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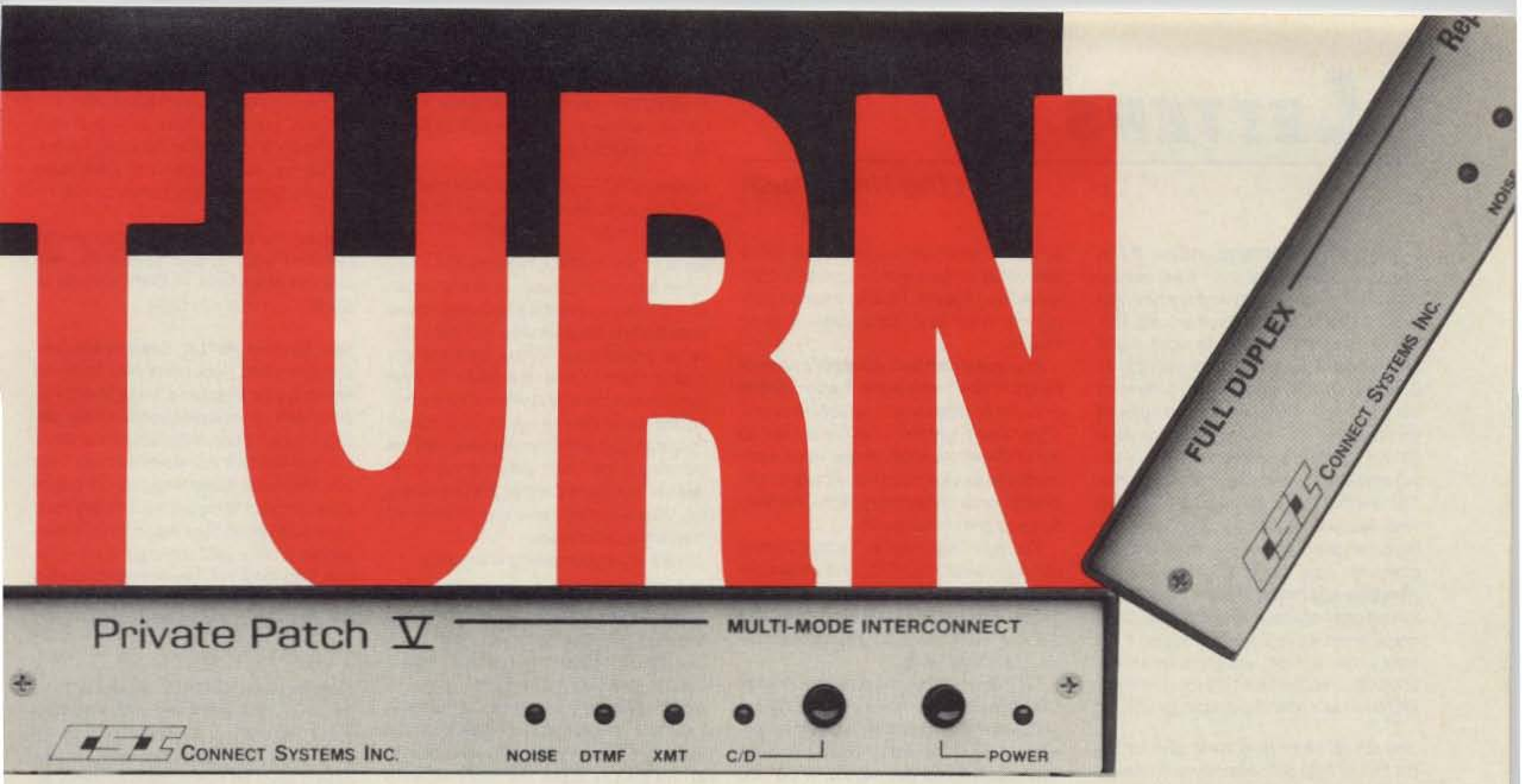

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LETTERS

From the Hamshack

George Fennell N3EQE, Butler PA A couple of other hams and I have started ATVing in Butler County and are having a ball. P5 audio and video is all around. This is the most fun I've had in ages. I just finished setting in a 10-foot parabolic to do EME and shuttle downlink (to rebroadcast on ATV) and am building a couple of transverters. I also bought a Kenwood 531A 1.2 GHz transceiver, and am building a small 24" parabolic antenna for that. To think that I could be missing all this fun while worrying about upgrading and building code speed. Maybe someday, but definitely not now. We're cooking with microwaves and having a blast. (Must avoid ionization of oneself—did you know that a crack in the waveguide of a 13cm, 1 kW amp 2 1/4" x 1/64" will produce energy 250,000 times the safe [?] exposure limit? WOW—that's what those cramps are!)

You should be starting some stuff for Radio Fun *to help get newcomers interested in ATV, 1200 MHz, and so on. Let's get on the ball and get more hams interested in doing fun things—and perhaps get them off the 20 garbage truck. . . . Wayne*

Ignatius N. Bova WA3GWD, Pittsburgh PA Mr. Jason Kelly's letter *[June '91 issue]* really irritated me. First, I would like to inform him that Morse code was included in the amateur tests for good reason. Our operators could get through under severe QRM using Morse code. Under emergency conditions, where ham operators are counted on to provide critical communications, this is a very valuable asset.

As for the existing amateurs being "a bunch of old men," I can only wonder how he would know. Do ham operators in Iowa give their age as well as their call?

Most ham operators are concerned, and rightly so, that some of the valuable ham bands could turn into another CB fiasco. Back in the 60s, like many ham operators, I read about all the wonderful things CB was going to do for ham radio. CB would "open the door" for many potential ham operators, and this would be the spark that would ignite new interest in this valuable resource. Baloney!

Mr. Kelly, I suggest that you listen in on the CB bands. It would be heart-breaking to have this happen on 2 and 6 meters.

The FCC does not have the resources to control the CB wasteland, and they certainly can't expect more funds with the federal budget bursting at the seams. If we get our bands run over by rude and careless operators, it is doubtful that the FCC could do anything about it, and we would all be the losers because of it.

First, re the code for getting through when conditions are tough. I've heard this claim for 50 years, and as far as I know, there is no authenticated case in the last 30 years of any amateur having to resort to code to get through in an emergency. Yes, of course it's possible . . . it's just incredibly unlikely. With most of today's transceivers not even having a key jack, we may never know.

The old men complaint Kelly makes is echoed dozens of times a month in the mail I'm getting from new hams. It isn't difficult to discover age when you ask a chap what he does and he says he's been retired for 10 years. I finally ran into a non-retired ham last Saturday—first in months.

At a recent hamfest I asked for a show of hands of how many present with General or better licenses would be able to pass a 13 per exam right then. Ten hands went up out of the whole room. A few years ago I proposed as a joke that we all be re-examined for code speed every year. The reaction was one of total panic.

You say "rightfully so" about turning our ham bands into CB. This shows me two things: 1. You haven't listened to 20m for the last year or so. It's worse than any CB I've ever heard. 2. You haven't listened to CB in years.

CB did indeed help us enormously. Until CB came along, we had a negative growth for several years. Almost 100% of our actual growth in the last 20 years has come from people who got started in CB and moved up to hamming.

I'm just back from L.A. I've never heard anything as bad as their 2m repeaters on CB . . . anywhere. And I often take a CB rig with me for use in my rental cars when I travel. I find CBers usually much more helpful than hams if I need to find my way or make a phone call.

Of course, I haven't been to Pittsburgh in years, and you may have a pocket of bad CBers. But remember, only two people in history have been arrested, tried, convicted, and put in prison for bad language on CB . . . and both were Extra Class hams. It's almost enough to make a person think! But maybe not . . . . Wayne

Alan S. Koester NOCALL yet, Coral Springs FL I finally did it! Last night I passed the basic theory tests and became licensed as a no-code Tech. I am anxiously awaiting the arrival of my callsign. Like many others, I felt the code requirement was an obstacle I was not yet ready to overcome. I think that the no-code Tech license is an excellent way to get a taste of amateur radio. From what I have seen and read so far, once the amateur radio bug bites, the effects are permanent. I, too, plan on upgrading to General in the near future. For now, however, my new no-code Tech license will enable me to get started in this great hobby.

My advice for anyone interested in becoming a no-code Tech is to ignore the disgruntled old-timers. We are not "glorified CBers." Good luck to anyone who will be taking the test. Have confidence in yourself. You can do it. I did!

Dorian Blasdell N7PCT, Grants Pass OR In February 1990 I wrote you a letter saying that I couldn't find out where to take the ham radio exams. I believe you printed it in the July 1990 issue.

Here is a progress report. In February 1990 I went to Radio Shack and asked if they knew where the license exams were taking place. They did! I took the Novice, CW, and written exams that month and passed. Then In May 1990 I passed the Technician exam. When December 1990 rolled around, I passed the General and Advanced CW and written exams. Finally in May 1991 I passed the Amateur Extra CW and written exams. I am now 18 years old. Ham radio is lots of fun.

Dorian N7PCT—yes we did print your letter in the July 1990 issue. Thanks for a fine progress report! . . . Linda KA1UKM

Ervin L. Sly W6TKJ, Nipomo CA I fully agree with your statements of last month on the crowded 2 meter band. Just moved from the Los Angeles area and my transceiver would scan all day long and not hear a signal. Once in a while I'd hear someone on the way to work or from work, but the rest of the day—nothing. Simplex? Forget it! Find it even worse here. Also on camping trips I can get into many repeaters but there's never anyone listening. Where do they come up with crowded conditions on 2 meters?

Sure enjoy your ranting and raving.

Gerardo O. Lopez Meza XE1UQL, Veracruz, Mexico Radio communications has been the most important activity of my free time. Unfortunately, I found out about it when I was too old to direct my professional advantages over the area. Anyway, I enjoy it deeply, and I understand that every one of us must increase the interest of the people about the many different things you can do in radio.

Three years after I looked for someone to teach me Morse code, I got my license, then I discovered that almost no one uses it regularly; the amateurs prefer voice 10 to 1. The problem—I think—is that some people use the inexpensive ham bands for business, so the government tests the neophyte's interest by means of the code examination.

There are many repeaters and radio amateurs in Mexico and all Spanish America, and they are always happy to answer every QSO received. In Veracruz we love to talk with other persons from far countries.

I want to express to you my desire for people to use more the 10 meter band and to learn to make QSOs in Spanish. You are losing half of America without this language.

Jeffrey Miller KB2FBI, Austin TX Good issue, the June *73*. You waxed quite eloquent this month. It will take several visits to the euphamism *(sic)*to read it all. Nonetheless, right on the mark about standing around watching the foreigners invent everything new and useful, while the useless simply complain about the new Techies. How about a new bumper sticker? You could make hundred$! "I'll give up CW when they pry my cold, dead hands from my brass key!"

Jim Farago, Minneapolis MN Per the June issue, page 76 on "rigs for kids": In your editorial you talk about how various parts from TV sets could be used to make no-cost QRP rigs and such. I have 40 new B/W picture tubes, 9" through 24", 15 good used ones 4" through 21", plus a few hundred TV tubes, replacement TV antennas, line cords, deflection yokes, etc., all of which I would give away to any interested individual, club, or organization. Schematics, too.

I am not looking for a tax write-off or a trash can—I just hope I can give these items to someone interested. Half of these sets are tube-type and half are transistorized. Brands from A to Z. The TV shops I used to work in are all closed now, so they are no help.

I do not want to put these items out with the trash to end up polluting a landfill.

It was good to speak to you at last November's Hamfest at Hennipin Technical Center, even though you were *much* too busy for any lengthy conversation.

Anyone interested in these parts can contact Jim Farago at 4017 42 Ave. So., Minneapolis MN 55406. PLEASE enclose an SASE. . . . Linda KA1UKM

Tom Rehnert N5PLX, Socorro NM Several years ago I got some mail from you hawking your magazine. I was already familiar with it and planning on someday getting a subscription. What struck me about the mail was that it contained a letter from you that was something like 13 pages long. I thought to myself that this guy must have some great large ego to think I'd read all this. It convinced me to get a subscription. I did read it all. I've been getting a big kick out of your editorials ever since. The magazine is the most fun to read and I always look forward to it.

Charles Holm KB7HUW, Spokane WA I am a Novice operator and enjoy your magazine very much. Your new magazine, *Radio Fun,* looks interesting, and I will be subscribing. Its introduction at this time, now that newcomers can get a license without knowing the code, will certainly help the new operators along, as well as inspire technically inclined people to get a license and join us on the air. You were promoting a no-code license years ago, and predicted its adoption. Again, you were right!

Mike Simmons WB9CWE, Belvidere IL Several months ago, you wrote in a *73* editorial about the hazards of low frequency electromagnetic fields as reported in a very reputable magazine. A few months ago, the XYL of an old acquaintance, Ed Pelc (formerly K9RAX), called us. Grief-stricken, she told us that her husband had been undergoing grueling treatments for leukemia, and she greatly feared for his life. The news had a particularly shocking effect, as Mr. Pelc was a TV repairman; he had spent most of his life surrounded by low level EM radiation in his shop.

As a former quality control engineer, I know that one case is poor proof for anything, but it does make one sit up and take serious notice.

James Moe N6ZOB, Newport Beach CA The April *73* described a DXpedition to Malpelo Island (page 81). These remarkable people operated five radios for about five days and logged 40,000 QSOs.

If they managed to keep all five going for 24 hours/day, this works out to about 66 QSOs/hour per radio. This ought to be considered some sort of a record. It must have been especially tough on a 20 wpm CW operator.

This leaves me wondering—is a 60-second QSO what ham radio is all about?

H.S. Van Winckel VE3FWE, Ontario As a Canadian ham, I have been a long-time fan of yours, having followed your career and agreeing with you on the past, present, and future of amateur radio. Here in Canada, I'm one small voice in the mess that we call ham radio, however I voice my opinions as often as I can. Please keep trying, the Amateur Radio Fraternity needs people like you to remind us of the problems we face. 73

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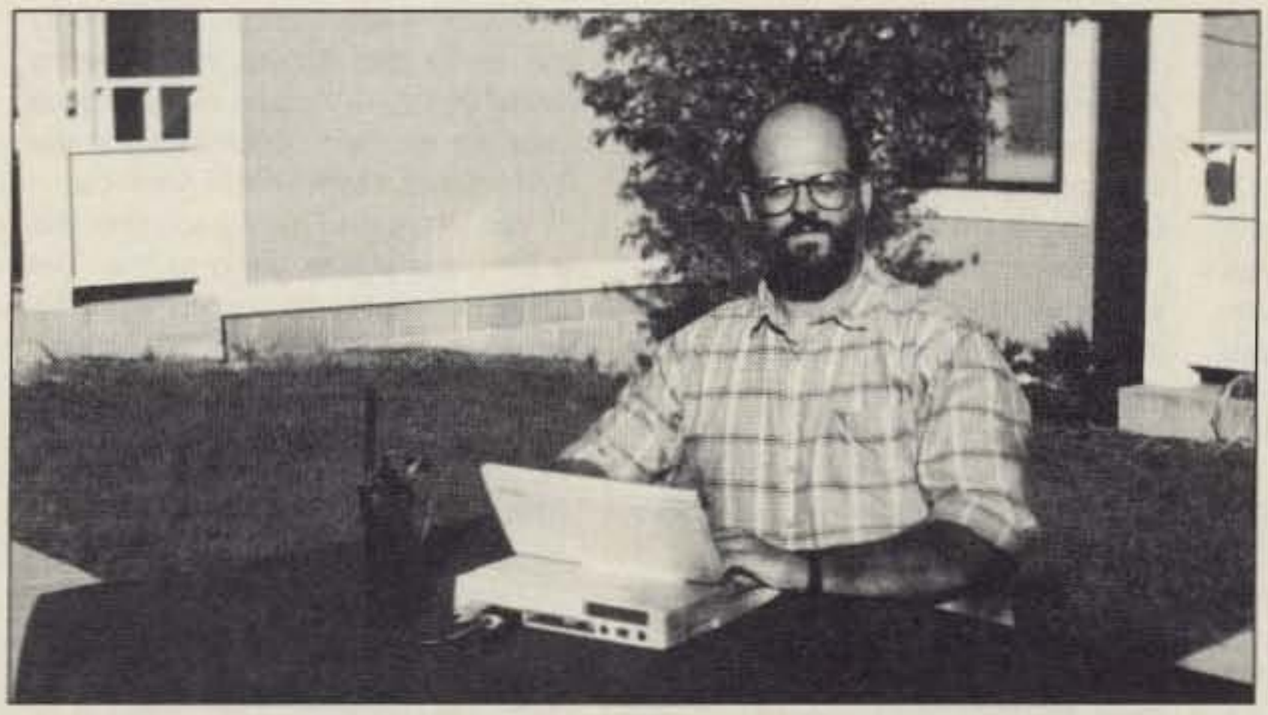

Packet without a TNC? WB2EMS shows you how . . . see page 8.

DEPARTMENTS

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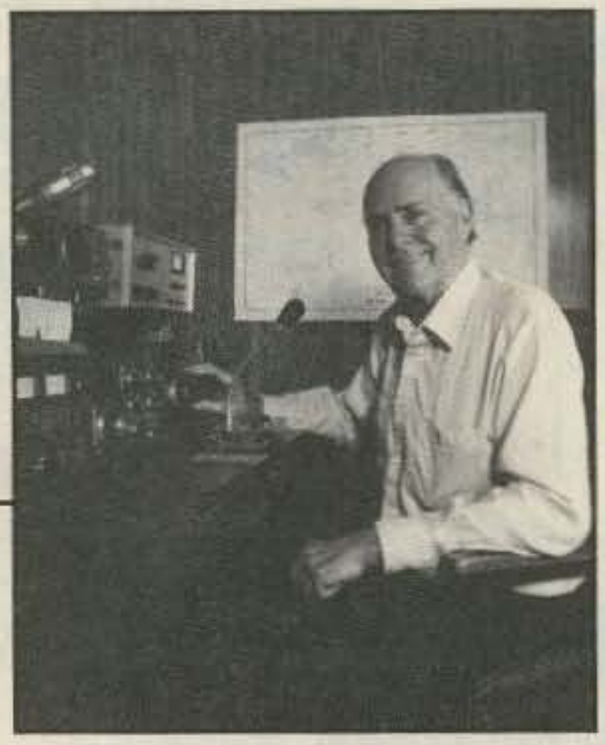
Wayne Green W2NSD/1



. . . de W2NSD/1

Humph, sked time and you're late, as usual. How'm I going to get you to shape up and stop being a wishy-washy wimp? And don't try and put on that "sensitive" act with me, I know you too well.

What in heck has happened to you? When you were a kid you had a sense of adventure. You were willing to be a pioneer. Some pioneer you are now! You don't even see the new movies before Ebert tells you whether you're going to like 'em or not. Pioneer? Pfagh! No, most of you've turned into milquetoasts.

Here you are with the greatest opportunity to pioneer in the history of the hobby. So what are you doing, endlessly gabbing on 2m through repeaters or blathering and kvetching about the mess KV4FZ and K1MAN have made on the low bands?

Are you even on packet yet? Or RTTY? The Japanese are busy discovering ways to squeeze high definition TV (HDTV) into narrower bandwidths. They've just announced a new digital audio format, the mini-disc (MD), which crams 74 minutes of digital sound on a 2.5" disc.

Old-timers will remember the '20s and '30s when Germany had the edge on high technology. German cameras, radios and scientific instruments were the best. Then they got involved with Hitler and screwed up. Through the '40s to the '60s America was way out ahead in almost every technology. The world bought Hallicrafters radios, Kodak cameras and General Radio instruments.

Then Japan discovered Ed Demming and the odd concept that quality really does count. Now we're all buying Japanese cameras, radios and scientific instruments. We're also, in case you haven't noticed, seeing Japanese pioneers skiing down Mt. Everest, crossing the Antarctic on skis, and inventing circles around us in one scientific field after another.

So here you are in amateur radio, firmly stuck in the past, all emotionally worked up over CW, a sad remnant of the '30s. I'll bet 50% of you aren't aware that CW is every bit as important to us today as preserving other antique modes such as AM and spark. Yes, I know, most of the "Spark Forever" crew have their Silent Key awards now and are grumpily moldering. Well, they gave up with the same grace with which our CW-forever brethren are folding their hands . . . buoyed on by the enthusiastic support of the Antique Radio Relay League. Radio *relay*? Har-de-har. Talk about a monument to the past! And let's not even talk about the hoary old goats you've repeatedly elected to help keep amateur radio an archeological resource.

But is amateur radio supposed to be using the incredibly valuable public airwaves as a monument to the past? Aren't we supposed to be experimenting? To be inventing? To be pioneering? Isn't there something in our charter about that? You bet your sweet bippy there is!

So while hordes of you are trying to resuscitate dying technologies such as AM and CW from the dim past, who have we got out there taking advantage of the technological explosion? Certainly not many here in America.

When I speak at hamfests I get blank stares when I bring up new technologies which have been written about recently in *Newsweek* and *Time*. A recent *Forbes* article put our situation into perspective. Today's technology is heading toward the microwaves, where there are more frequencies . . . the frequencies it's going to take to deal with HDTV, personal communicators which handle fax, messaging, and even graphics, computer networking, etc.

So here we are with 500 MHz up there at 10,000–10,500 MHz, with maybe 10 hams in the country using the band. Maybe less. Even if we use today's technology we can get our voice channels down to 5 kHz, which would give us 100,000 channels. Hey, we could all have our own repeater channels and never have to bother talking with anyone else again!

But, as these channels turn from solid gold to platinum, and the commercial demand escalates, unless we're up there doing something of value with 'em, they're going to go. I realize that this is a matter of little moment to most hams. I just don't understand how we ever got amateur radio off 600 meters and up to 160 meters a few generations ago.

That was back when Americans were pioneers. Back when we were eagerly exploring new technologies. Back when Americans were exploring the world. Back when we had some guts. Old-timers will remember Lowell Thomas, Frank Buck, Osa and Martin Johnson, Amelia Earhart, Frank Hawkes, Admiral Byrd.

Old-time hams will remember Copthorne McDonald (SSTV), W2GDG (NBFM), W2BFD (RTTY), W1FZJ (moonbounce and parametric amplifiers). These chaps didn't invent and pioneer to be good guys and save our hobby; they did it because they were having fun. I knew 'em all well. So what's happened to our country that we've stopped having fun with technology? These days 99.9% of us are appliance jockeys.

No, it isn't age. Sam Harris W1FZJ/KP4 was busy pioneering until the day he died. So was John Williams W2BFD. I think I could make a good case for old Doc Spock being at the bottom of this softening of America.

Yes, of course I have a solution. But it isn't one you're going to like. The solution lies in our youngsters. Perhaps we can sneak into our schools and start countering the general concept that technology is bad. Maybe we can get the kids interested in the fun we have to offer . . . not in rag-chewing endlessly, but in experimenting . . . in pioneering new communications.

The food is there on the table, with fascinating stuff from AEA and other ham maufacturers. The question is, how can we get today's hams, starved as they are for excitement and making up for it by making a shambles of our bands, to reach out and even taste the banquet? Please advise. It's out there, waiting. It isn't expensive, but it does mean having to learn . . . and to *dare*.

220 Lives!

A reader, who's in the communications business, advises that while we American hams may not be doing much with 220, there is a brisk business going on just to our south. The drug business in Colombia is apparently delighted with the 220 band and busy buying portable repeaters, HTs with scramblers in hundred lots, mobile transceivers, $15,000 monitors, amplifiers, antennas, night vision equipment, and so on. Hey, they've got to get that cocaine up here for our crack houses, right?

A good friend who ran a ham store in Boston said he often had Hispanic men come into his store with huge rolls of money wanting to buy 144 and 220 MHz repeaters and HTs for cash. Maybe the ham equipment business isn't as badly off as I thought.

Drug dealers make so much money on each delivery that they can afford to buy a repeater and HTs and throw them away after one use. I wonder where the Colombian surplus stores are. There may be some great buys.

U.S. vs. Japan

In case there's a question in your mind about what our new no-code license can do for us, let's just look and see what's happened in Japan, where they've had such a license for years. The May issue of *CQ Ham Radio*, *QST*'s Japanese equivalent, was the usual 586-page phone-book-sized magazine.

Yes, I've been endlessly hearing that unless we keep out the riffraff, we'll end up with one huge CB mess here in America. Well, for more than 20 years we've kept our barriers up to discourage the unwashed hordes, yet when I listen to 20m I hear worse garbage these days than I've heard on CB in years.

So how have the Japanese fared with their no-code licensing? I think we can get a good indication just by looking at their ham magazines . . . which are all monsters compared to the anemic ham magazines we have left here.

Looking over the May *CQHR*, the first 270 pages are solid advertising, mostly in four colors. The last 64 pages of the book are also advertising . . . plus many ads in between. They not only have all the ham gear we have available here, they also have a whole bunch of wonderful products that aren't being exported to the U.S. because our market is too small to bother.

After the front of the magazine advertising section they have 24 pages of fundamental antenna information—how they work—how to use a dip meter to tune your antenna—measuring antenna impedance—how to build a simple Z-meter—building simple low- and high-pass filters—building a 40 meter curtain—and a dozen or so more simple antennas. Then comes IC fundamentals and 14 pages of easy IC building projects.

There's a simple three transistor 10m FM rig construction article, a 440 MHz 25 watt amplifier and a good article on using DAT recorders with amateur radio. There are reviews of a computer logging program, a JRC 0.1–30 MHz receiver, an Azden 10m FM transceiver, a couple of new HTs, and the Yaesu FT-1011 transceiver.

Next comes basic transistor theory, more antenna articles, more simple construction projects, a colorful new products section, DXpedition pictures (in color), hamshack photos, satellite news, DX awards and certificates. The hamfest and club activity photo section has 163 full-color group photos. There are activity report sections for every

Continued on page 73

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- **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.
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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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- **Large capacity NiCd battery pack supplied.** The standard battery pack is 7.2 volts, 700 mAh, providing extended transmit time with 2.5 watts. (TH-47A: 1.5 W.)
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- **Dual Tone Squelch System (DTSS).** Compatible with the TH-26AT Series and the TM-941A Triple bander, as well as other Kenwood series transceivers, this selective calling system uses standard DTMF to open squelch.
- **Five watts output** when operated with PB-14 battery pack or 13.8 volts.
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- **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.)

Optional accessories:
• **BC-14:** Wall charger for PB-13 • **BC-15:** Rapid charger for PB-13, 14 • **BC-16:** Wall charger for PB-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-31:** Soft case • **SMC-31:** Standard speaker mic • **SMC-32:** Compact speaker mic • **SMC-33:** Compact speaker mic with controls • **WR-2:** Water resistant bag.

- **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.

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

Ham Physicians Speak Up

"Only a person familiar with both medicine and amateur radio can make this determination correctly," writes Christine Haycock, M.D., WB2YBA, in a letter to fellow physicians published in *New Jersey Medicine*. She is referring, of course, to the telegraphy waiver for handicapped hams. In December 1990 the FCC passed Docket 90-356, exempting handicapped persons from code tests if their physical condition prevents them from learning the code at 13 or 20 wpm. Dr. Haycock notes: "Totally handicapped quadriplegics have mastered these requirements, as well as blind or deaf individuals, and the psychological benefits of this achievement are immeasurable. There are, however, some rare instances where an individual cannot meet this goal, hence the FCC edict."

Morris Soled, M.D., W2NXS advises non-ham colleagues that "Ham radio is a popular hobby among physicians, and you should be able to find a member of your staff to answer further questions before being a 'nice guy' and signing a note you do not understand."

Dr. Edward N. Ludin, M.D., K2UK, president of the Medical Amateur Radio Council, Ltd., MARCO, was also published. He notes that the precise meaning of "severely handicapped individual" is unclear in relation to the Act *[the 1988 Developmental Disabilities Act, 29 USC 706(15)(A)(III)]*, and that the average physician ". . . could not be expected to know what effect these disabilities may have on [a person's ability in] learning Morse code." Like Doctors Haycock and Soled, he urges physicians to not sign a certificate of exemption lightly. He says, ". . . please request, from a local amateur operator, preferably another physician, appropriate advice. I hope that other physician hams will let their fellow physicians at the local level know of their availability in this regard." TNX *W5YI Report, Vol. 13, Issue 12.*

A Brave Young Ham

One of the highlights of K6IR's trek to the Dayton Hamvention was meeting Seth XU1SS from Kampuchea. "What a fascinating story of bravery and hardship," K6IR writes us. "Seth's amateur radio operations from the jungles of Kampuchea using the call XU1SS while under enemy gunfire . . . his heroic escape from Kampuchea . . . and his ultimate reunion, after over a decade of separation, with his family in Washington State after the death of his brother . . . all add up to a tale worthy of a suspenseful movie. The enclosed photo of this brave young man *[see Photo A]* who has endured so much belies the tragedies he has endured in his young life. Seth is truly a remarkable young man and an outstanding tribute to our worldwide hobby of amateur radio." TNX Kenneth M. Miller K6IR.

Photo A. Seth XU1SS (left) from Kampuchea and Ken Miller K6IR (right) meet at the Dayton Hamvention.

Mir Wants News!

U5MIR requests packet stations leaving messages on U5MIR-1 to include news—most messages are boring! KP4BJD had the ". . . unique opportunity, the rare pleasure, to QSO in FM voice with cosmonaut Sergey Krikalev U5MIR for about two minutes . . ." last June. He lists four messages from Sergey: 1. He sends to all: Greetings from space! 2. He congratulates the ship crew and NASA for the successful launch of mission STS-40 and the shuttle *Columbia*, and looks forward to making a QSO in FM voice when their footprints overlap. 3. He respectfully requests all the earth packet stations leaving messages on U5MIR to please kindly include news; they need entertainment, and the usual content of the messages they now receive is boring. 4. Sergey will be available on his "free time" for more FM voice QSOs on 145.55 MHz. *Dosvidaniya* to all from space. De KP4BJD @ KP4GE.PR.USA.CARB.

No American Woodpecker

The U.S. Air Force has scrapped its plans for an over-the-horizon backscatter (OTH-B) radar system, according to *Jane's Defense Weekly*. The program has been called the "American Woodpecker" because its Soviet counterpart is known as the "Russian Woodpecker." The interference this system causes in shortwave communications resembles the pecking of a woodpecker.

The American OTH-B would have had a range 10 times greater than that of conventional radar, and served as an early warning system. General Electric was to build four systems spanning the Northeast, West Coast, Alaska, and north-central states. The decision to scrap this project will help alleviate the fear of increased QRM to HF communications on the ham bands. TNX *Westlink Report, No. 602. (The major details of the OTH-B project was reported in "QRX" in the August 1990 issue.)*

No-Code ROs

Where it can legally do so, the FCC is relaxing its rules which require radio officers with Morse code proficiency on board ocean-going vessels. Recently, the Commission amended its rules to permit small passenger ships weighing under 100 gross tons to operate under the general exemption from the manual Morse code radiotelegraph station requirements beyond the current 100 nautical mile limit. TNX *W5YI Report, Vol. 13, Issue 12.*

Poor Man's Packet

A complete software TNC for PC compatibles!

F. Kevin Feeney WB2EMS and Andy Payne N8KEI

Poor Man's Packet (PMP) was conceived in the fall of 1988. Andy Payne N8KEI, an electrical engineering student at Cornell University, wanted to get into packet but a TNC wasn't within his student's budget. He was sure he could write a software TNC for IBM PCs and compatibles. I'd been involved in packet for several years, but I wanted a more compact means of operating portable with my new laptop computer—like a software TNC running on the laptop with a small modem interface. Andy and I ran into each other on the local repeater, met to exhange ideas, and PMP was born.

A regular TNC consists of a dedicated microcomputer, some software in ROM, a simple Bell 202 modem, perhaps an HDLC chip or a Data Carrier Detect (DCD) circuit, and some "glue" chips to tie everything together. Most people then hook up this specialized little microcomputer device to a personal computer of considerably more power and capacity. The processing power of the PC is mostly wasted, used only to loop on a simple terminal program, shuffling keystrokes to the TNC and bytes from the TNC to the screen.

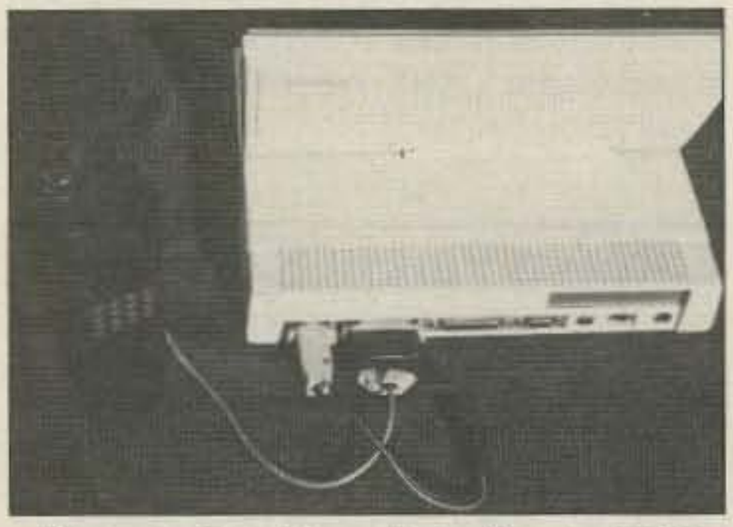

Photo A. Portable packet without a TNC!

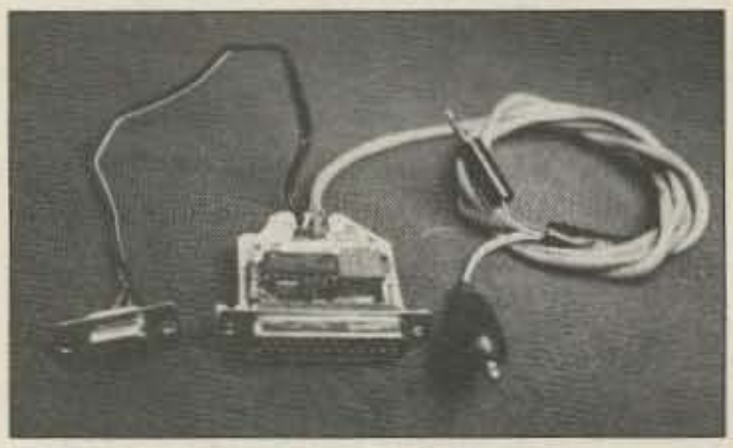

Photo B. The interface installs easily between your computer and radio.

What is PMP?

PMP approaches the task from a different direction, using the PC to do the work of the dedicated microcontroller. The software is on disk instead of in ROM. Hardware HDLC and DCD circuits are nice, but not necessary for simple TNC implementation. The modem is a simple, one-chip, external design that the software accesses via the handshake lines on the printer port. The terminal interface functions are built right into the program, with direct access to the screen and keyboard. Instead of storing operating parameters such as callsign, transmit delays, or number of retrys in a non-volatile memory like a regular TNC, PMP reads them in on startup from a configuration file.

Using this design, you can build a simple, inexpensive packet communications system. PMP won't support multiple connects or act as a black box TNC for use as part of a BBS, but it's good for the usual connections to the local BBS to read and post mail, for getting your feet wet in packet, and for portable or emergency operation. *[Ed. Note: The PMP program is available from the author as well as the 73 BBS at (603) 525-4438.]*

How It Works

To transmit a packet, the software builds the packet up from the entered data. It then commands data bit D1 (pin 3) on the printer port HIGH, turning Q2 on and keying the radio. Then the software begins toggling the D0 bit (pin 2) back and forth, sending the packet "flags" to open up the distant receiver and synchronize the demodulator. After the flags are sent, the software sends the actual data in the packet, then more flags at the end. Finally, the software turns off D1 and the radio unkeys.

Receiving packets is a little more complicated. While the radio is squelched, the Carrier Detect output (CDT—pin 3 of the 3105) is held LOW. The software "watches" this by looking at the printer port BUSY line (pin 11) indicating that packets are presently incoming, which frees the software to handle the keyboard processing, disk operations, and screen updates.

When the radio unsquelches and sufficient audio starts coming into the chip, the CDT line goes HIGH, signalling the software to "drop everything" by disabling interrupts. It starts timing the 1 and 0 transitions coming from the modem on the Receive Data line (RXD—pin 8 of the 3105).

It does this until the radio squelches and the CDT line goes high again, at which point the software translates the data it has just received from NRZI bit flips into ASCII and displays it on the screen. The program then goes on to handle the other tasks that were shut off during the incoming packet.

The Modem

While Andy was cooking up the software, I started building modems. I evaluated several of the chips available. The EXAR 2211/2206 are used in several commercial TNCs, but they can be finicky to tune and keep tuned, and I was concerned about temperature swings while portable.

The AMD 7910 World Chip offers several modem frequencies, including some suitable for HF packet, but it's physically large and requires three operating voltages.

Texas Instruments' TCM3105 won out. It has a Bell 202 half duplex modem that requires a minimum of external parts, crystal controlled stability, and low current drain, all in a 16-pin DIP. The final circuit is shown in Figure 1.

Starting in the upper left, U1, a 78L05 miniature voltage regulator drops the incoming voltage to 5 volts for the modem chip. C1 keeps the regulator stable when the power source is more than a few inches away.

Pin 2 is the clock drive output. To generate Bell 202 tones, the TCM3105 requires that an inverted clock be fed into Pin 5. The clock drive from pin 2 is fed into the base of Q1 through R4 to limit the base drive, and the inverted output is taken off the junction of the collector and R3, and fed back into Pin 5.

Pin 3 is the Carrier Detect output from the modem. The TCM3105 senses the audio energy coming into it and raises the line HIGH when the audio is sufficiently strong. Andy's software reads this line via the BUSY line of the printer port (pin 11), and starts trying to decode incoming packets whenever it is HIGH. The chip does not do any filtering or check to see if the incoming signal has the proper tones; it simply reacts to audio level. This means random noise or an unsquelched receiver can trip the line and start the sofware trying to decode. Unlike more complicated circuits with a DCD detector, PMP depends entirely on the radio's squelch to tell when an incoming packet is arriving.

