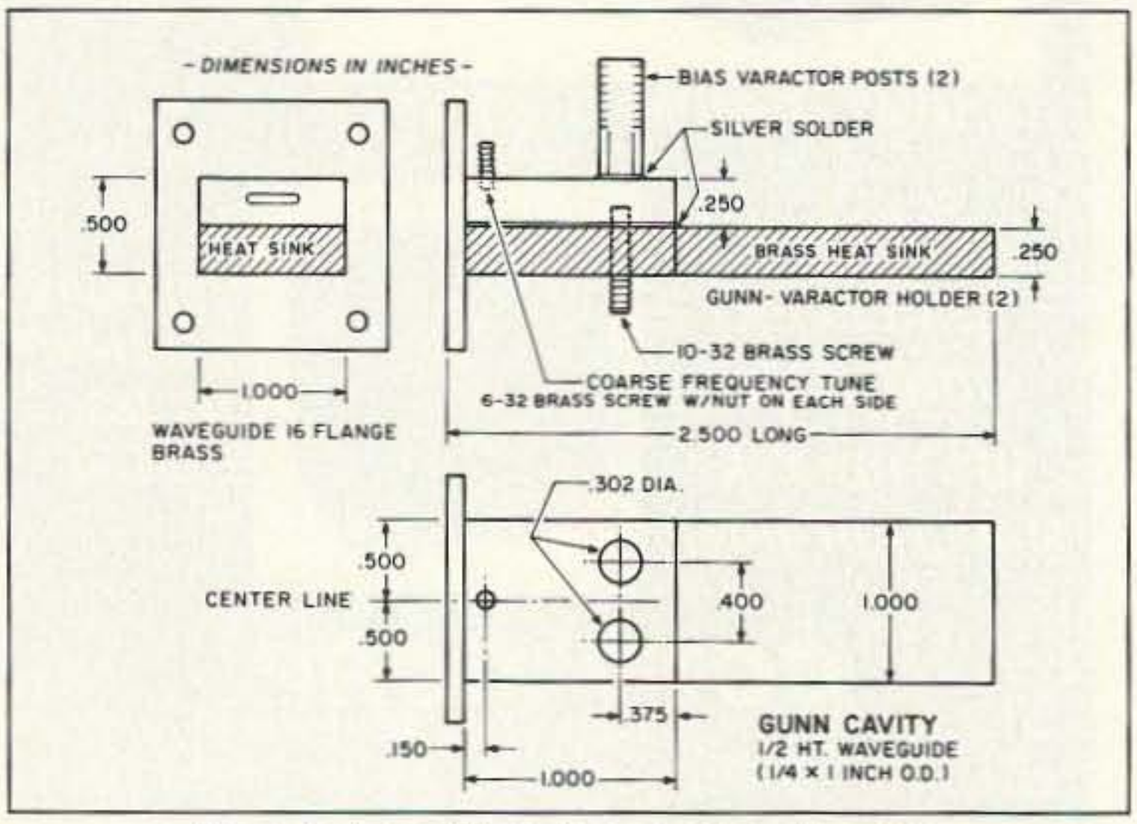

Figure 1. The 10 GHz cavity; front, side and top views.

short pieces of 0.200 brass rod, and drilled these through the center with a 0.050 bit. Inserting a brass brazing rod through each hole completed the chokes. The bottom of the choke should be turned down to 0.125", and

Photo A. Paul N1BWT and Matt KB1VC operate from Jay Peak, Vermont during the 10 GHz contest.

should be smooth where the chokes meet the diodes. The RF chokes were then soldered, which proved just as satisfactory as the lathe-produced chokes.

The hardest item to obtain is the "half-height waveguide" (Figure 4). If you can't find one, you can make it out of a short piece of standard waveguide. Use a hacksaw very carefully, making clean cuts. Any piece of brass waveguide can be cut open to retrieve the 1" piece needed. The half-height section of waveguide is then soldered directly to the top of the heat sink, taking care to keep solder out of the cavity. Once soldered to the heat sink, there is no difference between it and an actual piece of half-height waveguide.

Bob W6RHV came up with this method, and we've used it very successfully. Now that the cavity and heat sink are assembled into one solid assembly, the holes can be drilled to allow total alignment between between the Gunn/varactor screw holders and the upper RF choke bias posts. Proper alignment is important here. Keep two points in mind. First, don't use a center punch. This can deform the soft brass of the cavity. Mark the holes with a scribe and start all holes with a very small drill bit. Move up to larger bits as needed. This prevents the larger bits from wandering, which would change alignment.

Once the small pilot holes are drilled, the next holes to be drilled are the bias posts. These holes should be drilled through the top of the cavity and down through the heat sink in one motion, ensuring proper alignment. The drill used should be the proper size for the 10/32 tap. The heat sink is then tapped to accommodate the 10/32 diode holders. Now drill out the holes in the cavity top to 0.302" to accept the bottom recess of the bias posts.

Finally drill the hole for the tuning screw and tap for 6/32. A 6/32 nut is soldered over the hole to provide additional threads for the tuning screw to bite into, for a tight fit. The bias posts are made from the 3/8" solid brass rod cut to about an inch. They are drilled through the center with a #3 drill. Again, start with a smaller bit and work up to #3 bit. Drill completely through the rod, and finish its length to 0.950". The top portion of the bias posts are threaded with a 1/4-28 tap, to a depth of 0.400". This thread will accept the bias choke retainer, which is made from 1/4" insulated rod and threaded with the same 1/4-28 thread.

The bottom of the bias post must be reduced to allow it to fit into the 0.302" hole in the cavity. This is done by placing the post in the chuck of a drill press, and using the drill press as a vertical lathe. Using a small file, turn the edge down from 0.375" to 0.302", so that they fit tightly into the top of the cavity. The tight fit holds the posts in place while soldering, maintaining proper alignment. Both bias posts are prepared in the same manner.

Take the finished bias chokes and insulate them with a single turn of mylar or Scotch™ tape. Insert them into the bias posts to check the fit. They should fit through the posts with little friction. Once all the necessary fitting has been checked and rechecked, solder the posts to the cavity. At this point, the waveguide flange can be soldered to the assembly. The output slot, or iris, can now be drilled. This is easily accomplished by scribing a line and drilling a series of 1/16" holes along it.

The material between the holes is filed out to form a perfect slot. (In actual operation, I've found that more power can be coupled out of the cavity by enlarging the slot slightly in the center.) This is a custom adjustment peculiar to each device. Don't enlarge this hole too quickly; work in small increments. If it's too large, it will over-couple, and a new front plate will need to be constructed.

Check the alignment of the center of the bias posts and the 10/32 diode holder screws. Ensure that they are in perfect alignment. Insert the bias chokes, with the insulating tape, and position with the choke retainer just entering the cavity top by about 0.050". The Gunn and varactor diodes are inserted in the holders one at a time, to check for proper contact with the diodes and chokes. I suggest using a "DUD" until all fit OK, lest you damage a good device. Check for shorts. When all is well, seal off the end of the cavity with a section of brass stock.

Testing the Cavity

To test the cavity, use a closed environment. Connect the cavity to a waveguide attenuator with either a dummy load (waveguide type) or a directional coupler, to allow sampling of output power. (Always prevent stray radiation from escaping from the unit. Never look into the open end of a radiating waveguide. The eyes are susceptible to microwave damage—SAFETY FIRST—!!)

Frequency is set by varying the position of the coarse tune screw, and varying the voltage on the varactor diode. This will set your varactor tuning range, first mechanically then electrically. If you use surplus varactors, the amount of tuning excursions will vary with the type of varactor used. You will have to experiment to find the device best suited to your cavity.

The varactor diode I used was obtained surplus, and had a capacitance of 0.35 pF. Several types performed well. These were all similar to Microwave Associates part number MA-45225, and parts #46602 thru 46604. These devices are rated at approx. 30 volt breakdown 0.5 pF, 10 to 12 GHz operation. All parts are available in many case styles, with case 30 (drop-in package) and case style #118 (3/48 thread) mount. See Figure 3, case #118 style.

I can supply Gunn devices for this project. Fifty mW Gunn diodes are $5 each, and 100 mW devices, $10 each, postpaid U.S. destinations. I am running out of the 100 mW devices, as they are harder to gleen from existing stocks that the 50 mW types. If I come up with some suitable varactors, I will let you know.

New Products

Waveguide 16 (1" x 1/2" O.D. brass) has, as you know, been difficult to obtain in small quantities for amateur use. However, Ed Emich of Emcom Industries is willing to make small quantity purchases of both waveguide 16 and waveguide flanges. Flanges cost $4 each, and the brass waveguide is priced at $4 a foot plus shipping. This should rescue quite a few microwave construction projects waiting for materials. Contact Ed at Emcom Industries, 10 Howard Street, Buffalo NY 14206. Tel. (716) 852-3711.

As always, I will be glad to answer questions relating to our VHF/UHF microwave frequency bands. Please enclose an SASE for a prompt reply.

73's, Chuck WB6IGP. 73

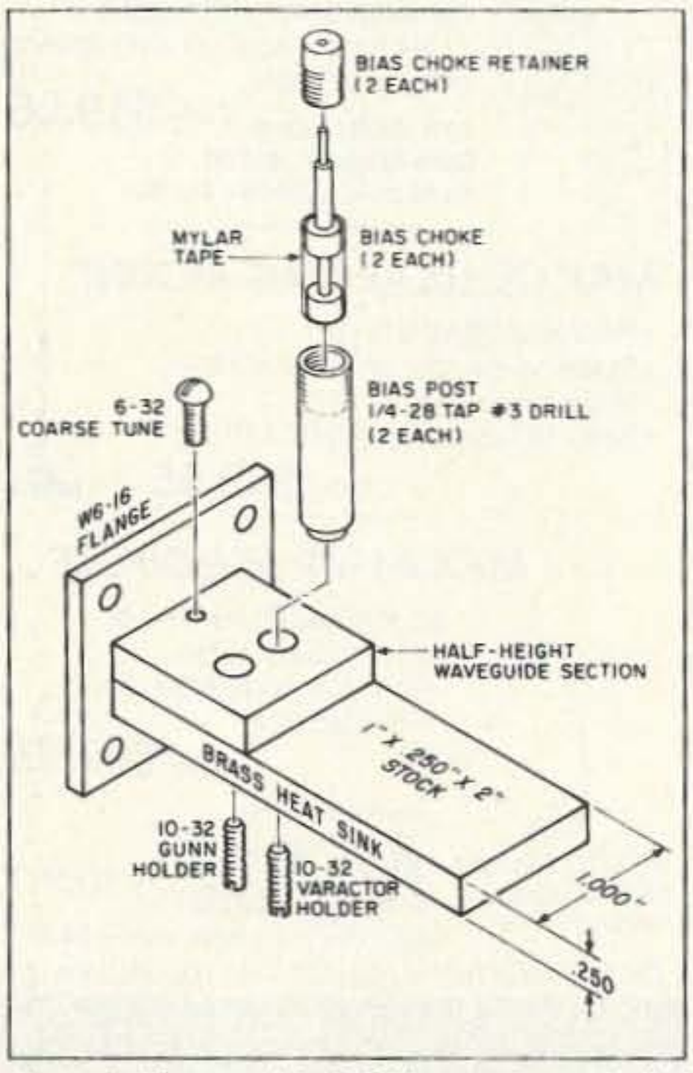

Figure 4. The complete 10 GHz varactor controlled Gunn oscillator cavity.