Pin 4 is the receive audio input. C3 provides AC coupling so the internal bias network in the chip isn't dragged down. Initially I had very poor receive results until I figured out I had forgotten this capacitor.

D1 and D2 provide clipping of the signal to protect the modem's input circuit if the audio is

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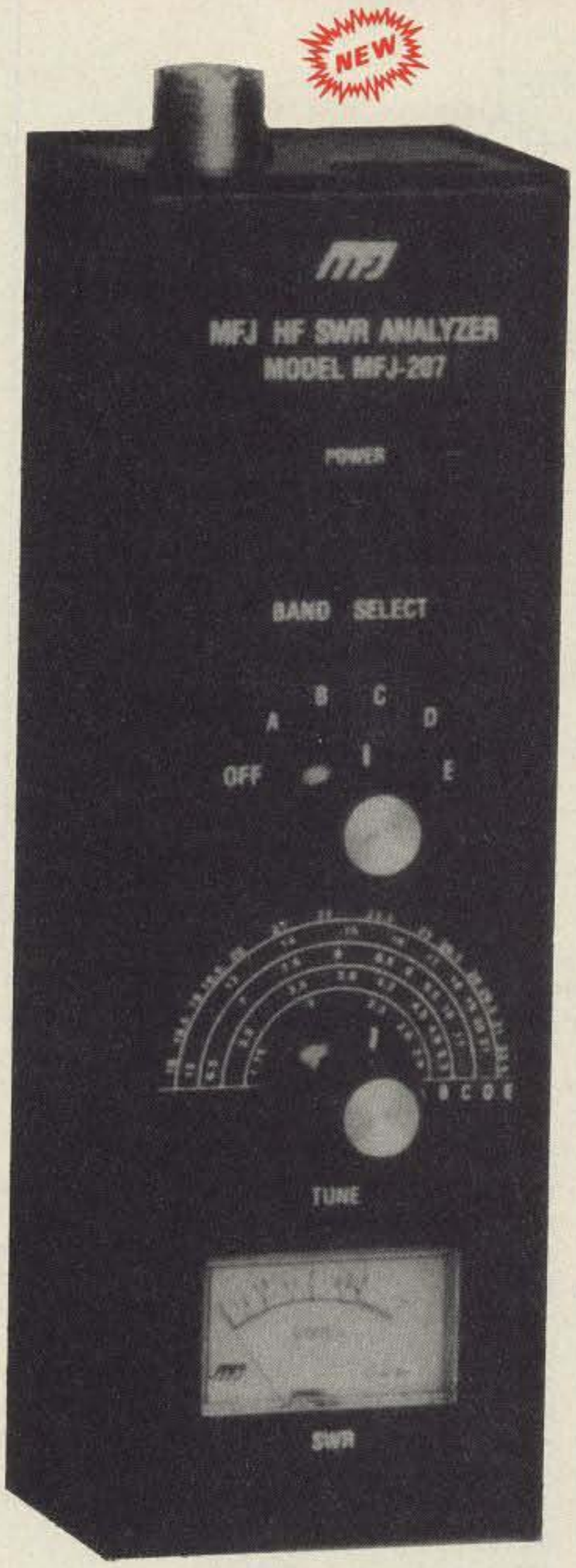

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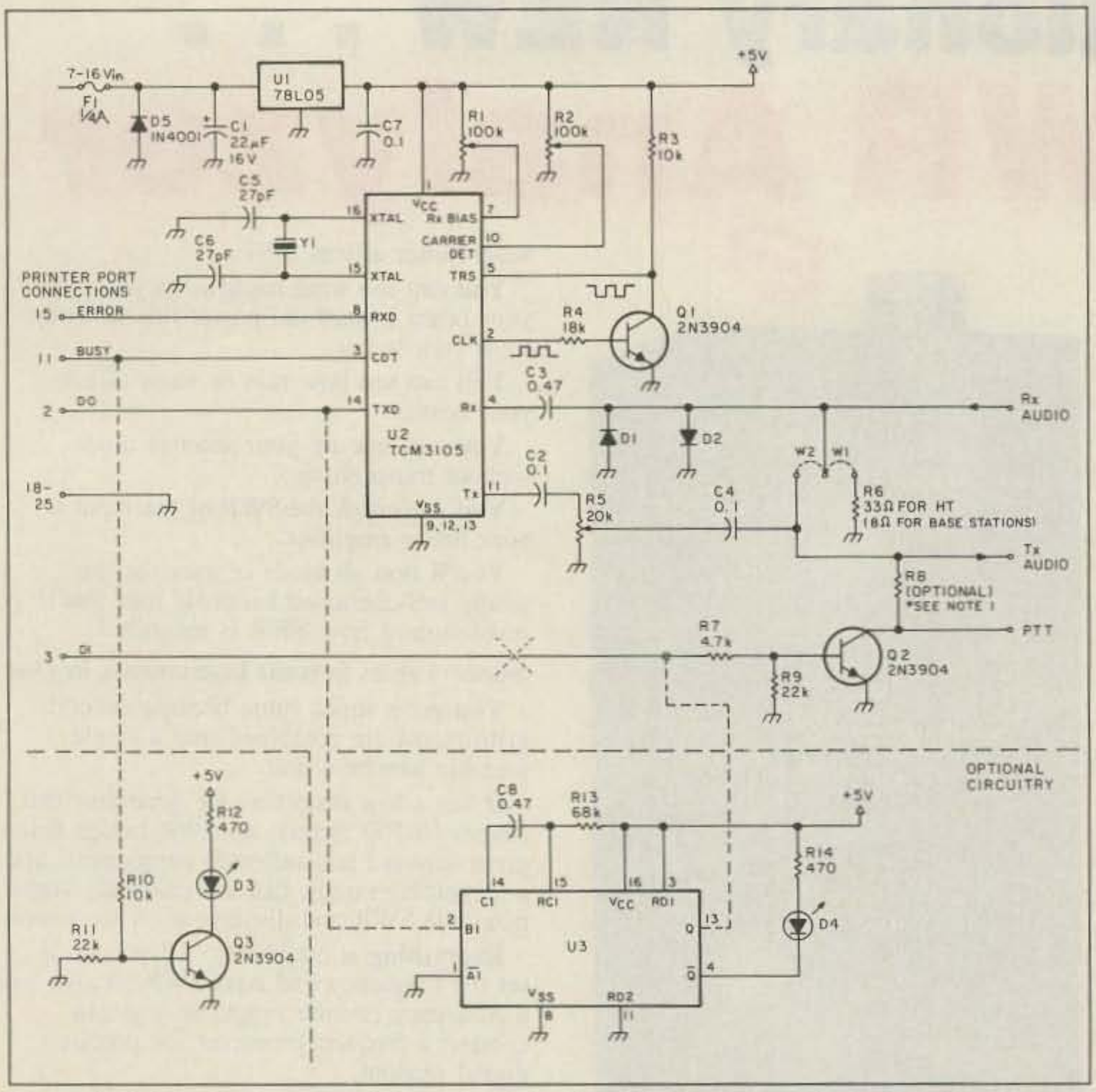

Figure 1. Schematic diagram of the modem interface. The bare bones laptop interface is shown above the dotted line. Use the whole schematic for the home station interface (includes a watchdog timer circuit).

cranked up too high. Even with an HT it's possible to develop enough voltage to damage the chip. The diodes limit the voltage to about 600–700 mV peak. Resistor R6 provides a load for the receiver. Since I generally use my modem with an HT, I put 33 ohms at R6 since that is a good match for the HT's output impedance and takes less power from the rig to drive. If you are operating with a base or mobile radio, you may want to change this to 8 ohms, and make it a 1 watt resistor, in case the audio gets cranked up by accident. This is easy to do when you aren't actually listening to the signal.

Pin 7 is the Receive Bias threshold adjustment. The voltage here determines how the incoming tones are divided into ones and zero. It requires careful adjustment. A 10-turn pot is recommended for fine adjustments.

Pin 8 is the Received Data output from the modem to the computer. It sends the ones and zeros from the modem to the software via the printer ERROR input line (pin 15 of the printer port).

Pin 10 is the Carrier Detect threshold adjustment, similar to pin 7 but not as critical in adjustment.

Pin 11 is the transmit audio output from the modem. C2 provides AC coupling, R5 allows adjustment of the audio level, and C4 breaks the DC path to the transmitter in case it has a DC bias, like the input circuits of many HTs.

Pin 14 is the transmit digital data from the software to the modem. It comes out from the D0 bit (pin 2) on the printer port and causes the modem tone output to switch between 1200 and 2200 Hz with the zeros and ones.

PTT for the modem is arranged by driving the D1 bit of the printer port (pin 3) HIGH. This output drives Q2 through R7, pulling the transistor's output LOW and keying the rig. Q2 can handle about 50 mA. For use with ICOM style HT keying, resistor R8 should be connected between the transmit audio line and the collector of Q2.

For radios with separate PTT lines, R8 should be eliminated. I have found values between 4.7k and 12k to work well at R8. If the resistance is too high, the radio won't key reliably. If it's too low, the transmit audio may be shunted to ground. In using the modem with an ICOM HT, I found that if the transmit gain is set too high, the radio will key as soon as the microphone plug is installed. I believe this is due to the negative-going swings of the audio pulling current from the HT keying circuit and turning it on. I just adjust the transmit gain pot R5 until the radio unkeys. At that level it is far too high for proper modulation anyway.

Parts list

U1	78L05	5-volt regulator
U2	TI TCM3105JL	1200 bps half duplex modem chip
U3	74LS123	one-shot multivibrator
Y1	4.433619 MHz crystal	European colorburst frequency
Q1,Q2,Q3	2N3904	or 2N2222, etc.
D1,D2	1N914 or 1N4148	switching diodes
D3,D4	LEDs	red for D4, green for D3
D5	1N4001 diode	
C1	22 µF, 16V	tantalum capacitor
C2,C4,C7	0.1 µF	
C3	0.47 µF (0.33 to 1 µF can be used)	
C5,C6	20 to 30 pF	
C8	0.47 µF	
R1,R2	100k trimpot	multi-turn
R3,R10	10k	
R4	18k R5	20ktrim pot
R6	33 ohm for HT use	8 ohm, 1 Watt for base/mobile use
R7	4.7k	
R8	4.7k to 12k (10k nomimal)adjust for keying HT (optional)	
R9,R11	22k R12,R14	470 ohms
R13	68k	
F1	¼ amp fuse	

Most parts are readily available, with the exception of the modem chip and crystal. These can be obtained from your local Texas Instruments distributor. F. Kevin Feeney WB2EMS can supply a chip/crystal pair for $24 as well as blank PC boards for $7 each (see author's bio for address). Kits may also be available. Contact the authors for details. The software, including source code, is available from the authors on disk for $10 and from various sites on Internet. You can also download PMP from the *73* BBS at (603) 525-4438. Look under the *73* MAG SIG.

Assembly and Tuneup

I have built a number of these modems in different configurations. If you are brave of heart and steady of hand, it is possible to cram the entire modem into a DB-25 connector housing, which can then plug directly into the back of a laptop with only a cable to the radio. I've managed it twice, and if you can steal power from the serial port to run it, it makes the sweetest little portable packet setup you ever saw. If you do try it, start with a 16-pin DIP socket and get the smallest pots you can. Mine has a couple of layers of components in one area, separated by tape. Be creative and know it *can* be done.

For those less fanatic builders, the modem can easily be built on a 1.6" x 2" piece of vectorboard. You can either attach the board directly to the DB-25 connector by wedging the board between the rows of pins and applying some epoxy (after making the required connections!), or you can separate the board and the connector with a short, 5-wire cable. Parts layout on the modem is not critical, except to keep the connections around the crystal short. I have built 10 modems with six different layouts from "crammed" to "wide open spaces," and none has failed to work.

A PC board is available to help in assembly (see the Parts List and Figures 2 and 3). Two versions of the modem interface are shown. The smaller board in Figure 2 is designed for portable laptop operation. While the larger circuit shown in Figure 3 can be used for portable laptop use, it is best used for a home computer installation where you plan to leave the modem interface hooked up for long periods. The home interface draws more current and needs a separate power supply (either from a 9-volt battery or DC wall supply).

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IC-765 Xcvr/ps/keyer/tuner	$2692.00	**2399**

IC-751A 9-band xcvr/.1-30 MHz rx	$1699.00	**1399**
PS-35 Internal power supply	219.00	**199.95**
FL-63A 250 Hz CW filter (Ist IF)	59.00	
FL-52A 500 Hz CW filter (2nd IF)	115.00	**109.95**
FL-53A 250 Hz CW filter (2nd IF)	115.00	**109.95**
FL-70 2.8 kHz wide SSB filter	59.00	
IC-735 HF xcvr/SW rcvr/mic	1149.00	**969.95**
PS-55 External power supply	219.00	**199.95**
AT-150 Automatic antenna tuner	445.00	**389.95**
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

IC-725 HF xcvr/SW rcvr	$949.00	**799.95**
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IC-4KL HF 1 kw amp w/ps • *Special*	6995.00	**5795**
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PS-30 Systems p/s w/cord, 6 pin plug	349.00	**319.95**
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SP-7 Small external speaker	51.99	
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SM-8 Desk mic; two cables, scan	89.00	
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IC-475H 100w 440 FM/SSB/CW	1599.00	**1399**
IC-575A 25w 6/10m xcvr/ps	1399.00	**1199**
IC-575H 25w 100w 6/10m xcvr	699.00	**1469**
IC-1275A 10w 1.2GHz FM/SSB/CW	1849.00	**1599**

VHF/UHF FM Transceivers

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IC-229H 50w 2m FM/TTP mic	462.00	**399.95**
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IC-2400A 2m/440 FM/TTP • *Special*	899.00	**639.95**
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Multi-band FM Transceivers

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UX-39A 25w 220MHz unit	349.00	**319.95**
UX-S94A 430MHz SSB/CW module	TBA	
UX-129A 10w 1.2GHz unit	549.00	**499.95**
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IC-970H 45w 2m/430 MHz transceiver	3149.00	**2699**
UX-R96 50-905 MHz receive unit	389.00	**349.95**
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IC-2SA 2m HT • *Special*	419.00	**289.95**
IC-2SAT 2m/TTP • *Special*	439.00	**319.95**
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IC-12GAT 1.2GHz/TTP	529.00	**469.95**
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IC-24AT 2m/440 HT	565.00	**419.95**

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	Regular	SALE
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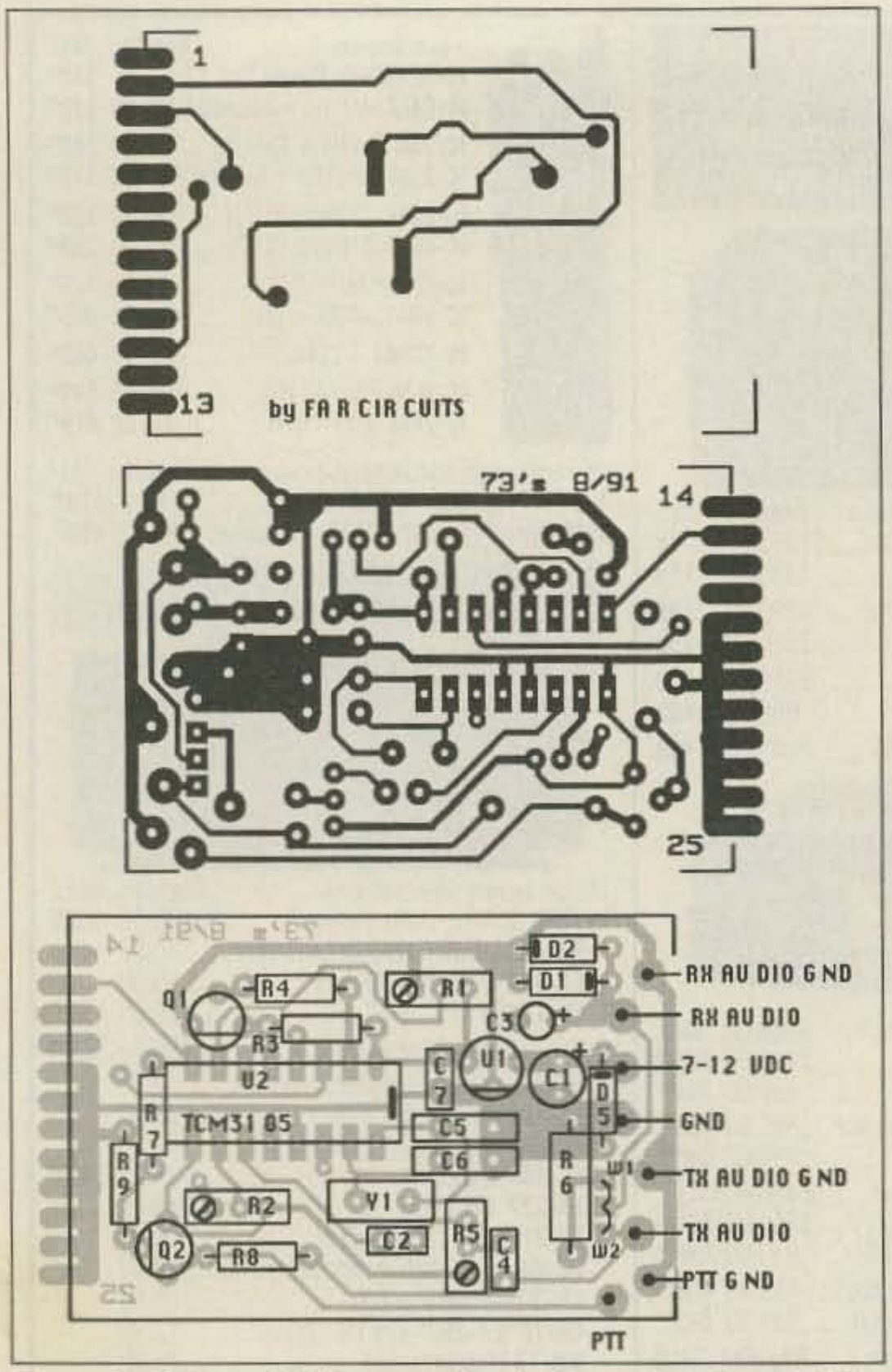

Figure 2. PC board foil pattern for the laptop interface. (a) Top layer (solder the top pads as well as on the bottom). (b) Bottom layer. (c) Parts placement.

Why two versions of the modem? In the interest of portability, the laptop interface lacks a time-out circuit to make it as small as possible. It is designed to be hooked up only when you want to operate packet. The problem is that when you exit the PMP program (or if the computer resets itself), the laptop interface may key down your transmitter continuously (a detailed explanation of this appears in the "Enhancing PMP" section of this article). This is not a problem when you are actually running the PMP program, however. The larger home station interface (Figure 3) solves this with a watchdog circuit and can be left hooked up to your parallel port indefinitely. Just remember: **When using the scaled-down laptop interface, always disconnect it from your computer when you're done operating packet!**

To assemble the laptop interface, just slide the PC board between the rear pins of the DB-25 connector and solder in place. Install the components and make up cables to run to your radio. The interface can be powered by running a cable over to the serial port.(See Figure 3 for serial port connection).

The laptop interface board will fit into the Radio Shack transmitter case (RS # 270–293). The end panel of the case should be notched out to mount the DB-25 connector. Use washers to space the connector away from the end panel far enough so that the PC board just fits into the compartment. This "transmitter case" has an internal space specifically designed for an optional 9-volt battery as well.

The home station modem interface requires a larger case. Also you will have to wire up a cable to run over to your computer's parallel port. See Figure 3 for details.

Checkout and Adjustments

After construction is completed, apply power to the modem with the TCM3105 chip unsocketed. You should have 5 volts on pin 1. If not, check the regulator chip U1 and associated wiring. Check pin 7 and adjust R1 initially for a voltage of 2.26 VDC. Check pin 10 and adjust R2 for 2.5 volts. Next, remove the power and insert U2. Connect the modem to the computer and the receive audio line to the radio. Don't connect the transmit line at this point. Boot up the computer, load the disk, and type PMP to start the program. When the title screen appears, press any key to go to the operating screen.

To adjust the Carrier Detect threshold pot, R2, connect the receiver and squelch the radio. Turn R2 until the RX indicator in the lower right corner of the screen disappears. The RX indicator is tied to the operation of the CDT line. It indicates when PMP starts to attempt decoding packets. Now unsquelch the radio and turn up the volume until it reappears. Resquelch the radio and be sure it disappears immediately. The object is to have the CDT line quickly and cleanly follow the operation of the radio's squelch. If R2 is set too close to the threshold, the CDT line will not follow the closing of the radio's squelch quickly enough. If the RX symbol on the screen never goes away, make sure you have the modem plugged securely onto the printer port, that it has power applied, and that pin 3 of the modem chip is wired correctly to pin 11 on the printer port connector.

To set the RX bias, set R1 for a reading of 2.26 volts at pin 7 of U2; that is a good starting value. When you begin listening to actual packets, if they are not being printed on the screen, you can rock R1 back and forth until you start copying packets. It helps to have a nearby friend send a bunch of beacons or unprotocoled packets for this. Andy has written a supplementary program called PMPTEST that simplifies this process by giving an indication of how closely adjusted R1 is. Using the program and listening to on-the-air packets will get R1 dialed in pretty quickly.

To adjust the transmit audio, send packets while listening on a second receiver. Adjust R5 until the audio stops increasing, then back it off until the audio just starts to diminish. This should put you near the edge of limiting and give you the cleanest audio. The adjustment isn't very critical, but if you are having problems communicating with a particular station, you may need to rock it a little near that threshold of limiting to account for the "twist" between the 1200 and 2200 Hz tones.

Easy Operation

To set up PMP for operation, you first have to edit the configuration file. This is where you tell PMP your callsign, and other information, such as how long you need to wait for your transmitter to key up—the same information you have to provide any TNC before operation. The default information will work for most users, needing only the correct callsign entered. This can be done with any ASCII text editor. The software supplied on the disk contains a program to build your configuration file automatically.

PMP is simple to use. Just hook up the cables to your radio, and plug the interface into your computer's parallel port. Hook up to the serial port for power if you aren't using a 9-volt battery (only for the laptop interface version). Insert your PMP disk and type PMP at the prompt. Hit enter after you see the opening screen and you're ready to go! Andy has simplified a lot of the commands to be single keystrokes. For instance Alt-C commands a connect, Alt-D a disconnect and Alt-H displays the help screen. Hit Alt-L to start capturing a text file. Hit Alt-L again whenever you want to close the capture file. See Table 2 for a complete list of commands. ASCII uploads and downloads are possible, and the scrollback buffer is as large as available memory. One operator in our area lets PMP monitor all day long, and simply walks back through the day's packets a screen at a time to view messages flowing in and out of the area BBS.

Table 2. PMP Commands

Alt-C	Connect
Alt-B	Send Beacon
Alt-D	Disconnect
Alt-H	Show the help screen
Alt-J	Copy a snapshot of the current screen data to a file
Alt-L	Download/Capture a text file
Alt-N	Show a list of nodes recently heard
Alt-P	Pause the screen
Alt-S	Show the system status
Alt-U	Upload a text file from disk
Alt-W	Write the scrollback buffer to disk
Alt-X	Exit PMP
F1-F4	User definable macros
Up/Down	Scrollback a line at a time
PgUp/PgDn	Scrollback a page at a time

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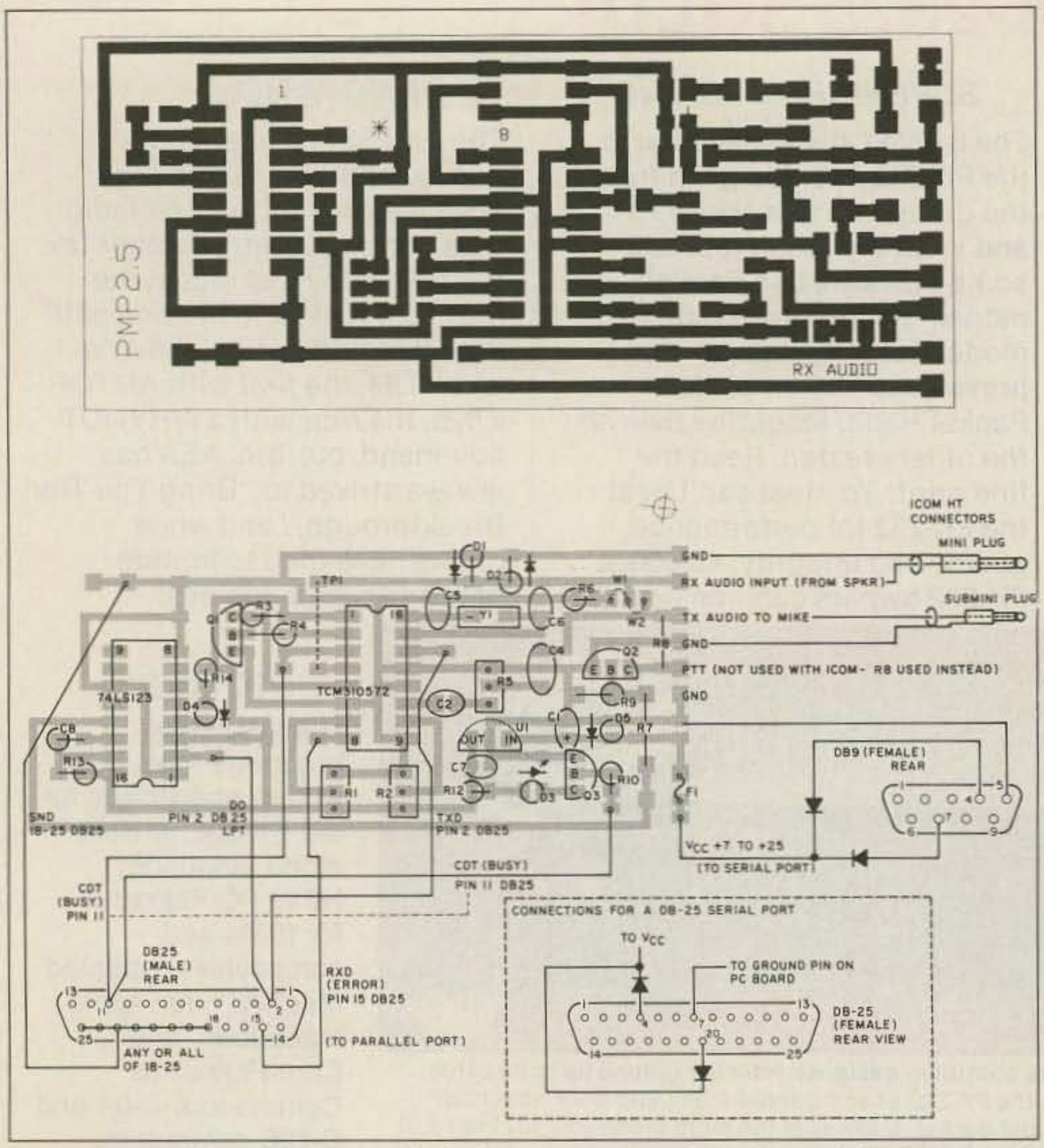

Figure 3. (a) PC board foil pattern for the home station interface with watchdog timer circuit. (b) Parts placement.

Possible Problems

Because of its simplicity, PMP is not quite as foolproof as a full-featured TNC. One potential problem area would be a slow squelch on a radio. Since PMP does not use a DCD (Data Carrier Detect) circuit, it depends on the squelch in conjunction with the CDT line from the modem to tell it when a packet starts and ends. A slow squelch opening may clip the packet header with the callsign information off, rendering the packet unusable. A slow closing squelch is less of a problem because the software can tell by the ending flags where the packet terminated, but the computer remains frozen from responding to the keyboard or displaying the packet until the squelch closes and the CDT line goes low again. The rule of thumb is to put the squelch close to the threshold of opening to help the speed.

The second potential problem is related—performance on a very busy channel. Because of the simplicity of the hardware, the software is very heavily tasked during receive periods, literally timing and counting the bit flips from the modem. Allowing a keyboard interrupt or other distraction during this period would cause the system to lose track of the packet it was in the process of receiving, so all the interrupts are masked off when CDT is high.

On a very busy channel, CDT will go high with each packet heard, and if there is near continuous traffic this can effectively lock the user out of the keyboard! (This will also happen if the radio becomes unsquelched accidentally, or if the modem falls off the parallel port, allowing the CDT pin to float HIGH.) In urban areas it can make things difficult. The only solution is to wait until the channel activity calms down, or pick a less busy frequency.

PMP has been checked out on a fair sample of IBM PCs and compatibles. It does require pretty good compatibility with the IBM standard. Some problems have been reported with machines that have known IBM compatibility problems, such as the ATT PC6300. A partial list of machines it is known to work on includes an IBM PC/XT, Toshiba T1000, Leading Edge Model D, Tandy 1100FD, WYSE PC286, and various 286 and 386 machines using Award BIOS. It even runs in a window under Desqview on my 386 machine.

Enhancing PMP

Figure 1 shows the schematic for the simplest version (the laptop interface) of the modem (the circuit above the dotted line), designed to be hung on the back of a laptop. However, there are a few enhancements below the dotted line that might be of interest (the home station interface).

The radio PTT line is keyed by a signal from the software via the D1 data line on the parallel port; but D1 is only under control when PMP is actually running. If you want to leave the modem and radio connected at all times, you may find that D1 is turned on by other programs, or following a reboot, which inadvertantly keys the transmitter. At times, you may also wish to leave the computer unattended, perhaps to monitor traffic on a channel. An accidental reboot from a power loss could leave D1 in an unknown state and the transmitter keyed.

To address this, U3 was added to form a time-out timer. U3 is a 74LS123 one-shot multivibrator with edge-triggered inputs, whose output circuit is used to drive Q2 instead of letting PMP control it directly. The output of the one-shot stays LOW until pin 2 goes HIGH, then it raises its Q output, turning on transistor Q2. The output only stays HIGH for about 10 milliseconds, unless pin 2 goes LOW and then HIGH again. Pin 2 is connected to the tranmit data from the PMP program. When PMP is running and sending data to be transmitted, the data line connected to pin 2 is toggling at about a 600 Hz rate. Each transition resets the time-out on the one-shot, keeping its output HIGH and the transmitter continuously keyed as long as data is being sent. When the flow of data stops, pin 2 stops changing state, and the one-shot times out 10 milliseconds later, unkeying the transmitter.

If the program locks up, or the computer resets, or if another program is being run, D1 will likely sit at either a one or a zero, but it probably won't be toggling at 600 Hz. So, the transmitter will only burp for 10 milliseconds if D1 goes HIGH, and then it will stay off. D4 and R14 use the /Q output of the one-shot to provide an optional keying indicator.

The circuitry associated with Q3 and D3 also provides for a receive LED. The base of Q3 is tied to the Carrier Detect (CDT) line of the modem chip, and when it goes HIGH indicating received audio, Q3 turns on, causing D3 to light. I use a green LED for D3, and a red LED for D4.

For portable operation, the bare bones modem has a low enough current drain that you may be able to steal enough power from your computer's serial port to run it (or use a 9-volt battery). The PMP configuration file has provisions that allow you to command the handshake lines of the serial port to a desired state. In my case, I command both the hardware handshake lines HIGH and OR them through a pair of diodes to provide about 7 volts at 12 mA, just enough to give me 5 volts out of the regulator. The voltage and current available from the CTS and DTR lines varies from machine to machine, but if you can do it, it reduces the entire packet setup to a computer, a cable and a radio. I have not seen anything simpler for portable packet! Because it is so simple to drag around compared to other packet systems, I find myself running packet from all kinds of locations—the park at lunchtime, a weekend campsite, or even the laundromat!

Poor Man's Packet has achieved both of the goals we set out to accomplish. Andy now has an inexpensive system to allow him to join local packet operations, and I have an easy-to-use packet system for portable operation. 73

Contact F. Kevin Feeney WB2EMS at 468 Hines Road, Newfield NY 14867. Please enclose an SASE. You can also reach him at kfeeney@helios.tn.cornell.edu. You may reach Andy Payne N8KEI, the software designer, at payne@theory.tc.cornell.edu.

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Mid:1W Low:0.1W

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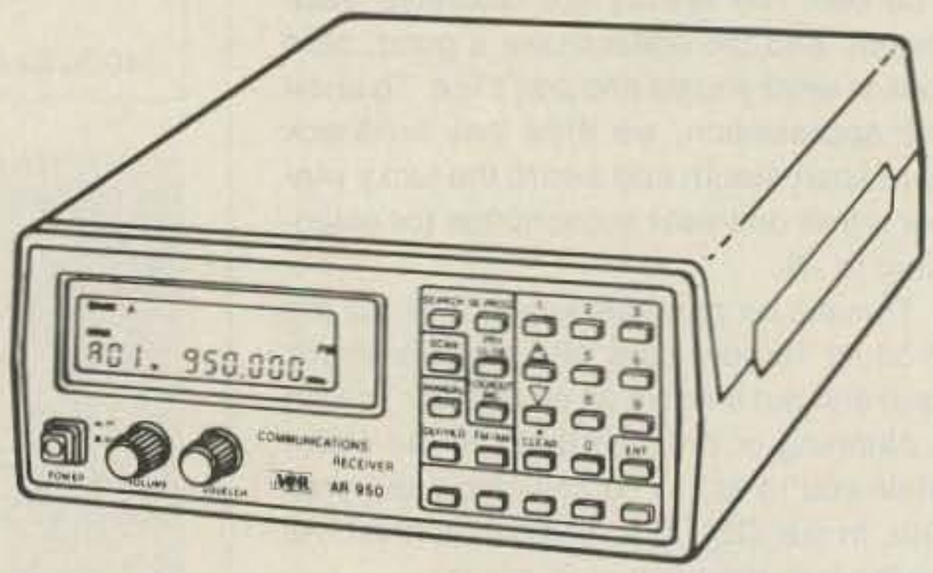

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- AC & DC Power cords w/ mtng hardware.
- One Year Limited Warranty.

Options:

Base type antenna 25 to 1000MHz w 50'coax.	AS300	$59.95
Mag Mnt Mobile Antenna. 15' coax.	MA100	$25.00
Cigarette Lighter power adaptor.	CP100	$4.00
External Speaker with mobile mount.	MS100	$19.50
Extended Warranty. 2/3 yrs		$40/$55

Specifications:

Coverage:	27-54, 108-174, 406-512, 830-950MHz
Sensitivity:	.4uV Lo,Hi. .8uV Air. .5uV UHF. 1.0uV 800
Scan Speed:	15 ch/sec.
IF:	21.4MHz, 455KHz
Increments:	10,12.5,25,30
Audio:	1W
Power:	12.8VDC, 200MA
Antenna:	BNC
Display:	LCD w/backlight
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D. 14oz wt.

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CIRCLE 164 ON READER SERVICE CARD

COMMUNICATIONS

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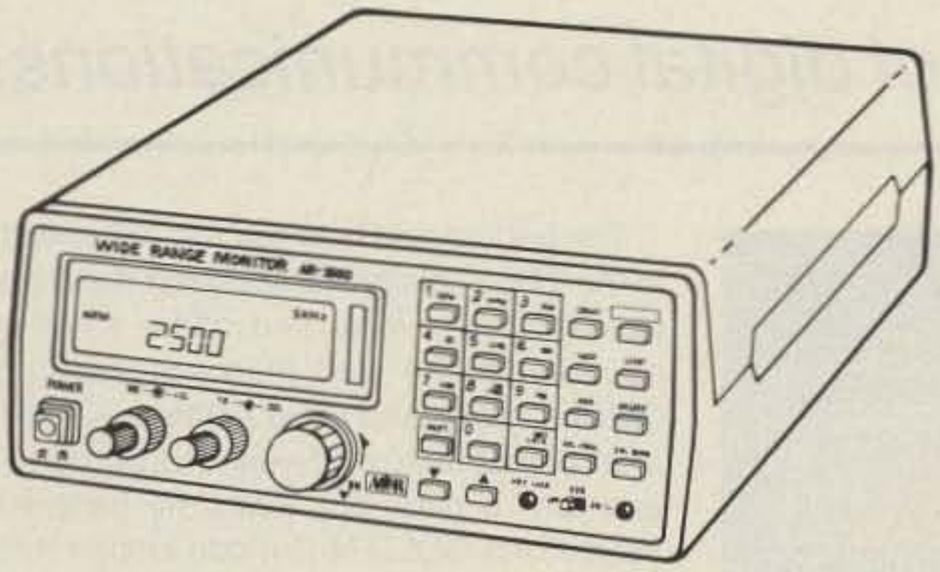

2016 Channels. 1 MHz to 1500 MHz

Standard Features

- Continuous coverage
- AM, FM, wide band FM, & BFO for SSB, CW.
- 64 Scan Banks.
- 16 Search Banks.
- RS232 port built in.
- Includes AC/DC pwr crd. Antenna, Mntng Brckt.
- One Year Limited Warranty.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS2	$295.00

Specifications:

Coverage:	1 MHz - 1500MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	38 ch/sec. scan. 38 ch/sec. search
IF:	750.00, 45.0275, 5.5MHz 455KHz
Increments:	5,12,5,25 KHz
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 300mA
Antenna:	BNC
Display:	LCD, backlighted.
Dimensions:	2 1/4H x 5 5/8W x 6 1/2D Wt. 1lb.

AR3000 $995

400 Channels. 100KHz to 2036MHz.

Standard Features:

- Extremely compact size.
- Continuous coverage
- Attenuation Programmable by Channel.
- Manual tuning knob.
- Tuning increments down to 50Hz.
- AM, FM, wide band FM, LSB, USB, CW modes.
- Backlighted LCD display.
- 4 Scan and Search Banks, Lockout in Search.
- 4 Priority Channels.
- RS232 control through DB25 connector.
- Delay, Hold Features.
- 15 band pass filters, GaAsFET RF amp.
- Sleep and Alarm Features.
- AC adaptor/charger. DC power cord.
- Telescopic Antenna.