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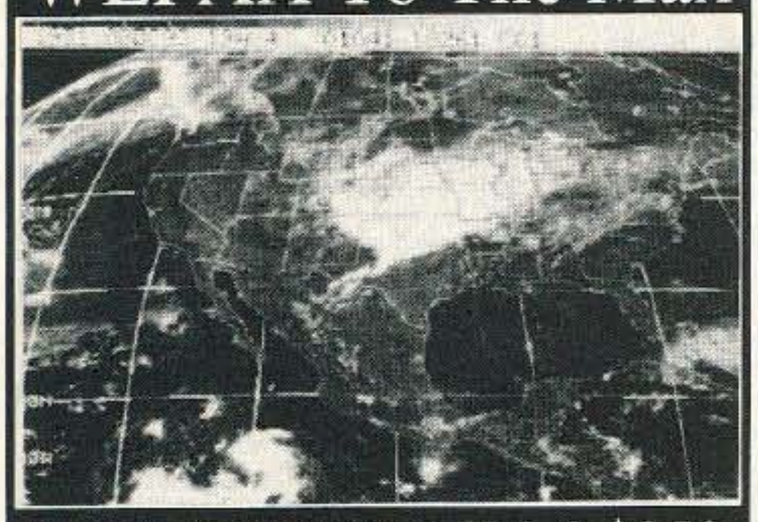

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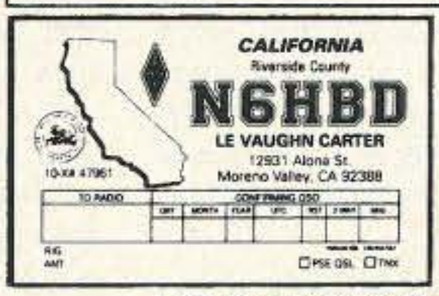

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The Joy of Tinkering

If there is one thing I really enjoy about ham radio, it's tinkering. I can spend hours on end working on a circuit, and accomplish nothing when I'm done. But the time was not entirely wasted! I've learned a thing or two about electronics in the process, even if all I got done was smoking transistor after transistor. Every time a transistor goes up in smoke, I learn a lesson. This is the way we all learn, from our mistakes. So, what does this have to do with QRP? Plenty.

Sometimes when tinkering on the workbench with a circuit, I can find a better or unusual way to do something. I enjoy looking over a schematic for a project and seeing something I can use in a different application. A good example is the two part series in *73 Magazine* on the computer controller for a repeater ("Microprocessor Repeater Controller," October and November 1991). Nothing there about QRP, but if you look over the schematic, you'll see the use of 4066 ICs for audio switching. Hmmm. . . . This part of the circuit can then be changed a bit here and there, and used in a receiver for audio muting or sidetone injection. To see just how well the circuit will perform, you can build just the portion you need and test it out. This is what tinkering is all about.

Using Perfboard

In the past, I used to tinker using perfboard. This always worked and still works today. But it does have its drawbacks. First, it's a real pooper to change parts. If you want to change the value of one resistor, you have to unsolder the old one and solder in the new one. No big deal, but after a few times of doing this, you end up with a messy perfboard project. The resistor is not in the best shape, either!

I also find it hard to keep track of what is going on from the top of the board to the bottom. Sounds like no big deal, until you have several IC chips scattered about with wires running on both sides of the perfboard. It then gets very confusing to keep track of what goes where.

Working on RF circuits brings out another problem—ground leads running all over the place; lines carrying RF getting too close to Vcc lines; inputs too close to outputs; and the list goes on. This mess is all too easy to do with perfboard. Tinkering with RF circuits on perfboard does not make for a happy camper.

Coming Unglued

I tried using a piece of double-sided copper-clad PC board for RF circuits, thinking the ground plane would keep the RF happy. A piece of PC board material 4″ x 6″ was acquired. Using a hacksaw blade, I made a horizontal and then a vertical cut every 1/2″ all over the board. I ended up with a checkerboard pattern. Each 1/2″ piece of copper was an island, not connected in any way to the other islands. I had the bottom of the PC board for a ground plane, plus all the connections were done on the top of the board. No more flipping back and forth from top to bottom. Didn't work worth a hoot!

Here's what happened. After working on the circuit for a bit, soldering in and out parts as I changed the design from the schematic, the board started to bow. This was from the heat of the soldering iron and the solder itself. The large blops of solder had a tendency to bridge over to another island, causing a short. I constantly had to suck up ex-cess solder from the islands. Some of the copper islands became unglued from the board by the heat and simply fell off.

Some of my little islands did not cut all the way through, and therefore were still connected to one or two other islands. I had to go through all the squares with an ohmmeter and find the shorts. (After spending many an hour trying to find out why the circuit did not work.) Needless to say, I was not impressed with my solution. Looking back, it seemed like a good idea. It still might be, but the 1/2″ islands are too big. A good size might be 1/4″ islands. It would be too much work to hand cut these with a hacksaw blade, but you might be able to use a motor tool with a grinder head.

ProtoBoard

For tinkering with RF circuits today, I use a combination of the perfboard and PC island board. But for digital, analog, and some simpler RF circuits, I use a product called ProtoBoard™ by Global Specialties. There are other companies who make something like the ProtoBoard, but the one by Global Specialties is probably the best known.

So what is a ProtoBoard? It's a breadboard with thousands of tie points. Some connect in rows, others are by themselves. The ProtoBoard I use has about 3500 tie points. I got mine from Radio Shack about 10 years ago, and it's still going strong. With the board, I can change a design as fast as I can think. Want to change a 10k resistor to a 15k? No problem! In and out just like that, and it's done. No soldering, no fuss. These things are great for IC chips. The board I use can hold up to 25 or so ICs.

I purchased a sloping panel box from Radio Shack years ago and mounted the board to it. I was going to add a small power supply inside, but never got around to doing it. The sloping front allows me to work on a project without eye stress. Just the thing for those late night tinkering projects.

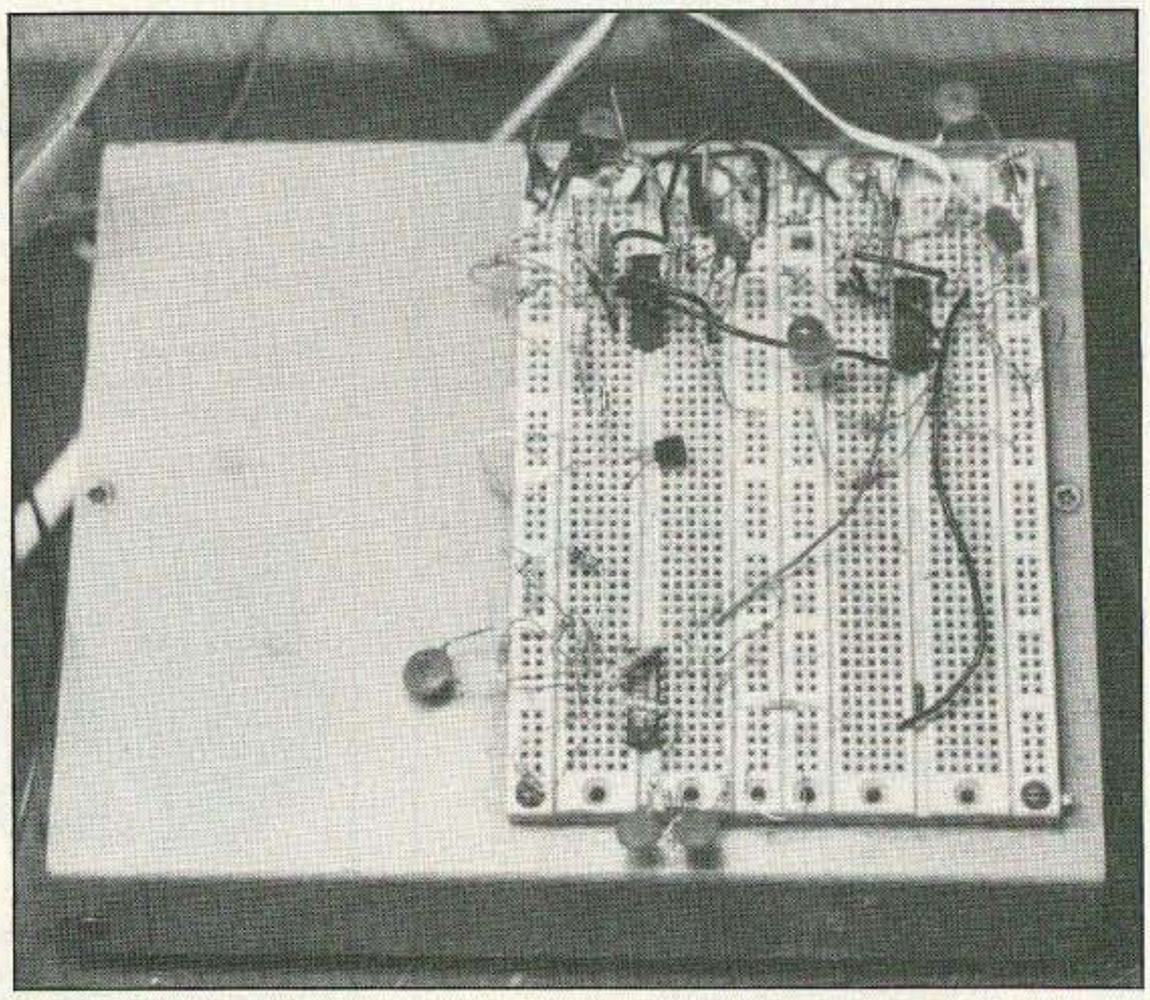

Photo A. ProtoBoard, made by Global Specialties, is great for trying out simple circuits.

Since Radio Shack still sells the breadboarding strips, you could fashion a similar system of your own. A hunk of aluminum from a 19″ relay panel would make a good start for a base. The 1/8″ aluminum is lightweight but very strong. Add some binding posts and you're done.

Of course, if you have the money, you could always get one ready made. Expect to spend about $29.95 on up, depending on the options and number to tie points.

Many of the circuits developed for the QRP column have come from the breadboard I described. More will be coming, I'm sure!

So, as you can see, you don't need special test gear or a work bench to become a world class tinkerer. All you need is a cold Saturday night, a plate of Oreo cookies, and some Diet Coke. My old cat, Bert, likes watching those little white whisps of smoke coming from a NE602. When he's purring and watching the smoke, I know I'm tinkering—world class. It just don't come any better than this. What a country! 73

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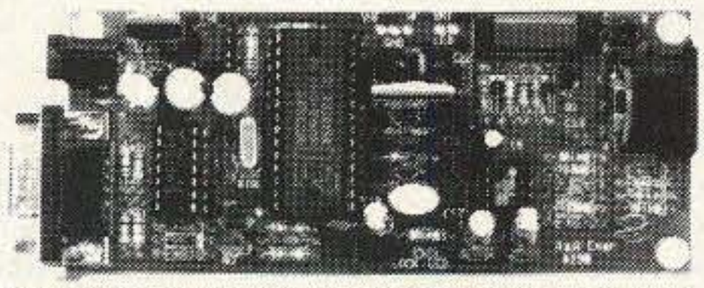

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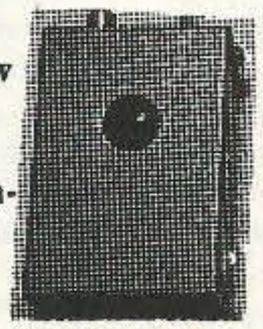

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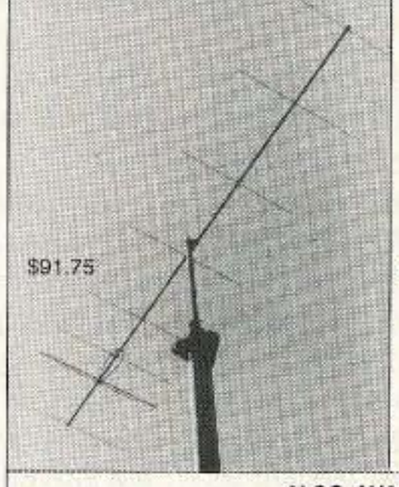

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1st E-Plane	-20 dB
1st H-Plane	-14.5 dB
SWR	<1.5:1 144 to 148 MHz
Maximum power	400 Watts
F/B ratio	22 dB
Impedance	50 ohm

MECHANICAL SPECIFICATIONS:

Length	11 ft. 9 in
Boom	1"OD 6061 T-6 AL
Mast	up to 1-1/2" diameter
Wind survival	90+MPH
Element Insulators	Black Delrin
All Stainless Steel Element Hardware	
Coax connector	N-type
Weight	3.5 lb.