Options:

Earphone.	EP200	$2.00
External Speaker. Mobile Mount.	MS190	$19.50
Extended Warranty. 2/3 yrs.		$65/75
Mobile Mounting Bracket.	MM1	$14.90
RS232 Control Package (software & cable) offers spectrum display and database.	SCS3	$295.00

Specifications:

Coverage:	100KHz - 2036MHz
Sensitivity:	.35uV NFM, 1.0uV WFM, 1.0AM/SSB/CW
Speed:	20 ch/sec. scan. 20ch/sec. search
IF:	736.23, (352.23) (198.63) 45.0275, 455KHz
Increments:	50Hz and greater
Selectivity:	2.4Khz/-6db (SSB) 12KHz/-6db (NFM/AM)
Audio:	1.2 Watts at 4 ohms
Power:	Input 13.8 V. DC 500mA
Antenna:	BNC
Display:	LCD
Dimensions:	3 1/7H x 5 2/5W x 7 7/8D Wt. 2lb 10oz.

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CIRCLE 164 ON READER SERVICE CARD

73 Review *by Marc Stern WA1R*

Pkt-GOLD Multimode

InterFlex Systems Design Corp.
P.O. Box 6418
Laguna Niguel CA 92607-6418
(714) 496–6639
Price Class: $60

Your software window into the world of digital communications!

I like new software, especially things I can use with my Heathkit HK-232 MBX multimode controller, a PK-232 clone.

Pkt-GOLD Multimode is a program that turned out to be one of the best implementations of multimode controller software that I have seen. In my opinion, the program does a great many things right, or better-than-right, and it all adds up to quite a nice piece of work by the developers at InterFlex Systems.

Installation

For starters, loading and setting up the program on a hard disk is easy. All you do is put the disk into drive A, and type "INSTALL"; the program does the rest. After you answer several questions about such things as baud rate, communications port, video adapter and the like, as well as filling in your call, you are ready to go by typing "PKTGOLD" at the system prompt.

Pkt-GOLD Multimode takes full advantage of AEA's "host" mode—perhaps the most robust implementation of "host" mode on the market. It allows you to keep the memory backup batteries in place during power-up. AEA's own software indicates that you have to pull out the batteries to prevent software hanging up, but Pkt-GOLD Multimode lets you leave the batteries in place. Pkt-GOLD Multimode emulates the PK-232's architecture in software, which makes your PC's RAM look like a multimode controller. To the controller, it doesn't make a bit of difference where it gets its information from, whether the information comes from its own buffers or your PC's RAM. Pkt-GOLD Multimode attempts to retain any text that might be in any of your controller's buffers. If it does not find text, after checking several times in an effort to avoid a RESET command, it then has to load the buffers with program and textual information and this takes time.

I found that InterFlex's advice was well-taken as I tried using my controller both without and with batteries. Without batteries, and if the TNC was turned off, the initialization process took the better part of a minute. With the batteries, the initialization took about five seconds because the controller was set up and ready to go with parameters that I had already entered.

Photo A. While you're connected to another station, Pkt-GOLD's versatile features allow you to monitor all of the channel activity. All activity is displayed at the top of the screen (Net View); your connect session is displayed at the bottom portion (Session). Pop-up screens are available at any time. For example, pressing <ALT> F2 gives you the current MHEARD list.

Photo B. The help screen is available at any time as a pop-up menu.

Photo C. Pressing function key F10 allows you to quickly change modes.

The bottom line is to put the batteries back in the TNC. This saves Maildrop messages in case of power loss, and offers some other advantages as well (like not losing your callsign, alias, and other settings if there is a brief power loss, or if you turn off your TNC and turn it back on). With the batteries installed, Pkt-GOLD Multimode zipped through the initialization. A pop-up window displayed the parameters that Pkt-GOLD Multimode was loading into memory from the default ASCII text file, called "Startup.TNC." If the Startup.TNC file is edited to bare bones startup parameters, the initialization is virtually instant.

A Versatile Program

Pkt-GOLD Multimode's development team, Lynn Taylor WB6UUT and Jeff Towle WA4EGT, have put lots of nice things into their software.

For starters, the user interface is clean and intuitive. There's a brief listing of the function keys at the bottom of the screen. The ALT key changes the functionality of those keys. The user interface also offers a split screen that lets you monitor what is going on with sessions other than your own, as well as of your own. It's like having an eye on the frequency you are using, as well as on the station you are trying to contact.

It's easy to see that this software is powerful. For example, when I was using Pkt-GOLD Multimode for multi-connects, I found that when I pressed the CTRL key on my PC, I saw a number of channels indicated at the bottom. In several of those channels I saw the stations that I was trying to contact. When I was multi-connecting, the program latched onto the station with which I was trying to connect and assigned it a specific memory location, or "channel." Also, if you are doing a multi-connect, a few keystrokes will put these stations into one or more conferences, which is great for emergency situations or general round-table discussions.

Pkt-GOLD Multimode is loaded with utilities. I found that not only could I log onto my favorite bulletin board and my home BBS, but I could also log onto other stations at the same time. All I did was type in the callsign of the station I wanted to connect to, hit the F7 func-

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The *RELM* RSP500B-A is our most popular programmable 5 watt, 20 channel handheld transceiver. You can scan 20 channels at up to 40 channels per second. It includes CTCSS tone and digital coded squelch. Snap on batteries give you plenty of power. Additional features such as time-out timer, busy-channel lockout, cloning, plug-in programming and IBM PC compatability are standard. It is F.C.C. type accepted for data transmission and D.O.C. approved. We recommend also ordering the **BC45** rapid charge 1½ hour desk battery charger for $99.95, a deluxe leather case **LC45** for $48.95 and an external speaker microphone with clip **SM45** for $59.95. Since this radio is programmed with an external programmer, be sure to also order one **PM45** at $74.95 for your radio system.

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CEI understands that all agencies want excellent communications capability, but most departments are strapped for funds. To help, CEI now offers a special package deal on the RELM UC102 one watt transceiver. You get a UC102 handheld transceiver on 154.5700 MHz., flexible antenna, battery charger and battery pack for only $79.95. If you want even more power, order the RELM **UC202** two watt transceiver for $114.95.

NEW! RELM® RH256NB-A

List price $449.95/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority Time-out timer • Off Hook Priority Channel
The *RELM* RH256NB is the updated version of the popular RELM RH256B sixteen-channel VHF land mobile transceiver. The radio technician maintaining your radio system can store up to 16 frequencies without an external programming tool. All radios come with CTCSS tone and scanning capabilities. This transceiver even has a priority function. Be sure to order one set of programming instructions, part # **PI256N** for $10.00 and a service manual, part # **SMRH256N** for $24.95 for the RH256NB. A 60 Watt VHF 150-162 MHz. version called the **RH606B** is available for $429.95. A UHF 15 watt, 16 channel similar version of this radio called the **LMU15B-A** is also available and covers 450-482 MHz. for only $339.95. An external programming unit **SPM2** for $49.95 is needed for programming the LMU15B UHF transceiver.

NEW! RELM® LMV2548B-A

List price $423.33/**CE price $289.95/SPECIAL**
48 Channel • 25 Watt Transceiver • Priority
RELM's new LMV2548B gives you up to 48 channels which can be organized into 4 separate scan areas for convenient grouping of channels and improved communications efficiency. With an external programmer, your radio technician can reprogram this radio in minutes with the **PM100A** programmer for $99.95 without even opening the transceiver. A similar 16 channel, 60 watt unit called the **RMV60B** is available for $489.95. A low band version called the **RML60A** for 30-43.000 MHz. or the **RML60B** for 37-50.000 MHz. is also available for $489.95.

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If you are the dealer or radio technician maintaining your own radio system, you **must** order a programming tool to activate various transceivers. The **PCKIT010** for $149.95 is designed to program almost all RELM radios by interconnecting between a MS/DOS PC and the radio. The **PM100A** for $99.95 is designed to externally program the RMV60B, RML60A, RML60B and LMV2548 radios. The **SPM2** for $49.95 is for the LMV25B and LMU15B transceivers. The **RMP1** for $49.95 is for the RMU45B transceiver. *Programmers must be used with caution and only by qualified personnel because incorrect programming can cause severe interference and disruption to operating communications systems.*

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12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A3** for only $179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
Now...nothing excluded in the 806-912 MHz band.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

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Call 313-996-8888 for special CEI pricing
12-Band, 100 Channel • Surveillance scanner
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The *Uniden* MR8100 surveillance scanner is different from all other scanners. Originally designed for intelligence agencies, fire departments and public safety use, this scanner offers a breakthrough of new and enhanced features. Scan speed is almost 100 channels per second. You get four digit readout past the decimal point. Complete coverage of 800 MHz. band when programmed with a personal computer. Alphanumeric designation of channels, separate speaker, backlit LCD display and more. To activate the many unique features of the Uniden MR8100 a computer interface program is available for $19.95. Due to manufacturers' territorial restrictions, the MR8100 is not available for *direct* shipment from CEI to CA, OR, WA, NV, ID or UT.

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CIRCLE 121 ON READER SERVICE CARD

tion key, and then switch sessions with the F4 function key. Each session would alert me if there was mail or traffic waiting with a flashing prompt on the graphics screen. I was then able to personalize things by going back to each session with the F4 function key and, by using ALT-N (name) keys, type in the operator's name which then appeared next to the callsign on each session screen.

Using the "next" key [F4], I was able to cycle through the sessions easily. Note that each session was individual and any text I typed was used only by the particular session I had attached to. Pkt-GOLD Multimode also has "cut and paste" features that allow you to transfer text to another station. For example, I cut text from an AMTOR session, and sent it to the local packet BBS after editing it using the clipboard editor. Also, printing to a printer or file is easy using [Alt-P]. Printing can commence from the beginning of the screen buffer (which can be as much as 300K), or you can just print new text.

The program also supports saving session text on a callsign-by-callsign basis. You tag certain sessions as "important," and every time that station connects, text is saved/appended to a file with the callsign as the file name. These are certainly useful features for emergencies or situations requiring backup documentation.

There is no special screen to go to, but you can enter a full screen parameter editor if you wish. Changing one or a few parameters is done easily by typing the parameter and value, and using the CMD key [F10]. Basically, you use the [Enter] key to send things THROUGH the controller over to the other station, and the [F10] key to send things TO your controller, such as parameter changes or new settings.

Pkt-GOLD Multimode also understands how to use NET/ROM for hopping from node to node. Connecting to a node and requesting a circuit to the next node takes time. Pkt-GOLD Multimode does the waiting and automatically issues the subsequent "connect" requests for you. You just type something like this: CNODE1 | NODE2 | NODE3 | W2ABC and Pkt-GOLD Multimode handles all the interim node connects, getting you to W2ABC. As it progresses through the node system, each successful connect results in a CW message and a pop-up screen telling you of the progress through the node system.

You can also set up "quick connects" with these multi-hop "path" statements and simply hit the [F7] connect key, highlight the target station, such as "W2ABC," and the program does the rest.

An interesting feature of NET/ROM is that you may have multiple connects to a single node by using its node alias. If you connect to the node using the station callsign, NET/ROM allows only a single connect. However, if you connect to a node using its alias (e.g. "GR-BOX" instead of "WA1R-2") NET/ROM will allow up to 15 multiple connects using the "alias-n," where "n" can be up to 15. Pkt-GOLD Multimode understands this, and allows you to use the same set of NET/ROM nodes to establish many sessions. It automatically assigns unique sessions with the entry node by assigning different SSIDs, the number after the "alias" name.

Multiple Features

Perhaps the neatest thing I found is Pkt-GOLD's ability to implement all the modes of the controller.

Pkt-GOLD Multimode takes advantage of the ROM that is already in your controller. With Pkt-GOLD Multimode, you can use the same friendly program features on all of the other modes available. If you have a PK-232, you can use AMTOR, NAVTEX, RTTY, Morse, TDM (Time Domain Multiplexing, a new PK-232 mode in which several signals are able to use one frequency by digitally shifting their timing slightly), packet, and the PK-232's patented SIAM mode. Changing modes is a snap.

Pkt-GOLD Multimode also offers protocol file exchanges for error-free transmission of any file, while allowing keyboard-to-keyboard conversation on the same channel, and of other multiple connects, all at the same time. You can get remote user directories and, while transferring a file, the program shows the remaining time and the effective baud rate of the transmission to other stations requesting files. It also provides file transfer statistics to these other stations, estimating when the file transfer will be finished.

For those with PK-88 controllers, Pkt-GOLD Multimode offers all of the powerful features that it does on the PK-232 (for packet mode). Briefly, some of the other features are "Brag" file support for longer descriptive messages, and [Alt-0..9] keys for one-line messages, both supporting macros such as "?callsign" to fill in the other station's callsign, or "?name" to fill in the remote user name, to make messages appear to be personalized.

Well Worth the Money

To say that I like this program is putting it a little mildly. I tested Pkt-GOLD on my PC clone (EGA monitor, 640K of RAM, 80286 CPU, hard disk). It also supports VGA and other enhanced video display cards. The program runs flawlessly at the highest terminal baud rates of 9600 for the PK-232 and 19200 baud on the PK-88. It has an integrated set-up area, accessed with the [Alt-S] key combination. This is where you enter quick connects, station information, and set many of the program refinements like 25/43/50 line screen mode color settings, size of the NetView screen, pop-up window time, Morse code announcement speed, file paths, and the like.

Pkt-GOLD features pop-up displays and menus galore. The documentation is clearly written and leads you quickly through the features of the program. In addition to the printed book, you get a complete online help system that is context-sensitive and hypertext.

You can learn about operating modes, parameter settings, frequencies, even how to tune up the controller and radio for maximum performance, by perusing this multi-page cross-referenced help system.

Overall, if you are looking for a reliable, solid system, I would say Pkt-GOLD Multimode is more than worth the price, much more than worth it! 73

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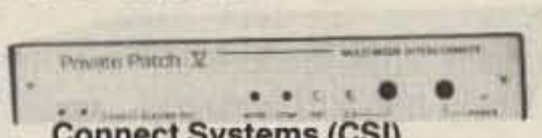

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CIRCLE 41 ON READER SERVICE CARD

Low Cost Discone Antenna

Wideband coverage from 144 to 1296 MHz.

by Phil Salas AD5X

I needed an antenna that would satisfy a lot of needs. After purchasing an ICOM R-7000 receiver (25–2000 MHz) for some experimental work in the UHF and low microwave ham bands, I wanted a good broadband antenna that I could easily mount in my attic and that would provide coverage of the 144, 220, 450, 903, and 1296 MHz ham bands. I also needed this antenna to provide a good match so that it could be used for transmitting within these ham bands as well. Though this sounds like I'm asking a lot, there is a broadband antenna that can satisfy these needs: the discone antenna.

The Discone Antenna

When properly designed, a discone antenna provides decade (10:1) frequency coverage with a good match (see Figure 1). The discone consists of a disk (the driven element) mounted over a conical ground plane. The cone is an equilateral triangle whose dimensions are a quarter wavelength at the lowest operating frequency. The disk (driven element) has a diameter of 70% of a quarter wavelength at the lowest operating frequency. The disk should be very close to the apex of the cone; the recommended spacing is from 10–30% of the diameter of the apex of the cone.

The trick is to be able to easily realize the cone and disk as well as provide a solid insulated support for the disk and a sound mounting method for the overall antenna. Also, this antenna should be inexpensive, and easily constructed with readily available

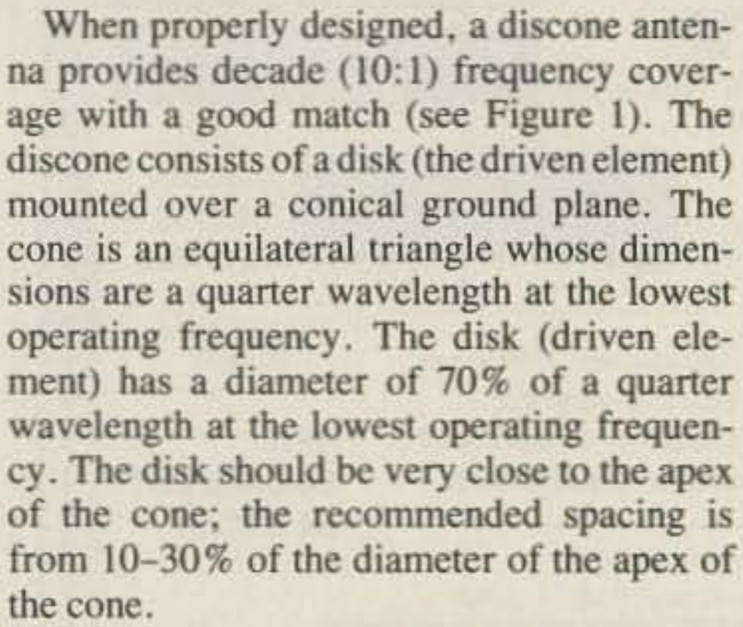

Figure 1. Design for the discone antenna.

Figure 2. Dimensions of the disk support.

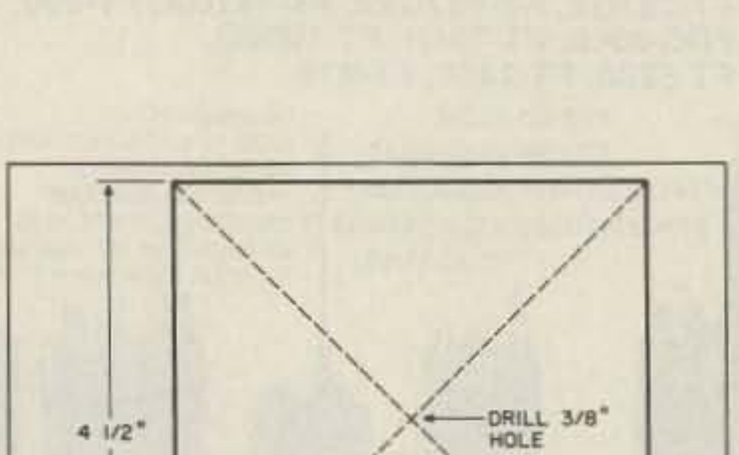

Figure 3. Disk support preparation.

parts from hardware and Radio Shack stores.

Since I wanted to cover the two meter band, I picked the lower frequency limit to be below the lower band edge. The actual frequency I picked was 137 MHz. A decade of coverage should still give me up to 1370 MHz, which suited my needs. The equation for this is: ¼ wavelength = 2952/137 = 21.5″ = cone side; disk diameter = 0.7 x 21.5″ = 15″.

Now all I had to do was figure out how to build it!

Constructing the Discone

See the "Parts List." The last three items came from Radio Shack. The ⅜″ solder lugs are part of the package (two per package) of solder lugs from Radio Shack, but you can save money if you can find ⅜″ solder lugs separately. I bought all of the other items in the electrical department of a local hardware store.

Now, let's get to work. We will first prepare all the individual pieces.

The disk support will be made out of the single-sided printed circuit board. First, cut this board into a 4½″ x 4½″ square. With a pencil, draw diagonal lines from corner to corner on one side. See Figure 2. Drill a ⅜″ diameter hole at the intersection of the lines (the center of the PC board). Referring to Figure 3, center a quarter over the hole on the foil side of the PC board and trace around its circumference. Using a sharp X-ACTO™ knife, cut through the copper on the circular lines just traced. Now remove the copper *within* the circle. A soldering gun will aid in removing the copper foil.

The light fixture canopy needs some modification. These kits include a fixture for mounting a lamp on, a short length of 1/8IP threaded steel lamp pipe, and some additional hardware. Refer to Figure 4. Nibble or cut a slot along one side of the canopy at least 0.3″ x 0.3″. This will pass the coaxial cable when the canopy and antenna are mounted.

Cut all eight welding rods to a length of 21.5″. Unless you have heavy cutters, you will need to use a hacksaw. Remove any insulation from the ⅜″ solder lugs, insert only one end of the cut welding rods into the solder lug crimp end, crimp the lug and solder. See Figure 5.

Cut the remaining eight short pieces of welding rods to 7¼″. Finally, determine the center of the 4″ round plastic electrical box cover and drill a ⅜″ hole. It is important that this hole be well-centered, so take care in determining this location.

Now take the 30″ 1/8IP all-thread steel lamp pipe and carefully tin one end of the pipe. See Figure 6. Be careful not to get solder on the threads of the pipe. This pipe is

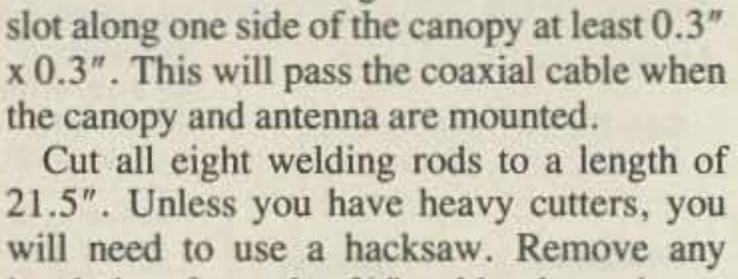

Figure 4. Modifying the light fixture canopy.

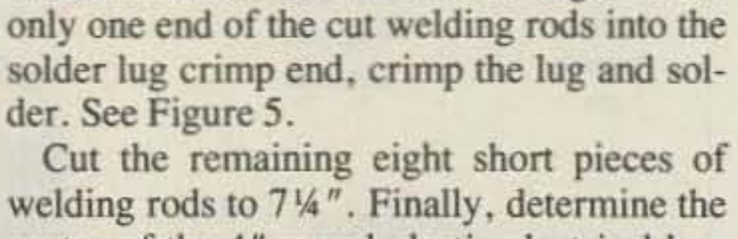

Figure 5. Element preparation.

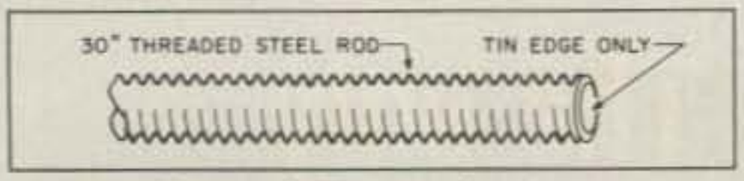

Figure 6. Tinning the pipe.

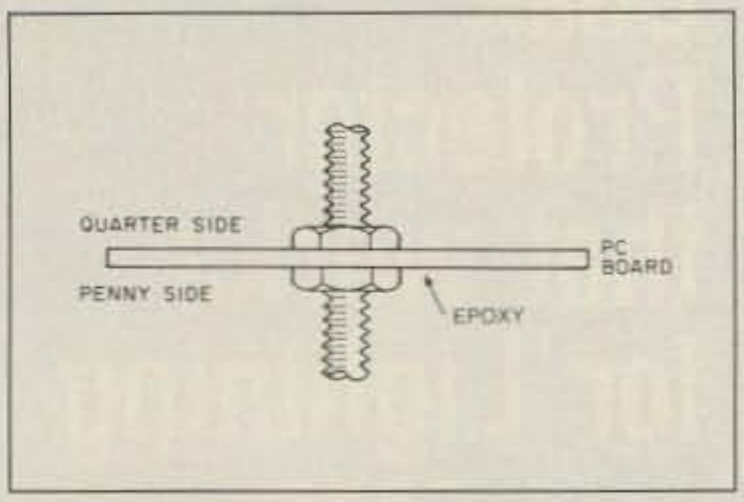

Figure 7. Disk support assembly.

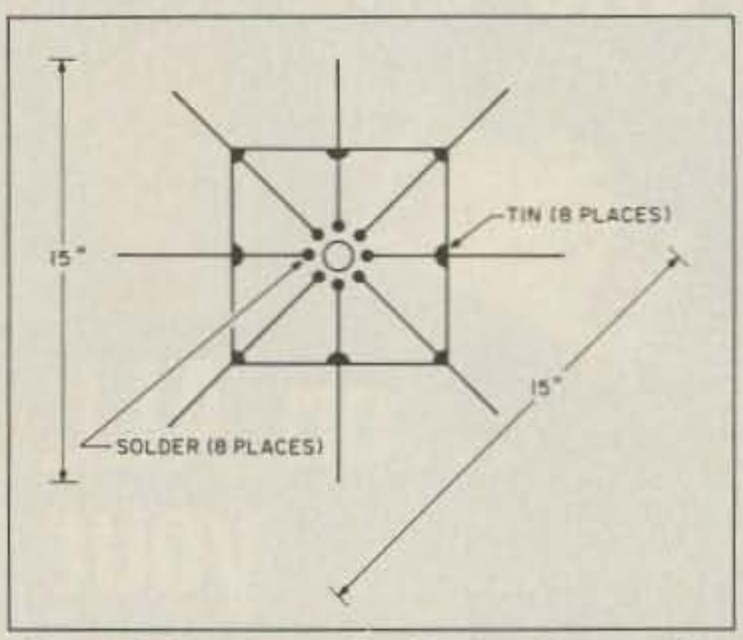

Figure 8. Tinning and soldering the top of the PC board.

not difficult to tin since it is made of steel, which doesn't conduct heat away as fast as copper or brass does. Cut 1" of the outer insulation off the RG-8M coaxial cable, separate the braid, and then fold it back over the cable insulation. Insert this end of the RG-8M cable into the non-tinned end of the 30" lamp pipe and push the cable through until the braid is flush with the tinned end of the pipe. Solder the braid to the pipe at this point.

Next, prepare the disk support printed circuit board. Insert a short length of steel lamp pipe (provided with the canopy kit) through the center hole in the printed circuit board and fasten it securely in place with two brass nuts. See Figure 7. Epoxy the brass nut to the PC board opposite the foil side. Be careful not to get epoxy on the threads. Now, remove the nut from the side of the board not epoxied, and unscrew the steel pipe from the nut still attached to the PC board. The side of the PC board with the nut will now be referred to as the bottom of the disk support PC board.

On the top of the PC board, tin each corner and tin the midpoint of each side. See Figure 8. Now solder down the 7¼" welding rods to the PC board, making sure that the total length from outer point to outer point is 15". You are creating a disk 15" in diameter out of the eight welding rods. Now go back and solder the inside edge of the welding rods to the PC board. Finally, place the 1" diameter brass washer over the ends of the welding rods centered over the hole in the PC board and solder the washer to the rods. See Figure 9.

Now it's time to start assembling the antenna. First, screw the end of the 30" pipe with the RG-8M center conductor sticking out into the nut on the bottom of the PC board. Screw it in just far enough so the end of the pipe is flush with the printed circuit side of the soldered down nut. The center conductor of the RG-8M will pass through the center of the brass washer on the top of the PC board.

Next, place the solder lugs of the eight long steel welding rods over the 30" steel pipe and hold them in place with a 1/8IP brass nut. Put this nut on finger-tight and then arrange each long rod so that it is exactly under each short rod on the top of the PC board. Carefully tighten the brass nut. Thread another brass nut on the steel pipe and position it about 3" below the nut holding the long rods in place. Hold the pipe upright with the PC board at the upper end, then bend all the long rods down along the steel pipe. Place the plastic electrical outlet cover over the steel pipe and thread on another brass nut. Push the electrical outlet cover up the pipe and spread the long welding rods until the bottom ends of the rods are 21.5" apart from their opposite rod. Adjust the nut positions as necessary and tighten the nuts to hold the electrical outlet cover in place. See Figure 10. I used a hot glue gun to attach the long welding rods to the plastic electrical outlet cover to help with the antenna rigidity, but this is not really necessary.

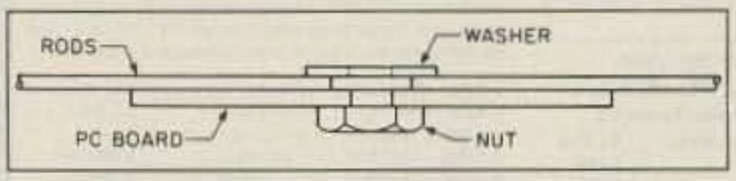

Figure 9. Finishing the PC board.

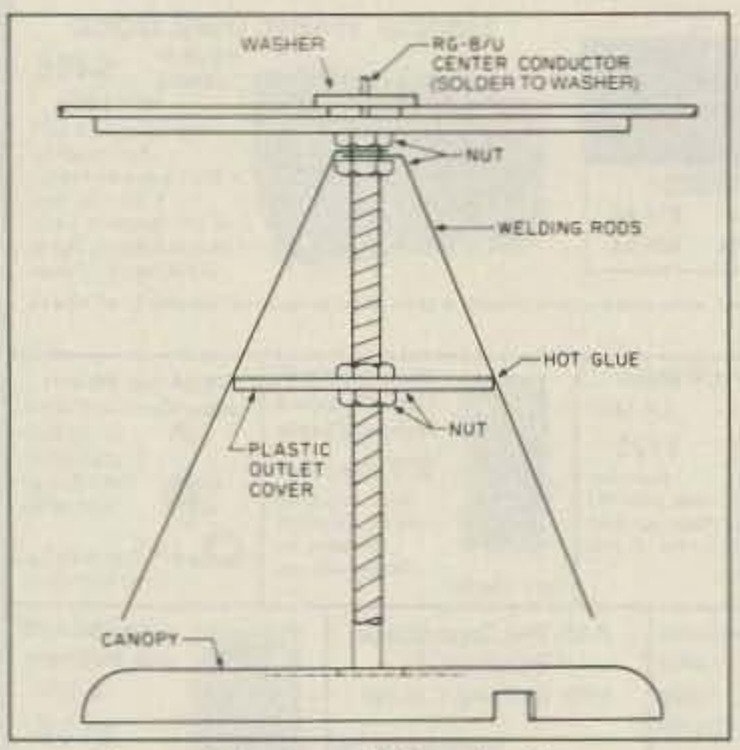

Figure 10. Assembling the discone.

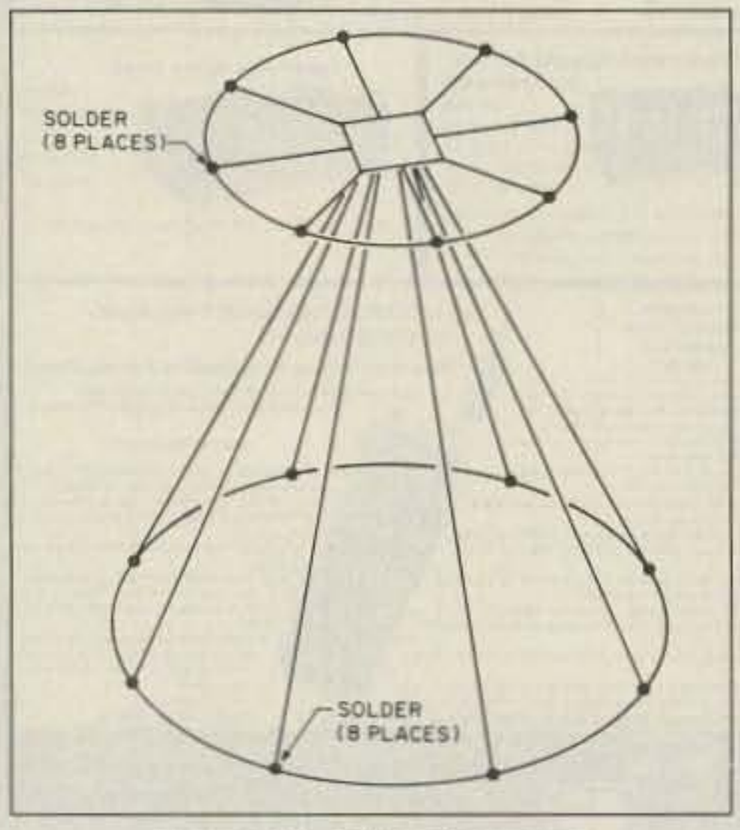

Figure 11. Wire placement.

Parts List

Description	Approximate Cost
1" diameter brass washer	$ .10
30" 1/8IP all-thread steel lamp pipe	$ 3.17
1 light fixture canopy kit	$ 2.45
6 brass 1/8IP nuts (pkg. of 6)	$ .99
1 plastic 4" round electrical box cover	$ .17
10 feet #12 copper wire ($.07/ft.)	$ .70
8 copper plated steel welding rods ($.20 ea.)	$ 1.60
12" x 24" x 1" piece of wood	$ 1.00
4½" x 4½" single-sided PC board	$ 3.99
6 ⅜" solder lugs (RS 64-3040 x 3)	$ 3.87
5 feet RG-8M (RS 278-1328 0.27 x 5)	$ 1.35
Total	$19.39

The long welding rods to the plastic electrical outlet cover to help with the antenna rigidity, but this is not really necessary.

Strip the insulation off the RG-8M center conductor as it passes through the brass washer on the top of the printed circuit board. Solder the center conductor to the brass washer. Now, mount the antenna to the canopy by threading another brass nut over the end of the steel pipe, passing the cable and pipe through the hole in the canopy, and threading another nut over the pipe and tightening it. You can now attach the canopy to a piece of wood (I used a 1' x 1' x 1" board), thus allowing the antenna to stand freely.

The last thing to do is to solder a piece of #12 copper wire around the circumference of the disk and cone. Cut a 50" piece of wire for the disk and a 70" piece of wire for the base of the cone. Tin the ends of each of the welding rods and solder the copper wire to them. See Figure 11. Though it is not really necessary to tie all the welding rod ends together, this and the hot glue mentioned earlier make the antenna very rigid.

Finally, attach your connector of choice to the end of the RG-8M coming from the discone. RG-8M has the same dimensions as RG-59. A PL-259 UHF connector with a RG-59 reducer or a BNC connector for RG-59 cable work well.

Operation

How does it work? I measured an SWR of less than 1.5 to 1 on all ham bands between 144 and 1296 MHz. I placed the antenna on its wood base in my attic and it provides excellent general coverage reception, as well as transmission in the covered ham bands. Not bad for about an hour's worth of work and less than $20 worth of parts! 73

Contact Phil Salas AD5X at 1517 Creekside Drive, Richardson TX 75081.

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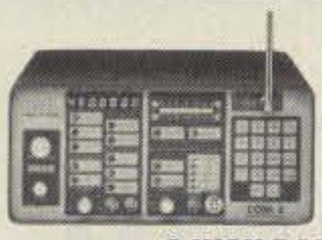

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CT-125	10 Hz–1.25 GHz	<25mV to 50 MHz <15 mV to 500 MHz <100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
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Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.
Complete kit, PC-1 .... $49.95

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Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
Each kit $17.95

TONE DECODER

complete tone decoder n a single PC board. Features: 400–5000 Hz adstable range via 20-turn ot, voltage regulation, 567 . Useful for touch-tone urst detection, FSK, etc. an also be used as a sta- tone encoder. Runs on to 12 volts.
omplete kit, TD-1 . $5.95

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Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
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Mini-sized with professional performance. Self-powered from phone line, transmits in FM broadcast band up to ¼ mile. Installs easily anywhere on phone line or inside phone!
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Talk on the phone hands-free, great to put in shop or shack, press the button to answer—no actual phone needed. Works same as commercial units. Talk from anywhere in room, phone line powered—no battery needed. Super for family and conference calls or buy two for hands-free intercom! Add our case set for a pro look.
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S-4 kit $9.95

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Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."
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Full-fledged superhet, microvolt sensitivity, IC detector and 10.7 MHz IF. Tunes Std. FM broadcast band as well as large portions on each end. Ideal for "bug" receiver, hobby experiments or even as FM radio!
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SUPER SLEUTH

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
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Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
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SYNTHESIZED—NO CRYSTALS TO BUY!

$149.95

Ramsey breaks the price barrier on 2 meter rigs! Here's the ideal rig for field days, hamfests, vacations, second cars and packet (it even has dedicated packet connections). Six expandable diode-programmed channels, 5W RF output, sensitive dual conversion receiver and EASY assembly. Why pay more for a secondhand old rig when you can make your own for less. Have some fun with your own truly AMERICAN-MADE FM rig! This kit comes complete except for the case, mike and speaker—ICOM or equal speaker-mikes plug right in. Add our own beautiful case set for a professional factory look.
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Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.
PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $79.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $79.95

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Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
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(Specify band: QRP-20, 30, 40 or 80)
Matching case & knob set, CQRP $12.95

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Build your own mini ham station. Sensitive all-mode AM, CW, SSB receivers use direct conversion design with NE602 IC as featured in *QST* and ARRL handbooks. Very sensitive varactor tuned over entire band. Plenty of speaker volume. Runs on 9V battery. Very EASY to build, lots of fun and educational—ideal for beginner or old pro. New 30-page manual. Add the case set for well-fitted professional look.
Your choice of bands $27.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

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Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
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Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit $24.95
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Matching case & knob set, CSS $12.95

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Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $27.95
Shortwave converter kit, SCI $24.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

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Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

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AR-1 kit $24.95
Matching case set, CAR $12.95

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CIRCLE 34 ON READER SERVICE CARD

High Speed Data Acquisition

Sample the outside world with this inexpensive interface.

by Mike Gray N8KDD

Personal computers have made huge improvements in nearly every field, including the scientific and engineering communities, acquiring and processing data for research projects. Hams, too, have made extensive use of computers, and many have an interest in using them for data acquisition.

To do this, all a computer needs is an input device and appropriate software. The keyboard is the most commonly used input device. Data taken manually from individual instruments is recorded on paper and entered later. However, keyboards are unacceptably slow for most projects, so an instrument such as a datalogger or a data-acquisition card is used.

Information stored in a datalogger is usually entered into the computer through the serial port, sometimes by means of a telephone or radio modem. Commercial dataloggers are too costly for most of us to justify the purchase of even the least expensive model.

A bus-oriented data acquisition card installed in a personal computer is a powerful, though expensive way to build a digital data acquisition system. Most portable computers will not accept a data acquisition card, so work is usually confined to a laboratory using a desk computer.