ALSO AVAILABLE
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CIRCLE 71 ON READER SERVICE CARD

Never Say Die

Continued from page 4

My instructor familiarized me with all the instruments and I was ready to give it a try. How could I possibly remember to do all those things at once? Well, taking off was pretty easy. We taxied along, gaining speed until we were doing 149 knots. I pulled up the nose, eased the flaps, pulled up the wheels and we were on our way.

At 3,000 feet I started making some turns to get used to how she handled. It was like steering an ocean liner. I put on some rudder to get her turning, then I moved the rudder back to neutral and waited until we'd almost hit our new course. A slug of reverse rudder put her on target. Ooops, I forgot to watch my altitude and I was 300 feet higher than I wanted. I eased her back to 3,000.

I made a few more turns, getting the hang of the beast. Sherry and Scott were sitting behind me, along with Capt. Chevallard. My instructor, Capt. Beale, made it easy. I never even felt nervous! It was just fun . . . and incredibly real.

We then went into a landing pattern and headed for the runway. It was a night simulation, so I could see the runway's flashing lights from about 30 miles away and headed for them. I've only flown a few land planes, so getting my plane into the right glide slope and making the last two turns of the landing pattern have never been easy for me. I was busy watching everything at once . . . the runway, the altimeter, the glide, the heading and so on.

My old plane was a seaplane. It was practical for me at the time. I lived just a few minutes from a small seaplane base in Brooklyn (NY). If I'd flown with wheels I'd have had to drive an hour or so to the nearest airport.

The seaplane was great fun. I took my 2m Communicator with me and talked all over the East Coast. I often flew up to New Hampshire and dropped into several of the lakes to visit. I visited my folks in Bethlehem, NH, landing at Long Pond, nearby.

Much to my surprise the first landing, with Capt. Beale helping considerably, came off fine. Nice touchdown and runout. The nose wheel steering control was as sluggish as steering a big boat too.

We tried a couple more takeoffs and landings, one landing in a dense fog with 100-foot visibility, and then, after only an hour, I was ready to solo. I moved over into the captain's seat and said, "Well, here goes!" Would I be able to keep this lumbering monster under control? Would I crash and burn? I pushed the throttle forward to 85% power and off we went. Much to my surprise it all went well. We got up to takeoff speed, went up, circled a bit and then came the hard part. We weaved a little, but I got her on course and into the right glidepath, all without automatic pilot, thank you. We touched down like a feather.

Well, if they ever ask on a commercial flight for an emergency pilot . . . heh, heh. Darn, I forgot to bring my pilot's log with me.

So that was my little coup for 1991 . . . just before Thanksgiving. Not bad. Last year I was at the helm of a hunter-killer nuclear submarine cruising around 800 feet under the Pacific. Now what'll I do for '92?

When I got out of the simulator they gave me the printouts of my flights. What I'll never get over is the realism of the experience. It's visually and physically like real life in every way.

Capt. Chevallard had one more thrill set up for me. The next morning I got to meet his band and hear them practice. I've got several of their CDs, so I knew how good they were. But even so it was great being right there. Then the captain turned the baton over to me and let me lead the band through "The Stars and Stripes Forever."

Now I've been leading the finest orchestras in the world in my own living room, but this was for real! When I wanted pianissimo on the trombones, I got it. When I wanted 'em to hit the drums and cymbals, I got it. What a feeling of power! What a rush! Now I want an orchestra of my own.

Oh, I know it's impossible. I don't have the time to do everything. There's just too much. Yet I look at people younger than me who are retired and doing nothing and I get mad. What a waste! What a terrible waste. Playing golf indeed. Sure hamming is fun, but as a hobby, not as a way to mark time until death. Hamming is fun if you get on OSCAR . . . if you try SSTV . . . if you go on some DXpeditions . . . if you are on packet . . . win some contests. It can be fantastic fun. It's fun to get kids excited about it and to help them learn. I love teaching. That's exciting too.

But I'm not just standing on the sidelines cheerleading and holding coats, I'm out in front doing what I champion. You can put me down for bragging if that satisfies you. I'm saying here, life can be one hell of a lot of fun. Here, try this and try that. I'm almost 70 and I'm doing these things, so how about you?

Are you doing all you can do to stay healthy? Are you eating right? Stopped smoking? Laying off the six-packs? Are you walking at least a half hour every day? Briskly walking? Are you keeping your mind active, reading magazines and books? Are you giving the politicians calculated hell? Are you a spark plug in your ham club or are you just another invisible doughnut eater?

You can be healthy. You can have fun. You can even make more money than you need. And you can contribute to society in the process. So yes, I brag and tell you about all the wonderful things I've done, I'm doing and I'm going to do. I do it to try and get you to join me and have fun too.

I'm getting more and more letters from readers saying they're getting their clubs moving . . . they're getting more new hams licensed . . . they're losing weight . . . they're off cigarettes. I say great, now send me pictures of those new hams. Take some videos of all this and let me see what you're doing.

Stop by here in Hancock and say hello. Meet me at Aspen for some skiing. Meet me at Sedalia for some ragtime. Meet me at Dayton and give me a chance to harangue you for an hour and tell you how rotten you are and how you should shape up. Write and tell me how much fun you're having with packet . . . with moonbounce . . . with OSCAR and so on.

Send me some articles and pictures when you finally have the guts to break loose and go on a DXpedition somewhere. Write for *Radio Fun* and help get new hams to try RTTY, SSTV and other exciting ham adventures. And if you're into some new technology the rest of us ought to know about, start writing.

Have you tried facing 5th graders yet? I'll bet one of your local school principals would be delighted to round up some kids to listen to you explain what ham radio is and why they might have a ball if they got interested. You might wave an HT at them and get someone to talk with them over a local repeater. Get 'em fired up . . . then write and tell me how much fun it was so I can print your letter and use it to get others off their recliners.

So yes, I'm piloting C-5Bs, leading a band, helming a nuclear submarine, starting record companies, skiing, diving and telling New Hampshire how to run the state. So why aren't I retired, playing golf and blowing wind on 20m while I await my Silent Key listing? Because I'm having a whole lot more fun, that's why. How about joining me?

Aspen in February?

Chuck, Eric and others of our ham/ski group will be hitting Aspen February 1 for a week of fun. Even if you're a beginner, come on out and join us. We'll be talking ham radio, computers and stuff. I'll be talking music and a few other interests too. Maybe we can work up some ideas on getting our hobby growing even faster than it is. I'd love to see it start to take off again, getting back to being a real industry.

I'd love to see hundreds of new ham stores opening. You know, we had over 850 good-sized ham stores back in the early 1960s. And we had hundreds of small ham entrepreneurial businesses. I'd just started *73* and knew everyone personally. Great bunch of guys.

In the meanwhile I think we're going to have a ball building up the American music industry . . . pushing music from independent music producers . . . pushing interesting and creative music, new and old.

There are some marvelous new rags being written. I'm putting together a CD of contemporary rags, with some by Scott Kirby, Dick Zimmerman, David Thomas Roberts, Joe Walsh and others. I can hardly wait for you to hear them! Scott played a couple at Fresno and the crowds went wild.

So, are you having fun? If not, why the hell not? It's sure out there to have, so it's only yourself stopping you.

Meanwhile I've been up to here working on my proposals for the New Hampshire Economic Development Commission. My report is almost up to 100 pages . . . and that's magazine pages, not typewritten . . . and I'm not out of steam yet.

I've covered some of my ideas in my past editorials. When I get done I'll get the report printed and make it available at cost. Who knows, you might be able to get some of my ideas going in your state and help your economy.

If New Hampshire goes for my educational plan we'll be cranking out thousands of new hams . . . maybe tens of thousands a year. And we'll be aiming them at high-tech careers so we can eventually reclaim our consumer electronics industries.

My proposals embody many good potential businesses which should be established. Dozens of them. Entrepreneurs should be able to go to their state governors and legislatures with business plans based on my ideas and be set up into any of several businesses which will bring big returns to their states.

I'm available for consulting, if you need some help. But remember, my time is limited. I want to go skiing, do some scuba diving, lead an orchestra, try sky diving, and so on. I'm almost 70, so if I don't get going on these things soon, it'll be too late!

My apologies to ham clubs and hamfests who'd like to have me come and talk. Fellas, I'm producing music in my new studio for Greener Pastures Records, my ragtime and bluegrass label . . . for Green With Envy, my rock and classical label . . . I'm starting some new publications . . . *Radio Fun* is taking off beyond our expectations, with over 10,000 paid subscribers already.

We're doing special inserts for business magazines like *Forbes* (see their Nov. 11th issue) . . . plus sampler CDs for them, the Rainforest Action Network and other special causes. We're making CDs and cassettes for over 50 different record companies. Our new distribution company is handling over a hundred labels. Our mail order music company handles 250 labels. Now how am I going to get away for hamfest talks?

Anyway, if you'd like more info on my sales rep plan . . . and your area hasn't been taken yet . . . let me know. Phil Martus will get you some poop. Write Phil at Creative Music Marketing, Forest Road, Hancock NH 03449; Fax: (603) 525–4423.

Supersonics

Reader Elsner from Colorado sent a clipping from *Science* (July 1991) you might want to think about. Seems there's been some surprising success in getting people to "hear" in the supersonic (40–90 kHz) range. It takes some power and you have to use bone conduction, not the ears. This even works for the deaf (now known as hearing-impaired). Heck, it even works with SSB! If you're adventurous you might want to check this out . . . if you can harness it, it's got great commercial potential. *Continued on page 76*

Number 23 on your Feedback card

UPDATES

The Quag-V

See the above article in the December 1991 issue, page 36. Table 3 on page 40, listing the materials for the 8-element antenna, contains an error. See the last column, the one for 146 MHz. The boom length should be 14 feet, NOT 12 feet. The total correct dimensions should be 1" x 3" x 14'.

The Dual-Combo FSM and Source Dip Meter

See the above article by Martin Beck WB0ESV in the January 1992 issue on page 8. Refer to Figure 1 on page 10. Diode D2 should be reversed from what is shown in the parts placement diagram.

The "Cheap and Simple" Power Supply Revisited

See the above article by Vern A. Weiss WA9VLK/G0NBZ in the December 1991 issue. Refer to Figure 2 on page 66. Ray Mack WD5IFS points out that the voltage rating of capacitor C1 should be at least 35 volts instead of the 25 volt rating shown. In addition, the author writes: "There are three noteworthy corrections. First, the 2N3055 transistors are NPN devices, although they are shown as PNP on the 'new' schematic (Fig. 2). Secondly, resistor R3 was drawn as a variable resistor, but a fixed-value resistor would work fine. And finally, the full-wave bridge rectifier, illustrated with dashed lines around it in Figure 1, states 'see text.' Unfortunately, no mention in the text was made of this bridge in the latest article (it was described in detail in the original 1981 article). For this component, use a 25 amp, 50 PIV rectifier such as the Radio Shack 276-1185."

Project INSPIRE

See the above article by Jim Ericson KG6EK in the December 1991 issue. The *Beginner's Guide to Whistler Hunting* by Michael Mideke WB6EER and an audio tape of a variety of sounds that can heard in the VLF spectrum is listed incorrectly in the article as being available for $6. The guide is available for that price, but the audio tape is an additional $10. These items are available from Michael Mideke WB6EER at P.O. Box 123, San Simeon CA 93452-0123.

Computerized Tuning for Ramsey Receiver Kits

See the above article by Mike Gray N8KDD in the December 1991 issue. The program listing to control the interface was omitted. The program (see box, below) will produce an output voltage from the DAC board depending on the value entered (0–255).

```
10 PRINT "Control + Break to quit"
20 INPUT " Enter D/A counts (0-255) ", OUTCOUNTS
70 PRINT OUTCOUNTS
80 OUT 890,0                  :REM WR line high
90 OUT 888, OUTCOUNTS         :REM data out
100 OUT 890,1                 :REM WR line low
110 OUT 890,0                 :REM WR line high
120 GOTO 20
```


Number 28 on your Feedback card

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. You may also upload a listing as E-mail to Sysop to the 73 BBS, (603) 525–4438, 8 data bits, 0 parity, 1 stop bit. Please remember to acknowledge responses to your requests. Thank you for your cooperation.

Wanted: Schematic and/or manual for Eico Model 625 Tube Tester. I will pay copying and mailing expenses. Thanks to all who responded to my previous requests. *Larry Keith KF8BX, 4251 Meadowsweet Dr., Dayton OH 45424. Tel. (513) 233–1148.*

Wanted: Manuals for Hallicrafter SX-100 and SX-111 originals; or will be glad to pay copy and postage. Thanks. *Milt Faivre K4EBT, Box 651032, Vero Beach FL 32965-1032.*

I need a schematic and operator and service manual for ICOM IC-211 2 meter all mode. Will pay all costs. Thanks. *J.Y. Lem KB6BO, 5222 Coringa Dr., Los Angeles CA 90042.*

I am interested in donations of the following: PTO RX R390 Shortwave set; Realistic DX-300 (for Novice CW work on AM/SSB). I am also interested in products from Fair Radio and Universal Radio. Many thanks to anyone who can help. *MacArthur Moore Herman KA3LLY, 5230 Heston St., Philadelphia PA 19131.*

I am in need of a schematic for a Zenith, green screen monitor, Model ZVM-121, Chassis 12MB15X. I will be glad to pay for copying and postage. *Fred L. Horton, 4024 Oakland Blvd., Roanoke VA 24012. (703) 366–6266.*

Pearl Harbor

I was chatting with a chap on 160m out in Western New York when he mentioned he'd just heard that Pearl Harbor was being bombed by the Japanese. It was Sunday, December 7, 1941. By the next day we'd all been chased off the air...for what turned out to be four years. Four interesting, long years.

My ham ticket got me into the Navy as an RT3/c in 1942. After nine months of superb school I graduated as an ET2/c and went aboard the USS Drum in 1943...where I spent until 1945 making five war patrols and made ET1/c. Then I taught school on the New London Submarine Base until I was discharged in 1946.

That little paragraph covers a whole book of adventures and sea stories. Let's say I had an interesting time. I lost a lot of friends...you probably know we had by far the highest losses of any branch of the military, around 20%. Were there some close calls? Ask me sometime when we're in QSO.

In those days, being a ham meant a lot. It not only got me into a fantastic program in the Navy. I also found that all my instructors in the Navy schools were hams. There were long lists of calls on blackboards, carved into desks and all over the place.

That was when hams were automatically buddies...fraternity brothers. Eighty percent of the American hams went into the military. We were needed, young and old. Our equipment was needed too. My Hallicrafters SX-24 receiver ended up on the Amazon with the Rubber Development Corporation, an OSS operation.

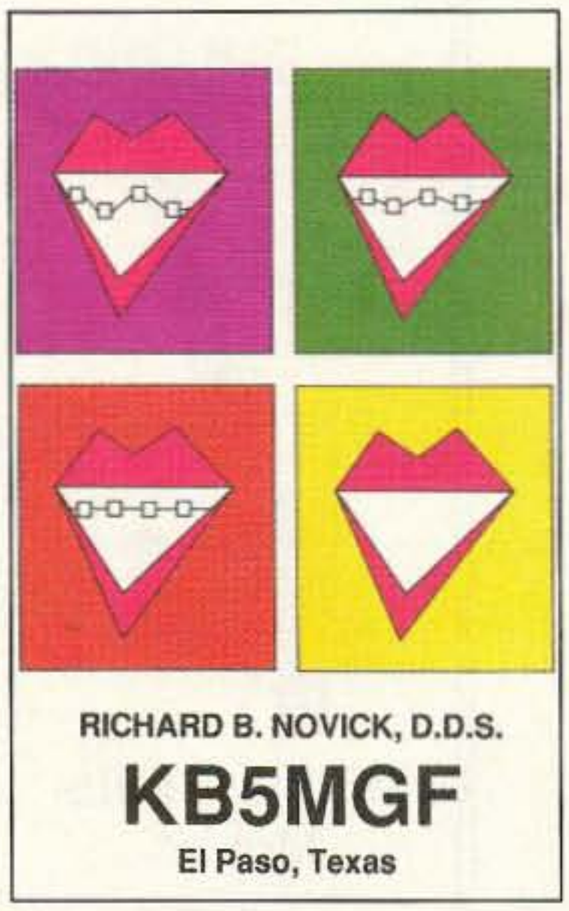
In our latest war they didn't want hams for anything. Further, our equipment is so far behind the current military communications technology they'd have no use for it.

Considering that when the lease on our ham bands came up for review in the past our biggest supporter was the military, we could find ourselves all alone against a big, bad commercial world. Of course, if we'd get into gear, fire up kids about hamming and start pioneering new technologies again, our lease would be easier to keep. The FCC doesn't want to know what we did for them 30 years ago. They want to know what we've done lately...and what we're going to do tomorrow.

IARN Disintegrating

The Intermidable Amateur Radio Nuisance (IARN) was, until recently, pretty much a two man show, with Hap Holly KC9RP cheerleading Baxter K1MAN in his megalomania. Hap's a nice chap. Blind (now known as sight-impaired). Hap's been providing a dial-up news service which Baxter has been using on his endless self-promotional broadcasts. Hap, who had a stronger stomach for Baxter than most of us, finally got fed up and split.

Say, you can do me a big favor, if you will. Please check with the members of your club and see if any of 'em are listening to the K1MAN broadcasts with any regularity. Does Baxter have any listeners? Please advise.



RICHARD B. NOVICK, D.D.S.

KB5MGF

El Paso, Texas

QSL of the Month To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

Dayton '92

Are the members of your club planning on a mass invasion of Dayton this year? You'd better make your plans soon since it starts April 24th. Are you driving or flying? Where are you going to stay? What channel will you be using to keep in touch?

If you wear an "I Hate Wayne" tee shirt I'll give you a $2 discount on a renewal subscription. Say, what did you do with your *73* hat? You're going to wear it while you walk past the *CQ* and *QST* booths, right? And don't forget to congratulate *CQ* on their *Ham Radio* takeover.

Good Old Hiram!

You all know about some old geezer named Hiram Percy Maxim starting the ARRL, right? Jeesh, I hope you know about that. The pity is that you don't know more about old Hiram...now there was one hell of an entrepreneur! Hiram was not only a pioneer in amateur radio, he was also one in film... and in automobiles too. He was interested in just about everything. He also was a great writer. How many of his books have you read?

One of his books got on the best-seller list back in the early '30s. He wrote *A Genius In The Family*, a book about his father, the chap who invented the Maxim silencer. I read that before I even knew about amateur radio. The book hasn't gotten any the worse for having been written about 60 years ago, so maybe you can find a copy in your library.

One of the big problems an entrepreneur has is in finding a successor. Hiram didn't. He just worked full steam (yes, he smoked) until he suddenly dropped dead. Then all hell broke loose at the ARRL as his staffers fought for power. The eventual winner was "Bud" Budlong W1BUD, who was more ruthless and conniving than the others. In a way it was much like the behind-the-scenes battles in the USSR when dictators died.

Allowed to do just about anything he wanted, and kept in power by directors who were terrified of him, Bud ran amateur radio as his personal fiefdom. He alone made our rules, which were rubber-stamped by the FCC. He made the companies who played ball with him rich and destroyed those that didn't.

Alas, with the entrepreneur gone from the top, what had been a benevolent dictatorship under Maxim became a nasty one under Budlong. He was busier fighting his enemies and protecting his power than in pushing amateur radio to grow.

Like most tyrants, Bud's power corrupted him. He became a hopeless alcoholic and was infamous for his wenching. When I first visited the hams at the ITU in Geneva in 1958, they explained how Budlong had been thrown out of meetings at the previous WARC conference because he was drunk and brought prostitutes into the meetings with him.

This was not news to our State Department, and had a lot to do with their accrediting me as an official delegate at the 1959 ITU WARC. Bud was there too. While I stayed at a small, inexpensive hotel, he had a lavish suite at the most expensive hotel in Geneva... paid for by the ARRL, naturally. I don't recall seeing him sober.

Then along came Mort Kahn W2KR, who edged out Harry Dannals for the Hudson Division director's job. Mort found himself among a bunch of directors who, for the most part, knew little about business. They'd worked their way up the League ladder to the most important thing they'd ever do in their entire lives...be an ARRL director! Mort, who was a successful businessman, had made his money by selling Tempco, a radio transmitter manufacturing company, to Otis Elevator. He wasted little time in getting the directors to retire Budlong...who died shortly after that.

Mort had the strength and the business background to get the ARRL into gear. He was torn between running the League from his spot as Hudson Division director and taking it easy on his yacht. He promoted John Huntoon to General Manager and settled in to run things mostly by telephone.

It all started to come apart for Mort when he got a small group of directors together on his yacht in December 1962. The ARRL had lost membership that year and he wanted to come up with something which would get it moving again. The winning idea came from Tom McCann K2CM, one of Mort's 3999 buddies. The plan was to get the FCC to return to the prewar Class A-Class B licensing system.

This had been screwed up, in their estimation, by George Sterling (W1AE), when he was the FCC Chairman. With Senator Goldwater's support he broke things loose, giving us the Novice and Technician Class licenses. Budlong fought those changes with everything he had, but he was no match for George.

Once the decision was made to propose this rule change, Mort, Tom and the directors had to put the best face they could on it. They decided to call it Incentive Licensing...a brilliant political move. They proposed that only the Advanced and Extra Class licensees be permitted to use voice between 160 and 10 meters, as pre-war.

Mort dictated the editorial announcing this move to Huntoon, who published it in the February 1963 *QST*. It sure did get everyone's attention.

When this ill-considered idea bombed, almost killing the ham industry in the next year and a half, Mort moved his yacht to Florida and stopped answering Huntoon's frantic calls.

I found John to be a nice chap...he was just totally over his head. He'd functioned well as a gofer for Budlong, but had no business experience and certainly was no entrepreneur.

Today we have David Sumner K1ZZ general managing the League. David

W2NSD/1 flies a C-5B!