Many projects need only one channel of data, acquired at relatively high speed, and this project will satisfy that requirement at very low cost.

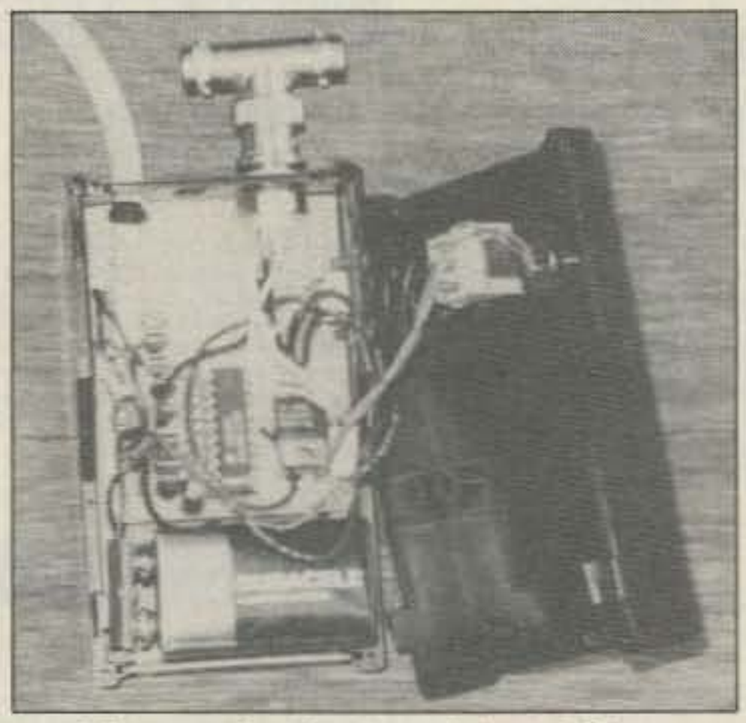

Photo A. Inside view of the A-D box.

Hacker Method

Another means of getting data into a computer is through the parallel printer port. This port is generally not used for anything but driving a printer, but like most things, it can be adapted (hacked?) to other uses. Data can be transferred much faster in parallel than in serial form.

There are three port addresses at the printer connector of IBM-compatible computers. At 378 (hexadecimal) is the 8-bit data word. This address is all that we'll discuss for now. Address 378 is LPT1, and most compatibles are configured in this manner. LPT2 is address 278 (hex). Some computers may be configured such that the data lines appear at address 3BC (hex); check your manual for the proper address for your system. Note that the BASIC program will have to modified for your computer system's port address if different than 378 (hex).

Printer connector pins 2–9 correspond to data bits 0–7. Pins 18–25 are grounded. If a pin is high, grounding that pin saturates the output driver and the logic state changes from 1 to 0. Communicating over the parallel port in this manner is easy, but it also inverts the conversion result. It's a simple matter to fix that in the software.

A-D Converter

An analog-to-digital (A-D) converter chip converts an analog value to its binary equivalent. The chip requires a reference voltage, against which the analog signal is compared. In most cases, the reference voltage is 5 volts, the same as the supply voltage.

The Data Bit output lines are numbered DB0–DB7. These lines are connected to pins 2–9 at the computer printer connector.

If the analog input voltage is zero, all eight lines will be low (0 volts), and the decimal value of the 8-bit data word will be zero. If the analog input is greater than or equal to the reference voltage, all eight lines will be high (5 volts), and the decimal value of the 8-bit data word will be 255. An 8-bit A-D converter has a maximum resolution of 256 (0–255 counts).

The amount of current required to drive the printer port of many computers is greater

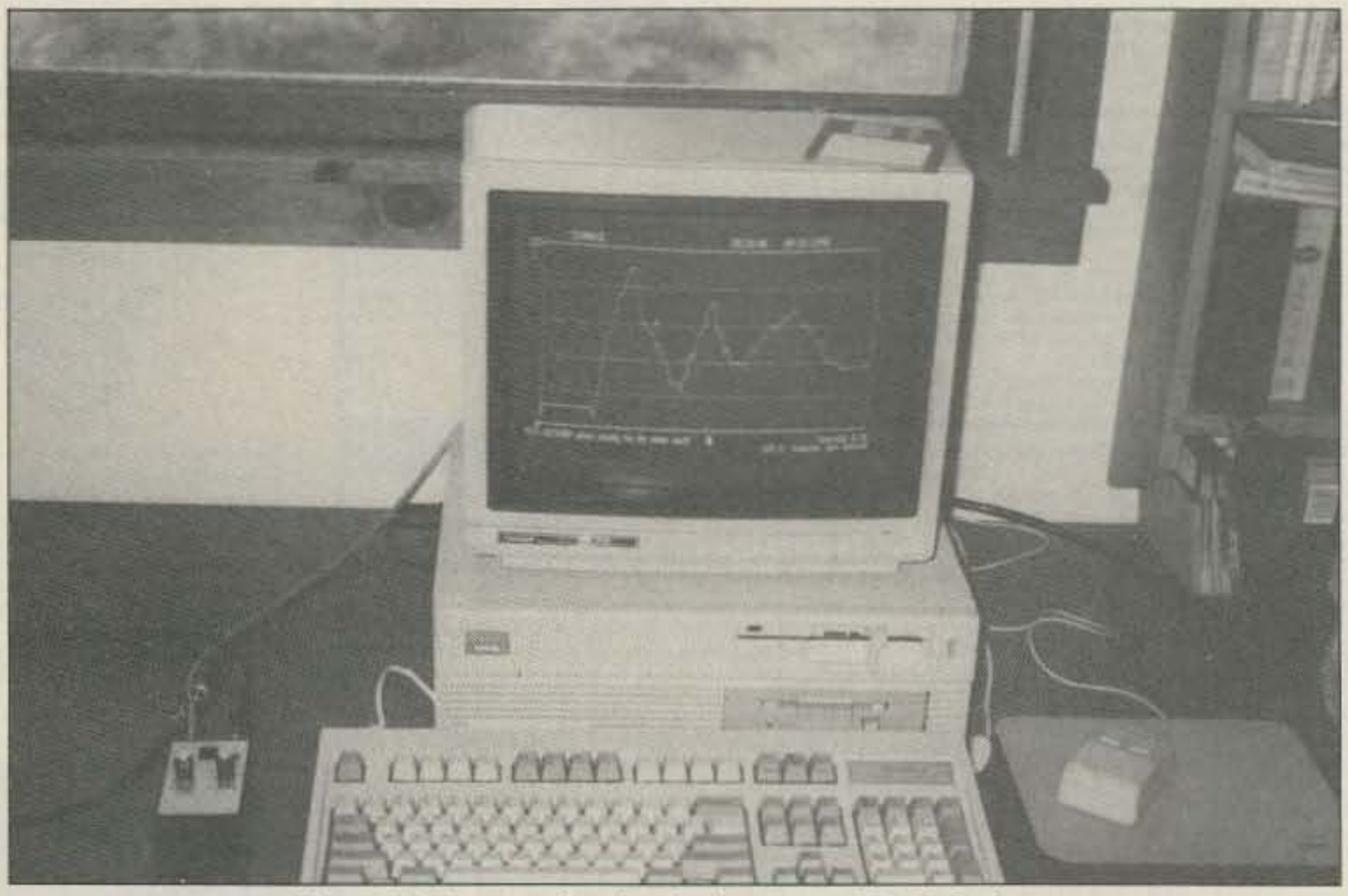

Photo B. The interface hooked up to an IBM PC clone.

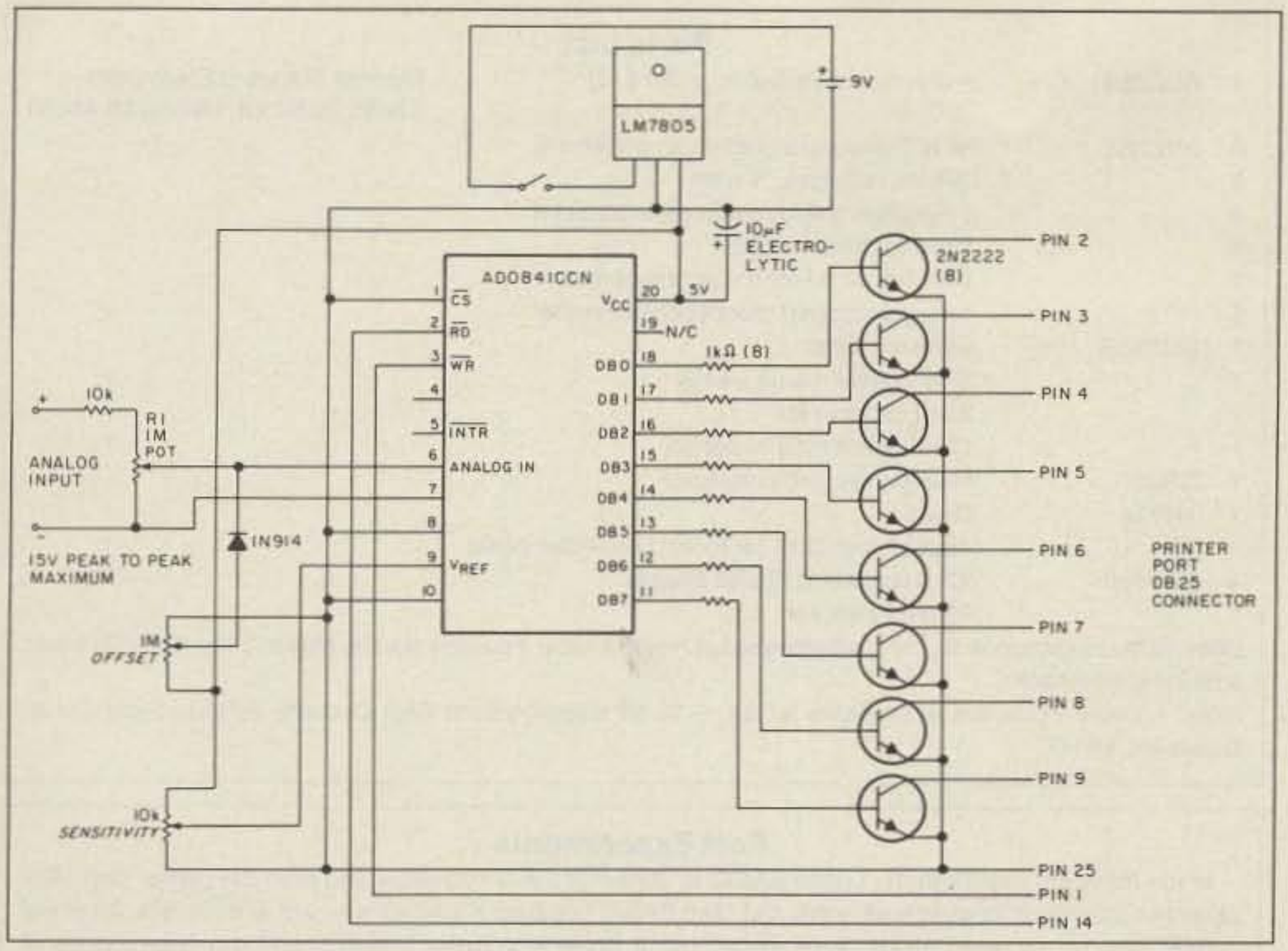

Figure 1. Schematic diagram of the interface.

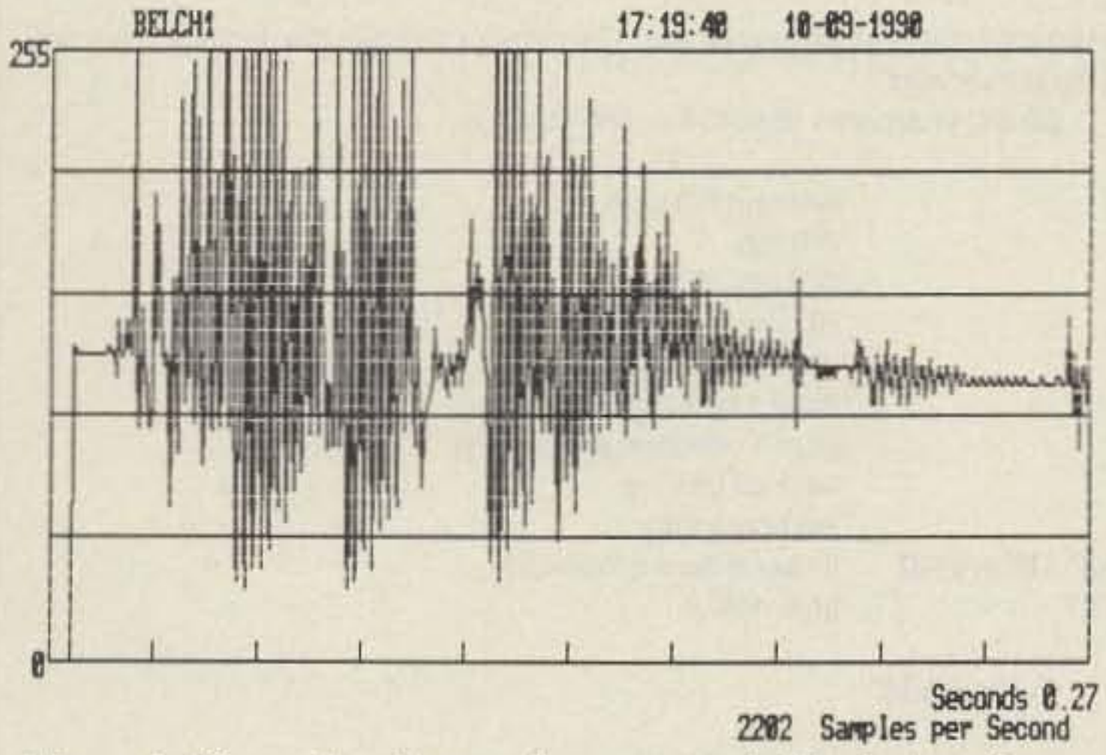

Figure 2. Unusual audio waveform as sampled by the interface.

than the A-D converter chip can handle, so external drivers are necessary. I chose common NPN transistors.

In addition to the data bit lines 0–7, two more lines from the printer connector are required. These control the A-D converter. They are found at address 37A (LPT1), 27A (LPT2) or 3BE on some computers. Pin 1 controls when the chip performs a write (WR), and pin 14 controls when the chip performs a read (RD). Both lines need to be set high initially, then WR is pulled low, which starts a conversion. After WR is asserted high, RD can be pulled low and the conversion result will appear at the output lines.

Precaution

Grounding any of the printer port pins 2–9 pulls the voltage below the threshold necessary for the computer to recognize a logic 1. The logic levels vary, but all are under 0.8 volts. Some computers are capable of driving very high loads, which means that the current required to pull the pin voltage below the logic level threshold could be as high as 60 mA per pin.

In testing five different computer brands, I have not found even one to be damaged by grounding these pins, but the drivers may get warm after a while. In order to protect the computer from any possible damage, the printer port should be held in a high state only long enough to read an input from the A-D converter. The software will accomplish this.

Once completed and working, the converter should not be connected to the computer for more than 10 to 20 minutes, unless the converter is off, the analog input is zero, or the software is running. The software program allows current to flow only long enough to read the port.

Construction

Since the component count is low, the circuit can be assembled on perfboard. The chip is static-sensitive, so mount a 20-pin socket to the board and install the chip only after assembly is complete and the wiring has been checked.

The sample rate is entirely dependent upon the speed at which the computer can toggle the WR and RD lines, and interrogate the printer port. The operation of this chip is described in greater detail in the *National*

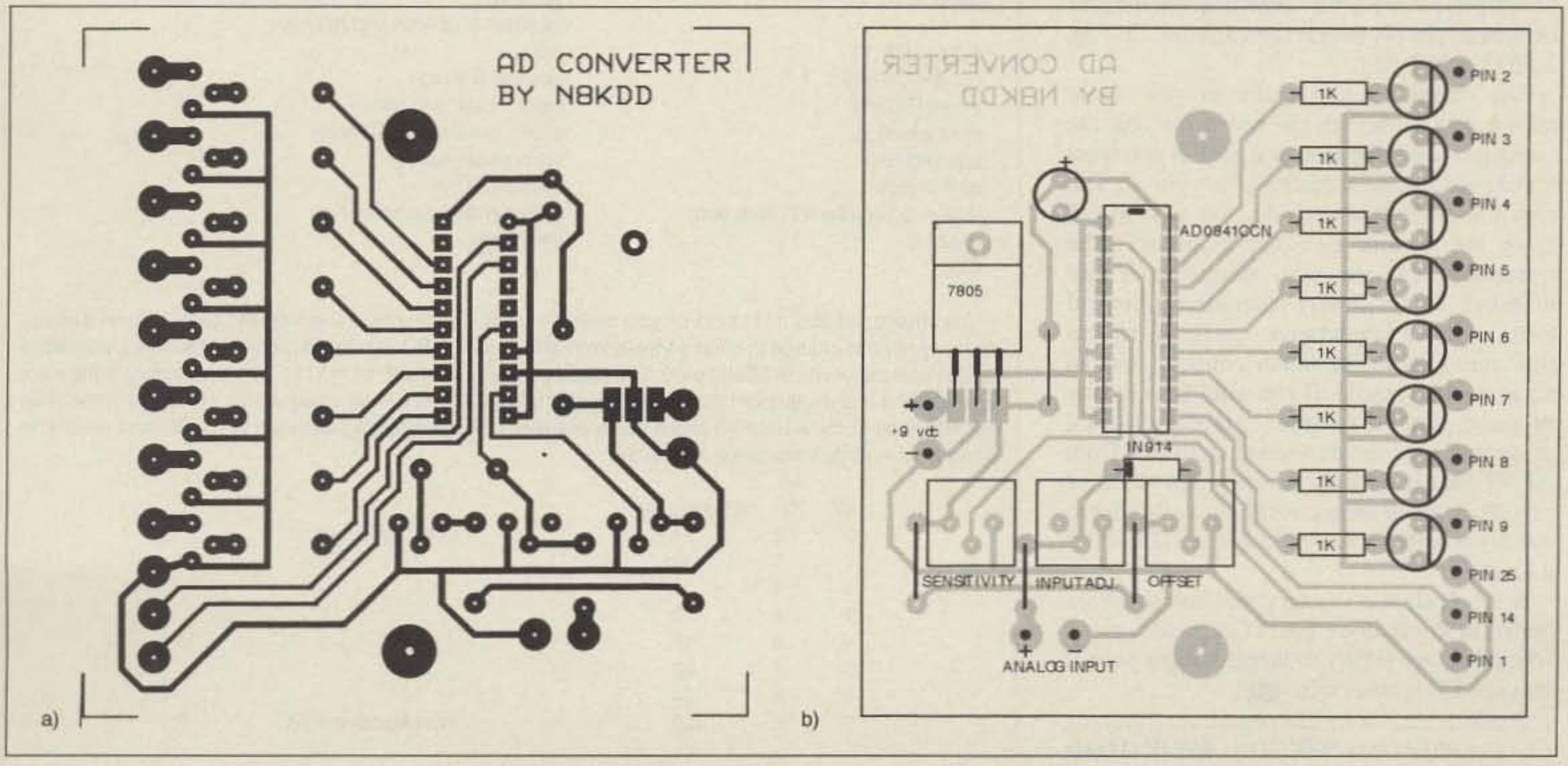

Figure 3 (a). PC board foil pattern. (b). Parts placement.

Semiconductor Linear Databook, Volume 2.

The A-D converter chip may be destroyed if more than 5.1 volts are applied to the input. R1 should be adjusted to divide the input voltage by three, so that there won't be any damage unless the input is greater than 15 volts. The offset and sensitivity potentiometers allow the instrument to measure bipolar inputs, and to measure low level signals with good resolution. If you measure only signals between 0 and 5 volts, all three pots may be eliminated.

Smoke Test

Make sure the power switch on the converter is off, then plug the DB-25 connector into the printer port on the computer. Load BASIC and add the following line to the program listed in the sidebar:

65 Y=255-Y.

(Since the NPN transistors cause a bit inversion, the bits must be inverted again in order to get representative data.) Now run the program listed in the sidebar.

Adjust the offset and sensitivity pots to midscale and turn the power switch on. The display will read something between 0 and 255, depending on where the pots are set. Turn the offset pot and watch the decimal value change.

Software Suggestions

The application possibilities are endless, and everyone has his own particular reason for getting analog information into his digital computer. An experienced Gizmologist should be able to build a custom program around the core program listed in the sidebar.

You can connect many different transducers to your new A-D converter. I have used these transducers with good results: audio, position, displacement, temperature, strain.

The software you write can convert the raw A-D counts to engineering units for you. If, for example, you have a position transducer which produces 5 volts when it is 100 percent extended, simply divide the variable "Y" by 2.55 (Y=Y/2.55).

The computer can make graphs while taking data, although the more you ask the computer to do, the slower it gets. If you want speed, acquire the data first, then plot it. The plot in Figures 2 were made with an IBM AT using the acquire-then-plot technique. The transducer was an audio amplifier. If you measure some slowly changing physical event such as temperature, program execution speed is not of much concern, but an accurate time base is. If you would like a copy of some general purpose, graphic-oriented programs, you can download them free from the *73 Magazine BBS* at (603) 525-4438 or send $6 to me at the address below. Be sure to specify whether you would like a 5.25 or 3.5 inch disk.

A 9 volt alkaline battery will last about six hours in continuous use. You could use a filtered power supply or larger battery pack if you need longer service. 73

Contact Mike Gray N8KDD at 465 W. Maple Rd., Milford MI 48381.

Parts List

1	ADC0841CCN	A-D converter (price is under $10)	Pioneer Standard Electronics, 13485 Stamford, Livonia MI 48150
8	2N2222	NPN Transistors (metal can preferred)	
8		1k ohm resistors, ⅛ watt	
1		1 megohm board mount potentiometer	
1		10k ohm fixed resistor	
1		10k ohm panel mount potentiometer	
1		1 megohm panel mount potentiometer	
1	LM7805	5 volt regulator	
1		SPST panel mount switch	
1		9 volt battery clip	
1		10 µF electrolytic capacitor	
1	DB25	Male printer port connector	
1	1N914	Diode	
		About 2 feet of 11 (or more) conductor cable	
1	276-150	IC circuit board (Radio Shack)	
1		20-pin IC socket	

(Most of these components can be purchased at Radio Shack. You may also be able to order the A-D chip at a local Radio Shack.)

Note: A blank PC board is available for $4 + $1.50 shipping from FAR Circuits, 18N640 Field Court, Dundee IL 60118.

Port Experiments

In the following experiments, I used BASIC to control the A-D converter and read the printer port. Any other programming language will work, but I like BASIC because it's so easy to use and explain. All of the *.EXE files for my applications were written using Borland's Turbo BASIC™, and the source code is available for those who want to write their own software applications. Turbo BASIC runs about eight times faster than BASIC interpreter.

The following program reads the bit status at the printer port. The monitor displays the decimal value and bit status of a byte read from the printer port.

BASIC Interpreter (BASICA or GW-BASIC)

```
10 OUT &H37A,12                          'WR and RD high
20 OUT &H37A,13                          'WR low
30 OUT &H37A,12                          'WR and RD high
40 OUT &H37A,14                          'RD low
50 OUT &H378,255                         'latch all bits high
60 Y=INP(&H378)                          'input 1 byte (variable y)
70 PRINT Y,BIN$(Y)                       'print Y (decimal and binary)
80 OUT &H378,0                           'latch all bits low
90 Q$=INKEY$                             'keyboard trap
100 IF Q$="q" OR Q$="Q" THEN END         'if user enters q then quit
110 FOR D=1 to 2000:NEXT                 'time delay
120 GOTO 10
```

Turbo BASIC

```
do
out &H37A,12                             'WR and RD high
out &H37A,13                             'WR low
                                         out &H37A,12 'WR and RD high
out &H37A,14                             'RD low
out &H378,255                            'latch all bits high
y=inp(&H378)                             'input 1 byte  (variable y)
print y,bin$(y)                          'print y (decimal and binary)
out &H378,0                              'latch all bits low
q$=inkey$                                'keyboard trap
if q$="q" or q$="Q" then end             'if user enters q then quit
delay .5                                 'time delay
loop
```

You should see 255 11111111 on your monitor. If not, double check the program code and run it again. You may need to change the port address from &H378 to &H3BC. While the program is running, connect a jumper wire between pin 25 and pin 9. The display will now read 127 01111111. The left-most bit is the most significant. It has a value of 128. Connect pin 25 to pin 2. The decimal value is now 254. Pin 2 is the least significant bit of the 8-bit word and it has a value of 1. Try connecting each pin to pin 25, and watch the display. You will see this pattern develop:

Bit	Pin	value (bit high)	
0	2	1	least significant bit
1	3	2	
2	4	4	
3	5	8	
4	6	16	
5	7	32	
6	8	64	
7	9	128	most significant bit

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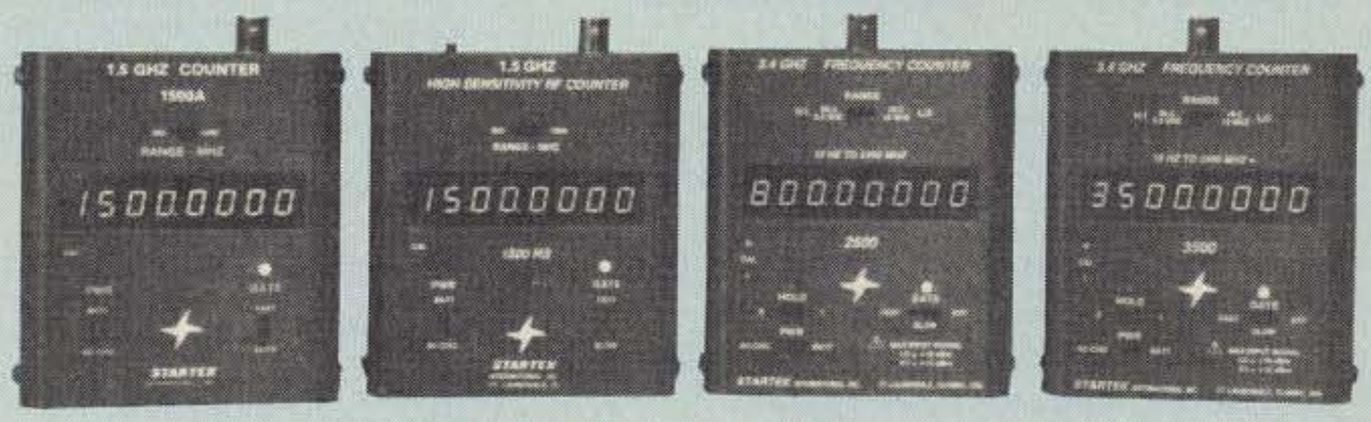

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#AC-15	110 VAC adp/chgr for 1500A	9.00

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#TA-90	Telescoping BNC antenna	12.00
#RD-800	800 MHZ Rubber Duck-BNC	29.00
#CC-90	Black vinyl zipper carry case	12.00
#DC-690	12VDC Auto adaptor/charger	9.00

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#LP-22	Probe, Low Pass/Audio use with 2500 & 3500. Attenuates RF noise.	$22.00
#P-110	Probe, freq counter or scope use, 1X, 10X. 200 MHZ scope use.	39.00

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CIRCLE 247 ON READER SERVICE CARD

Software for the Ham Shack, Part IV

Useful ham calculations you can program yourself!

by Bill Clarke WA4BLC

This is the fourth, and last, part of this series of articles. The Ham System has grown to be quite capable of saving time and aggravation for the user.

Let's add the last modules to the system. This month the MAIN MENU will grow to nine choices. Added will be:

8 - RESISTOR COLORS TO OHMS
9 - AIR COIL INDUCTANCE

Module Eight

Last month, you added module seven, which gives you the resistor color codes when you enter the value of ohms required. This month, with module eight, you get to do the reverse: Enter the color codes and get the value in ohms.

Module Nine

Have you ever looked in the junk box and come up with an air-wound coil of unknown value? This last module asks for the physical dimensions of the coil, then gives you its value in microhenries. No more unknown coils!

Entering the Listing

Before you add program lines from this month's listing, you must first LOAD "HAM3". After it is loaded, LIST it. Then you are ready to start typing in the new material.

After you have completed typing in all the lines, save it under the name HAM4.

Using the New Program

LOAD the new program by typing LOAD "HAM4" and pressing ENTER. When the computer signals READY on the screen, type RUN and press ENTER.

The next thing you should see is the MAIN MENU for your new Ham System. It should show nine selections: ANTENNA DESIGN MATH, TRANSMISSION LINE MATH, OHM'S LAW, POWER FORMULAS, EFFICIENCY FORMULA, RADIO HORIZONS, OHMS TO RESISTOR COLORS, RESISTOR COLORS TO OHMS, and AIR COIL INDUCTANCE.

Clone users, put GWBASIC on a disk and add this handy batch file to start your system: At the DOS prompt type:

```
A> COPY CON HAM4.BAT
     ECHO OFF
     CLS
     GWBASIC HAM4
     (function key F6)
```

Press ENTER after each line.

C-64 Modifications

C-64 users remember the modifications listed in Part 1 of this series and the following:

Replace the listed lines as follows:

```
810 INPUT "FIRST BAND COLOR ";F$
811 INPUT "SECOND BAND COLOR";S$
812 INPUT "THIRD BAND COLOR ";T$
831 PRINT "THE  RESISTOR VALUE IS:"
832 PRINT F$S$T$" OHMS"
910 INPUT "DIAMETER IN INCHES: ";D
911 INPUT "LENGHT IN INCHES:   ";L
912 INPUT "NUMBER OF TURNS:    ";N
921 PRINT "INDUCTANCE = "FNA(L)" MICRO HENRYS"
```

HAM4 Listing

```
21 PRINT SPACE$(26);"8 - COLOR CODES TO OHMS"
22 PRINT SPACE$(26);"9 - AIR COIL INDUCTANCE"
39 IF M$ = "8" THEN 800
40 IF M$ = "9" THEN 900
800 CLEAR : CLS
801 PRINT SPACE$(25);"RESISTOR COLOR CODES"
802 PRINT SPACE$(20);"----------------------------"
803 PRINT : PRINT : PRINT
810 INPUT "ENTER THE COLOR OF THE FIRST BAND ";F$
811 INPUT "ENTER THE COLOR OF THE SECOND BAND";S$
812 INPUT "ENTER THE COLOR OF THE THIRD BAND ";T$
820 X$ = F$
821 GOSUB 850
822 F$ = A$
823 X$ = S$
824 GOSUB 850
825 S$ = A$
826 X$ = T$
827 GOSUB 870
828 T$ = A$
830 PRINT : PRINT : PRINT
831 PRINT "THE RESISTOR VALUE IS: "F$S$T$" OHMS"
832 PRINT
840 PRINT "N - TRY AGAIN"
841 PRINT "M - MAIN MENU"
842 M$ = INKEY$
843 IF M$ = "N" THEN 800
844 IF M$ = "M" THEN 10
845 GOTO 842
850 IF X$ = "BLACK" THEN A$ = "0"
851 IF X$ = "BROWN" THEN A$ = "1"
852 IF X$ = "RED" THEN A$ = "2"
853 IF X$ = "ORANGE" THEN A$ = "3"
854 IF X$ = "YELLOW" THEN A$ = "4"
855 IF X$ = "GREEN" THEN A$ = "5"
856 IF X$ = "BLUE" THEN A$ = "6"
857 IF X$ = "VIOLET" THEN A$ = "7"
858 IF X$ = "GRAY" THEN A$ = "8"
859 IF X$ = "WHITE" THEN A$ = "9"
860 RETURN
870 IF X$ = "BLACK" THEN A$ = ""
871 IF X$ = "BROWN" THEN A$ = "0"
872 IF X$ = "RED" THEN A$ = "00"
873 IF X$ = "ORANGE" THEN A$ = ",000"
```

Continued on page 36

Radio Fun

If you were one of the smart ones, your subscription to *Radio Fun* began with the premier summer issue. If you waited, you're too late. The premier issue sold out in three weeks.

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02H

73 Review *by Bill Brown WB8ELK*

The TAPR METCON-1 Kit

Add telemetry and control to your packet station.

Tucson Amateur Packet Radio (TAPR)
P.O. Box 12925
Tucson AZ 85732-2925
Tel. (602) 749–9479
FAX: (602) 749–5636
Price Class: Main Board, $85;
V-to-F Converter, $25; Temperature Board, $30.

How would you like to have the ability to read sensors or control circuitry from a remote location via packet radio? Thanks to a new kit from the folks at TAPR (Tucson Amateur Packet Radio), it's now easy to take full advantage of advanced packet control.

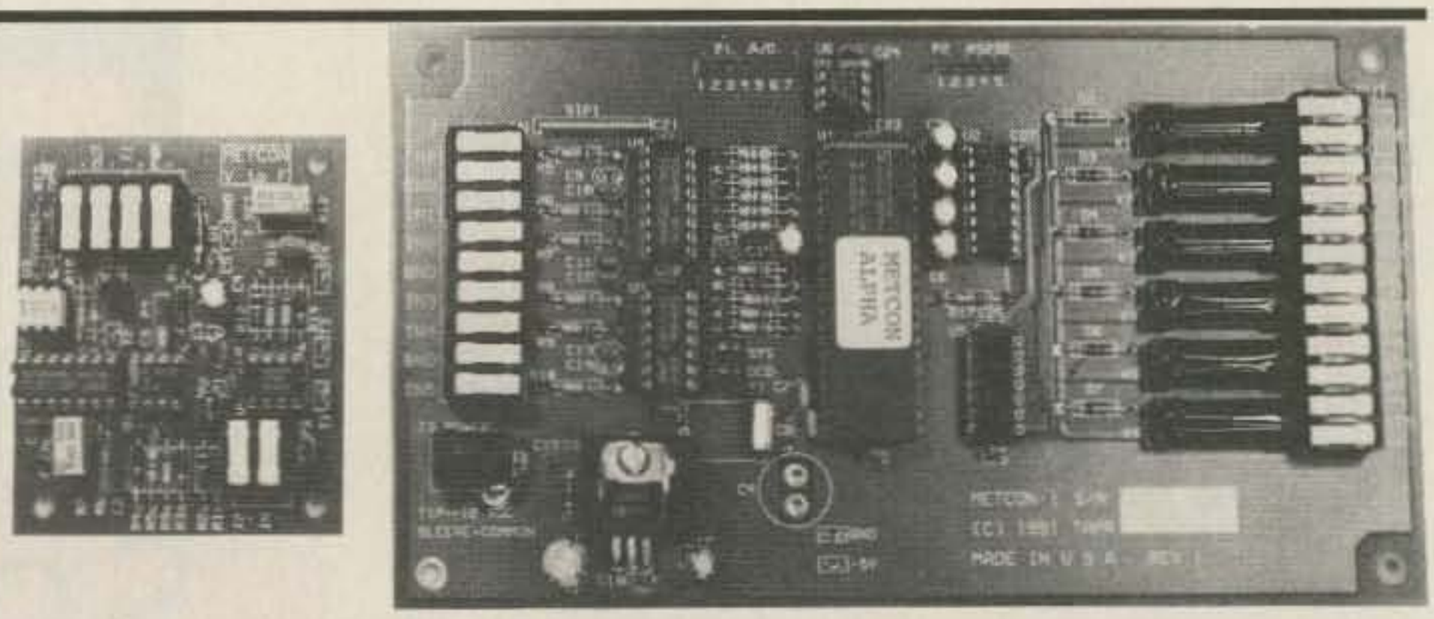

Photo. The assembled TAPR METCON-1 telemetry and control unit. The smaller PC board to the left is the optional V-to-F interface board.

Packet Telemetry

The METCON-1 kit (TeleMETry CONtrol) is a versatile telemetry/control unit that uses a serial port for communications. You can send commands to the METCON-1 board via a computer serial port, telephone modem or a packet TNC.

The METCON-1 board simply hooks up between a packet TNC's serial port and the circuits you want to control or sense.

One of the most obvious uses for the METCON-1 board would be in a remote repeater installation. Useful information such as building temperature, amplifier temperature, backup battery voltage, and AC power status can be easily sent back at fixed intervals (or upon a connect request). You can also use the METCON-1 to turn on transmitters, lights, amplifiers, antennas, and just about anything else that can be activated by a relay.

The METCON-1 board also looks at the status of binary inputs. Whenever it detects a change in one of these lines it automatically sends out a status message. I use this feature as an intruder alert in my installation. I hooked up the METCON-1 to a micro-switch that closes whenever anyone opens the hamshack door! Since the METCON-1 has a built-in clock, it actually sends me a timestamp of the event (I know exactly when the door was opened!). Not only can the unit detect "On/Off" transitions on its six inputs, it can measure frequency as well (0 to 10 kHz).

Kit Assembly

The kit comes complete with all components as well as a high quality doubled-sided PC board. An optional voltage-to-frequency interface board is also available. Component placement is well-marked and silk-screened onto each board to make assembly a real breeze.

Construction was quite straightforward and went easily. The assembly instructions were excellent, with every step spelled out in detail. The checklist format helps ensure that you don't miss a step or component. Since this is a double-sided board with plated through-holes, it's important to take care in assembly. Removing components from a double-sided board could be difficult.

Sockets are provided for all ICs. I particularly like the connectors used for interfacing to the outside world. You just slide a wire into the hole and hold it in place with a snap lever (no soldering!). This scheme also makes it easy to quickly change your external wiring (particularly useful when you're at a remote repeater site).

Installation

The METCON-1 board communicates via its serial port. You can use a telephone modem, computer serial port, or a packet TNC to send commands and receive data. In a typical packet hookup, you just connect the METCON-1 to your packet TNC's serial port and hook up the items you want to control to any of the six onboard relays. The six inputs to the METCON board can be used as "On/Off" detectors. These inputs can also function as a frequency counter which allows use of a voltage-to-frequency interface board.