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CIRCLE 153 ON READER SERVICE CARD

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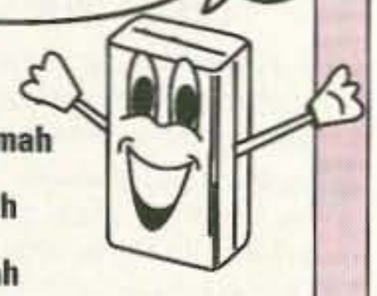

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is intelligent and dedicated, but he doesn't have the entrepreneurial vision and drive to make his visions happen, which would give him the control he needs over the directors. David is a nice chap and I like him, but he's living in a time when someone like old Hiram is needed to blast the ARRL into the 21st century.

This all came to mind when I got a fax from my friend Joe Sugarman W9IQO . . . you remember JS&A and his Blu-Blocker glasses ads? Joe's an entrepreneur, a great businessman and a visionary. The ARRL directors need to go out and find someone like Joe to get our hobby back on the tracks and charging into the future.

Chained Again

I enjoy a good scam as much as anyone else . . . so I was amused when a couple of readers sent me copies of a chain letter from the Ivory Coast. They'd never contacted anyone in Ivory Coast, so they wondered . . .

The idea is a good one. It's illegal to send chain letters in the U.S., but there's not much the post office can do about someone in Ivory Coast sending them. This one has four names on the list, each with a ham call. The first is in Hungary, the second in the Philippines and the last two in Ivory Coast.

If everyone follows the instructions and mails $1 to the top name, he'd get $20. The second name, if the chain is unbroken, would get $400. The third would get $8,000 and the fourth would get $160,000. Nice idea. Heck, even if only 1% of the chain pays off, that's a $1,600 payback!

But I suspect this chap has loaded the dice a little heavier in his favor. With the last two names in Ivory Coast, any bets that they're not both him?

So next I checked the calls on the four names. I was not overly surprised to find them bogus. None were in the *Callbook*.

Now, if I were doing this, I'd send out a thousand or so letters, not just 20. I might even go to the trouble of setting up a letter drop in Hungary and the Philippines . . . why waste any of the chain letter booty? With an unbroken chain I'd make $8,420,000. Heck, if 0.1% of the chain works I'd get back $8,420. Let's see, how much is a ticket to Ivory Coast?

That reminds me of another great ham scam a few years back. Hams began getting letters from a clipping service saying that they had an article from a national amateur radio publication which mentioned them. Send $1 for the clipping. Now who could pass that one up? Many sent the buck . . . and got a clipping of their name and address from the *Callbook*. I'm saving that scam for my retirement. That ought to be good for at least $100,000 even today.

Then I'll head for some small country and start chain letters.

How About YOU?

How about *you*? Are you satisfied with yourself? Are you making enough money? Are you doing everything in amateur radio you'd like? Are you fatter than you want? Can't you quit smoking? Is your life under control?

All of these things are within your grasp. You already have everything you need to be successful in life . . . in every way. You only have one more step you have to take . . . a step that is scary . . . a simple step that will change your life forever and bring you those things that you want, but haven't achieved.

The step really is simple. It's also difficult because it means you'll be breaking habits . . . often lifetime habits. We allow habits to control around 99% of what we do, so breaking them isn't easy. But when you think about it, it's habits that are keeping you where you are in life. It's eating habits that make people fat. It's a drug habit that keeps people smoking. It's habit that keeps us from achieving business success. It's habits that louse up our personal relationships.

The alternative to letting habits control our lives is thinking about what we're doing and making a decision based on the results we want. We all have brains, it's just that we're not used to using them. It's easier to repeat the same old reaction . . . habit.

So what's that "little" step you need to take which can start the process of breaking your habits . . . your destructive patterns? You have to make a decision. Yep, instead of doing what you've always done, you have to decide you're going to change.

Since most people are overweight, if you are, how about deciding that you're going to get down to some ideal weight? This is not a decision that next week you're going to start dieting. You want to learn how to break the habits that have been making life difficult for you. So you decide that from this minute on you're going to start losing weight.

This is a great way to start breaking habits because eating is something you do every day, several times a day so breaking your eating habits will keep your mind focused on the change you've decided to make.

There isn't one of you reading this who can't make this decision and make it stick. Yes, I know all about the problems that come with dieting. Your body will fight back . . . for a few days. Your family will in all probability make it miserable for you. Your eating is now going to be very different from theirs.

You've made a decision, so you're going to do it. You're not going to go for diet aids or Dexitrim baloney. You're going to change your eating habits. No more of the things you know are doing the damage. No desserts. No snacks. No more bread. You're going on fruit, vegetables and meat . . . and you're going to cut your calories down so you'll be losing about 1/3 pound a day . . . couple pounds a week.

A drastic diet throws too much of a strain on your body and heart. Just take it easy . . . and stay away from restaurants with their rolls, butter patties and desserts. You're eating to live . . . to live a longer time . . . and a much healthier time. You're eating to look better. This isn't going to hurt you in personal relationships or in business.

And part of your rehabilitation program should include more exercise. No, I'm not suggesting you get out every morning and jog five miles . . . I'm not that heartless. No, a couple of miles will do it. Just joking . . . actually all you have to do is walk a couple miles at a brisk walk. This may require a second big decision . . . but by now perhaps you're ready for it.

Yes, I know all about it . . . no time. Sure. No time to get in a half hour brisk walk in the morning. No time to get up a half hour early and spend a half hour walking and thinking. When's the last time you spent a half hour thinking? That's the nice thing about walking, it doesn't take much concentration.

I know it'll be difficult breaking all those old morning habit patterns. Well, you're just going to make some new habits, just as you're doing with eating. The new habits will keep your body in better shape . . . and the practice in breaking old habits and making new ones is going to stand you in very good stead. Once you get the hang of breaking old patterns it gets easier.

When you've changed your eating and exercise habits, then it's time to start looking at your habits in business and in personal relations. Anything need changing? Are you ready to make a decision to change?

Are you a member of your local ham club? Go to meetings very often? What are your habits with regard to the club? Are you a spark plug who makes things happen? Well, why in hell aren't you? How about making a decision to double your club's attendance? That's a great decision to make . . . and one you can accomplish. The down side is that instead of being a fat old-timer sitting in a back row of the club, you'll probably be made president next year.

Hey, this'll work even if you're an 18-year-old no-code Tech who's been ignoring the hints from the old guard clique running the club that no-coders are dirt. They're going to have a 19-year old president next year and they don't even have a clue. But of course, you have to decide to break your habits.

How're you going to double club meeting attendance? Easy. You get started sending releases to the local papers and radio stations inviting people to come to the meetings . . . with your phone number for further information. You get off short pieces about things like Field Day, a club auction, any special speakers coming, anything a club member has done out of the ordinary.

Write an article about a club member who's active on packet. Another about one who's DXing. Got anyone around who's DXpeditioned anywhere? Anyone on slow-scan? On RTTY? Look for anything unusual to hang an article on . . . and get that phone number in there.

Are meetings a dreadful bore? How about seeing who you can find to give a talk? How far away is your nearest ham dealer? You won't believe the stories he can tell about crazy hams he's had to deal with. Any ham manufacturers within driving distance? Any who might be visiting your area?

Have you any club members who've done anything unusual? Builders? Any gotten articles published? Yes, it takes some habit breaking. You'll have to start writing letters and making calls. But what a breakthrough this will be for you. It'll start opening up whole new areas for you.

If you can't find anyone nearby for a speaker, how about getting some famous hams or major manufacturers to make a short video for the club? I've been known to get out my 8mm video camera and answer questions for clubs. It's a lot easier than flying to Missouri or something.

One of the problems I have when I join clubs is that I seem to get voted to be the president in short order. This is because I *do* things. I bought a Porsche and joined the Porsche Club of America. The next thing I knew I was the president and I had us putting on rallies, gymkhanas and other events.

I joined the Peterborough Chamber of Commerce, became president and tripled meeting attendance in short order. All it takes is a decision to do something.

You've been thinking about trying packet. When are you going to actually make the decision to do it? It doesn't cost much and it's a lot of fun. It's only habit holding you back.

If you use the same decision-making process in business, you'll find it will open all sorts of doors for you. The same enthusiasm you put into your ham club will make your business grow.

If you're a cog in the wheel of a company, start making that cog go faster. Get in earlier . . . work later. Stop wasting time on useless phone calls. Stop wasting time with gossip. Make more business calls. Start letting your bosses know what's going on. Start asking for more responsibility. Break those old habits.

Look for weaknesses in your business and help solve these problems. Find out what your customers think . . . what your suppliers think. What problems are they having with your company? What can you do about them?

Oh yes, if you're worried about the old-timers who are running your local ham club knowing what you're up to, don't worry. They don't read *73* . . . and they probably aren't friends with anyone who does.

All that stands between you and the whole world out there is a decision. Are your habits too strong for you to make that decision? I want to see a slim, healthy you at my booth at Dayton in April. 73

Number 24 on your Feedback card

HOMING IN

Radio Direction Finding

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

Doppler Fun in Phoenix

"Over my dead body!" You're sure that's what your "significant other" will say when you suggest drilling an inch-and-a-half-diameter hole in the roof of the family's shiny sedan. You need the hole to install a rotating quad or beam for 2 meter radio direction finding (RDF) contests (often called foxhunts or T-hunts).

Properly done, a hole in the roof will not ruin the resale value. But a big antenna sprouting from a car top is not beautiful to non-hams. It is certainly not a covert way to hunt jammers, either. Furthermore, your wrist and arm get a real workout spinning these antennas against wind load at highway speeds.

After a while, you may long for RDF sets with certain "creature comforts." Wouldn't it be nice if the antenna rotated electronically, with no moving parts? And wouldn't it be great if there were a direct display of the bearing, updated regularly, perhaps even a digital readout in degrees? Of course, no holes would be needed for this ideal system, and it could be quickly installed on and removed from any car.

If you have lots of kilobucks, you can buy Watson-Watt or cavity-backed annular slot antenna RDF sets with all these features and more. Those are what the FCC and other government agencies use.

Your pockets aren't that deep? Fortunately, there is a ham-budget alternative: the Doppler array.

From Trains to Hidden T's

As a car or train approaches you with its horn sounding, its pitch seems to rise. Then there is an apparent abrupt change to a lower tone just as it passes by.

An Austrian physicist named Doppler noticed this phenomenon back in the 1800s (not with cars, of course). He derived a set of formulas predicting the frequency shifts that observers perceive in waves (sound, radio, and light) when the wave source and the observer are moving relative to one another.

Over a century later, H. T. Budenbom figured out how to use Doppler effect formulas to determine the source direction of an incoming radio wave in a matter of milliseconds, using a mechanically rotating antenna. But to be effective on 2 meter FM, the antenna spin rate must be greater than 10,000 RPM! It took the invention of RF diodes and digital integrated circuits to make inexpensive mobile ham-band Doppler RDF sets possible.

Typical Doppler RDF sets for VHF have a ring of four or eight quarter-wave whips on a ground plane. Vertical dipoles are better than whips, but mobile mounting problems make them less common. Switching diodes connect each whip to the receiver, one at a time, in sequence. The receiver thinks it is connected to a single antenna that rotates around an invisible vertical axis in the center of the ring.

This pseudo-rotation causes FM modulation to appear, superimposed on the received FM signal, as a tone at the rotation frequency. The phase of this demodulated tone, relative to the antenna switching sequence, determines the direction of the incoming signal. Bearings are usually displayed on a ring of light-emitting diodes (Photo A).