The V-to-F Interface

Through the use of the optional V-to-F (voltage to frequency) board, sensors can be interfaced to the METCON-1. Any device that outputs a voltage between 0 to 10 volts (when configured for low input range) or 0 to 100 volts (high input range) can be measured. You can also configure the V-to-F board to function as a temperature sensor. Each V-to-F board hooks up to one of the input ports of the METCON-1 board. You just read out the frequency on the main memory map output. In the case of voltage, just divide the frequency by 10. To get temperature readings you must divide by 10 and then subtract 100.

The voltage-to-frequency scheme has some intriguing advantages over traditional A-to-D (analog to digital) converters. Since the voltage level is converted to a frequency directly at the source, it doesn't suffer from voltage drops or noise when using long wire leads from a sensor. The drawback to this method is that it takes a full second for each sample (each channel). For most applications this is more than sufficient. However, you can plug an optional ADC (analog-to-digital converter) directly into the METCON board if you desire. The ADC board is a future option that is not currently available.

Operation

Commands to the METCON-1 are performed in individually addressed bits or bytes. Each area of the METCON's memory contain specific locations for input and output status, frequency counter output, system configuration and A/D conversions. You can display a memory location, write to it or reset it. All commands are preceded by an "=" sign and a METCON station address (in case you have more than one METCON board in your system—The default address is "A").

```
-A- SUN/910624/0556/00 AUTO TIMEOUT FOR MEMORY DISPLAY

   P6          P5          P4          P2          P0
0000 0000   0000 0000   0000 0000   0000 0001   0000 0000   OUT   (08 07 06 05 04)
0000 0000   0000 0000   0000 0000   0000 0001   1101 1110   IN    (0D 0C 0B 0A 09)
0000 0000   0000 0000   0000 0000   0000 0001   1111 1111   CHG   (12 11 10 0F 0E)

  7      6      5      4      3      2      1      0
00000  00000  00000  00000  00000  00000  00000  01253  FREQ CTRS

 7    6    5    4    3    2    1    0
255  255  255  255  255  255  255  255  ADC

-A- MEMORY DISPLAY COMPLETE
```

Figure 1. The METCON-1 memory map can be sent out every 15 minutes (or every minute) for testing. Output port P2 shows that relay 0 is activated, input port P0 shows a closed circuit on input 6 and the frequency counter indicates a temperature of 25.3°C.

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module
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METCON-1 KIT

Continued from page 34

For example: The memory address for the six relay outputs is location number 05. To turn on relay 1, you send the command "=AS050". The "S" is the set command, the "05" is the memory address, and the "0" is the relay number. To turn off the relay, you just need to send the clear command: "=AC050". If you want to look at the memory location, the command is "=AD050" ("D" for display). That's really all there is to it. If you want to turn on or off several relays, you can send a byte write command that sets all of the control bits in one operation. Example: "=AWY050F" turns on relays 0,1,2 and 3 simultaneously, since the "0F" address sets the lower 4 bits "On".

For repeater or remote base control, the password feature adds a level of security. You can set up certain portions of memory as restricted. In this mode, you need to logon to the METCON-1 with a password in order to perform control operations.

Impressions

I have the METCON-1 installed in the W2NSD/1 hamshack. It's hooked up to a 10 meter CW beacon transmitter, a low-power 2m FM transmitter, an ATV transmitter, a TV camera, and lights. Whenever I want a signal source on ATV, 10 or 2 meters, I just connect up on packet and have a blast turning the equipment on and off remotely. I use the inputs to measure the shack temperature as well as to indicate when the shack door is opened.

Sure, I could've done part of this with a touch-tone decoder, but the METCON-1 system allows me to control things error-free, as well as provide real-time telemetry.

The review unit was the preliminary version of METCON-1 (Alpha Test). I found the assembly instructions to be very complete and easy to follow. For those of you with the preliminary manual, you may have to dig around a bit to understand how all of the commands work, however. Once you figure out how the memory addresses are configured, you'll be well on your way to controlling things.

To some extent, you do have to decipher the values presented to you in the memory map. The METCON-1 board won't come right out and tell you "The Temperature is:" or "Battery voltage =." Once you have figured out the memory map, you can easily read your system's status.

For those hardware and software hackers out there, there is room to add a substantial amount of I/O capability to this system. There is provision for a fast upload and download of the system memory. You could write a program to display this information in graphics form for a really spectacular display in an easy-to-read format.

The METCON-1 system is a powerful and economical tool for anyone considering remote control applications. You'll probably wonder how you got along without it! 73

Hamshack Software

Continued from page 32

Listing continued

```
874 IF X$ = "YELLOW" THEN A$ = "0,000"
875 IF X$ = "GREEN" THEN A$ = "00,000"
876 IF X$ = "BLUE" THEN A$ = ",000,000"
877 IF X$ = "VIOLET" THEN A$ = "0,000,000"
878 RETURN
900 CLEAR : CLS
901 PRINT SPACE$(26);"AIR COIL INDUCTANCE"
902 PRINT SPACE$(20);"----------------------------"
903 PRINT : PRINT : PRINT
910 INPUT "ENTER THE COIL DIAMETER IN INCHES: ";D
911 INPUT "ENTER THE COIL LENGTH IN INCHES:   ";L
912 INPUT "ENTER THE NUMBER OF TURNS OF COIL: ";N
915 A = (D*D)*(N*N)
916 B = (18*D)+(40*L)
917 L = A/B
918 GOSUB 390
920 PRINT
921 PRINT "THE INDUCTANCE IS: "FNA(L)" MICRO HENRYS"
930 PRINT
931 PRINT "N - TRY AGAIN"
932 PRINT "M - MAIN MENU"
933 M$ = INKEY$
934 IF M$ = "N" THEN 900
935 IF M$ = "M" THEN 10
936 GOTO 933
```

When you want to use HAM4, just place the disk into the drive and type "HAM4", then press ENTER. GWBASIC will execute, and HAM4 will load and run. The bottom light bar will be extinguished, leaving a very professional appearing menu.

Comments

The system has grown over the past few months. I sincerely hope you find it as useful as I found it fun to write. If you would like for the system to grow more, write me. I would consider doing an update from time to time.

For readers not wishing to type in the many lines of program code that have appeared in this series, I will make copies. The cost is $5, which includes the disk, copying, and shipping. SPECIFY CLONE OR C-64. Write to me at the address below. Also, each module as well as the complete program can be downloaded from the *73* BBS at (603) 525–4438. Look for the listings under the *73mag* SIG. 73

You may write Bill Clarke WA4BLC at RD#2 Box 455-A, Altamont NY 12009. Please enclose an SASE for a reply.

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Universal CAT Interface

Control your rig with your computer!

by Art Harding K5YEF

Many of us got excited in the early '80s when microprocessor radios appeared on the market. This heralded the beginning of the patching together—"interfacing"—of personal computers and amateur radio equipment. This offered the promise of menu-driven radio operation, vastly increased and enhanced memory, complete rig status display on the computer monitor—and the imagination went wild.

But there is a hitch—many computers and microprocessor rigs can't "talk" to each other directly. Most rigs want to converse with Transistor-Transistor Logic (TTL) bit transfer levels between 0 and +5 volts, but most of our computers demand that the digital dialogue go along RS-232C levels, which are from −12 to +12 volts. Commercial interface units mean more bucks, and, well, someday maybe we'll get around to creating one. And so for many of us, the rig and the computer remained separate. *[Ed. Note: Many modern rigs have a computer control port. They are known as Computer Accessed Transceivers (CAT)].*

Birth Of The Project

For me, "someday" finally came. After operating Yaesu's FT-980 HF radio for several years, the itch for CPU control got too strong, and I set forth to design and build the interface.

What follows is a solution, not just for the IBM and FT-980, but for any computer with an RS-232 serial port and a CPU radio with a TTL port. You can keep it simple on a breadboard or you can build up a permanent black box for full-time operation.

Digital Transfer

Figure 1a shows a random RS-232 waveform coming from a computer's serial port. The waveform needs to be converted to TTL levels for the radio. Note that the signal is inverted at the TTL port from whence it came. It could have been left in phase, and the software signals programmed to make 1's into 0's and vice versa. But this step can be eliminated by the hardware, and that's the course I took, preferring to keep the software simple.

In Figure 1b, the reverse takes place. Many radios send back command echoes, confirmation and status signals, for the computer to process. Again, an inverting action is desirable.

Refer to Figure 2, a portion of the FT-980 schematic for the CPU section. Note that any interface circuit must deliver its output data

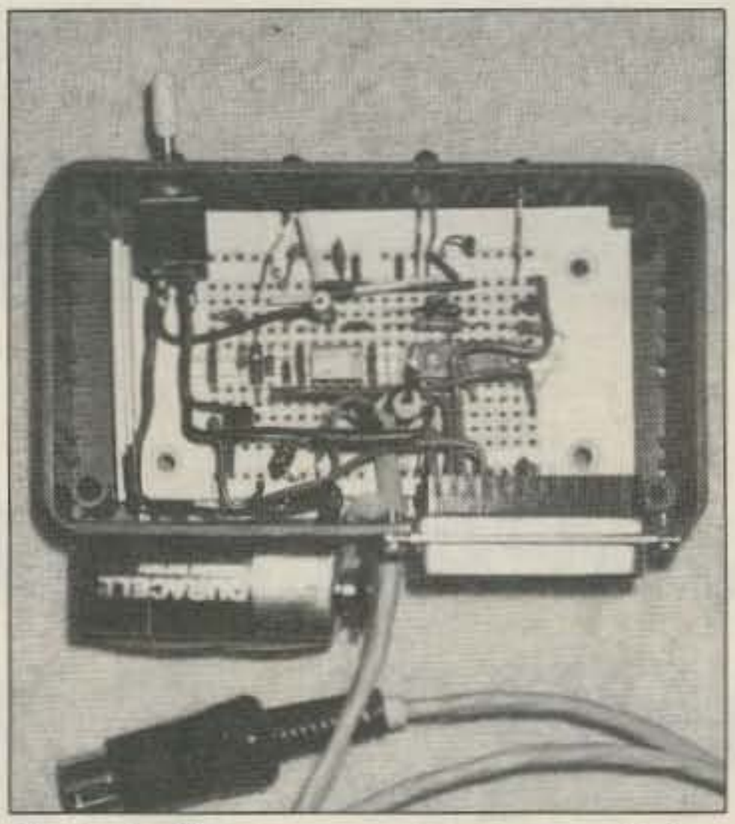

Photo A. The components were mounted on an Experimenters Socket which fits neatly into a case available from Radio Shack (no soldering!).

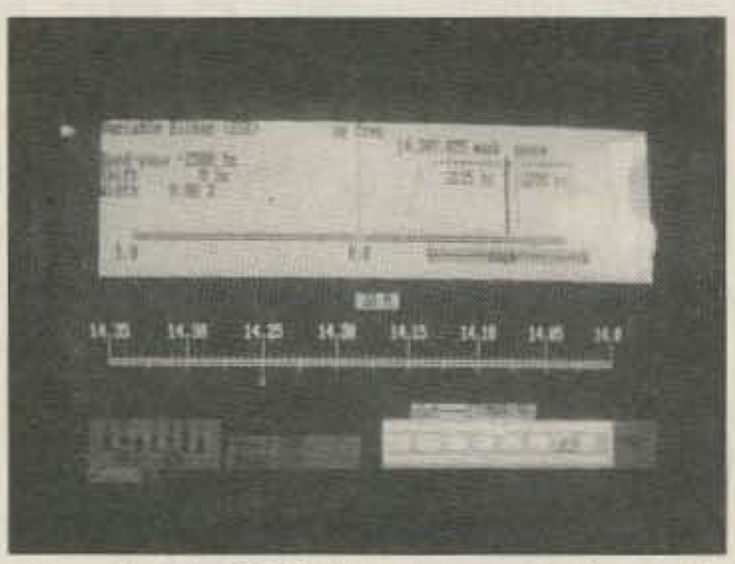

Photo B. The CAT980 program display. This full-featured program is available from the author as shareware (see the Parts List for details).

stream into a load of at least 165 ohms (330/2)! However, the serial data stream out of the radio is a stiff NPN switch, a nice signal to work with.

I could not get my hands on all microprocessor-controlled radios, of course, but on-the-air surveys indicated that the FT-980 radio is a good test bed for circuit development for other CPU radios on today's market. So, even if you're not dealing with this specific configuration, it's worth it to read on!

A Simple Interface Circuit

The result is the circuit shown in Figure 3. An old friend, U1, an LM324 quad op amp, does the job with two of its amps still unused. U1a acts as an inverting, saturating differential voltage comparator with a Schmitt trigger personality, and U1b does the same thing in the reverse direction.

They are not identical circuits, however. U1b drives the TTL input to the radio, the low 165 ohm load mentioned above. The idea is to only draw serious power when the negative going or "ground" level pulses occur. As the RS-232 pulse from the computer goes positive on pin 2 of the input connector, the output is driven negative through R7 and D2. D3 clamps the pulse so that it just stays above ground level, yet low enough to be read as a zero TTL signal. The negative input pulses, or static state (no commands being sent to the radio), draw minimum current from the power source.

U1a doesn't have quite the demand on it to perform its function of converting TTL signals from the radio to the computer. R1 was originally 18k during software development, and that value seems to work fine for IBM and compatibles. When I used a laptop, I found more drive was needed. I settled on a value of 3.3k, which has worked with all computers used to date.

Figure 3 shows you all that you will need to breadboard a no-frills interface in order to try some of your programming ideas. You can easily put it all on a Radio Shack Experimenter Socket (RS 276-175), and use cable ties to hold down the interconnecting cables to the breadboard. *[Ed. Note: The Radio Shack prototype board is an excellent way to quickly build circuits without any soldering.]* I used this circuit for eight months during

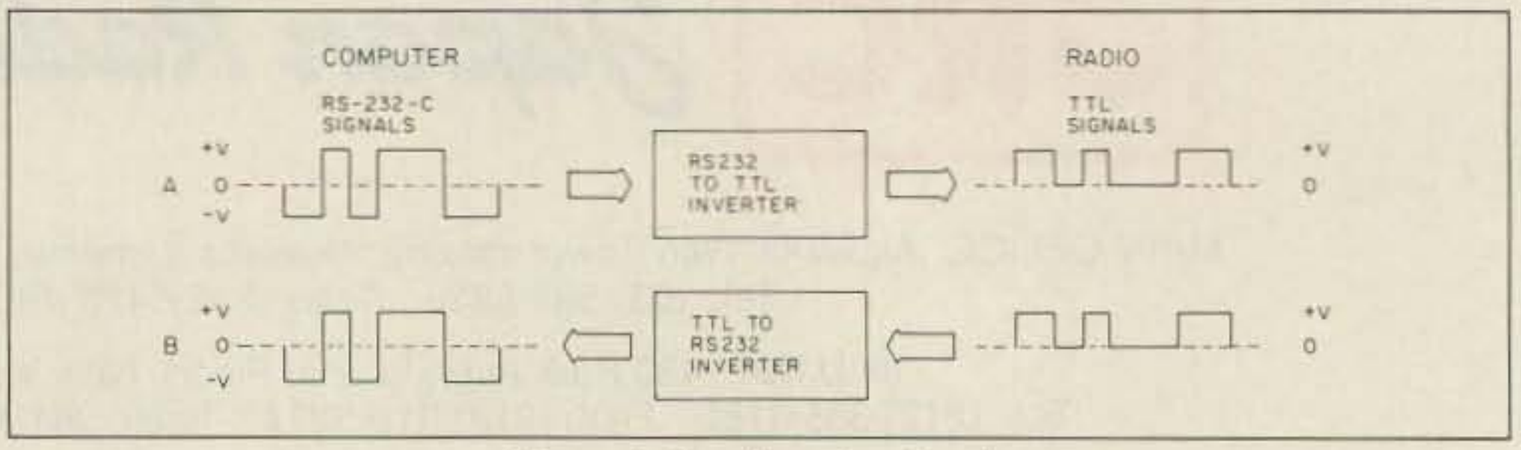

Figure 1. Interface signal path.

If you always thought a microprocessor-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

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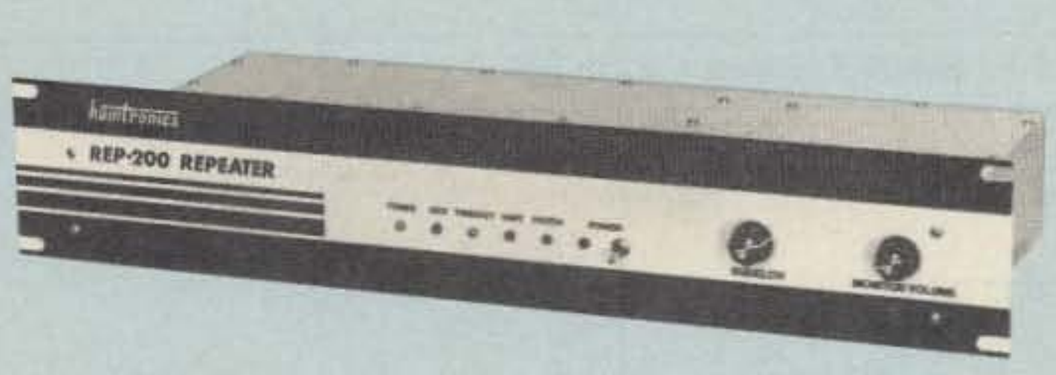

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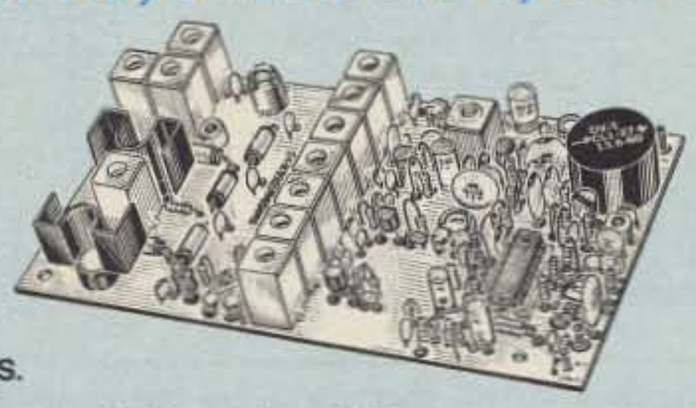

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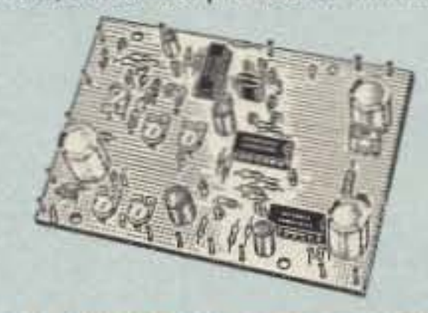
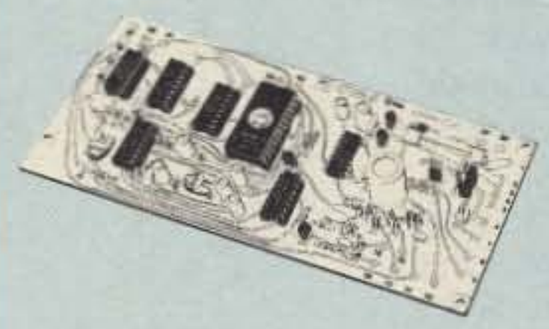
ACCESSORIES

TD-3 SUBAUDIBLE TONE DECODER/ENCODER kit. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions $24



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

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

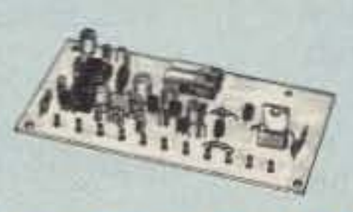


COR-4 kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call $99

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! $79

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std .$79

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

DE-202 FSK DEMODULATOR kit. For receive end of link. $39

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FEATURES:

- **Very low noise:** 0.7dB vhf, 0.8dB uhf
- **High gain:** 13-20dB, depends on freq
- **Wide dynamic range** - resist overload
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**Specify tuning range: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

LNW-(*) MINIATURE GaAs FET PREAMP

***ONLY* $24**/kit, **$39** wired/tested

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

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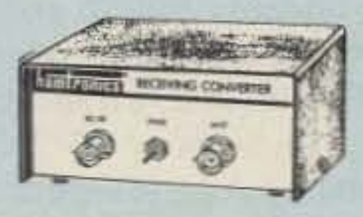

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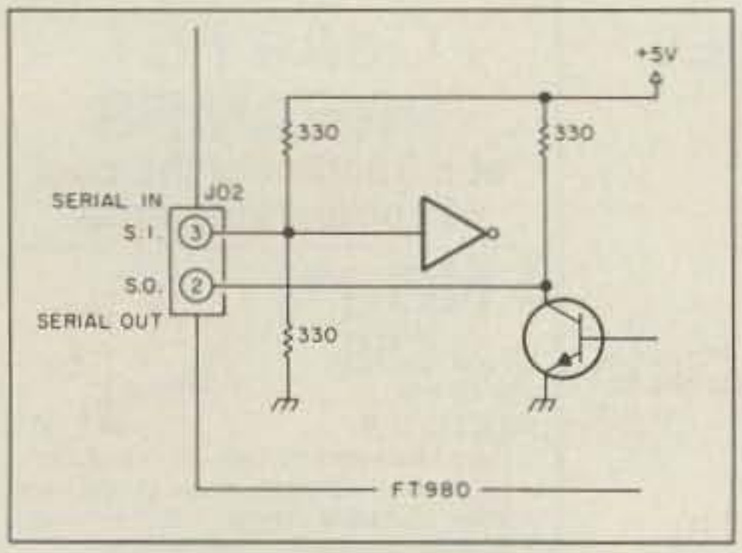

Figure 2. FT-980 CAT typical port circuit (part of the radio).

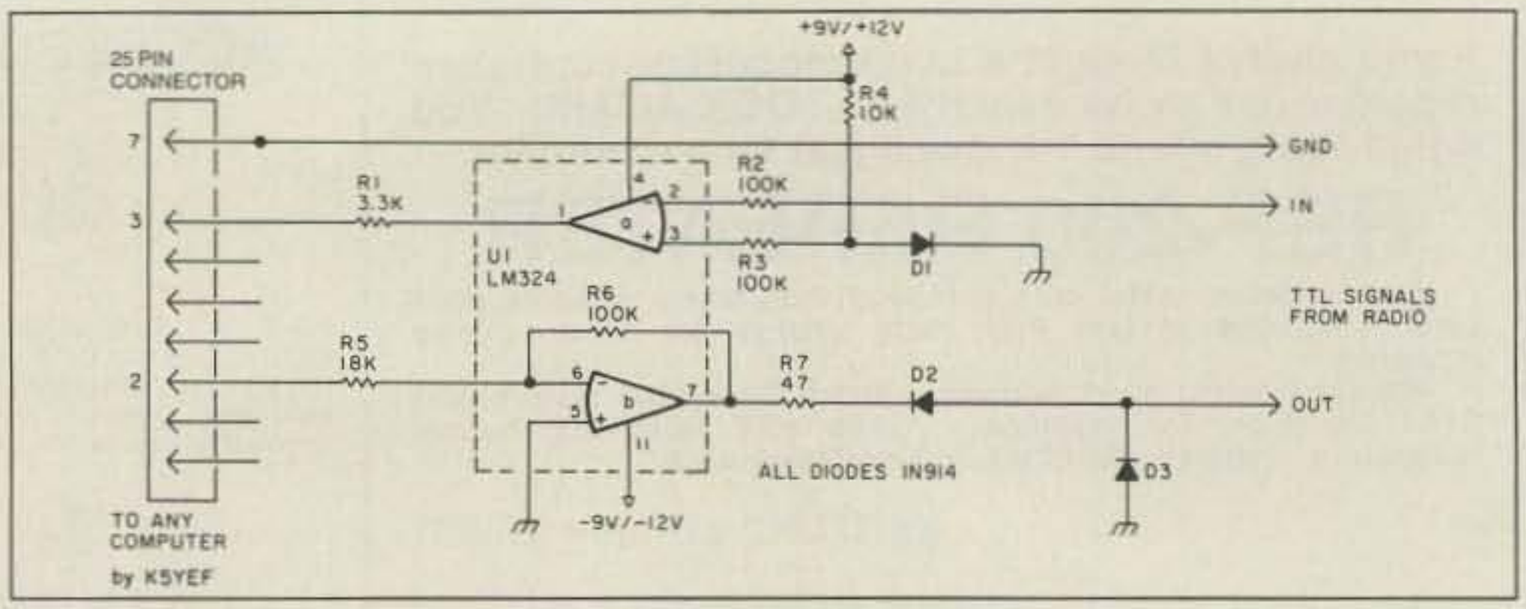

Figure 3. Simple CAT interface.

software development, with a power source of two 9 V batteries, which I switched in and out as needed.

A Deluxe Interface

When the last line of code was written (though we who write code know that no such time ever comes!) and a couple of operating months went by, I wanted a permanent black box with only one battery to mess with. Or maybe no battery at all! Figure 4 shows the results. In the final version, I added a number of refinements, which we'll examine.

It seemed most desirable to have a visual handle on the operation of the interface, some lights that showed what was going on. When writing software and dealing with a computer port, the nagging question often is: Did that command go out the port like it was supposed to? By replacing D2 in Figure 3 with an LED, not only is this question put to rest, but the same LED also signals the transition of the command to a TTL level. When serial positive-going pulses output the computer port, D2 will light up as U1B, making the signal negative-ground going.

The addition of R10 and LED D4 serves the same function for inputs to the computer after TTL to RS-232 transition. A new diode, D5, blocks negative RS-232 levels from the computer, yet passes the all-important positive-going levels.

I have added a new circuit consisting of Q1, D6, D7, R5, and R9, to control a radio key line with a computer. I chose the RTS line in the computer port to key the radio. A positive signal on this line saturates Q1 and grounds pin 4 of the 6-pin DIN radio connector that keys the rig. Note that D6 is also an LED, so the operator has a visual on-the-air light. This is optional, but the odds are you're also going to want to key your radio from the keyboard. You may wish to omit this portion of the interface if you plan to key the radio as you normally do, such as for VOX operation.

The last enhancement, shown in Figure 4, is a negative voltage supply for the interface, so that you need only one battery or positive

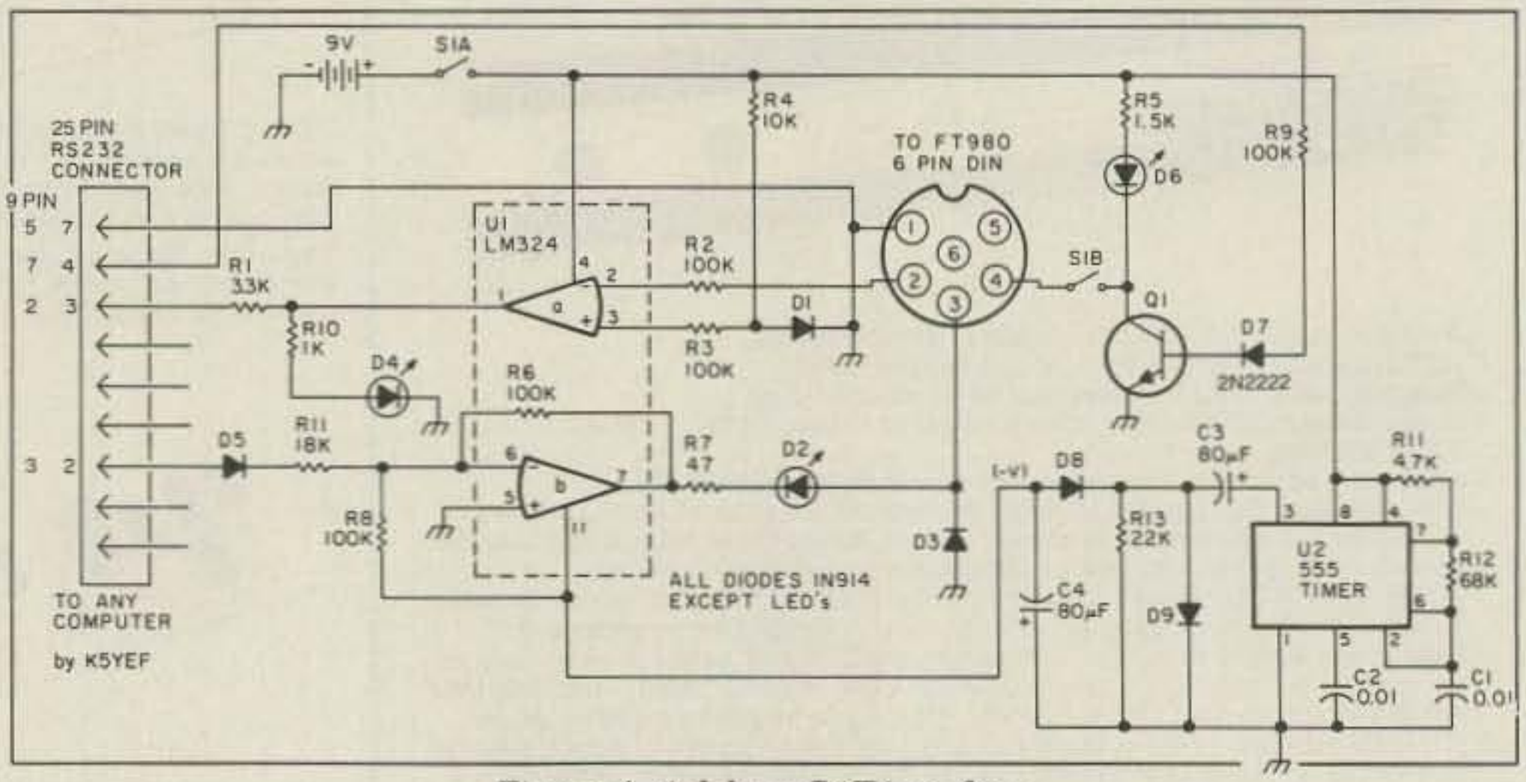

Figure 4. A deluxe CAT interface.

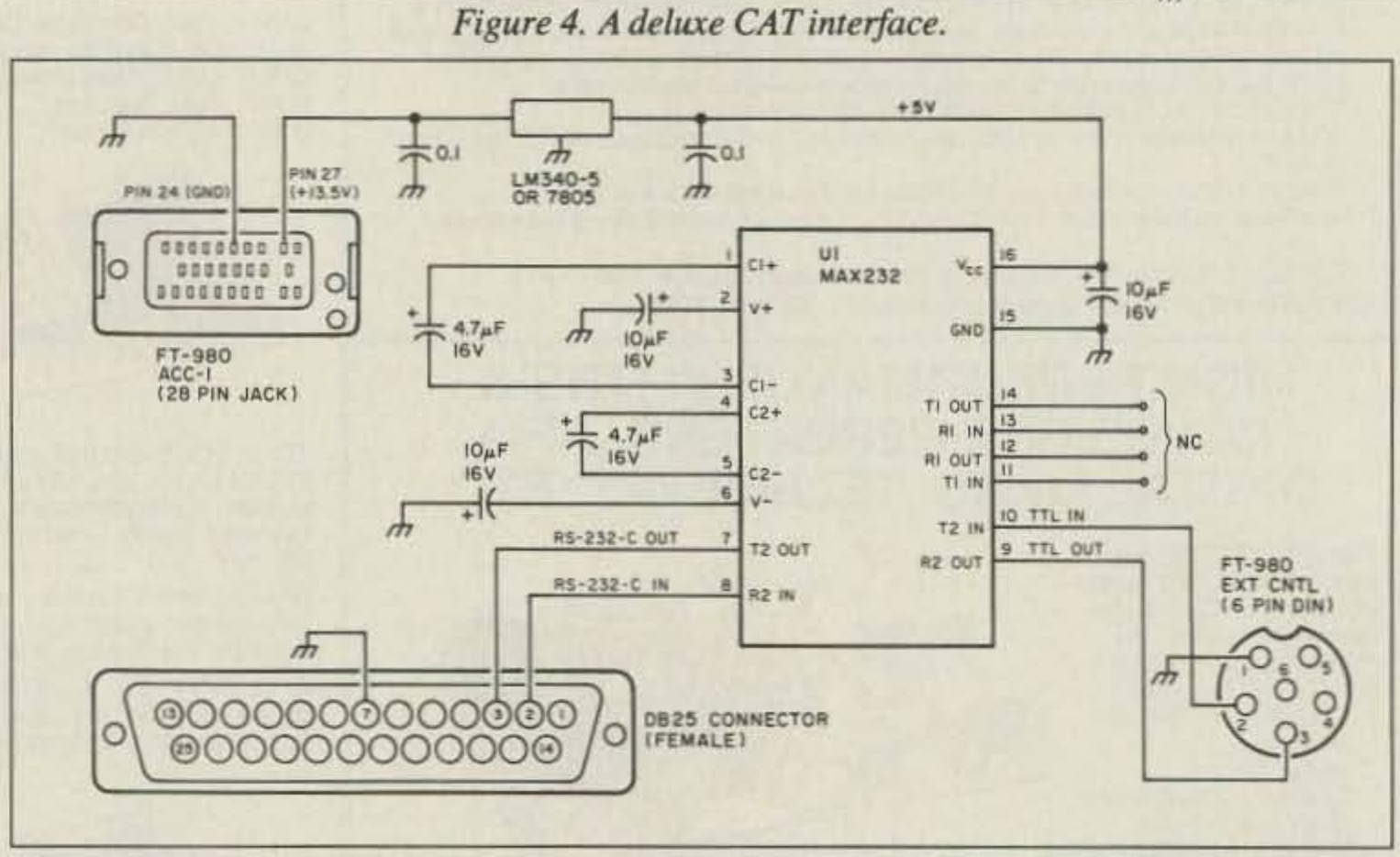

Figure 5. An alternative interface circuit that simplifies the circuitry. Thanks to M.G.D. Vermeulen ZS1HQ for this design.

supply voltage. This simple circuit has been around in various forms over the years. U2, a 555 timer, oscillates around 1 to 2 kHz at the output of pin 3 on the chip. The network consisting of D8, D9 C3, and C4 comprises a full-wave rectifier circuit to take the place of an external negative supply. You may wish to eliminate the battery and use a 9 V supply, perhaps by bringing in a +9 V to +12 V line from the radio itself.

An on/off switch completes the interface. It seemed wise to use one section of the switch to disconnect the key line from the interface when it was not in use. If you do bring in the power from the radio, you may wish to eliminate the power switch.

Table 1. 6-Pin Signal Assignments

6-Pin Din	Signal
1	GND
2	TTL signal from radio
3	TTL signal to radio
4	Key line

Construction of the Interface

The parts list contains the few components you will need to get the simple or permanent interface operational. Both of them use the Radio Shack Experimenter Socket, which fits snugly down into the Radio Shack Deluxe Project Case.

Well, it almost fits. It's certainly tight enough; no hardware is required to keep it in place. I chose to view this as a blessing, not an "Oh no!" If you wish, you can easily drill the plastic case to mount the LEDs and the power switch. I used the faithful nibbler tool to eat out a three-sided hole in the back panel to mount the RS-232 male connector. The cable from the radio was brought in through a back

Table 2. Parts List - Deluxe Interface

Part	Description	Part Number
D1,D3,D5,D7,D8,D9	1N914 diodes	RS 276-1122
Q1	2N2222 (or 2N3904) NPN transistor	
U1	LM324	RS 276-1711
U2	555 timer IC	RS 276-723
S1	DPDT switch	RS 276-636
D2,D4,D6	LED	RS 276-1622
R1	3.3k, ¼W resistor	
R2,R3,R6,R8,R9	100k "	
R4	10k "	
R5	1.5k "	
R7	47 ohm "	
R10	1k "	
R11	4.7k "	
R12	68k "	
R13	22k "	
C1,C2	0.01 µF, 15V ceramic capacitor	
C3,C4	80 µF, 15V electrolytic (or substitute 100 µF, 35V, RS 272-1016)	

Packaging

1	Experimenter socket	RS 276-175
1	Deluxe project case	RS 270-221
1	6-pin din connector*	RS 274-021
1	DB-25 Subminiature female connector	RS 276-1429

*For FT-980 only. Use radio connector shown in your manual.

Alternative Interface (see Figure 5.)

Qty.	Description	Part Number
1	MAX232 (or ICL232)	Digi-Key ICL232
1	7805 voltage regulator	
3	10 µF, 16V electrolytic (or tantalum) capacitor	
2	4.7 µF, 16V electrolytic (or tantalum) capacitor	
2	0.1 µF ceramic capacitor	
1	DB-25 female connector	RS 276-1429
1	6-pin DIN connector	RS 274-021
1	28-pin accessory jack for FT-980	Yaesu

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NOTE: The GW-BASIC program CAT_SEED shown in this article (Figure 5) is included on this disk. The CAT_SEED program is also available from the *73* BBS under the *73MAG* SIG at (603) 525-4438.

panel hole and held in place on the circuit side with a cable tie.

I found a couple of small capacitors at a street sale to use as C3 and C4. Radio Shack equivalents are listed in the parts list, but I suspect their physical size will not be as pleasing to the eye. That's why they make tops to the boxes.

When all was said and done, there was still room on the back panel to mount a 9 V battery with a rubber band passing through two small holes, then tied off.

The 6-pin DIN connector at the end of the cable is shown for operation of an FT-980 only. You may be talking to another radio, so you will have other pin connections and connector. Check your manual and use Table 1 to wire your configuration. The RS-232 connections are the same for all computers, even non-IBMs. Check your serial port manual to make sure this isn't a lie!

Operation

Operation is straightforward. Except for the on/off power switch, it can be unattended. As your program commands the radio, LED D2 will follow the activity. If your radio responds with echo or status information, as does the FT-980, LED D4 will likewise follow the TTL to RS-232 response. LED D6 lights when the radio is keyed either by the computer or by the radio itself.

Most radios require a 4800 baud rate for computer-to-radio communication. Since we're dealing with a saturated amplifier configuration, the baud rate is of no consequence if it stays within reason. "Reason," of course, is some high baud rate where the circuit frequency response can no longer keep up with the transistion time. I don't know of any radio presently available which should cause concern.

One final note about operating: RFI. When you look at the schematics, you can see that I used no bypass capacitors. You may wish to include 0.001 µF caps across all input and output lines. That's fine, but there's a better solution to computer-generated RFI: toriod traps, like Radio Shack's toroid choke RS 273-104, or those offered by MFJ and other manufacturers. No installation is complete at K5YEF without one of these somewhere in the line of the new gadget. I did a four-turn choke using one of these between the interface and the FT-980 without any noticeable increase in birdies when it's on line.

Testing the Interface

Testing is done with the interface not connected to the computer or the radio, but with the interface battery installed. Use a second 9 V battery to connect the negative terminal to pin 7 of the RS-232 interface connector (ground). Be sure to use a 10k resistor in series with the testing battery in the following steps!

Turn the interface on and touch pin 2 of the RS-232 interface connector. LED D2 should light. If you've included the key line circuit, then touch pin 4, and LED D6 should light.

Now disconnect the test battery; you're through with it. Run a wire to pin 7 of the RS-232 interface connector, and short it to pin 2 on the 6-pin DIN connector. LED D4 should light. Be sure to see Table 1 if you are not using a 6-pin DIN for an FT-980 for this test point.

That's it, you're ready. Turn off the interface and put it in line between your radio and computer.

An Alternative

Most of the parts for the simple and deluxe versions of the interface are available from your neighborhood Radio Shack store. However, if you can obtain a MAX232 IC, a smaller version of the CAT interface can be built. M.G.D. Vermeulen ZS1HQ came up with this design which also takes power directly from the FT-980 accessory socket (no battery needed). If you have difficulty finding the MAX232, you can replace it with a Harris ICL232. The ICL232 is available from Digi-Key, P.O. Box 677, Thief River Falls MN 56701-0677. Phone (800) 344–4539. See Figure 5 for this circuit.

Just the Beginning

This project is not an end unto itself; it is really the beginning. The CAT interface is a door to all the control ideas you have running around inside your head when you bought your radio. It's simple to build, and you can begin experimenting with software (don't let anybody tell you it can't be done in BASIC—they haven't proven that to me yet!). Spread spectrum, maybe?

Design Your Own CAT Program

After you do the simple hardware tests on the Universal CAT Interface, you'll be itching to try your system in the CAT mode. Presented here is a GW-BASIC (Version 3.2) program which I believe you can use to adapt to any CAT equipped radio. "Those are big words, stranger." I know, I know. The big problem is a lack of a CAT standard. If there are two radios with the exact same I/O command set I am unaware of them! I would urge the radio industry to get together and agree on a standard command set for CAT control. But you have to start somewhere and I would like to plant this program which I have put into the Public Domain into your schedule and let you run with it.

It's not going to be easy, but it is relatively simple. You'll understand what I mean if you'll commit to the attempt, and if you will just maintain an I-CAN-DO-IT attitude, take your time and keep trying, you will eventually get the desired results. And I can't describe what a great feeling it is to see the radio respond to your keyboard.

You lucky FT-980 owners can use the program as is. It will come up and capture the radio and display all 148 status bytes from the radio. It will settle on 20 meters, USB, 14.250.000, picked because that is the example in the YAESU manual. Hit <ENTER> and the radio switches to AM and WWV on 10 MHz. Hit <ENTER> again and the radio switches to 10 meter FM and begins a frequency scan from 29.500 to 29.690 ad infinitum. You can interrupt the scan or resume it by hitting any key at any time. The screen displays the frequency too. <F1> exits the program at any point you desire.

The one quirk 980 owners will discover is that it will require two tries to capture the radio the first time. Run the program and after a few seconds do a Ctrl-Break. Then run it again. From then on (unless you turn the radio off) it will run on the first try. Sure, you can add a fix. I had to add one to my Pascal version, but it is beyond the scope of this exercise.

OK, so what if you own a radio other than the FT-980? This program will be a good solid starting point. Oh yes, it will require some knowledge of BASIC, patience and study, but the trek will be worth it. The program has the two main ingredients necessary for CAT activity: a way to output commands and a way to capture data from the radio.

First study your manual and become familiar with the sequencing of events that your radio requires. The FT-980, for example, requires the following:

1. Send a command to the radio.
2. Receive an echo of the command from the radio.
3. Have your software compare the command against the echo. If they are the same, then perform the next step, #4. If not, then start over again at step #1.
4. Send OK-TO-EXECUTE command to the radio.
5. Receive a status stream from the radio to update the changes it just made.

WOW! Well the fact is the FT-980 is one of the more complicated CAT radios ever put on the market. (I give that a plus, not a minus!) Unlike the sequence listed above, your radio may only need to receive a command to change mode or frequency. It may or may not "talk" back to your computer at all. So at this point we can begin to trim down the CAT_SEED program to customize it to your radio. In the following steps when you're advised to "eliminate the following lines" you might wish to simply REMark them out—just in case.

Tailor the Program For Your Particular Radio

1. Eliminate line 2030; it surely just applies to the FT-980.

2. If your radio isn't captured during a CAT session, that is, if it only responds to commands but the front panel controls re-

```
10 '       P U B L I C   D O M A I N   CAT SEED P R O G R A M
15 '*************************************************************************
16 '* This program may be freely distributed and exchanged. It may          *
17 '* be rewritten, modified, changed and/or expanded. Indeed you           *
18 '* are  encouraged to do so to make it work with your particular         *
19 '* radio. You need not even give this author any credit. While           *
20 '* this program is originally intended for the YAESU(tm) FT-980          *
21 '* transceiver, a careful approach and rewrite should make it a          *
22 '* seed for the development of most other ham radios on the              *
23 '* market. One request: share your ideas with others. This is an         *
24 '* still an exciting frontier of ham radio. On with it!                  *
25 '*     (Program prepared at the suggestion of 73 Magazine)               *
26 '*       Art Harding K5YEF, PO Box 1719, Plano, Tx 75074                 *
27 '* Full featured FT-980 EXE program available from above address        *
28 '*************************************************************************
50 GOSUB 9000 'Set up your computer COM port
60 GOSUB 1000   'INITIALIZATION
70 GOSUB 2000   'Begin CAT action
80 'Release radio and shut down COM port
90 CMD$=ONOFF$:GOSUB 6000
100 PRINT#1,OK$;
110 CLOSE #1
120 PRINT:PRINT:PRINT"Radio released - COM 1 NOW CLOSED -Program complete..."
130 END
1000 '* INITIALIZATION
1010 OPTION BASE 1
1020 DIM ECHO$(5) 'Echo is same length as a command, 5 bytes
1030 DIM STATUS%(148) 'The FT-980 complete status stream, 148 bytes
1040 CMD$="     "   'This could have been a DIM CMD$(5), but this works too..
1060 OK$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&HB)      'OK to execute CMD
1070 ONOFF$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)            'ON-OFF CMD
1080 ALLSTATUS$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&H1)  'Status ALL CMD
1085 TIMER1=4000 'Change if trouble with receiving status inputs
1090 TIMER2=1000 'Change for hang time between 10 meter FM freqs
1100 GEN$=CHR$(&H21): HAM$=CHR$(&H22):              'Choose GENeral or HAM vfo
1110 USB$=CHR$(&H11): AMW$=CHR$(&H14): FM$=CHR$(&H17)      'Some modes choices
1120 MR$=CHR$(&H1E): VFO$=CHR$(&H1F)                      'MEMory or VFO choice
1130 RETURN
2000 '* MAIN PROCESSING
2010 '1)Capture radio 2)Choose VFO 3)Choose HAM/VFO 4)Choose USB 5)Choose freq
2020 CMD$=ONOFF$: R=148: GOSUB 5010   'R is the number of status bytes expected
2030 IF STATUS%(27)=1 THEN PRINT "Radio Is Captured!" ELSE 2020
2040 CHOICE$=VFO$: R=22: GOSUB 5000
2050 CHOICE$=HAM$: R=22: GOSUB 5000
2060 CHOICE$=USB$: R=22: GOSUB 5000
2070 'The next line changes the frequency. You can "read" 142500 reading
2080 'from the next to last byte, right to left.
2090 CMD$=CHR$(0)+CHR$(&H50)+CHR$(&H42)+CHR$(1)+CHR$(&H8): R=5: GOSUB 5010
2100 CMD$=ALLSTATUS$:R=148:GOSUB 5010 'Task radio for a complete status
2110 GOSUB 9100
3000 PRINT:PRINT:PRINT "Hit any key to switch to WWV on 10 MHz (F1=quit)"
3010 GOSUB 9999 'Hang around for next key hit
3020 GOSUB 9200
3030 GOSUB 9100:
3040 PRINT"Compare the 2 status displays now on the screen. Notice the changes."
4000 PRINT: PRINT"Hit any key to scan 10 meter FM frequencies...(F1 to quit)"
4010 GOSUB 9999
4020 GOSUB 9500
4030 RETURN
5000 CMD$=CHR$(0)+CHR$(0)+CHR$(0)+CHOICE$+CHR$(&HA)
5010 ' OUTPUT COMMAND - GET ECHO - COMPARE/CONFIRM - GET STATUS
5020 GOSUB 6000          'Output Command, Get ECHO
5030 GOSUB 7000                  'OK
5040 GOSUB 8000                  'Get status
5050 RETURN
6000 '* OUTPUT COMMAND AND GET ECHO
6010 '*
6020 N=0
6030 COM(1) OFF
6040 PRINT#1,CMD$; 'ALL CAT radios will need to do this!
6050 N=N+1: IF (EOF(1) AND N<TIMER1) THEN 6050 'Wait for input but not forever!
6060 REM IF N>=TIMER1 THEN 7100 'Oh oh, no COM action was detected, try again.
6070 WHILE NOT EOF(1): ECHO$=INPUT$(5,#1): IF LOC(1)=0 THEN 6080:WEND
6080 IF ECHO$=CMD$ THEN RETURN: ELSE PRINT"Echo received does NOT match command!
     [trying again]": GOTO 6020
7000 '* send OK to 980
7010 COM(1) ON 'Prepare Event Trap for expected incoming status stream
7020 PRINT#1,OK$; 'The FT-980 OK CMD - ok to execute last command sent
7030 RETURN
8000 '*Get Status
8010 IF EOF(1) THEN 8010
8020 FOR S=1 TO 4000: IF R=1 THEN 8030: NEXT 'Twittle thumbs loop while trapping
8030 COM(1) OFF 'No more input expected at this time
8040 RETURN
9000 'Set up Com Ports, event trap and F1 key trap
9005 'If you get port errors then increase CS10 to CS100 if you have a fast
9006 'computer. For slow computers (10 MHz down) eliminate CS parameter -
9007 'i.e., just CS with no value. These changes are made on line 9010.
9010 OPEN "COM1:4800,N,8,2,RS,CS10,DS0,BIN" FOR RANDOM AS #1
9020 REM FOR S=1 TO 2000: NEXT 'Allow time for port to settle down????
9030 ON COM(1) GOSUB 10000
9040 COM(1) ON
9050 ON KEY (1) GOSUB 80 'F1 key will release radio, close port and quit
9060 KEY (1) ON
9070 RETURN
9100 'Print all status bytes on screen in Hex...
9110 PRINT:PRINT "STATUS Input in Hex (Compare with your manual):"
9120 FOR S=1 TO 148: PRINT " "HEX$(STATUS%(S));: NEXT S
9130 PRINT:PRINT:PRINT"Bytes 2 thru 5 above yield Frequency: ";
9140 FOR S=2 TO 5: PRINT HEX$(STATUS%(S));:NEXT S
9150 RETURN
9200 'SWITCH TO GENERAL VFO, AM AND WWV ON 10 MHz
9210 CHOICE$=GEN$: R=22: GOSUB 5000
```

Listing continues

Figure 6. A universal CAT interface program (CAT__SEED) for IBM compatibles (written in GW-BASIC). This program is available from the author (see the Parts List) or can be downloaded from the 73 BBS under the 73MAG SIG at (603) 525-4438.

Listing continued

```
9220 CHOICE$=AMW$: R=22: GOSUB 5000
9230 CMD$=CHR$(0)+CHR$(0)+CHR$(0)+CHR$(&H1)+CHR$(&H8): R=5: GOSUB 5010
9240 RETURN
9500 'SCAN FOR 10 METER FM ACTIVITY
9510 PRINT: PRINT: PRINT"Hit any key to stop and restart scan (F1 to quit)"
9520 CHOICE$=VFO$: R=22: GOSUB 5000
9530 CHOICE$=HAM$: R=22: GOSUB 5000
9540 CHOICE$=FM$: R=22: GOSUB 5000
9550 TEN$=CHR$(&H95): GOSUB 9580: PRINT
9560 TEN$=CHR$(&H96): GOSUB 9580: PRINT: PRINT"* Complete cycle (F1=quit)"
9570 GOTO 9550 'Keep the loop going forever - or until <F1> hit
9580 FOR Q9=1 TO 10
9590 T=1
9600 READ F
9610 BUMP$=CHR$(F)
9620 CMD$=CHR$(0)+BUMP$+TEN$+CHR$(&H2)+CHR$(&H8): R=5: GOSUB 5010
9630 FOR S9=2 TO 5: PRINT HEX$(STATUS%(S9));:NEXT S9
9640 PRINT" ";
9650 T=T+1: IF(INKEY$="" AND T<TIMER2) THEN 9650
9660 IF T<TIMER2 THEN T=1: GOSUB 9999
9670 NEXT
9680 RESTORE 9700
9690 RETURN
9700 DATA &H0,&H10,&H20,&H30,&H40,&H50,&H60,&H70,&H80,&H90
9999 IF INKEY$="" THEN 9999 ELSE RETURN
10000 'THERE IS A CHARACTER RECEIVED!
10010 WHILE NOT EOF(1):STATUS%(R)=ASC(INPUT$(1,#1)):R=R-1:WEND
10020 RETURN
```

main operational between commands, then you should eliminate the following lines: 90, 1070 and 2020.

3. If your radio does NOT echo the commands you send it, you should eliminate the following lines: 1020, 6050 thru 6080.

4. If your radio does NOT have an OK or EXECUTE-THE-COMMAND type command you should eliminate the following lines: 100, 1060, 5030, 7000 thru 7030.

5. Does your radio send back any information like a status stream or some sort of acknowledgement that the command took effect? If your radio does NOT send back anything, you should eliminate lines: 1030, 1080, 2110, 3030, 5040, 6030, 8000 thru 8040, 9100 thru 9150, and 10000 thru 10020. You may eliminate the variable R and all references to R.

Now the next thing you want to do is study the INITIALIZATION portion of the program, lines 1000 thru 1130. Whatever brand of radio you own it's going to need a command buffer defined in line 1040. The one in our seed program is presently 5 bytes. If you need less or more, change it accordingly. A 6 byte command would appear as CMD$=" " (that was six spaces) or perhaps even better, use DIM CMD$(6).

Other FT-980 commands are part of the initialization subroutine such as the command for VFO, USB, etc. Simply substitute commands required by your radio. If there is no substitution in some cases then eliminate that particular one and any other reference to it you may find in the program. After you get this program working then you can add the complete command set.

If your radio does receive status then be sure line 1030 is configured correctly. It is now 148 bytes, the maximum number of bytes the FT-980 radio will send to the computer at any one time. You should make it as large as the number of bytes your manual shows is the maximum you may receive from your radio.

What's left? One of the most important things: setting up the COM port for your particular needs. Let's look at line 9010: OPEN "COM1:4800,N,8,2,RS,CS10,DS, BIN" FOR RANDOM AS #1.

Check your GW-BASIC manual and your radio manual; make sure these parameters are correct. More than one program I've seen was "bad" because the author used one stop bit. Why not? The rest of the world uses one stop bit—but not the FT-980 PROM. It demands two! So make sure all is OK. The parameter 10 associated with CS above will most likely have to drop to zero if you are using a slow computer and a value higher than 10 for faster machines. I have tested the program at 4.77 MHz on a laptop (CS0) and at 16 MHz on a 386 machine (CS10). One other comment on the port: you may also use COM2 instead of COM1. If you wish to do this be sure to change all COM references throughout the program.

As you work with the program I recommend that you just concentrate on getting the computer/radio dialog going with consistent results. Then you can open up your imagination and add the bells and whistles. Today, my CAT980 program (available as shareware) has some pretty fancy displays, like filter plots, analog dials and user menus for instant deployment. Even a log is included which automatically records all the radio parameters of the moment. But there was a time when the program just sat there and did nothing.

So with that in mind here is one last thought: share your basic ideas with other hams. Write an article or submit a listing to the technical correspondence sections of our magazines. Put your program on BBS's like CompuServe. And if you feel like you've got a program for the big leagues, then enter the world of Shareware. The real fun, and I believe this strongly, is still out there.

There's a barely scratched world of controlled excitement waiting to take shape, and like a lot of things in ham radio, we can have more fun if we keep each other informed. These pages and this interface are a good place to start. 73

Contact Art Harding K5YEF at P.O. BOX 861719, Plano TX 75074. Please enclose an SASE.

73 Review

by Dick Goodman WA3USG

The Kantronics KTU Telemetry Unit with Weathernode EPROM

Remote weather observations via packet!

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Options: Anemometer—$110
Rain gauge—$ 90

Packet radio is the most rapidly growing and diverse mode in the history of amateur radio! In the early 1980s, the "Packet Revolution" was started by dedicated groups of amateurs in both Canada and the USA. These amateurs stimulated packet growth by setting standards and protocols, offering the first TNCs in kit form at a price affordable to amateurs and, perhaps most importantly, providing much needed information on this fledgling mode. As the years progressed, packet technology accelerated at an exponential rate.

Packet research and development, until recently, has been in the direction of increasing pure communications capabilities. There is another aspect of packet that is finally receiving attention, and that is data acquisition and control.

While communications, BBS usage, message handling and related applications will always be the mainstay of packet, automatic collection and forwarding of data will become widespread in the upcoming years. Wouldn't it be nice to have access to weather conditions at your club site via packet? Parameters such as temperature, wind speed, direction, and even rainfall could be valuable prior to starting an antenna work party. What about the condition of your club's repeater? Knowing the repeater's PA stage heat-sink temperature, PA current, line and Vcc voltages, and AGC voltage, could be most helpful to control operators. How about remote control of equipment? The capability to power down, energize, or reset various devices might be beneficial. Again, as with the "communications" aspect of packet, experimenters have been doing this for years, but until recently there has been no turnkey system to make this possible for the less technically orientated.

Photo. The Kantronics KTU Telemetry Unit.

Data Acquisition and Control with the KTU

The Kantronics Telemetry Unit (KTU) with the Weathernode EPROM makes these functions possible. The KTU is a small device, 1.75" x 6" x 8", designated as Data Terminal Equipment (DTE). It simply plugs into your existing TNC where your computer (orterminal) would normally be connected. Your computer is then plugged into the rear of the KTU.

The power requirements are 11–20 VDC at 45 mA or, in the "Low Power" mode, 11–28 VDC at 30 mA. The KTU front panel is laid out quite simply. There is a power switch and a power indicator LED. Next to that, a "Telemetry/Local" switch and two LEDs show which position that switch is in. Finally there is a "Bypass" switch and companion indicator LED.

The KTU rear panel consists of a standard DB-25 connector for your computer or terminal, a modular style connector that connects to your TNC (cable and mating connector are supplied), and an 8-pin external sensor connector (cable and mating connector are supplied). Note that normal packet operation is not affected by the KTU; pressing the "Bypass" switch connects the terminal to the TNC and takes the KTU out of line.

Since the KTU includes the Weathernode EPROM, I got the optional anemometer/wind direction indicator. This unit, which includes mounting hardware, is of high quality plastic construction and requires minimal assembly. It's not necessary to calibrate the wind speed portion of the instrument; the wind direction sensor is calibrated with just a compass. Ensure that the instrument is mounted outside as high as possible, and away from obstructions, in order to obtain accurate readings. Both this unit and the external temperature sensor (included with the KTU) connect to the 8-pin connector on the rear of the KTU.

The serial cable from the computer should be connected to the DB-25 connector on the rear of the KTU, and the TNC connected to the KTU via the modular cable provided. These levels may be either RS-232 or TTL, set by internal jumpers in the KTU. If any cables have to be made up, pinouts for all connectors are adequately detailed in the documentation. Once these connections are made, the KTU may be powered up and initialized for operation with your TNC.

Set-Up and Configuration

Set your communications terminal for 8 data bits and the baud rate to match the TNC to the computer baud rate. Set the KTU "Bypass" and "Telemetry/Local" switches to "OUT," then apply power. The KTU will sign on your terminal with its autobaud routine and sign-on message. You will be prompted to enter the date and time.

Once this is completed, operational parameters may be set. These parameters are similar to those used in your TNC (e.g.: abaud, flow, echo, parity, xflow, etc.). The KTU will be optimized in this process to communicate with your TNC. Once the KTU is initialized, some TNC parameters will probably have to be modified. Those options are adequately explained in the documentation.

Once these steps are completed, the KTU is ready for programming. Programming the KTU instructs the unit on how often to sample the external sensors, how to display the results (metric/USA), how many entries to send in response to a data command, and how many entries may be stored in the KTU's inter-

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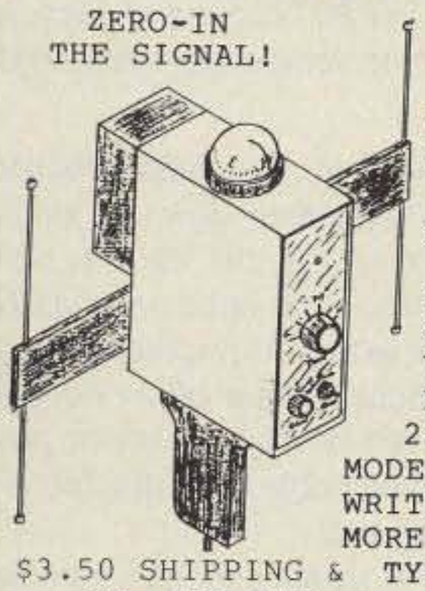

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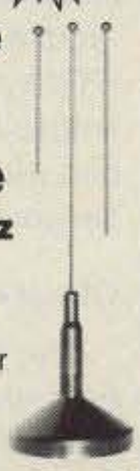

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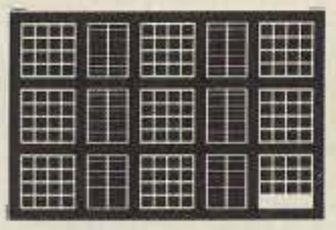

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nal memory. Sensors may be sampled and displayed in a range of time from seconds to months. This versatility is quite impressive! The documentation goes into considerable detail on proper syntax and procedures. The KTU may be configured to operate with a variety of TNCs and is compatible with virtually all packet LAN configurations. The KTU may be programmed in a local mode directly from the terminal connected to it, or from over the air. Over-the-air programming requires entry of a password and other unique security constraints.

Using the KTU to obtain weather data is quite simple after reading the user instructions. These instructions are formatted to allow the KTU owner to simply photocopy both sides of one page in the KTU system manual and pass it along to potential users.

On-Line with the KTU

The TNC used for this review was the Kantronics KPC-4. By issuing a connect request to my station a user receives the normal "Connected to" response followed by a "wxn:" prompt. At this point the KTU may be queried for weather data, or programmed by the "Sysop." By simply typing a "D" for (D)ata, the KTU will display the last reading of wind speed, direction, external temperature, and internal KTU PC board temperature (see Figure 1). If the optional rain gauge sensor is installed, this data will also be presented. By entering the correct command, USA or Metric units may be specified. The data command may be modified to request virtually any number of entries from those stored internally.

An example of the data command syntax is: "Data TF 3 WS 5 WD 2"—This would display three readings of external temperature, five readings of wind speed, and two readings of wind direction. Entering the command "PR," displays how the data is being stored. An example of a reply to a "PR" request might be:

"PROGRAM R10M TP TF A15S WD WS
7813 Samples 1 Day 08:00:00."

This response to the "PR" command would tell the user that the internal and external temperatures are being sampled and recorded once every 10 minutes and the wind speed and direction are being averaged and recorded once every 15 seconds. The second line displays the capacity of the KTU's internal memory buffers in this data configuration. In this case, the buffers will store one day and eight hours of data before the earliest information is overwritten. Knowing this, the user can request data in a format useful to their application. If the outdoor temperature is being saved every 10 minutes, the user may not want every reading. Entering a data command of "Data TF 20 3" would display every third reading of temperature for 20 readings (or 20 readings in half-hour steps). All data read with the "Data" command is date and time stamped by the KTU (see Figure 2).

As you can see, by judicious use of programming, the Sysop can save data over long periods of time by keeping the sampling rate low. This would be efficient for day-to-day weather data collection. However, during unique weather phenomenon, the sampling rate may be increased on all sensors to allow instantaneous response to changing temperatures, wind speed, direction, and rainfall. This would be excellent for recording the passage of storm fronts and the like. With this simple, yet versatile data gathering language, the user may request data from any sensor as little or as often as desired.

Other Capabilities

The KTU will support up to seven sensors attached to the rear panel inputs. Each of these sensors accepts a 0–5 VDC input. These inputs are those that are presently being accessed by the Weathernode EPROM. Depending on how the KTU is configured (with internal jumpers), certain rear panel connections may also be programmed to output digital levels (0 and 5 VDC). These connections may also be commanded to generate pulses with the frequency being determined by the user via the "F0" or "F1" command. This capability would be excellent for controlling remote devices. All this is explained in the KTU system manual. This sophisticated data acquisition mode may not be used in conjunction with the Weathernode, since the weather sensors use all rear panel inputs.

Observations

The KTU did absolutely everything that it was advertised to do. I was impressed with the ease of assembly of the weather instruments and their quality. The anemometer tracks what my existing Heathkit unit displays to within about five percent. The wind direction indicator provides resolution down to single degree units and displays this data in both heading and compass rose notation (e.g.: N, NE, ENE, etc.). The external temperature sensor comes with about 50 feet of connecting cable, as does the anemometer. It is also possible to add additional cable without affecting the calibration of the unit.

The KTU itself is small and has minimal power requirements. I thought that since the internal temperature sensor was located inside the KTU it would indicate considerably higher temperatures than ambient due to component heating. This is not the case, due to the low current requirement of the KTU. The internal temperature displayed by the KTU is within a degree or two of the actual air temperature.

Finally, it took me no more then one hour to get everything fully operational (and that's from the time I opened the two boxes that the units were shipped in). The Kantronics firmware in the KTU operated flawlessly. The flexibility in the way weather data may be captured and presented should meet the requirements of the most demanding amateur and professional meteorologists. The only room for improvement I could suggest is that memory slots be made available for high and low temperatures and peak wind speeds. This data may be derived from the stored weather data, however.

With the development of additional EPROMS, telemetry and data acquisition from a wide variety of applications will be possible. Kantronics has effectively entered a new era in packet technology with this innovative product! 73

```
wxn: d

06/16/91   18:19:54 TPCB= +0079.1 DEGF
06/16/91   18:19:54 TF   = +0083.3 DEGF
06/16/91   21:32:28 WS   = 00012 MPH
06/16/91   21:32:28 WD   = 00268 DEG   W
```

Figure 1. Response to the data retrieve command, "D". Current readings for all attached sensors are displayed. TPCB = PC board temperature, TF = external temperature (deg. F.), WS = wind speed, and WD = wind direction.

```
wxn: d tf 20

06/16/91   18:19:54 TF   = +0083.3 DEGF
06/16/91   18:14:54 TF   = +0083.3 DEGF
06/16/91   18:09:54 TF   = +0083.3 DEGF
06/16/91   18:04:54 TF   = +0083.8 DEGF
06/16/91   17:59:54 TF   = +0084.8 DEGF
06/16/91   17:54:54 TF   = +0084.8 DEGF
06/16/91   17:49:54 TF   = +0084.8 DEGF
06/16/91   17:44:54 TF   = +0084.8 DEGF
06/16/91   17:39:54 TF   = +0084.8 DEGF
06/16/91   17:34:54 TF   = +0085.0 DEGF
06/16/91   17:29:54 TF   = +0085.0 DEGF
06/16/91   17:24:54 TF   = +0085.0 DEGF
06/16/91   17:19:54 TF   = +0085.3 DEGF
06/16/91   17:14:54 TF   = +0085.3 DEGF
06/16/91   17:09:54 TF   = +0085.3 DEGF
06/16/91   17:04:54 TF   = +0085.3 DEGF
06/16/91   16:59:54 TF   = +0085.8 DEGF
06/16/91   16:54:54 TF   = +0085.8 DEGF
06/16/91   16:49:54 TF   = +0085.8 DEGF
06/16/91   16:44:54 TF   = +0085.8 DEGF
```

Figure 2. Issuing a "TF20" command displays the last twenty external temperature readings.

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Hope for Monolingual Hams

If you really want to communicate!

by David Cowhig WA1LBP

Most hams on or orbiting this planet do not speak English as their first language. *The Radio Amateur's Conversation Guide*, written by Jukka OH1BR and Miika OH2BAD Heikinheimo, with the help of ham native speakers, teaches monolingual hams how to get their tongues into acceptable shape for foreign ears. The second edition, published in 1985, includes English, German, French, Italian, Spanish, Portuguese, Russian (in Cyrillic and phonetic script), and Japanese (romanized). Hour-long cassette tapes made by ham native speakers cover these languages, plus Swedish and Finnish.

Supplements to the *Guide* introduce you to Finnish, Danish, Dutch and Serbo-Croatian. Phonetic guides and number lists are followed by 50 pages of phrases in each of the eight languages of the *Guide*. In the 30-page multilingual glossary at the back of the book, you can look up the equivalent of English words commonly used by hams in seven other languages.

The phrases give you all you need to conduct a very basic QSO (contact), describe your equipment, complain about the other guy's splatter, inquire into the other operator's marital status (an important question for international radio romances), and ask for a QSL card. Next time a Japanese station QRMs (interferes with) your long rag-chew on 160 meters, you can tell her "Shuhatsu-o tsukatteimasu!" If the offending OM (male ham) is in Moscow, you might say, "Castata zanjata!" If you want to ask a Russian to give you a call next time he hears you, why, just say, "Kagdá byi vyi ni uslýisali minjá pazálsta, vizavítje minjá" (and don't forget the accent marks).

Some You Have to Hear

Language tapes are necessary for those languages which English-speaking people find hard to pronounce. Japanese pronunciation is fairly easy and regular. You could probably make yourself understood in Japanese without the tape if the authors would explain the phonetic systems they use. Romanization is used for Japanese and Russian, but the conventional spelling of languages written in the roman alphabet is given. Just a list of the kana syllabary used to write Japanese would help readers pick out the pronunciation much more easily. The standard romanization of Japanese used in the *Guide* can mislead. For example "five years," *gonenkan*, is pronounced "go-nen-kan," not "gon-en-kan."

A one-hour tape of any language in the *Guide* costs $9.95 plus shipping. Text supplements cost $1.75 per language. You can order *The Radio Amateur's Conversation Guide*, by Jukka and Miika Heikinheimo, from *CQ Communications*, Main St., Greenville, NH 03048. Tel. (800) 457-7373. The price is $9.95 plus $3.75 postage.

Spanish and Russian

"Hola CQ," by "Doc" Schwartzbard AF2Y, gives you all the sentence patterns and vocabulary you need to carry out a basic QSO in Spanish. Many hams who took high school Spanish will find that the sentence patterns come back. Their new ham vocabulary also makes them want to learn more Spanish by radio.

The ARRL's "Hola CQ" consists of fine Spanish lessons for hams. A 90-minute cassette tape accompanying the text teaches the basics of Spanish pronunciation as well as the pronounciation of each phrase in the text. AF2Y reminds us of the many words Spanish shares with English and other romance languages, and how recognizing these words will speed our progress. You can get "Hola CQ" from the ARRL, 225 Main St., Newington CT 06111. It costs $7 plus postage.

Once you have mastered some phrases in your chosen language, you might try to find a night course at a local high school or junior college. You could also pick up a first-year college textbook on the language to get a systematic introduction to vocabulary and grammar. With your access to on-the-air tutoring, you may become an outstanding ham linguist.

Russian and Japanese in Particular

Other language lessons for hams are available. Len Traubman, with the help of some Russian hams, wrote "Russian Phrases for Amateur Radio," a 20-page booklet. The accompanying audio cassette tape is for English-speaking hams who want to communicate in Russian. The booklet contains English words and phrases for ham contacts, with Russian translation and transliteration for each phrase. You can get the booklet for $5 ($7 overseas) and the audio cassette for $6 ($8 overseas) from Len Traubman W6HJK, 1448 Cedarwood Drive, San Mateo CA 94403.

You can also download "Japanese for Hams," a 12-page guide I have written on making simple QSOs in Japanese, free from the *73* landline BBS (603) 525-4438; or from JAHAM in the files section of the N4QQ packet BBS. Call K3AF-7 in Washington, DC on 28.195 MHz 1200 baud, connect to K3AF-3, and then to N4QQ.

Goh Kawai 7L1FQE/N6UOK, a linguistics scholar at Stanford University, is working on a text of Japanese lessons for hams. You can contact him at CompuServe 76056,1726. If you get more serious about learning Japanese, you can order *Japanese for Beginners* and *Japanese for Today*, edited by Yasuo Yasuda, and published by Gakken, from Kinokuniya, 10 West 49th St., New York NY or from some other bookstore. Tapes accompany the text.

After you have worked on Japanese for awhile, you will find reading articles in *CQ Ham Radio*, the wonderful telephone-book-size (!!!) ham magazine from Japan, a great incentive to improve your Japanese. You can order *CQ Ham Radio* through Nihon IPS, Iidabashi 3-11-6, Chiyoda-ku, Tokyo 102 JAPAN for about $120 per year. You may be able to order single copies of it, or of its more technical cousin *Ham Journal*.

As the karatkavalnaviks (hams) say back in the U.S.S.R., "Zeláju vam udáci i mnóga di-eks": I wish you good luck and lots of DX. 73

David Cowhig has translated articles in Japanese for us and written articles on ham radio in Japan.

Number 13 on your Feedback card

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

Photo A. The pulse charger—upgraded to handle larger batteries.

The Pulse Charger

The use of batteries in portable QRP operation captivates the attention of a lot of people. In the August 1989 column, I discussed a small pulse charger for Gell/Cell™ batteries. This project produced huge piles of mail. The original circuit has been changed slightly, to improve switching, and a PC board is now available to speed construction.

Perhaps a quick review of the circuit is in order. The Gell/Cell battery is charged using high current pulses, rather than a constant current. High current pulses won't heat up the battery, which reduces the chance of damage.

Operation is simple. A 555 timer operating as an astable oscillator provides adjustable pulses to an IC voltage regulator. The duty cycle of the oscillator may be varied by the front panel 50k pot. This control adjusts the current to the battery by varying the pulse width from the 555 oscillator. The output of the 555 is coupled to the base of the 2N2222 transistor via a 1N914 diode. This diode protects the 555 just in case the LM317 goes out to lunch and takes the 2N2222 with it for company.

When the output of the 555 timer goes high, the transistor is turned on. This shorts out the ADJ line of the LM317, shutting it off. Thus, no current will go to the battery. When the 555 timer is off, so is the transistor, allowing the LM317 to operate at the voltage selected by one of the 5k trimmers. In a nutshell, when the 555 is on, the LM317 is off.

The 5k trimmers set the state-of-charge for the battery. For cycle use, a Gell/Cell battery should have a full state-of-charge voltage of 14.4 volts. For standby use, select 14.0 as a full state-of-charge voltage. I also have a handful of 6 volt gelled batteries I use now and then. So, the second voltage I selected is 7.2 volts.

NiCds

A note about NiCds before we get too far into this project. When this charger first came out, many of you asked about charging up HT batteries. Well, you can—*if* you understand some of the limits of both the charger and the NiCds. First and foremost, HT batteries are all different. Batteries that came with the HT and those you have replaced from a third-party vendor may be different. In most cases they *are* different.

I know of one particular battery pack that does some magic when dropped into the manufacturer's quick charger. The battery pack is normally 12 volts, but a small relay inside the battery pack switches the batteries to a 6 volt configuration to allow high speed charging. To keep things from blowing up, a heat sensor glued to one of the cell's case will open up, stopping the charge current until the cell has cooled down. Some third-party battery re-fitters don't include this sensor. How many of us, in repairing an HT battery pack, have removed the sensor?

If you use the pulse charger to charge up the NiCds for your HT, limit the current to whatever value is listed on the battery's charge table. After you get the feel of things, you can increase the current.

Construction is very easy, thanks to the circuit board supplied by Far Circuits. Not knowing what everyone has in the junk box, I laid the PC board out to use several different styles of the LM317 and diode bridge. Use whatever version of LM317 you have, either in the TO-220 case or the TO-3 case style; BUT NOT BOTH AT THE SAME TIME. The same goes for the diode bridge. You can use either four individual diodes or a bridge rectifier pack from Radio Shack (RS 276-1146), but not both. I prefer the Radio Shack part myself; it's easier to install on the board.

The filter capacitor is also mounted on the PC board this time. A 2200 µF capacitor is used. This value is not especially essential; you can use as low a value as 1000 µF and as high a value as 10,000 µF. The filter smooths out the DC from the bridge so the 555 timer sees a nice smooth Vcc. The 78L12 provides a regulated +12 for the 555 timer. Don't forget to use the bypass capacitors on the 78L12.