The Doppler Capitol of T-Hunting

There is no better place to observe ham Dopplers in action than Phoenix, Arizona. "Every T-hunter has a Doppler here," says John Moore NJ7E, a regular at the monthly hunts with his daughter, Beth N7MAT. John has received commendations from the Arizona FCC office for assisting in apprehension of jammers and bootleggers in the ham bands using RDF.

Competitive T-hunting in Phoenix has a long history. In the '70s, Dave Cunningham W7BEP tested out his ideas for soft-switching Doppler antennas there, developing what was to become the Doppler Systems line of com-

Photo A. Doppler RDF sets are "standard equipment" on Phoenix area hunts. Bob and Jackie Neve (WB7SMU and WB7SMT) strap their home-brew readout to the top of the dashboard.

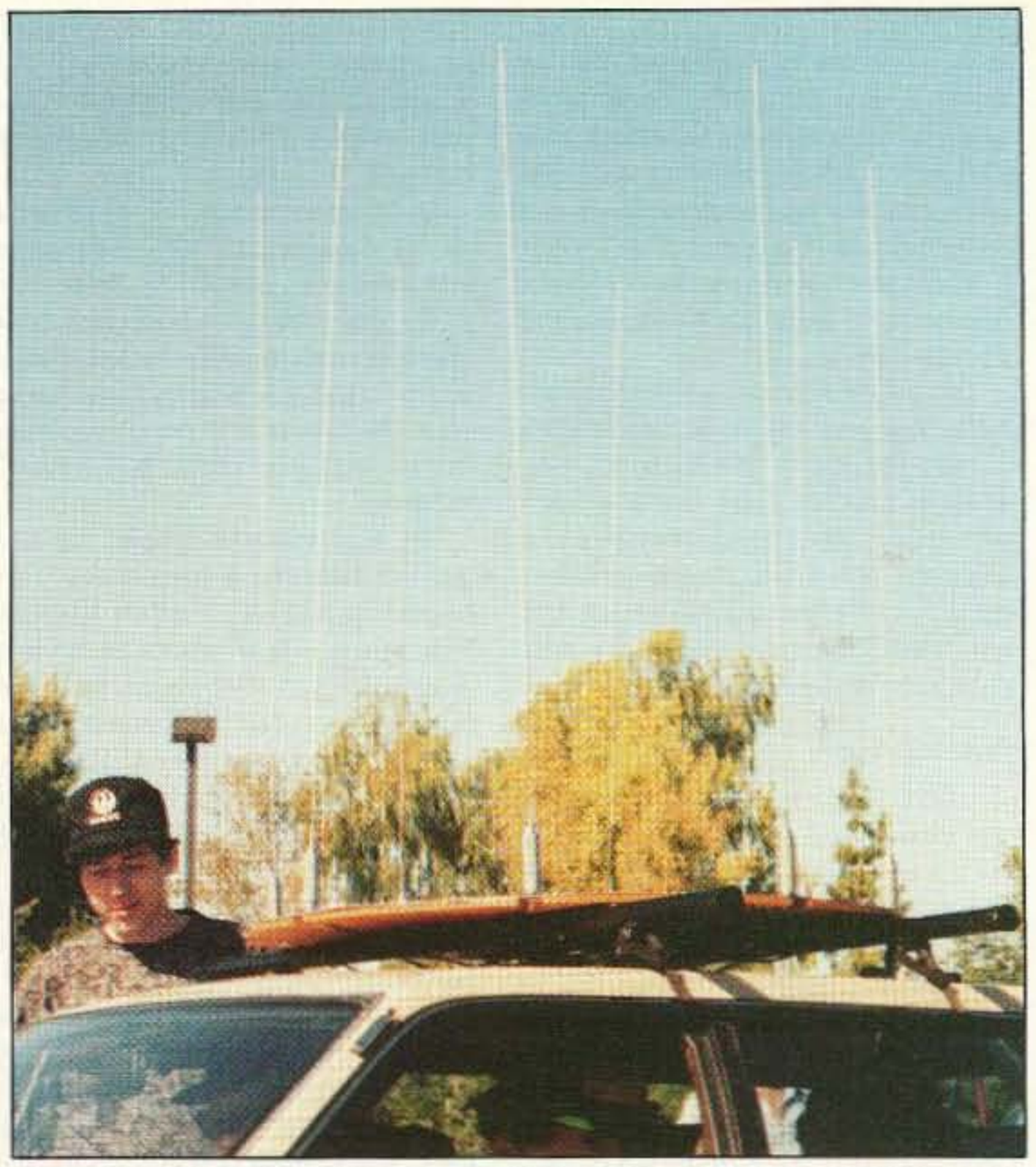

Photo B. A ham radio Explorer post got several Phoenix area teens involved in T-hunting. Eric Jonland N7KDV is captain of this team, which uses an eight-whip Doppler array.

Photo C. It's easy for Bill and Boni Pineups (KC7VV and WT7Z) to change polarization on their yagi from inside by sliding this lever on the mast up and down. These clever hunters have a Doppler on board, too.

Photo D. For weak signals or on-foot "sniffing," Damon Stewart KB7FUT is ready with his beam and attached hand-held.

mercial RDF sets. W7BEP has not been seen on a hunt for some time, but most hunters still use Doppler technology on the monthly hunt.

Boundaries for this hunt, held on the second Saturday of the month on 146.43 MHz, are a 15-mile radius from the starting point. The hider declares that spot in advance, usually choosing between two large parking lots in different parts of town. Once everyone hears the fox's signal, the hunt is declared to be under way, and the mad dash begins.

To win, you have to be the first to identify the transmitter, so every second counts. Hunters like the instant readout and rapid update rate of Doppler sets for this type of hunt. Home-brew models predominate, usually some variation of the eight-antenna design by Terrence Rogers WA4BVY (see the sidebar).

To aid in tracking weak signals, some put 5/8-wavelength whips in the antenna ring (Photo B). We used both a rotatable beam and a Doppler, as did one other team (Photo C). All the others used only Dopplers for the mobile part of the hunt.

Just like everywhere else, Phoenix T-hunters are super-friendly. I felt right at home hunting with them. Still, even with a top-notch navigator and beam-turner (WA6OPS), I had some trepidations about participating as an out-of-towner in a timed hunt in the dark in totally unfamiliar territory.

You see, these folks start their hunt at 7 p.m., with the idea that they will all find the T in an hour or so and head to a nearby pizza place for dinner. The last thing I wanted was to be the cause of a bunch of starving hams standing around at the end point waiting for us with growling stomachs.

Fortunately, a couple of SWLs arrived at the last minute, looking for a ride along. Since they knew their way around metro Phoenix, I invited one to go with us as an additional navigator. (Aha, someone else to blame!)

Resources for Home-Brew and Commercial Doppler RDF Sets

Complete details of W7BEP's advanced Doppler are in the June 1981 issue of *73 Magazine*. This is a complex project, with about 40 ICs and MOSFET preamps on each antenna. This design is the basis for the Doppler Systems line of commercial RDF units and the switching concept is patent-protected.

Current models from Doppler Systems have improved antenna preamps and new display/interface features. Prices start at about $600, not including antennas. Contact the company for more information: Doppler Systems, Incorporated, P.O. Box 31819, Phoenix AZ 85046; (602) 488–9755.

Construction plans for the eight-antenna WA4BVY Doppler, called the DoppleScAnt, are in the May 1978 issue of *QST*. Contact the ARRL for an update sheet before attempting to build it.

For a complete discussion of the theory of Doppler RDF, read *Transmitter Hunting—Radio Direction Finding Simplified*. This 323-page book by KØOV and WB6UZZ is published by Tab Books and is available from Uncle Wayne's Bookshelf. There is an entire chapter on Doppler techniques, including construction plans for the Roanoke Doppler. The cost of the parts for this 11-IC project is less than $100, including four antennas.

Jim Hoff, our ride-along and a soon-to-be ham, was more help than I could have imagined in avoiding dead ends and low overhangs. We still finished last, of course, but we didn't keep them waiting too long.

Did Anyone Salute?

Be prepared for just about anything on a Phoenix hunt. Hiders love to use modified dual-band rigs as remotes to foil hunters. This time, the T was a dual-band handheld dropped into a fake sprinkler vault, with a dozen feet of leaky coax out on the ground as an antenna. Gee, what polarization is that?

"A while back, a friend of mine hid it in a US flag," NJ7E chuckled. "He stitched two flags together with an HT inside it—it looked like one flag—and ran it up a flagpole in front of an apartment house down in Mesa.

"There is more emphasis on the sniffing (on-foot hunting for a concealed fox) than on long road chases," John reports (see Photo D). Hiders also like to take advantage of the signal reflections you can get from terrain features. "People do a lot of multipath work, but it isn't long distance. Phoenix has enough mountains that you can play a lot of multipath games. In fact, it's frustrating living in Phoenix because there's no place you can live where you don't have mountains blocking your radio signal."

"Be prepared for just about anything on a Phoenix hunt. Hiders love to use modified dual-band rigs as remotes to foil hunters."

The Down Side

Easy-to-read displays and rapid response of Dopplers make them a good choice for hunting strong jammers or for short first-finder-wins hunts like those in Phoenix. But in the interest of "full disclosure," I should point out a few disadvantages.

A beam or quad RDF setup has significantly more sensitivity than a Doppler. Some teams use 5/8-wavelength whips on their Dopplers and some designs use "soft switching" to improve signal-to-noise ratio and reduce cross modulation products. But the beam/quad hunters will still get bearings at much greater range. Dopplers are seldom usable at the starting point of long distance weak-signal hunts.

Sensitivity and accuracy of the Doppler method is reduced further if the transmitting station is not vertically polarized. When the hider uses horizontal polarization, multipath reflections are enhanced relative to the direct signal, making homing in much more difficult in urban or mountainous terrain.

The Doppler technique requires a receiver with FM detection, even if the signal is AM (in the aircraft band, for instance). Doppler sets will not track non-carrier modes such as single sideband and pulsed noise signals.