Keeping it Cool

The LM317 can get kinda hot. In my prototype, it got too hot. (How hot did it get, Mike?) It got so hot the black heat sink turned silver! It was my fault. I was charging up 24 amp/hour batteries. This was way too much current for the one amp LM317 to pass. I was really surprised that it didn't fry the LM317! One way of generating too much heat is over-sizing the transformer. For 12 volt charging, use only an 18 volt trans-

Parts List for the Pulse Charger

Part	Description
U1	78L12 voltage regulator
U2	555 timer IC
U3	LM317K (or LM317T) adjustable regulator
Q1	2N2222 NPN transistor
D1–D4	1N4001 (or bridge rectifier RS# 276-1146)
D7	1N4001
D5,D6	1N914 diode
C1	2200 µF, 35 V electrolytic, axial
C2,C3	2.2 µF, 35V tantalum
C4,C7	4.7 µF, 35V tantalum
C5,C6	0.1 µF ceramic
R1,R3,R4	2.2k, ¼W resistor
R2	50k potentiometer
R5	220 ohm, ¼W resistor
R6,R7	5k potentiometer
T1	18V at 2A AC transformer

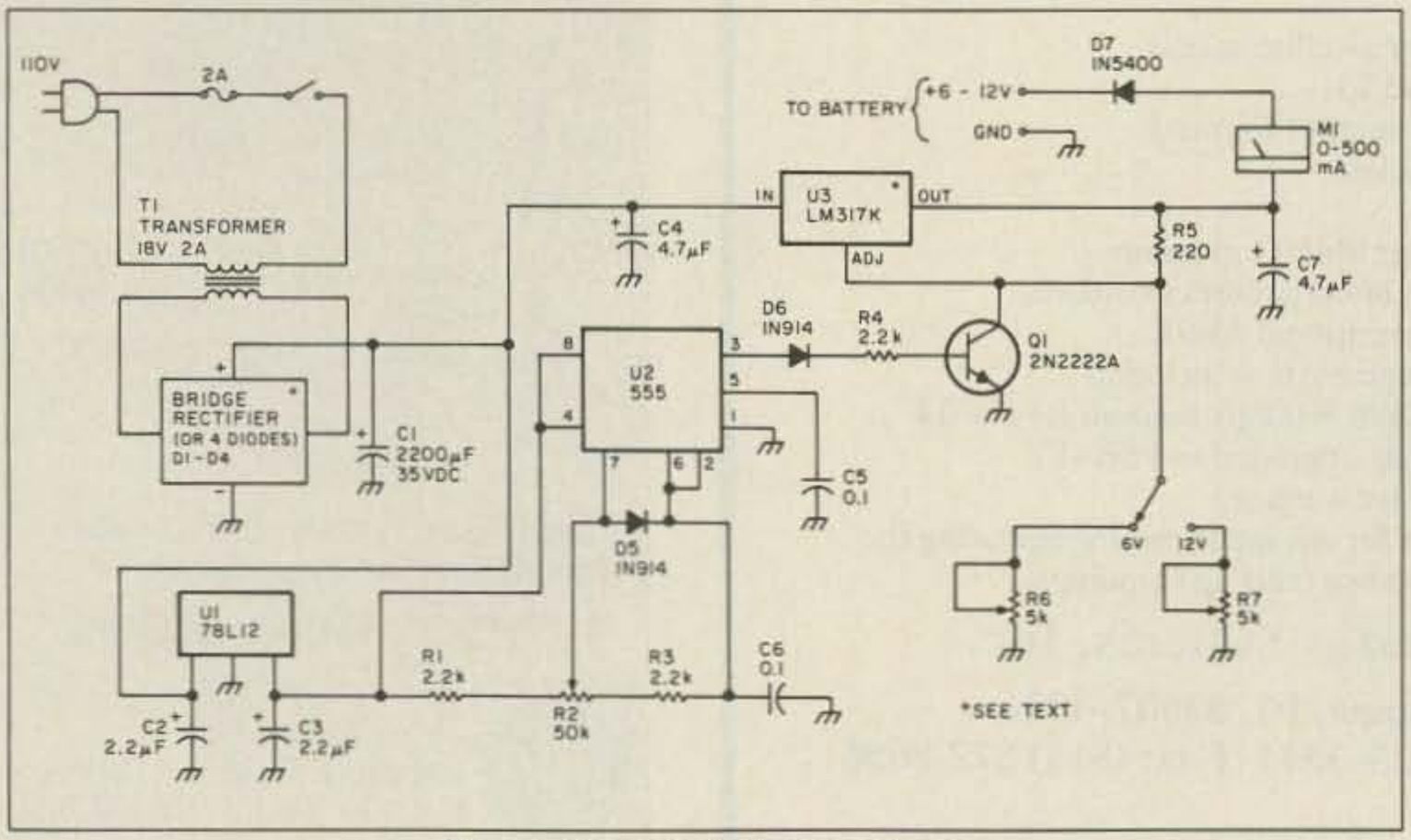

Figure 1. Schematic for the pulse charger.

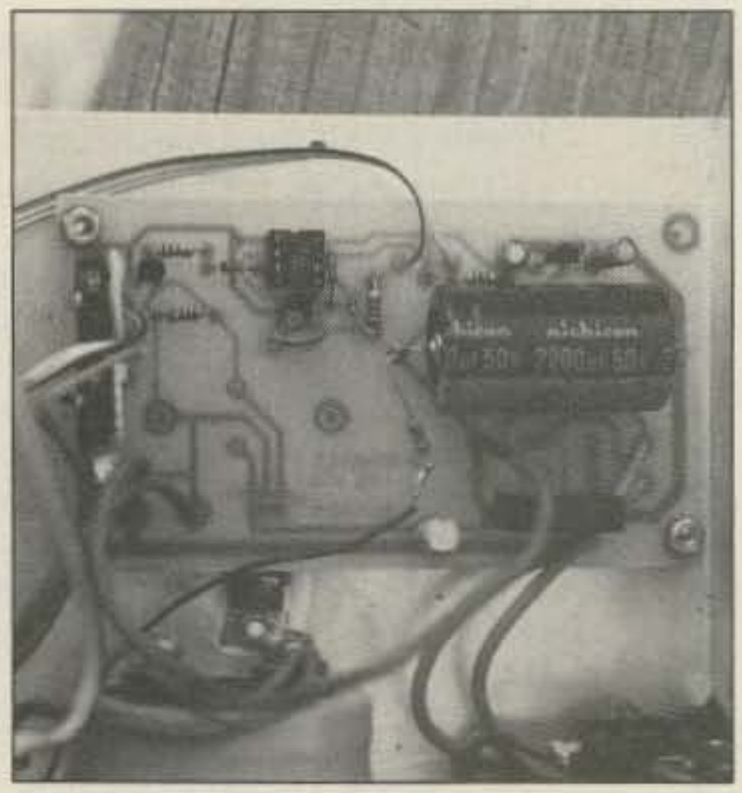

Photo B. Prototype PC board used in charger. Note the extra resistor soldered to the capacitor. Now the resistor is on the board. Just under the larger capacitor, the LM317 is bolted to the metal chassis.

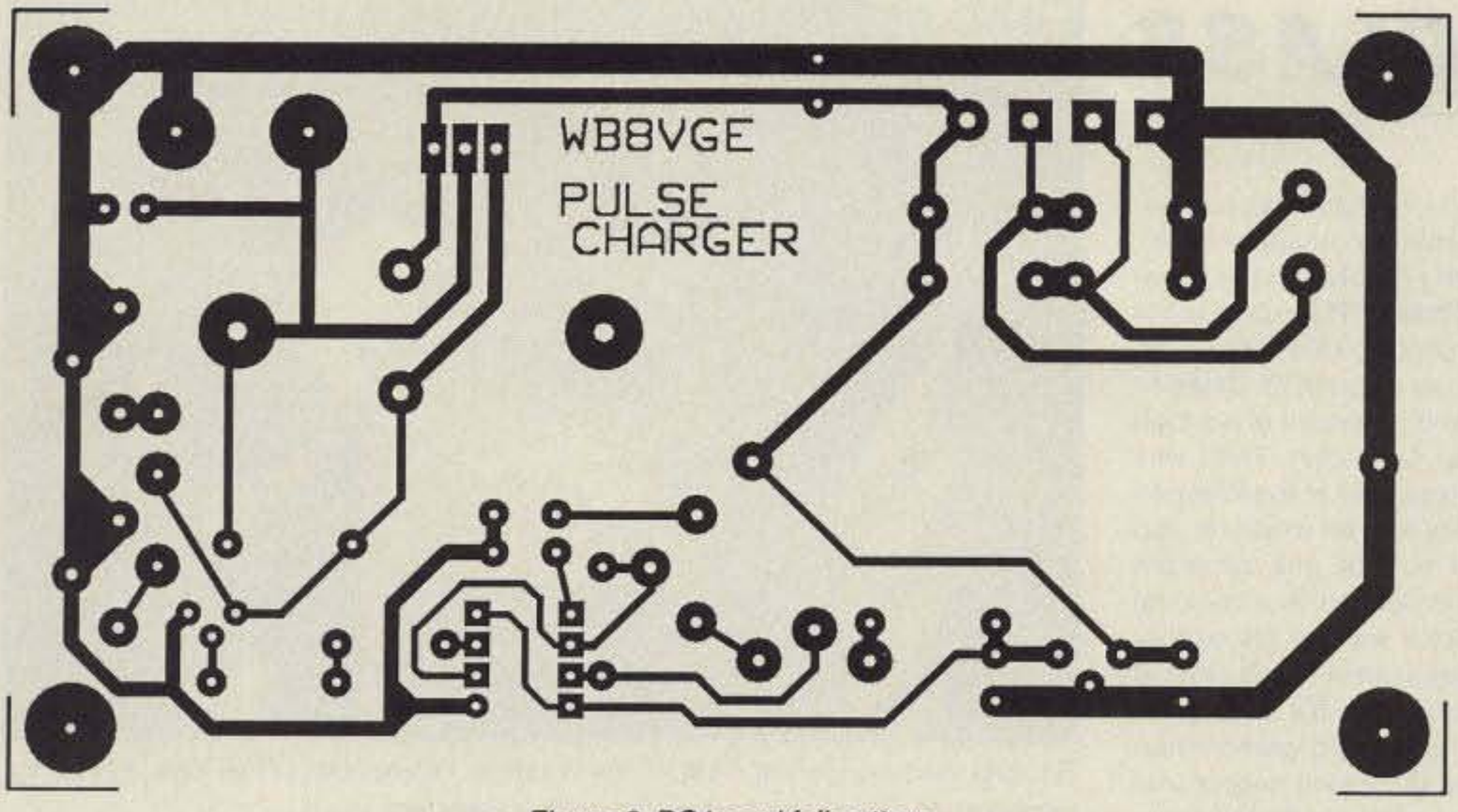

Figure 2. PC board foil pattern.

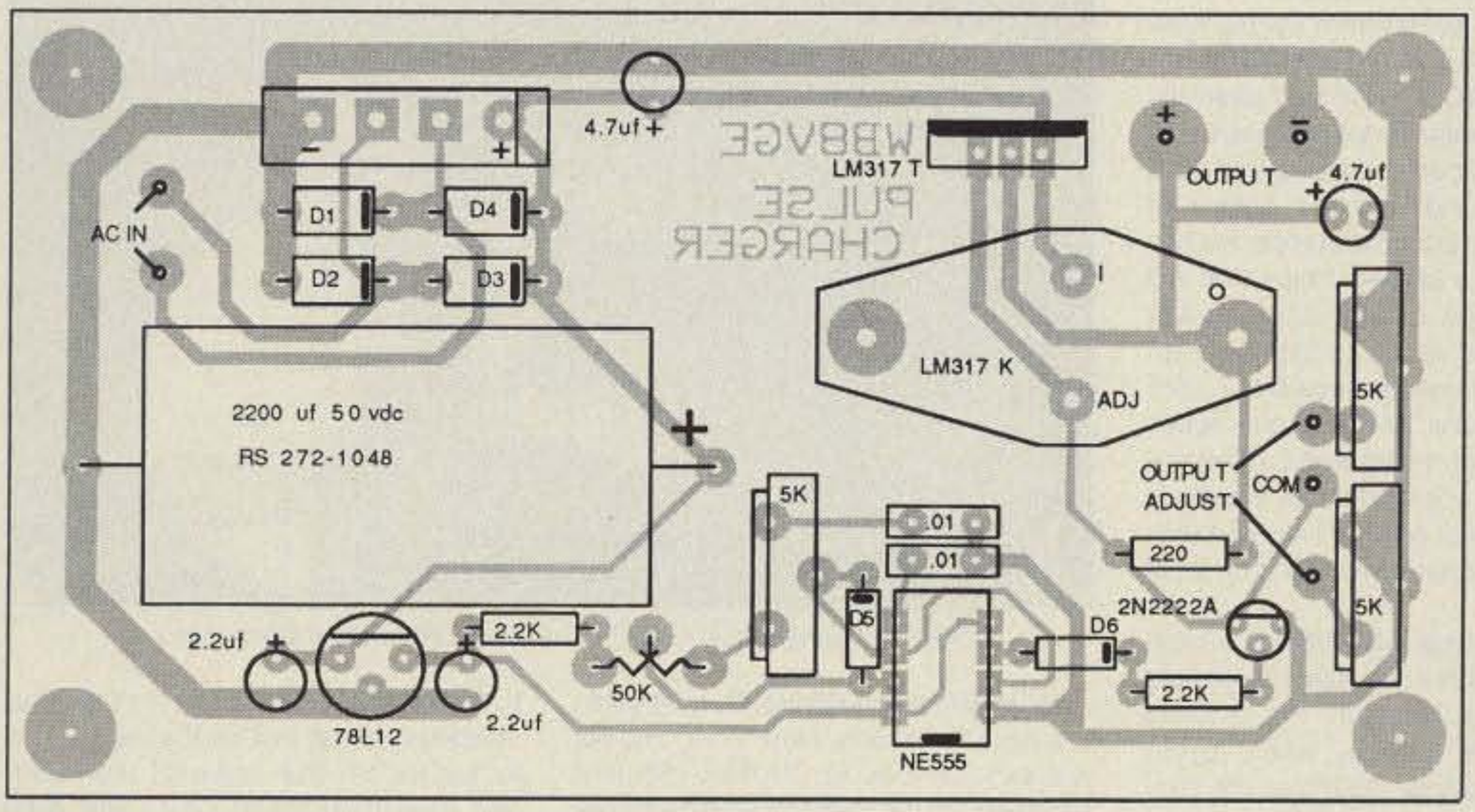

Figure 3. Parts placement.

former, no more. If you regularly charge HT batteries or 6 volt gells, a 12 volt transformer will do just fine.

If you want to charge larger batteries, use the LM350K. This device is good for 3 amps of current. In any case, to keep your charger from becoming your own personal Three Mile Island, you have to heat-sink the LM317. If you use the TO-220 case, you have an easy option. Just use the metal chassis as a heat sink. You have to insulate the case from the chassis, as it is hot. Radio Shack sells a mounting kit for the TO-220 for a buck.

If you go this route, use 1/4-inch spacers for the board, and solder the leads of the LM317 from the foil side of the board. Bend the LM317 back down so it will lay flat against the chassis. Spread some heat-sink compound on both the LM317 and the chassis to improve heat transfer. Don't forget to insolate the LM317 from the chassis. Pre-fit everything before you drill holes into the chassis.

Another option is to use the TO-3 case, LM317. The PC board is big enough to hold it and a heat sink. Because there are many different styles of heat sinks on the market, it's a good idea to make a dry run to be sure everything fits before soldering.

Easy Set-Up

Remove the 555 timer and lay it aside. Apply power to the circuit. Check for +12 volts at pins 8 and 4 of the 555. Select one of the trimmers. Set it for 14.4 volts. Set the other for 7.2 volts. Again, you can set these for whatever value you want or need. If you use the blocking diode, set the voltage on the battery side of the diode. This blocking diode is not on the PC board. You really don't need it, but if you're like me and forget to disconnect the battery and to power down the charger, the battery will discharge into the charger. The diode prevents this from happening.

In the prototype, I used a 0–500 mA meter. I found this to be too small for the batteries I was charging. Use a 0–1 amp meter if you plan on charging 4.5 amp/hour or larger batteries.

Power down the charge and let the caps discharge. Replace the 555 timer. With a battery connected to the output, power up the charger. With the duty cycle control, set the current for proper charging. Remember, the meter will average out the reading from the pulses going to the battery. That's about all there is to do. When the battery becomes fully charged, the current will drop to a very low reading. How much current is flowing when the battery is fully charged depends on the type of battery, battery size, and of course, the battery temperature. Don't use the charger to operate any of your gear!!

Kit Available

To make it easier to get this project going, I can supply a complete kit of parts for the charger. The kit will contain all of the PC board components. There won't be too many of these kitted up, so don't wait too long. Cost of the PC board and parts is $29.95, plus $2.50 for postage.

That should take care of all your portable batteries. No reason to not pick up the HW-9 and head for the woods. Ah yes, QRP; better living with less. 73

Number 14 on your Feedback card

HAMS WITH CLASS

Carole Perry WB2MGP
Media Mentors, Inc.
P.O. Box 131646
Staten Island NY 10313-0006

The Dayton Youth Forum

For several months prior to the 1991 Dayton Hamvention, I was concerned about finding dynamic youngsters who were also active hams to speak at the Youth Forum I was going to be moderating there. I was also anxious about how many hams would be bringing their own youngsters with them to the Forum, as we had been publicizing and advertising in all the ham magazines.

Happily, all anxieties were for naught. The Youth Forum got off to a flying start when astronaut Tony England W0ORE stopped by to wish us well, and offered to speak to the standing-room-only audience.

Dr. England was appointed a NASA scientist-astronaut in 1967, and acted as mission scientist for the *Apollo* 13 and 16 flights. He also flew as a mission specialist on the space shuttle *Challenger's* Spacelab 2 mission in 1985. Currently, he is professor of electrical engineering and computer science at the University of Michigan in Ann Arbor. There he both teaches and conducts research on microwave emission, propagation, and scattering.

Tony England enchanted everyone with his stories of how he and his high school ham friends used their knowledge of Morse code to better "communicate" during tests. The audience of more than 60 youngsters, plus all the adults who attended, were privileged to hear Tony speak of his interest in amateur radio as a vehicle to interest young people in science and engineering. With few and progressively fewer bona fide role models for young people in today's society, Tony England made a superb opening speaker for the 1991 Youth Forum at Dayton.

Dynamic Speakers

After such an auspicious introduction, the young speakers had no problem picking up the ball and impressing the audience with their eloquence, composure, and dedication to amateur radio.

The first young speaker on the agenda was **Todd Tittle KF7LX** from Sedro-Woolley, Washington. This personable 17-year-old is an Advanced Class license holder and president of his high school amateur radio club. Todd was secretary and treasurer of the Western Country Cousins Net, for which he also served as net control. His apparent ease at the microphone at a national convention spoke well for his experiences at the radio over the last several years. Todd attributed his original interest in ham radio to his grandfather. He encouraged the young people who were present to pursue different areas of the hobby and have fun with it.

Willis Almekinder KB2LEP is a 15-year-old ninth grader from Lyons, New York. Despite his young age, Willis is a member of RACES, and has used his New York Disaster Preparedness Commission identification card to get past road blocks and into the center of emergencies to offer assistance. He has already made a career choice that will take advantage of his outgoing demeanor. Willis wants to combine an extensive electronics knowledge with an interest in law, and to argue cases that involve high technology. Willis encouraged the youngsters in the audience to consider getting involved with emergency preparedness in their local areas.

Sammy Garrett AA0CR was next at the podium. This articulate 13-year-old from Florissant, Missouri, has an Extra Class license. Sammy and I spent some time together talking at the convention leaving no doubt in my mind about why he was selected the 1991 Westlink Young Ham of the Year. He amazed the audience with his aplomb, and encouraged the adults to share their enthusiasm with the youngsters they wanted to recruit into ham radio. Sammy suggested that we all look for the "little child" in ourselves when speaking to young people. He made an enormously favorable impression on everyone.

Photo A. Astroham Tony England W0ORE got things off to a flying start with Carole Perry WB2MGP at the Dayton Youth Forum.

Photo B. Sammy Garrett AA0CR, the Westlink Young Ham of the Year, encouraging adults to share their enthusiasm with youngsters.

Photo C. Lenny Mack KB8KTC participated in Moonbase America.

Brian Cresenzi KB2GTD, a 14-year-old from Ryebrook, New York, shared his experiences as SAREX (Shuttle Amateur Radio Experiment) net control at Blindbrook High School, New York, for the STS-35 mission last December. Brian made the initial contact that gave students at his school a chance to ask questions of Ron Parise WA4SIR, payload specialist on board the *Columbia*. Brian and his dad, KB2GTE, are members of the Westchester Emergency Communications Association. Someone in the audience commented to me on how wonderful it was for young people to be playing such an active role in some of the most extraordinary events in the world today. Amateur radio has provided an unparalled opportunity for children to become motivated about tomorrow's possibilities in technology.

Lenny Mack KB8KTC is a tenth grader who had the incredible experience of participating in the Moonbase America project during the third week of April 1991. Moonbase America is a national educational project created in conjunction with NASA. Project headquarters is in the Copely-Fairlawn City Schools in Copely, Ohio. Lenny explained that the project is a simulated moon-station constructed out of geodesic domes. Moonbase, designed to provide a lunar environment where students could study science, was located beside the tennis courts of Copely High School. As a command controller, Lenny described how ham radio played a major role in the communications setup of this course for teaching students how to live on the moon, and to appreciate the value of teamwork and individualization. *[See the April "QRX" for more details about Moonbase America.–Eds.]*

All Hopes Fulfilled

I hope never to conduct a youth forum that doesn't include at least one distaff member. Through the generosity of several hams, **Mary Alestra KB2IGG,** a 13-year-old from my class, was able to attend Dayton and speak at the forum. This Extra Class license holder was the 1990 Westlink Young Ham of the Year. She has gone on to be an inspiration for many other young people, especially girls.

It was my profound hope when we began this that the Youth Forum would showcase young people who were accomplished, involved, and having fun in amateur radio. It was a personal honor to be able to bring together such an outstanding representation from across the country. It was clear to anyone in attendance that day that at least some of the not-yet-ham children attending the forum will be considering the possibility of joining our ranks.

Thanks must go to the members of DARA who are always so supportive of educational efforts, and to everyone in the ham community who encourages and lends support to youth-oriented activities, thereby ensuring continued recruitment of bright, energetic, and dedicated young people. 73

Number 15 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

AMSAT at Dayton 1991

If you haven't made the trip to the Dayton Hamvention at least once, plan now to attend next year. Over 30,000 hams were on hand for a ham radio convention of gigantic proportions. I thought the Houston gathering was large and the one from Dallas huge, but both paled before the massive assembly of commercial exhibitors, presentations, swapfest enthusiasts and ham participants that took over southwestern Ohio for a long weekend in April.

The event organizers outdid themselves with quick registration, shuttle buses to outlying parking areas and talk-in information on 2 meters, 220 MHz and 70 cm. The convention guide was a full-sized magazine, not just the simple forum list so common at other ham conferences.

AMSAT was well represented with speakers in the meeting rooms and informed volunteers at the booth in the commercial exhibit area. Most of the AMSAT board members and officers attended and were available at the Hamvention to answer questions about the amateur radio satellite program.

AMSAT President and General Manager Doug Loughmiller KO5I spoke at a forum about the successful launches of several new hamsats in 1990. Lou McFadin W5DID and AMSAT Director Tom Clark W3IWI described the Shuttle Amateur Radio Experiment (SAREX) equipment used on board STS-35 and STS-37. Lou showed a tape of amateur television video as received by Ken Cameron KB5AWP on the recent STS-37 mission. Dr. Tony England WØORE, who took ham radio to space on a shuttle mission several years ago, spoke on the educational benefits of the SAREX operations.

AMSAT Director and Vice President of Manned Spacecraft Operations Bill Tynan W3XO touched on future shuttle and space-station activities, while AMSAT Director Dr. Bob McGwier N4HY discussed the Microsat programs under consideration or construction in several international locations including Mexico, Australia and Italy.

Back at the AMSAT booth, in addition to the excellent advice and help offered by the volunteers, AMSAT had new publications for sale. *Decoding Telemetry from the Amateur Satellites* by G. Gould Smith WA4SXM provides an in-depth look at all the current hamsat telemetry schemes from the simplest CW on AMSAT-OSCAR-21, to the complexities of the University of Surrey satellite systems.

The Satellite Experimenter's Handbook has been completely revised by author Marty Davidoff K2UBC. The result is an updated and expanded reference book for both beginners and longtime hamsat enthusiasts. Although the price is up to $20, this 350-page volume covers all the bases when it comes to satellite chasing.

A Beginner's Guide to OSCAR-13 by Keith Berglund WB5ZDP is into another print run. AMSAT ordered a large batch of these popular booklets to be ready in time for Dayton and for potential sales through 1991. For a bargain $7, you learn how to get a fully-functional station on the air for the high-orbit satellites.

A new Webersat manual was offered in loose-leaf form from Weber State University. AMSAT carries this publication for WSU at $15 per copy. For those looking for more data on the inner workings of Weber-OSCAR-18, this edition provides some useful insight.

No new versions of "Instant Track" and "Quiktrak" were introduced this year. The current software packages continue to outperform many amateur and commercial offerings. In addition to the IBM-PC software, AMSAT carries tracking programs for the Commodore, Macintosh, Apple II, Amiga, Tandy CoCo and HP calculator. Software for the older TRS-80 computers and Sinclair machines is no longer supported.

You can get details on prices of the AMSAT software offerings, and publications can be obtained by calling AMSAT at (301) 589-6062 during normal East Coast business hours. Inquiries can also be sent to AMSAT, P.O. Box 27, Washington DC 20044.

RS-14/A-O-21/ Radio-M1/RUDAK-2

This new amateur satellite has brought back the excitement of easy-to-copy strong signals via Mode B (70 cm up with 2 meters down) from low earth orbit. As one longtime hamsat enthusiast said while making a contact via the transponder, "It's like OSCAR-7 all over again, only 6 dB better!"

From its 620-mile-high orbit, RS-14, also known as AMSAT-OSCAR-21 or Radio-M1 or RUDAK-2, is providing excellent communications to stations not yet fully configured for operation on AMSAT-OSCAR-13's high elliptical orbit. This joint Soviet/German satellite is a part of a Soviet geological research satellite. It offers several modes of operation, but the most promising is the transponder system. Frequency charts were published in the May 1991 "Hamsats" column.

Simple systems with omni antennas can access the analog transponder with SSB and CW with ease. Mobile and portable operation with the clarity of Mode B is now a realistic possibility. While the specifications of the uplink/downlink system appear similar to OSCAR-7 (launched in 1974 and operational through 1980), the signals sound much stronger. This could be a result of many years of high-orbit Mode B transponders on A-O-10 and A-O-13 and the extra effort needed to equip ground stations to receive the weaker signals from orbits ten times higher than A-O-21's.

Advances in receiver performance over the last 17 years and small high-power transmit radios give today's A-O-21 enthusiasts an edge over the homebrew and exotic equipment users of two decades previous.

During late May and early June, experiments were underway to test the systems of A-O-21. Some oscillation problems were noted in the preamp of linear transponder number 1. Linear transponder number 2 was operating normally, but due to the investigations of the complete system, it was not always active. Some even heard it switch off in the middle of a pass without ground-station commands.

The best way to check on the satellite and its functionality is to monitor the CW telemetry. For linear transponder two, the data can be heard on

Photo A. AMSAT's booth at the Dayton Hamvention (l. to r.): AMSAT Coordinator Mike Crisler N4IFD, AMSAT President Doug Loughmiller KO5I, and AMSAT Corporate Secretary Martha Saragovitz.

Photo B. AMSAT Executive Vice President John Champa K8OCL answers another question about satellites at the Dayton Hamvention.

145.948 MHz. Decoding the number groups is simple. A typical frame of telemetry consists of eight four-digit numbers.

An actual sample of data copied in late May looked like: PPPPRS14/7007/7116/7224/7316/7409/7500/7600/77. To decode the data, refer to Table 1.

The first four-digit number was "7007." The first digit defines the channel status. A prefix of "6" identifies a general status, while a "2" identifies a command status. The "7" is likely a general status. The second digit, a "0," is the channel number. Channel "0" defines the transponder output. The last two digits give the power level output in watts when multiplied by 0.05. For "07," the result is so close to zero watts that it is assumed the transponder is off. A number in the neighborhood of "80" would give a nominal reading of 4 watts.

The second four-digit number gives the status again as "7," with the channel number as "1." The last two digits, "16," show the transponder power amplifier temperature to be 16 degrees Celsius. If the transponder were on, a higher number with resultant temperature would be expected.

For the remaining channels, the effects are easy to compute. A calculator isn't needed. The numbers directly reflect voltages and temperatures as detected on the spacecraft. Information for decoding the data on channel "7" is not currently known.

The most important number to those wishing to make contacts via the satellite is the value of channel "1." Anything above "40" should reflect active transponder operation. Although DX activity is limited due to the height of the orbit, excellent communications to a few thousand miles range will provide some very satisfying contacts from A-O-21/RS-14. 73

Channel	Parameter	Formula	Unit
0	Transponder Power Output	0.05•N	Watts
1	Transponder PA Temperature	N	Deg. C
2	+24 Volt Regulated Supply	N	Volts
3	+16 Volt Regulated Supply	N	Volts
4	+ 9 Volt Regulated Supply	N	Volts
5	+24 Volt Regulated Supply	N	Volts
6	Inside Temperature	N	Deg. C
7	Engineering Value	N	?

Table 1. CW telemetry decoding parameters.

Dx

Number 16 on your Feedback card

Hams Around the World

Bob Winn W5KNE
%QRZ DX
P.O. Box 832205
Richardson TX 75083

More DXing Techniques

One of my friends told me recently that he had used what can be considered a bad technique to work a new country. He wasn't necessarily proud of the fact, but after several unsuccessful days of using conventional techniques, he finally broke down and worked the elusive station by "calling out of turn," or "breaking-in." He did this only after he heard another station successfully work the DX station using this technique. This should remind us that there is more than one way to work DX in pile-ups.

Calling on or near the same frequency at the same time as a station working the DX station is considered by many to be rude or unethical. But it is done, and it is too often successful. A more appropriate technique is "tailending."

Tailending means transmitting your callsign on or near the same frequency as the station working the DX station immediately after that station finishes. Tailending is especially successful on CW, and it can be effective in SSB pile-ups as well. But it is not an easy technique to master.

Tailending used against an inexperienced DX operator often causes more problems than successes. A poorly executed tailend does nothing more than QRM the calling station, and more than likely will require the DX station to ask for a repeat, thus slowing his QSO rate. An excellent discussion of tailending is provided by Wayne Mills N7NG in the newly published *Where Do We Go Next?* by Martti Laine and others (KTE Publications, 2301 Canehill Avenue, Long Beach CA 90815). Wayne, an experienced DXpedition operator, shares his experience in Appendix I.

CY9 St. Paul Island

Jan VE2OL reports that a group of amateurs from the West Island Amateur Radio Club (VE2CWI) in Montreal will activate St. Paul Island August 1–7 with the callsign CY9CWI. The list of operators includes VE2SEI, VE2WHO, VE2JBF, VE2DAV, VE2PTT, VE2GZV and VE2OL. Three stations will be active during this operation. The following frequencies have been mentioned: CW—1820, 3520, 3680, 7040, 14050, 21110 and 28050 kHz; SSB—1870, 3795, 7060, 14195, 21295 and 28495 kHz. CY9CWI will also be active on the WARC bands. QSL via VE2CWI.

St. Paul Island sits in the Gulf of St. Lawrence just off the northeast coast of Cape Breton Island, Nova Scotia. Outside of Nova Scotia, few know about it — encyclopedias don't even mention it, and the usual know-it-all geographical dictionaries merely mention its location. But to many residents of Nova Scotia, and to those people who have been there, St. Paul Island is remembered as the graveyard of the Gulf of St. Lawrence.

As many as a thousand deaths have been attributed to the rocky embraces of the island. One of the first recorded shipwrecks was of the English transport *Royal Sovereign*, which was carrying troops home from the war of 1812. Of the 311 men on board, only a dozen or so survived. In 1825 the Canadian barque *Jessie* ran aground on the island during a snowstorm. The crew was able to get ashore, but they died of starvation.

The island, which actually consists of two islands and several rocks, resembles an exclamation mark (!). It's three miles long and averages 1-1/4 miles in width. It is currently inhabited by two lightkeepers who stay on the island for 28 days. Around 1900 there were as many as 40 people living on the main island. There was a post office, a cannery, a school and a telegraph office. The lighthouses were first built in 1838.

The main island, heavily wooded with stunted spruce, is about two miles long. The island on which the lightkeepers live (and DXers operate!)—the dot of the quotation mark—is about two acres in size and about 40 feet above high water. Lighthouse keeper Mel Tanner describes it as "this desert island of ours." Tanner also mentioned that the island is "...surrounded by a rough, rugged shoreline so exposed to disturbances that we are constantly overcast in spray during winds of any velocity."

Yuri Blanarovich VE3BMV, writing about the XJ3ZZ/1 DXpedition in the November 1977 issue of *CQ*, had the following to say about St. Paul. "St. Paul lies 18 miles northeast of the northern end of Cape Breton Island. It is small, rocky, and practically desolate. The northern point is a detached pinnacle, which appears from seaward to be joined to the main island, but it is separated by a narrow channel about 100 feet wide from the peninsula. The main part of the island rises in two parallel ranges of hills, the southeast being the higher with a summit of 485 feet....

"There are two lighthouses on St. Paul, one on the detached rock forming its northern extreme, and another on its southern point.... The only access to the small island is through the channel separating both islands, and only by small boat. Wooden platforms and walkways abound over the island. It is very difficult to walk on the island during bad weather, as the rocks are slippery and dangerous, but walkways connect all buildings on the island." Yuri also mentioned that "the expedition was not what you would call a pleasure trip, but hard work...."

St. Paul Island (CY9DXX QSL card), prefix (CY9).

St. Paul Island qualified as a separate DXCC country based on "separate administration." St. Paul, like Sable Island, was administered by the Federal Department of Transportation. This was established by an act of Canadian Parliament as part of the Canadian Shipping Act.

There have been several DXpeditions to St. Paul since it was added to the DXCC list of countries. The first signed the special callsign VY0A. Other operations included XJ3ZZ/1, VE1CR/1, CY0SPI, CY9SPI, CY9DXX, W5KNE/VE1 and CY9CF. The callsign CY0SPI was issued to the island to be used by ALL operations, but without any obvious reason the licensing authorities changed it to CY9SPI. The island callsign for Sable Island was changed from CY9SAB to CY0SAB at the same time. (Adapted from an article by W5KNE published in the August 1, 1988 issue of *QRZ DX*.) See the photo.

British Virgin Islands (VP2V)

Arch K8CFU, who will be visiting the islands August 16 through 25 with his wife, will be active as VP2V/K8CFU. Look for him on 20 meter SSB. QSL to Arch's *Callbook* address.

Greenland (OX91)

Laurent F6GOX (ex-TK5BL and FJ5BL) is a member of a scientific expedition scheduled to be in Greenland during July and August. Laurent should be active on the HF bands as OX91REF. The callsign of his 6 meter beacon on 50.100 MHz is OX91BCN. QSL via F6AJA.

DXing How-to Books

There have been several excellent DXing how-to books published in recent years, but the two that I believe are the best for new DXers are *The Complete DX'er*, by Bob Locher, W9KNI and *The DXCC Companion* by Jim Kearman KR1S.

Jim's book brings the beginner into the hobby of DXing at an easy pace and Bob's book, written in an interesting narrative style, sharpens the techniques.

Both books are available from major ham radio book outlets. You might want to check "Uncle Wayne's Bookshelf" in this issue of *73*, too.

New Islands-On-The-Air Directory

The new *IOTA Directory*, all 50 pages of it, is now available. It includes a fully updated list of islands to work for the IOTA Awards program and fully revised IOTA rules. Price: Europe—$10 or 15 IRCs; other countries—$12 or 18 IRCs. Send requests to IOTA Director Roger Balister, G3KMA, La Quinta, Mimbridge, Chobham, Woking GU24 8AR, England. 73

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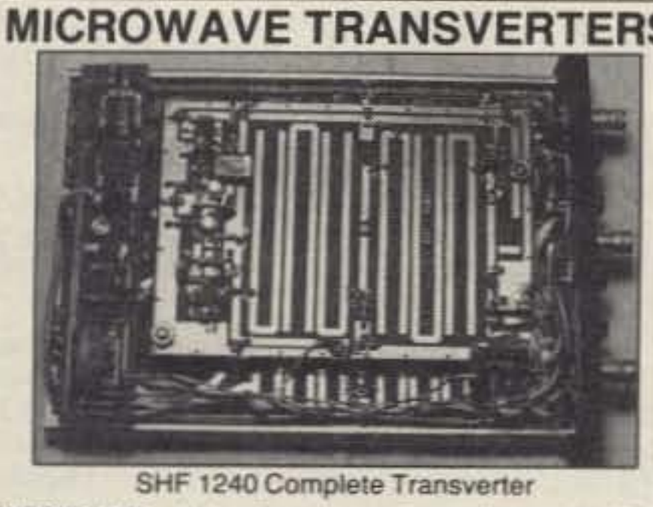

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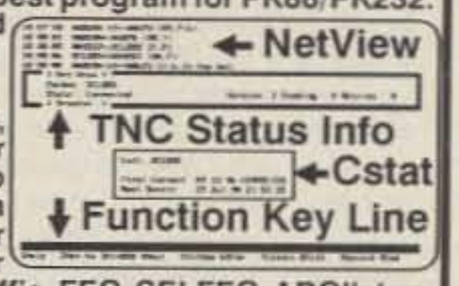

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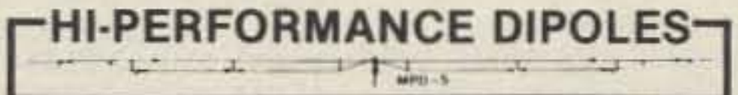

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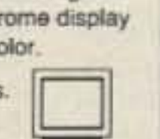

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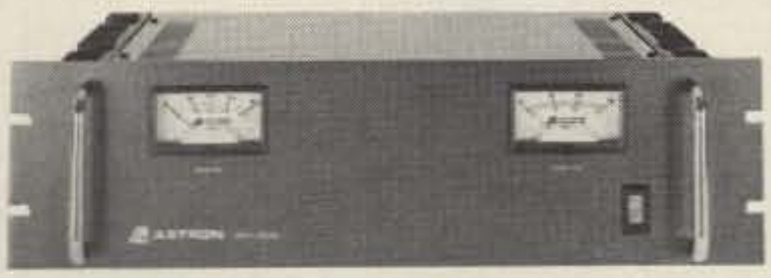
SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• 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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MODEL RM-35M

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

RS-A SERIES

MODEL RS-7A

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

RS-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

VS-M AND VRM-M SERIES

MODEL VS-35M

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

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

RS-S SERIES

MODEL RS-12S

• Built in speaker

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

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

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Lasers and Photomultiplier Tubes

It has been a year since the FET switcher AC power inverter appeared in this column—August 1990, in fact. The basic switch driver has been used in quite a few different applications. The photomultiplier tube (PMT) covered this month uses a modified version of this power supply to deliver the high voltage required for proper operation. The PMT is a sensitive detector used in the receiver portion of the system. Now for a little about the power supply and PMT requirements.