Your Doppler's accuracy will be degraded by proximity to other antennas. The effect is greatest when the other antennas are in front of the Doppler array. NJ7E says his communications whips pull the Doppler indication forward when the signal is toward either side. Rotating a vertical quad or yagi on the same vehicle makes the Doppler indication move 10 to 40 degrees, depending on closeness and mounting location. However, this problem is much less severe when the beam is horizontally polarized. 73

Number 25 on your Feedback card

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

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

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

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

Send your ads and payment to the *Barter 'n' Buy*, Sue Colbert, Forest Road, Hancock NH 03449 *and get set for the phone calls.*

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ROSS' $$$$ NEW February (ONLY): KENWOOD TS-850S $1,459.90, TM-741A $699.50, VFO-700S $149.90; ICOM 725 $725.00, 2SAT $299.90, 900 $439.99; YAESU FT-703RTT $259.90, FT-709R $289.99, FT-470 $388.00; MFJ 815B $41.90, 941E $89.90, 207 $89.90; HUSTLER RM-40 $19.90, 5BTV $103.90; TEN-TEC 535 $1,129.90, 425 $2599.90. ALL LIMITED TIME OFFER, CALL OR SEND 2 STAMPS FOR USED LIST AND MORE SPECIALS. LOOKING FOR SOMETHING NOT LISTED OR HARD TO FIND, CALL OR WRITE. Over 9000 ham-related items in stock for immediate shipment. Mention ad. Prices cash, F.O.B. Preston. HOURS TUESDAY–FRIDAY 9:00 TO 6:00, 9:00–2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB707

EMERGENCY SUPPLIES: Disaster preparedness packs for your shack, auto, office, etc. Free catalog. Slates Products, P.O. Box 4375T, Walnut Creek CA 94596. BNB708

ROSS'$$$$ USED February SPECIALS: KENWOOD TH-75 $369.90, TM-701A $399.90, TR-851A $529.90, TS-180S/DFC $549.90; ICOM IC-211 $389.90, 2KL SOLID $1,495.00, IC-735 $729.90; YAESU E-72L $32.00, FT-ONE $1,099.90, PA-3 $25.90, PA-6 $14.90; COLLINS 30L-1 $899.90, 312B-4 $299.90, AC-3805 $79.90, GD-6C $259.90, ETO 77 $3,899.90; TEN-TEC 961 $179.90,

229B $249.90, 562 $1,499.90. LOOKING FOR SOMETHING NOT LISTED?? CALL OR SEND 2 STAMPS. WE HAVE OVER 140 USED ITEMS in stock. MENTION AD. PRICES CASH, FOB PRESTON. HOURS TUESDAY–FRIDAY, 9:00 TO 6:00, 9:00 TO 2:00 P.M. MONDAYS. CLOSED SATURDAY & SUNDAY. ROSS DISTRIBUTING COMPANY, 78 SOUTH STATE, PRESTON ID 83263. (208) 852–0830. BNB709

TRANSISTORS RF FOR SALE: MRF454, MRF455, Series Toshiba 2SC2290, 2SC2873, and more. Looking for repair shops, dealers, and manufacturers. Call (201) 839–3360. BNB710

SEIZED GOODS, radios, stereos, computers, and more by FBI, IRS, DEA. Available in your area now. Call (805) 682–7555, Ext. C-6223. BNB711

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GIANT SOLAR PANELS $44.00 EA! Excellent Prices/Solar Equipment/Accessories. Free Information/Send Stamped Envelope, Catalog $3.00. To: Pak Rat Electronics, P.O. Box 690073, Houston TX 77269. (713) 893–0313. BNB715

SIMPLEX REPEATERS $149.00! We manufacture them ourselves. Pak Rat Electronics. (713) 893–0313. BNB716

ELECTRON TUBES: All types and sizes. Transmitting, receiving, microwave . . . Large inventory = same day shipping. Daily Electronics, P.O. Box 5029, Compton CA 90224. (800) 346–6667 or (213) 774–1255. BNB719

WE HAVE IT! AEA, Astron, Butternut, Callbook, Comet, Diamond, Hustler, Kantronics, laser computers, MFJ, Radio Shack, Smiley, antennas, Ten-Tec, Valor antennas, and more. Small town service with discount prices. Dandys, 120 N. Washington, Wellington KS 67152. (316) 326–6314. BNB722

CROSS REFERENCE DIRECTORIES: Kansas, Colorado, Nebraska. Over 1000 communities in each referenced by counties, highways, and the amateur and search and rescue grids. $22.95 each postpaid from VASI, 3624 Citadel Drive North, Suite 309, Colorado Springs CO 80909. BNB723

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31.00 kit, (219) 489–1711. P.O. Box 80096, Fort Wayne IN 46898. BNB725

BUILD YOUR OWN WIRE ANTENNAS, parts, GROUND RADIAL WIRE, open-wire feedlines, copper-weld various wire, insulators, vertical phasing, coax, Dacron rope, baluns, etc., LOWEST PRICES. Catalog, $1.00, DAVIS RF Co., P.O. Box 230-S, Carlisle MA 01741. (800) 484–4002, ext. 1356. BNB726

REVOLUTIONARY NEW World view time indicator, attractive and easy to use. Designed by utilizing a South Pole projection of the entire earth with the time zones color-coded in. A coordinated color-coded band extends around the circumference of the map. Simply rotate the earth until your time zone color coding is at your correct time. Instantly, you have the total world times. (Excellent for quick referencing.) **SIZE:** 8½" x 11". **TO ORDER:** Phone (613) 345–1537, or send name and address, cheque, M.O., or VISA No. & expiry. date to: WORLD VIEW TIME INC., P.O. Box 266, Brockville, Ontario, Canada K6V 5V5. FAX: (613) 345–7264. **PRICE:** $13.45 U.S., $14.95 Canadian (total cost including taxes & shipping). World Patents and Designs. BNB727

HAM RADIO REPAIR Experienced, reliable service. Robert Hall Electronics, 1660 McKee Rd., Suite A, San Jose CA 95116. (408) 729–8200. BNB751

PICTURE QSL CARDS of your shack, etc., from your photo or black ink artwork. 500 $26.00. 1000 $40.50. Also non-picture cards. Custom printed cards, send specifications for estimate. Send 2 stamps for illustrated literature. Generous sample kit $2.00, half pound of samples $3.00. RAUM's, RD 2, Orchard Road, Coopersburg PA 18036. BNB756

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ATHEIST AMATEUR RADIO NET forming. SASE for details. Beckett W9OE, 2003 Logan Apt. 2, Hamilton OH 45015. BNB759

WANTED: Ham equipment and other property. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(C)(3) status by the IRS, incorporated with the goal of using the theme of ham radio to further and enhance the education of young people nationwide. Your property donation or financial support would be greatly appreciated and acknowledged with a receipt for your tax deductible contribution. Please look over whatever unwanted equipment you may have, and call us. We will pick up or arrange shipping. You will receive the tax deduction, but most important, the privilege of knowing that your gift really made a difference in the education and upbringing of a child. You are invited to check into the WB2JKJ CLASSROOM NET, 1100 UTC on 7.238 MHz or on 21.395 throughout the day. Hope to meet all of our PA friends at the AARG Hamfest on Feb. 29 in Lebanon PA. Write us at: The RC of JHS 22 NYC, INC., P.O. Box 1052, New York NY 10002. Round the clock HOTLINES: Voice (516) 674–4072, FAX (516) 674–9600. BNB762

ELIMINATE MULTIPLE NOISE TONES in your receiver audio output. The revolutionary new JPS noise filter, model #NF-60, Digital Signal Processing simple hook up to speaker jack. Unlike other Notch Filters, notches out multiple varying tones. **Deep Discounted:** $138.50 delivered continental U.S.! (Elsewhere $150.00 plus shipping.) Authorized JPS dealer: Davis RF Co., P.O. Box 230-S, Carlisle MA 01741. 24-HR orders: (800) 484–4002, ext. 1356. BNB763

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LAMBDA AMATEUR RADIO CLUB International amateur radio club for gay and lesbian hams. On-air skeds, monthly newsletter, and annual gathering at Dayton. (215) 978–LARC. P.O. Box 24810, Philadelphia PA 19130. BNB812

INEXPENSIVE HAM RADIO EQUIPMENT. Send postage stamp for list. Jim Brady—WA4DSO, 3037 Audrey Dr., Gastonia NC 28054. BNB890

HOOKED ON CODE Morse code music. A logical learning concept. Send $7.95 for *The Rhythm of the Code* cassette to: Kawa Records, P.O. Box 319, Dept. ST, Weymouth MA 02188. BNB899

AMATEUR RADIO REPAIR!! All makes & models, any age. $20.00 per hour—maximum labor per unit, $80.00. TELO (Dan), 1302 S. Uplands Dr., Camano Island WA 98292. (206) 387–3558. BNB900

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Number 26 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

Have you ever wondered why, in a hobby that is based on the art of communication, so little communicating gets done? I'm talking about your average, everyday HF rag-chew QSO. Most of them go something like this:

"CQ, CQ, CQ from W1ABC . . . by for a call."

"W1ABC, this is K0XYZ . . . Kilo Zero X-ray Yankee Zulu."

"K1XY . . . eh, was it Tango? This is Whiskey One Alpha Bravo Charlie. Thanks for the call, old man. The name here is . . . The QTH here is . . . Your signal report is . . . My rig is . . . The weather here is . . . *[Each of these statements is repeated two or three times, then again with phonetics.]* So . . . how copy?" The same exact information is now exchanged from the other side, and then the two parties quickly say, "Thanks for a great QSO . . . hope to hear you on the band again . . . 73."

This is communicating? This activity, repeated over and over again, is why we spend hundreds or thousands of dollars? This is the kind of activity that will attract and hold onto youngsters by the thousands?

Almost all of us would like to have more interesting contacts—to really get to know our fellow hams and make a few friends over the air. The problem lies in the fact that speaking to strangers is not something most people feel comfortable with. Even if you don't have a problem with talking with new people over the air, chances are that the person who has just answered your CQ is terrified.

I'd like to offer a few suggestions on how we can all get over this communication blockage.

Get Off On The Right Foot

The first and most important thing you can do to get a QSO going is to immediately break the monologue cycle. The monologue cycle is present in about 98% of the QSOs I've ever been a part of. You know what I'm talking about—one person speaks for about three minutes, then the other party speaks for about three minutes. Callsigns are exchanged before and after every transmission. This isn't conversation, this is boring.

When I call or answer a CQ, my initial transmission is: "Hi! How are you today? It's a pleasure to meet you. My name is David, and I'm in a little town called Hillsboro, New Hampshire. Over."

That's it. No phonetics. No talk about rigs, signals, antennas or weather. No repeated callsigns. Just a simple introduction, just like meeting someone in any other situation (since amateur radio is a hobby concerned very much with geography, I add the QTH). What happens next is one of two things. Either the party on the other end immediately realizes that he is in a conversation, and an enjoyable discussion begins, or a long silence is heard (he's waiting for the typical exchange of callsigns), followed by a confused but certain entry into the monologue cycle. When this second scenario begins, I give the guy one more try. I ask a quick question, followed by "over." If he launches into another monologue I realize that it's hopeless. On my next transmission I give him all the information he's given me (rig, antenna, weather, etc.), then immediately say good-bye.

Ask Questions

It is a basic rule of conversation that people love to talk about themselves. Oh sure, most are shy at first but, with a little prodding, most people really enjoy talking about their own lives.

To get a conversation going, try asking a question. If you get a short, stumbling answer, ask a follow-up question that forces the other person to go into more detail. Everyone has a story to tell, and if you are the curious type, most everyone's story is truly fascinating. In the last year I've met:

A guy who retired early, sold his house, bought an RV, and spent the next five years traveling around the country.

A guy who worked on NASA's *Apollo, Skylab* and shuttle programs.

A guy, operating from a hotel room in Colorado, on tour with the Rolling Stones as a lighting technician.

Talk About What Interests You

The easiest way to make a friend is to find a common interest. When all else fails, we all have an interest in amateur radio to fall back on. Talk about what areas of amateur radio interest you. Are you into packet, moonbounce, ATV or foxhunting? Talk about it.

Of course, the really interesting QSOs start when you can find a common interest other than amateur radio. If I can get past the usual boring monologue with someone, they will usually find that I am interested in aviation (I soloed last month and will probably have my private pilot certificate sometime this spring), music (I used to earn my living as a guitar player/singer—I write songs, too), the outdoors (canoeing, camping), history (the Civil War especially), Stephen King novels (have you read his latest?), woodworking (I have a modest shop in my basement and spend a lot of time making small pieces of wood out of large pieces of wood), skiing (I haven't broken anything yet) and motorcycles (I haven't broken anything yet) . . . and, this is a short list.

You don't know what you have in common with a person until you ask. Finding out what someone does (or did) for a living is a good first step. ("I'm in the publishing business. What do

Continued on page 51

Number 27 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

10 and 12m DX Decline

As we go from the winter solstice toward the spring equinox, conditions on the HF bands begin to recover from the winter doldrums. The higher bands, so quiet after dark during the winter months, begin to show signs of life after dark and before dawn.

However, bear in mind that the sunspot cycle is well on its way down, and propagation will become progressively poorer as solar flux values decline. Solar activity will decrease to the lowest point since the mid-1980s, and your DX opportunities on 10 and 12 meters will become fewer as the year progresses.

For February, look for the *best* conditions between the 3rd and 10th, and again between the 19th and 23rd. The *poorest* conditions are expected between the 11th and 14th, and again between the 26th and 29th. Yes, that's right: This is leap year, and February has 29 days!

The full moon will occur on the 18th.

On the best days, there will be *some* DX on 10, 12, and 15 meters during daylight hours, and occasionally around dusk and dawn. You may expect 20 meters and 17 meters to support most of the DX opportunities, and 20 will be open after dark on good days. On the lower HF bands of 30, 40, 80, and 160 meters, you will find lots of DX on the Good (see the calendar and chart) days, but not much on Poor days. Atmospheric noise is still low, and except for an occasional winter storm, it should not bother the weaker signals. Storms often occur on or near the days marked Poor on the chart.

It is now time to dig for the weaker DX signals, as those rock-solid ones of a year or two ago will become less apparent, and often the rare ones will be close to noise levels which, fortunately, will be low. The fellows with yagis and quads will have a definite advantage . . . and even more so, as conditions weaken.

Try for DX across the equator on poorer days, but not over the poles; and, as always, use WWV at 18 minutes after any hour to keep you informed about propagation trends. High solar flux values and low Boulder K and A indexes are the best indicators of DX opportunities on the HF bands. See you in March! 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15/17(1)
ARGENTINA	15/17	15/17	20	20	—	—	—	—	—	10/12	10/12	10/12
AUSTRALIA	15/17	15/17	—	20	20	—	20/40(1)	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15/17	15/17	15/17	15/17	15/17
ENGLAND	20	20	20/40	—	—	—	—	15/17	15/17	—	15/17	20
HAWAII	15/17	15/17	20	20	20	20	20	—	—	—	—	10/12
INDIA	20(1)	20(1)	—	20(1)	20(1)	—	—	—	—	—	—	15/17(1)
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15/17(1)
MEXICO	20	20	20	20	20	20	20	15/17	15/17	15/17	10/12	15/17
PHILIPPINES	—	—	20	—	—	20(1)	20(1)	15/17(1)	15/17(1)	—	—	—
PUERTO RICO	20	20	20	20	20	20	20	15/17	15/17	15/17	15/17	15/17
SOUTH AFRICA	—	40(1)	20	20	20	—	—	15/17	15/17	20	—	—
U.S.S.R.	20	20/40	20/40	—	—	—	—	—	—	15/17	15/17	20
WEST COAST	15/17	15/17	40/80	40/80	40	40	40	—	20	15/17	15/17	15/17

CENTRAL UNITED STATES TO:

ALASKA	15/17(1)	—	—	—	—	20	20	20	—	—	—	15/17(1)
ARGENTINA	15/17	15/17	20	—	—	20(1)	—	—	—	—	10/12	10/12
AUSTRALIA	15/17	15/17	—	20	20	—	20	—	—	—	15/17(1)	15/17(1)
CANAL ZONE	15/17	20	20	20	—	20	20	15/17	15/17	15/17(1)	10/12	10/12
ENGLAND	20	20	—	—	—	20(1)	—	—	—	—	15/17(1)	15/17(1)
HAWAII	—	—	20	20	20/40	—	20	—	15/17	15/17	15/17	10/12(1)
INDIA	15/17(1)	20(1)	—	—	—	20(1)	20(1)	—	—	—	—	15/17(1)
JAPAN	15/17(1)	—	—	—	—	20	20	20	—	—	—	15/17(1)
MEXICO	15/17	20	20	20	—	20	20	15/17	15/17	15/17(1)	10/12	10/12
PHILIPPINES	15/17(1)	—	20(1)	—	—	—	20(1)	20(1)	—	—	—	—
PUERTO RICO	15/17	20	20	20	—	20	20	20	15/17	15/17(1)	10/12	10/12
SOUTH AFRICA	—	—	20/40(1)	20(1)	—	—	—	15/17(1)	15/17(1)	20(1)	—	—
U.S.S.R.	20	20	20	20	—	20(1)	—	—	15/17(1)	15/17(1)	15/17(1)	20

WESTERN UNITED STATES TO:

ALASKA	15/17	20	20	20	20	20	—	20	15/17(1)	15/17(1)	15/17(1)	15/17
ARGENTINA	10/12	15/17	15/17	20	20	—	—	—	—	—	10/12	10/12
AUSTRALIA	10/12(1)	15/17	15/17	20	20	20/40	20/40	20	—	—	—	10/12(1)
CANAL ZONE	15/17	15/17	20	20	20	—	—	—	—	10/12(1)	15/17	15/17
ENGLAND	20	20	20	20	—	20(1)	—	15/17(1)	15/17(1)	—	—	20
HAWAII	10/12(1)	15/17	20	20	40	40	20	20	—	15/17	10/12(1)	10/12(1)
INDIA	—	15/17(1)	15/17(1)	—	—	—	20(1)	20(1)	15/17(1)	15/17(1)	—	—
JAPAN	15/17	20	20	20	20	20	—	20	15/17(1)	15/17(1)	15/17(1)	15/17(1)
MEXICO	15/17	15/17	20	20	20	—	—	—	—	10/12(1)	15/17	15/17
PHILIPPINES	—	15/17(1)	15/17(1)	—	—	20	20	20	15/17(1)	—	—	—
PUERTO RICO	15/17	15/17	20	20	20	—	—	—	—	15/17(1)	15/17	15/17
SOUTH AFRICA	—	—	—	20(1)	—	—	—	20(1)	15/17(1)	15/17(1)	—	—
U.S.S.R.	20	20(1)	20(1)	20(1)	—	—	—	—	—	—	—	20
EAST COAST	15/17	15/17	40/80	40/80	40	40	40	—	20	15/17	15/17	15/17

Notes: (1) Possible but rare dual bands (10 or 12, 15 or 17, 20 or 40). Try where shown. The highest possible bands shown. Also try next lower band at times shown.

FEBRUARY 1992

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

Barter 'n' Buy

Continued from page 83

BEST PRICES/FREE SHIPPING on all major brands! Radios, antennas, scanners, etc. Call or write Spreng Communications, Box 1002-A, Lake Crystal MN 56055-1002. 1 (800) 283–2337, ext. 08883. BNB901

TEST EQUIPMENT SERVICE MANUALS originals and copies from my extensive reference library. Send LSASE for large list of HP, TEK, GR, Boonton, Measurements, etc. Many rare items. No radio manuals. Joseph Cohen, 200 Woodside Winthrop MA 02152. BNB902

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INDIVIDUAL PHOTOFACT FOLDERS. Under #1400 $5.00. Others $7.00. Also Sams books. Allen Loeb, 414 Chestnut Lane, East Meadow NY 11554. (516) 481–4380. BNB906

FOR SALE: Drake TR-M SSB Radiotelephone, Drake SPR-4 Communications Receiver. Both with original books. Clean, not abused, but neither work. Both for $75 UPS collect. Charles Teetor, P.O. Box 1330, Amagansett NY 11930. BNB907

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WANTED FC102 ANTENNA TUNER for Yaesu FT-102. Call Martin N1FOC, (203) 585–5301. BNB909

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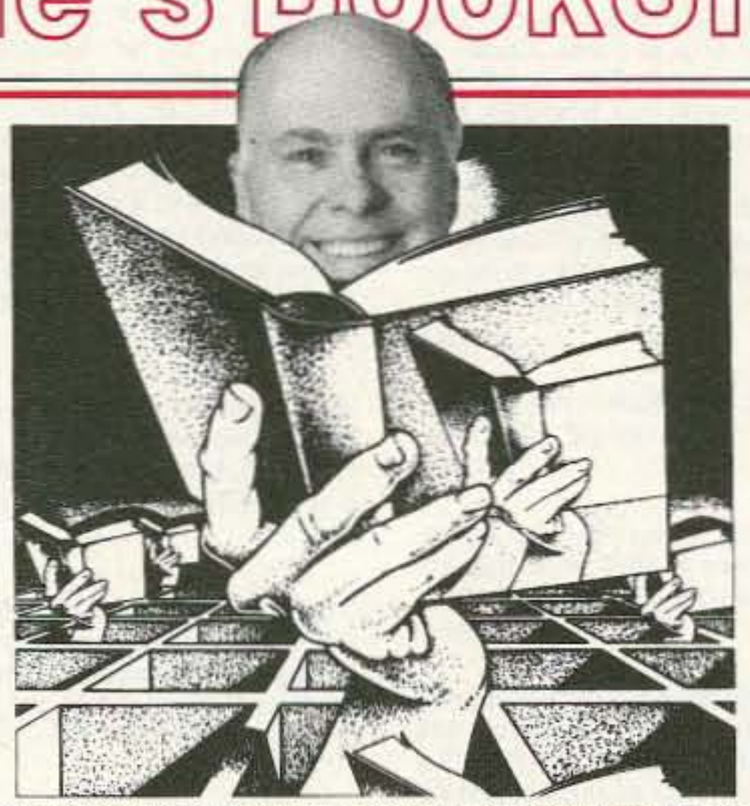

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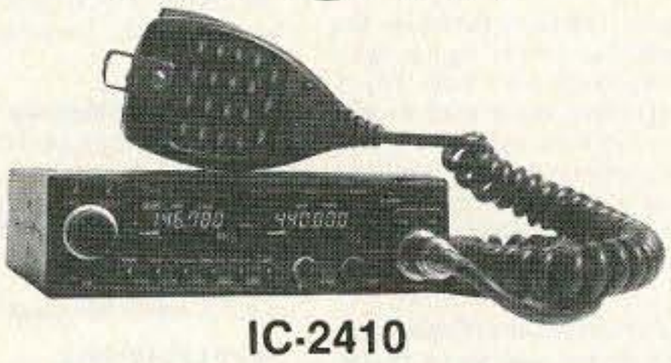

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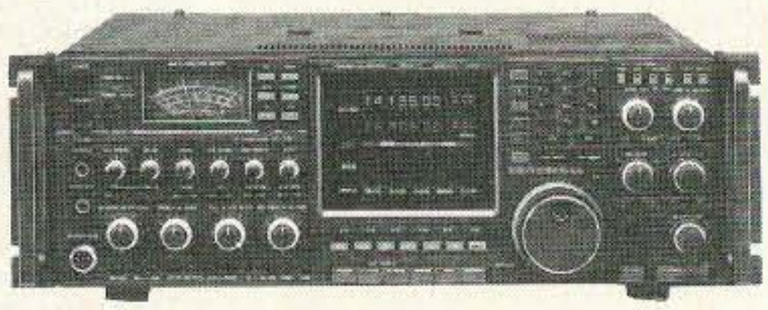

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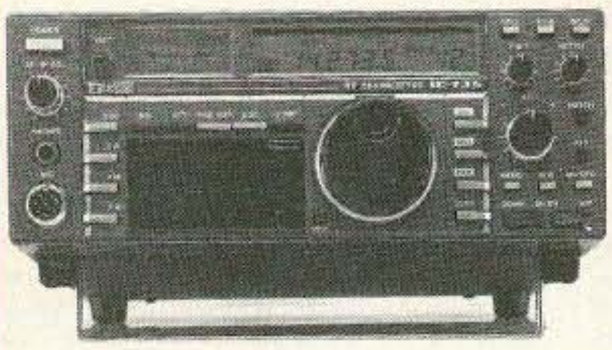

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