PMTs and Gain

The laser receiver described last month used a low voltage pin diode. Further improvements can be made by using a PMT with higher sensitivities. The pin diode circuit is modified by removing the first op amp to prevent too much gain from the PMT. In the end I used a single op amp tied directly to the LM386 audio amplifier. Steve Noll WA6EJO used an LM387 in his system, and experimentation proved him correct. The modifications are due to the fact that PMTs are much more sensitive when compared to photo diodes. In fact, PMTs have gains (current amplification) that run in the millions!

Photomultiplier tubes are electron tubes that receive light (a stream of photons) and convert it to electric current. A photo cathode, the first element of the tube, intercepts the light, then emits electrons (or, if you prefer, repels electrons because it's intercepting positive photons) towards the first dynode.

This first dynode is more positive than the cathode, and attracts the electrons. However, due to electron bounce, when electrons hit the dynode, they collide with other electrons on the dynode and join the original electrons at some exit angle. They are attracted by the next dynode (more positive) before they can return to the first dynode. See Figure 1. You might also use the old pool-table analogy to visualize all this activity. This process continues through nine successive dynode stages, providing very high current gains for a very small input signal.

Electron bounce happens in every electron tube, but a grid type structure near the plate, called the suppressor, is tied to the cathode potential. It repels electrons, sending them back to the plate and reducing secondary emissions. In the PMT, the opposite is required in order to obtain current gain.

PMTs can be so sensitive that when they are used for very low light applications, such as astronomy, they are contained in magnetic shields, and cooled to very low temperatures. The magnetic shielding limits external forces affecting the electrons as they are reflected internal to the tube's elements (dynodes), and maximizes performance.

As you can see in Figure 2, the internal construction of the dynode is different in the various types of PMTs. Some types are: the Side-On, the Head-On (compact, with fast response; like the 931), the Box-and-Grid (generally provides best uniformity and sensitivity), and the Venetian Blind (high output, slow response time). All of these PMTs work very well, as time response is not a critical factor for our applications.

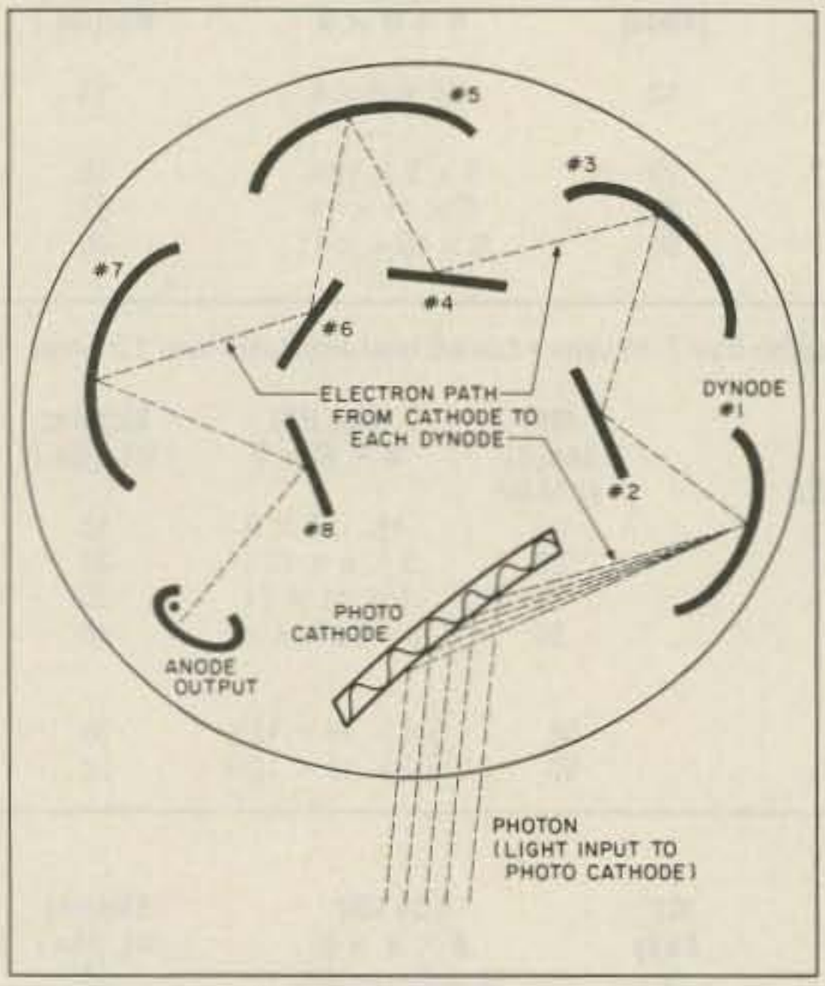

Figure 1. The 931 photomultiplier (PMT), showing current path from photo cathode (light input) to each dynode involved in current amplification. Current gain is very high.

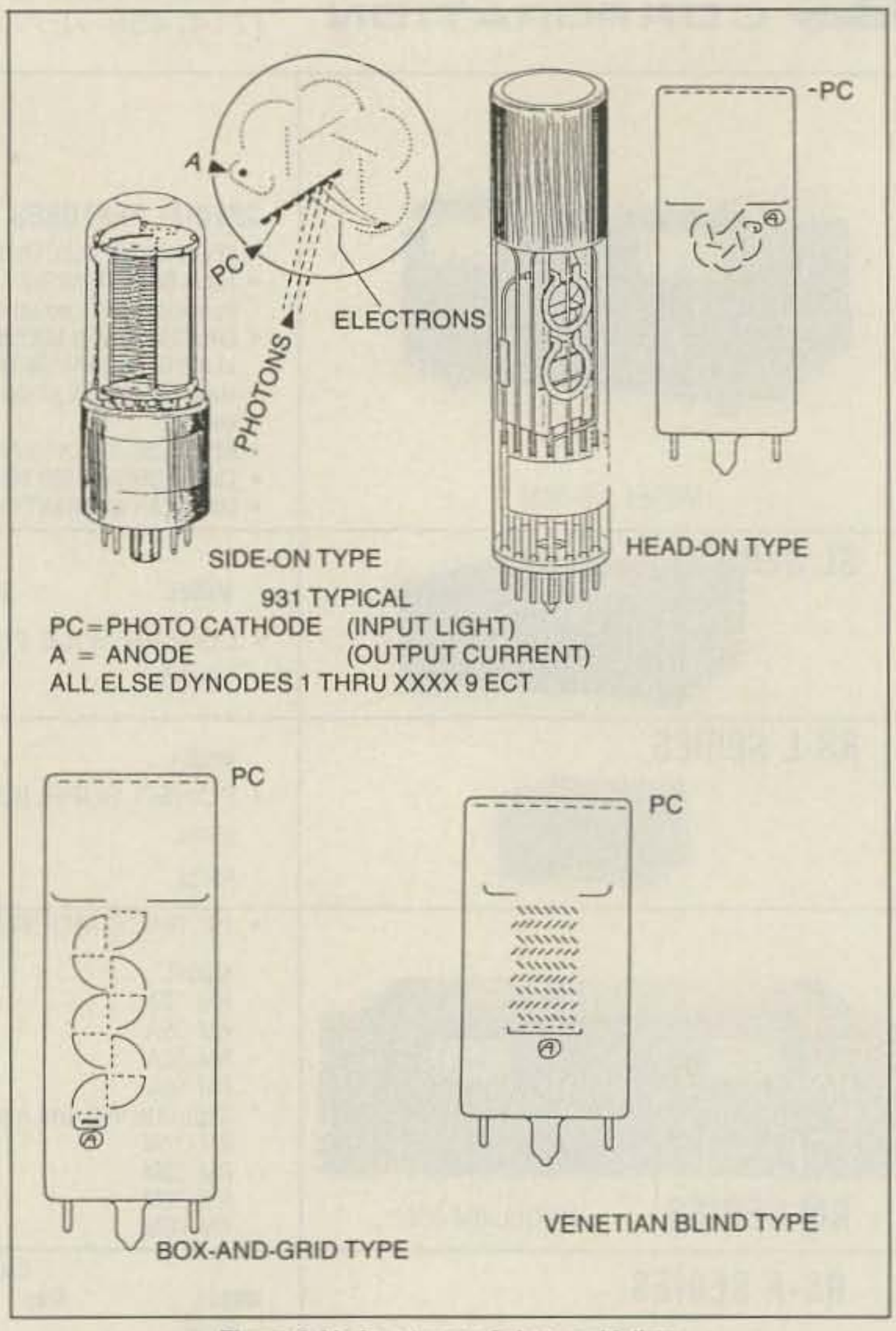

Figure 2. Various types of photomultipliers.

The 931 and similar types of PMTs require a power supply voltage near 1000 volts, and 2 to 3 mA of current for the tube and resistor network. The power supply connections for a 931 PMT are shown in Figure 3. This resistance network is usually contained in a well-insulated tube socket base.

The change to the circuit is minimal. With a PMT, all you need is a high voltage capacitor coupling the PMT's output to the detector's audio preamplifier circuit. A high voltage capacitor is necessary since PMTs operate at a potential around 1 kV, and you don't want high voltage leading into the low voltage audio circuit.

The Power Supply

The PMT power supply uses the basic switch driver coupled with a hand-wound toroidal step-up transformer to produce a home constructed 1 kV power supply at a few mA. The power supply application was covered in detail in the August 1990 column. *[Ed. note: See the May 1991* Updates *section for the schematic.]* In that application, a 24 volt center-tapped transformer was used, driving it backwards, which made the primary the 110 volt AC output. Depending on the current rating of the 24 volt winding, you could obtain 100 or so watts of power at 110 volts AC from this simple system. In our application, the 24 volt transformer is replaced with a home-wound toroid step-up transformer.

The construction of a power supply meeting the PMT's voltage requirements fit well with the FET switcher design. What was desired was a system to operate from 12 volts for portable operation. Construction on a step-up transformer was started by winding a ferrite bobbin (cup core transformer). The cup core type was selected due to the ease of winding a high number of turns required for the secondary. The secondary was wound by hand, and a very small transformer resulted. By using a ferrite cup core transformer, the entire unit can be constructed in a very small container.

The ferrite bobbin/core can be ordered new or obtained in surplus. The transformer construction uses a single ferrite cup core that is about an inch and a half in diameter and an inch high. The cup core transformer is constructed of two identical ferrite halves that sit on top of each other and contain an internal plastic bobbin. This bobbin is removed to facilitate rapid winding. Compared to a toroid, the bobbin can be more easily wound.

The bobbin (transformer) is very similar to a sewing machine bobbin. I was able to wind a primary of 54 turns center-tapped #24 gauge wire with a layer of insulating Mylar and transformer tape (to isolate the primary from secondary) in about three minutes. The secondary required about 1800 turns of #36 gauge wire to obtain the 1 kV needed for the PMT. A small gauge

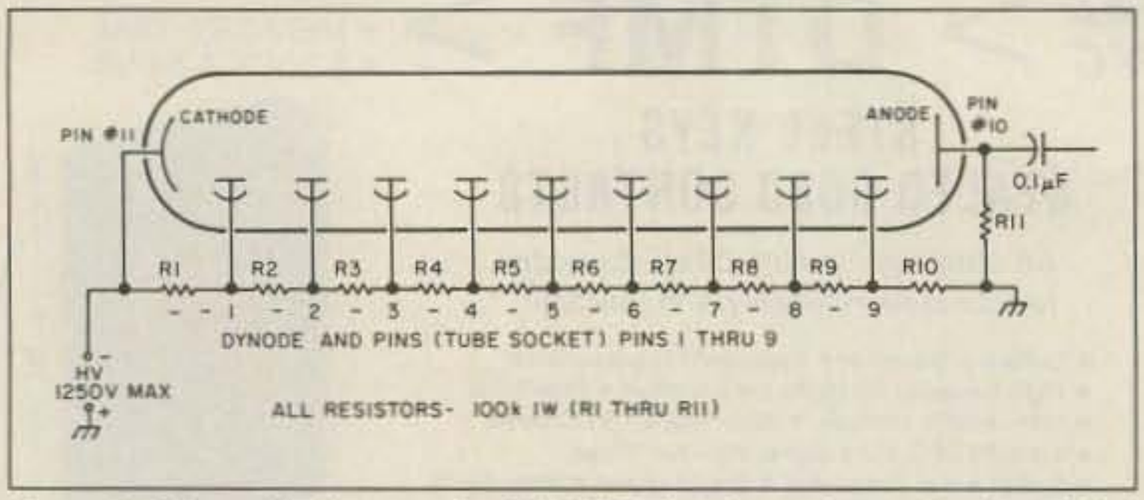

Figure 3. Schematic diagram of a 931 PMT, showing resistor network and high voltage.

wire is used for the secondary, since the PMT's current there is only 1 to 2 mA. The wire gauge is not critical.

In the initial test transformer, I scramble-wound the secondary in one large coil. I have to admit I lost count several times on the exact number of turns, but it was close to 1800. Normally I would have laid a layer of tape every 200 turns or so to give voltage flashover protection on the secondary, but I didn't do this to the trial transformer.

The enamel wire should be good to 1 kV, but why push it as I did with the prototype? When finished I had plenty of room for the six or so layers of Mylar insulating tape, which would hold voltage to lower limits in each separated winding bundle. Other insulating material can be used.

it, as it can draw quite an arc that I don't wish to be near. Just use good insulation procedures and good construction techniques, and keep you hands out of it when it is on. Can't say it enough: SAFETY FIRST.

Mailbox

Joe Foss USN on the *SS Cleveland* writes that he found an old copy of *73* in Subic Bay R.P. He enjoyed the article covering the 30 MHz IF amplifier used in the receiver for 10 GHz microwave wideband FM. He wanted to build one, but knew that Radio Shack doesn't stock the main ingredient—the TDA-7000 chip. Well, Joe, the chip comes with the kit along with a few other parts that I can muster up to help defray costs. It's amazing how many of these

Once the transformer was completed, I found that due to an error in winding (turns ratio) I had too much output voltage for a current draw at 2 mA. I could have opened up the transformer and removed turns, but I decided it would be better to put a voltage regulator in the switching input circuit, and regulate the DC voltage. This way I could set the output voltage to compensate during test evaluations for different type of tubes. A minor variation, but part of the prototyping game.

All that was required was an LM317 adjustable voltage regulator. I set the voltage to the 9 to 10 volt range for input to the switcher and obtained 1 kV output with ease. A small pot controlled the DC regulated voltage. The LM317 required a heat sink, as it was passing a half amp of current at 12 volts for this circuit, but that's a small price to pay for such easy voltage control. I ran the prototype for three hours, and it did not falter. I did detect some transformer heating, but this was slight, as with the switching FETs. I am always suspicious of something that works the first time.

NOTE: Use caution with this power supply, as it can deliver a lethal jolt! Always keep safety in mind when working with high voltage. Do not think that just because it provides only a small current it is not serious. THINK AGAIN! If you need proof, this baby will provide

simple kits have surfaced on the microwave bands since the first article went out. I still use mine, and it did not have a PC board, being the prototype. Cost of the kit is still $10 postpaid.

Steve Caesar KF8LW is planning several microwave beacons using simple keyed CW oscillators for the bands 450 MHz and up (the 70cm, 35cm, and 23cm ham bands). I supplied a beacon CW IDer for the project.

Junji Tamura JH1MNOY obtained a phase-locked brick from me and reports it arrived safely in Japan. He was very happy to find some SMA connectors and voltage regulators in the package. These are difficult to get in Japan, he says. When Junji completes the negative 20 volt power supply, the brick oscillator will be tested in the lab at the Japan Amateur Radio League. I set the brick up for 10.0040 GHz to use with a 430 MHz SSB radio for operation on 10.475 GHz, their portion of the band.

I am gathering components for a weather satellite receiver operating on 1691 MHz, and I'll report on that when time permits. As always I will be glad to answer questions concerning microwave or related topics. Please include postage (SASE) for a prompt reply. Those without return postage will go unanswered, but may be answered in the column. Best 73s, Chuck WB6IGP. 73

UPDATES

Number 19 on your Feedback card

Micro ATV Transmitter

See the above article in the July '91 issue, page 9. Although the Micro ATV Transmitter will work as shown in the article, there are a couple of changes that will improve its performance. There is one error in the original schematic. As shown in the original article, the video clamping circuit will not function. This could cause sync loss (an unstable picture) during wide variations of scene illumination. To correct this, note the new location of the 1k resistor R9 (see Figure 1). Remove the chip resistor R9 from the bottom side of the circuit board and add a standard 1k, ⅛W resistor to the top side. This new resistor R9 should go from the junction of diode D1 and potentiometer R8 to ground (see the new parts placement diagram—Figure 2).

Note that the polarity of capacitor C7 was reversed in the original parts placement diagram. The correct configuration is shown here in Figure 2. Also when using the corrected circuit, you should increase the value of capacitor C7 to 100 µF with a 10 volt rating. Mouser part# 140-MLR10V100 is recommended for C7. One final note: when installing the MRF-911 transistor, make sure that the collector lead points towards the RF out connection. 73

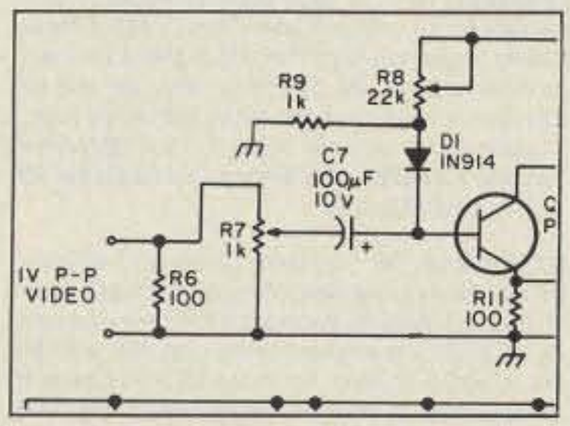

Figure 1. Corrected schematic for the Micro ATV Transmitter. Note new placement of R9.

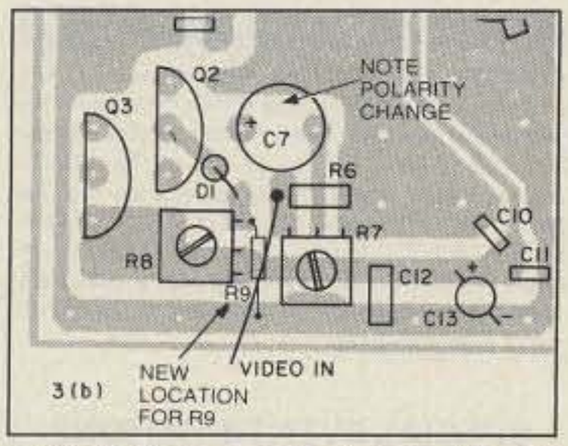

Figure 2. Correct parts placement for the Micro ATV Transmitter. Remove chip resistor R9 from the bottom of the board, then solder a 1k, ⅛W resistor to the top of the PC board as shown. Note also the correct polarity of capacitor C7.

Number 20 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 /HAMFESTS on our BBS (603-525-4438) for listings that were too late to get into publication.

AUG 2

CAMILLUS, NY VE Exams will be held at the Town of Camillus Municipal Building beginning at 7 PM. Test fee for Technician through Extra is $5.25. Talk-in on 147.300. Please bring two forms of ID and a copy of your license. Contact ***John Patchett KB2ERJ, (315) 487-0298.***

AUG 3

HANCOCK, MI The Copper Country Radio Amateur Assn., Inc. will host the 1991 Upper Peninsula Hamfest at the Houghton County Arena. A banquet will be held Sat. eve. at the Ramada Inn in Houghton, following the Hamfest. For info on tables call ***(906) 337-5537***, or write to ***Howard D. Junkin N8FHF, Publicity Coordinator, Copper Country RAA, PO Box 217, Dollar Bay MI 49922.***

AUG 3-4

JACKSONVILLE, FL Eight Amateur Radio clubs of the Greater Jacksonville area will combine efforts to present the 18th annual Greater Jacksonville Amateur Radio/Computer Show at the downtown Prime Osborn Convention Center. Swap tables. FCC Exams and Auction will be held on Sun. Admission $5. Reserved swap tables are $15 for the weekend. Fri. set-up is 2-7 PM; Sat. set-up is 7-9 AM. Open for the general public from 9 AM-5 PM Sat., and 9 AM-3 PM Sun. To order advance tickets, send an SASE with payment to ***Greater Jacksonville Amateur Radio & Computer Show, PO Box 10623, Jacksonville FL 32207.*** Swap tables may be ordered via ***PO Box 11882, Jacksonville FL 32239***. For exhibitor info write ***PO Box 9673, Jacksonville FL 32208.***

AUG 4

CROOKED LAKE, IN The Second annual Land of Lakes Angola Hamfest will be held at Steuben County 4-H Park from 6 AM-2 PM. Camping available. Free parking. Walk-in VE Exams. Advance tickets $3, $4 at the door. Table charge $5; trunk sales $2. Contact ***Land of Lakes Angola Hamfest, PO Box 465, Fremont IN 46737.***

PEOTONE, IL The Hamfesters Radio Club, Inc. will sponsor their 57th Hamfest/Computer Festival at the Will County Fairgrounds from 6 AM-3 PM. Overnight parking. Set-up Sat. $10 plug-in fee by Fairground. Exhibits open at 8 AM. Advance tickets $4, $5 at the gate; under 12 years free. Talk-in on 146.52 and 146.76-. Contact ***David F. Brasel NF9N, 7528 W. 109th Place, Worth IL 60482. (708) 448-9432.***

AUG 10

LOS ALTOS HILLS, CA The Perham Foundation will sponsor an Electronics Flea Market at Foothill College Parking Lot "C". Sellers $10 per vehicle (2 spaces); buyers free. Call ***(408) 255-9000*** for Exam info. Talk-in on 144.67/145.27 MHz SPECS repeater. Campus parking rules are enforced! Please park legally.

BEND, OR The High Cascade Hamfair, sponsored by Central Oregon Radio Amateurs, will be held indoors at Mt. Bachelor Sunrise Lodge from 9 AM-4 PM. 2 meter foxhunt, VEC Exams, commercial exhibits. Advance tickets $5, $7 at the door. Flea Market space $2; $10 with table. Reservations required. Overnight area for self-contained RVs. No hook-ups or tents. Preregistration deadline is June 30th. Talk-in on 147.060 (+600). Contact ***Jack Ulstead N7DDS, PO Box 506, Sisters OR 97759. (503) 549-9480.***

AUG 10-11

HUNTSVILLE, AL Huntsville Hamfest 1991 will be held at the Von Braun Civic Center. Round-the-clock security provided. Free electricity in each booth. Huntsville Hilton directly across the street. Contact ***Huntsville Hamfest, Inc., 2804 S. Memorial Pkwy., Huntsville AL 35801.***

AMARILLO, TX The Panhandle ARC will sponsor the P.A.R.C. Golden Spread Hamfest. Tickets $6 in advance, $7 at the door. Tables $5. VE Exams both days. Wheelchair accessible. Talk-in on 146.920, 146.940 and 146.670. Contact ***P.A.R.C., PO Box 1524, Amarillo TX 79105***, or call ***Troy Reno, (806) 358-5906.***

AUG 11

ST. CLOUD, MN The St. Cloud ARC Hamfest will be held at the Whitney Senior Center on Northway Dr. Donation $4. Talk-in 34/94 primary; 615/015 secondary. Contact ***SCARC, Box 141, St. Cloud MN 56302.***

WARRINGTON, PA The Mid-Atlantic ARC Hamfest will be held at the Bucks County Drive-In Theater on US 611. Set-up at 7 AM. General admission at 8 AM. Admission $3; $2 for each tailgate space. Talk-in on 147.66/.06 and 146.52. Contact ***Al Maslin W3DZI (215) 446-4936.***

PAULDING, OH The Paulding County AR Group and Modern Woodmen of America Ins. Co. will co-sponsor a Hamfest at Paulding County Fair Grounds beginning at 8 AM. To register for License Exams, send an SASE and a check for $5.25 payable to ***Bob High, 12838 Tomlimson Rd., Rockford OH 45882.*** For Flea Market info contact ***Allan Helle, (419) 263-3093***, or ***Jerry Rhodes, RR 2 Box 1582, Paulding OH 45879, (419) 399-4507.***

CEDAR RAPIDS, IA Cedar Valley ARC will sponsor the Cedar Rapids Summerfest at Teamsters' Hall, 5000 J St. SW. VE Exams. Free tailgating. Commercial exhibits. Admission $4 at the door. Tables $12 w/power, $10 without. To reserve tables, send an SASE with check payable to ***CVARC, c/o V. Wilcox KB0DNA, 3122 Sue Land NW, Cedar Rapids IA 52404.*** Talk-in on 146.745 repeater.

AUG 17-18

BREWSTER, NY PEARL, The Putnam Emergency and Amateur Repeater League, will hold "PEARLFEST" at the John F. Kennedy Elementray School on Foggintown Rd. VE Exams. Commercial Exhibits. Fox-hunts. ARRL table. Admission $4. Dealer tables $10 in advance. Tailgaters $7. Talk-in on 145.135 -600. Contact ***Joel Rappaport WA2AWG, Box 216, RR2, No. White Rock Rd., Holmes NY 12531. (914) 855-1672.***

ITHACA, NY The Tompkins County ARC is presenting the Finger Lakes Hamfest and Computerfest on Sat., August 17, 1991, at the New York State Armory, Ithaca, NY. Vendors will be offering both new and used equipment, and there will be a large paved flea market area. VE testing is available by preregistration. Send 610 forms to NK2V, P.O. Box 4704, Ithaca NY 14852. Admission is $3 in advance, $4 at the door. Under 18 free. Indoor tables $6, outdoor spaces, $2. Breakfast and lunch will be served. Indoor spaces should be reserved and paid for by July 15. N.Y. Army National Guard equipment displays. For more information contact ***Ross Boyer, N2ISU, T.C.A.R.C., P.O. Box 4144, Ithaca, NY 14852-4144.***

SHREVEPORT/BOSSIER CITY, LA The Shreveport ARA will sponsor a Hamfest at the Bossier City Civic Center. Astronaut Steve Nagel N5RAW, STS-37, will be guest speaker. Admission $3. Talk-in on 147.03/.63. Contact ***Ric Crouch N5QML, 3201 Knight St., Apt. 2508, Shreveport LA 71105. (318) 865-0313.***

MOBILE, AL The Mobile ARC will sponsor a Hamfest at Abba Shrine Temple from 8 AM-4 PM Sat., and from 8 AM-3 PM Sun. Admission $3, ladies free. Tables $12 (200 available, pre-registered only). VE Exams Sun. at 9 AM. Bring two ID's (1 photo) plus original license and copy, and $5.25. Contact ***N4EM***. Talk-in on 146.82/.22; contact ***Marc, PO Box 9315, Mobile AL 36691*** or ***Jess Ferguson N4HPL, (205) 957-6674, PM.***

AUG 18

TOWSON, MD The Moose ARC will sponsor a Hamfest at the Towson Moose Lodge. Admission $3, tailgating $5, inside tables $10. Doors open at 8 AM. Talk-in on 224.12, 224.16, 145.13, 145.33 repeaters. Contact ***Rick N3HIA, (301) 574-3998 eves.***

QUINCY, IL The Sixth annual Tri-States Swapfest (ARRL approved) will be sponsored by the Western Illinois ARC, and held at 3737 N. 5th St., 1 mile N of US 24 and N 5th, from 8 AM-3 PM. Advance tickets $2.50, $3 at the door. VE Exams. XYL activities. ARRL table. Talk-in on 147.63/.03 and 146.34/.94. Contact ***Jim Funk N9JF, c/o WIARC, PO Box 3132, Quincy IL 62301. (217) 336-4191,*** or ***(217) 336-3321.***

ELGIN, IL The annual T.C.R.G. FEST, sponsored by the Tri-County Radio Group Inc., will be held at Elgin VFW Post #1307 from 8 AM-3 PM. Set-up from 7-8 AM. Advance tickets $4, $5 at the door. Registered tables $8, $10 at the door. Tailgate space $5. To register, send an SASE with check or MO to ***T.C.R.G., c/o Ken Whitmire N9KSP, 10210 Rt. 31, Algonquin IL 60102. (708) 658-3411.*** Ask for Ken. M-Sat. 10 AM-7 PM CST. Talk-in on 443.025 (114.8 PL); 147.225 + (107.2 PL)

CAMBRIDGE, MA The MIT Electronics Research Society, the MIT Radio Society and the Harvard Wireless Club will co-sponsor a Flea Market from 9 AM-2 PM at Albany and Main St. Admission is $1.50. Free off-street parking. Sellers $8 per space at the gate, $5 in advance (includes 1 admission). Set-up at 7 AM. Covered tailgate area. Contact ***(617) 253-3776.*** For advance reservations make checks payable to ***MIT Radio Society*** and mail with an SASE before Aug. 5th to ***W1GSL, PO Box 82 MIT BR., Cambridge MA 02139.*** Talk-in on 146.52 and 449.725/ 444.725-PL 2A-W1XM repeater.

AUG 22-24

BLACKSBURG, VA Personal Computer Interfacing-Practical Instrument Automation, Networking and Control Techniques. A 3-day hands-on workshop. Contact ***Dr. Roy Jones, (703) 231-5242,*** or ***(703) 231-6478.***

AUG 23-25

SAGINAW, MI The 1991 ARRL National Convention will be held at the Saginaw Civic Center. Advance 3-day general admission tickets are $7, $9 at the door. For lodging reservations ($32-$69 per night) call ***1-800-444-9979***. Call ***(517) 792-6270*** for camping info. Make checks payable to ***1991 ARRL Convention Committee***. Mail to ***Camping Registration, PO Box 1783, Saginaw MI 48605-1783***. Reserve Flea Market tables ($15 each) by calling ***(517) 893-3475.*** Make checks or money orders payable to ***1991 ARRL Convention Committee***. Mailing address: ***Convention Pre-Registration, PO Box 1783, Saginaw MI 48605-1783.*** If registration with SASE is received before July 4th, the 3-day tickets will be mailed to the applicant. Tickets requests received July 5th-Aug. 16th will be held for pick up. Advance registration closes on Aug. 16th.

AUG 25

FORT WAYNE, IN The Summit City Hamfest, sponsored by the Fort Wayne RC, will be held at the 4-H Fairgrounds on Carroll Rd., from 8 AM-3 PM. Free parking. Tailgating $7. Flea Market. Set-up at 6 AM. Advance tickets $3, $5 at the door, kids under 12 free. Reserved table & chair in open air building is $10; in air conditioned building, $15. Contact ***Frank Jaworski, PO Box 15127, Fort Wayne IN 46815. (219) 485-2634.*** Talk-in on 146.16/.76, 449.875/444.875. All Flea Market reservations include one admission ticket to a maximum of three tickets.

ST. CHARLES, MO The St. Charles ARC will sponsor HAMFEST91 at Blanchette Park from 6:30 AM-3 PM. Forums and License Exams (10 AM). Free admission and parking. Handicapped parking available. Fee for Flea Market space. Talk-in on 146.67 and 444.65 repeaters and 146.52 simplex. Contact ***John Lehnhoff N0HMZ, 155 Brentwood, St. Charles MO 63303. Phone (314) 928-2510 after 5 PM.***

LEBANON, TN The Short Mountain Repeater Club will sponsor an outdoor Hamfest from 7 AM-3 PM at Cedars of Lebanon State Park, US Highway 231, seven miles south of I-40. Exhibitors bring your own tables. Space available on first come, first served basis. Free admission. Talk-in on 146.91. Contact ***Mary Alice Fanning KA4GSB, 4936 Danby Dr., Nashville TN 37211. (615) 832-3215.***

MARYSVILLE, OH The Union County ARC will sponsor the Marysville Hamfest/Computer Show at the fairgrounds in Marysville starting at 6 AM. Free overnight camping with free entertainment on Sat. eve. at 8 PM. Set-up on Sat. at noon. Admission $3. FCC Exams at all levels (walk-in only). The world famous HAMCAM VAN will be on display in the Merchants Building. No advance tickets. Vendor spaces are $5 for a 10' space. Contact ***Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040*** or call ***(614) 261-8871 days; (513) 644-0468 eves.***

AUG 31-SEP 1

ALAMORORDO, NM The Alamogordo ARC will present their Seventh annual Hamfest on Labor Day weekend at the Otero County Fairgrounds from 8 AM-5 PM Sat.; 8 AM-2 PM Sun. RV parking for self-contained vehicles. Admission and parking are free. Tables and booths available on a first-come basis. Talk-in is on 146.80. VEC Exams will be held at 12 noon on Sat; 9 AM on Sun. Contact ***Larry Moore WA5UNO, 1830 Corte del Ranchero, Alamogordo NM 88310-4717. (505) 437-0145.***

SPECIAL EVENT STATIONS

AUG 1-4

GRAND HAVEN, MI In conjunction with the annual Coast Guard Festival, the North Ottawa ARC will operate SE Station KE8DL from 1600Z-0000Z. Frequencies: 7.225/.250, 14.250/.300, 28.400/450. For certificate, send QSL card or equivalent with an SASE to ***KE8DL, 1815 Hillcrest, Grand Haven MI 49417.***

AUG 2-4

ST. LOUIS, MO "Youth in Ham Radio" is the theme of special event stations operating from three locations from 0001Z Aug. 3rd (Friday eve., Aug. 2nd, local time) until 2359Z Aug. 4th. Sammy Garrett AA0CR (1991 Westlink Report Young Ham of the Year) will operate from St. Louis MO; Mary Alestra KB2IGG (1990 Westlink Report Young Ham of the Year) will operate from New York City; Darrel Craig KK6BB, will operate from Fullerton CA. For QSL from any station, send QSL and contact number with a legal size SASE to ***AA0CR, PO Box 5832, St. Louis MO 63134.*** For a certificate for contacting all three stations, send 3 QSLs and 3 contact numbers with a 9x12 SASE. Frequencies: General/Novice portions of 40, 20, 17, 15 and 10 M (phone/CW).

AUG 10-11

BARNEGAT LIGHT, NJ The Old Barney ARC will operate SE Station W2OB from 1200-2300UTC Sat. and Sun. to celebrate National Lighthouse Day. Frequencies: CW-7040, 14040, 21040, 28040; SSB-7275, 14290, 21390, 28390; 146.835 repeater; 146.52 simplex. QSL via ***Joe Fleishinger NU2F, 75 Joshua Dr., Manahawkin NJ 08050.***

AUG 14-16

BRIDGEWATER, NJ The Somerset County Office of Emergency Management will operate WC2ADK 1400-0100Z each day to promote Amateur Radio, R.A.C.E.S. and Public Service at the annual 4-H Fair. HF on lower 25 kHz of General 80-10 meters, packet, ATV; visitors on 145.32 simplex. Send QSL and SASE to ***Somerset County OEM/4H, PO Box 3000, Somerville NJ 08876.***

AUG 16-18

YORKTOWN, VA The Southern Peninsula AR Klub will operate N4KZR between 1400Z and 2200Z on Aug. 16, 17 and 18, to commemorate the 300th anniversary of the Founding of Yorktown VA, where the last battle of the American Revolution was fought. Phone operation is planned for the General portions of 80, 40, 20 and 15 meters, as well as the Novice 10 meter phone subband. For a commemorative certificate, QSL with SASE to ***M.C. Ellis, 300 Artillery Rd., Yorktown VA 23692.***

AUG 17-18

VANCOUVER, WA The Clark County ARC of Vancouver/Clark County WA, will sponsor station W7AIA to help celebrate the 32nd annual Antique Aircraft Fly-in and Display at Evergreen Flying Field (just East of Vancouver). Operating times will be from 1800-2359 UTC Sat.; 1800-2300 UTC Sun. Frequencies: Lower portion of General class part of the 40, 20, 15 meter bands and on or near 28.455 in the Novice/Tech portion of 10 meters (conditions permitting). For a commemorative certificate showing a 1917 Jenny, SASE only to ***CCARC, W7AIA, PO Box 1424, Vancouver WA 98668.***

MANITOWOC, WI The Mancorad RC of Manitowoc will operate W9DK from 1400-0000Z both days, from the WW II Submarine "Cobia" to celebrate Maritime Week. Frequencies: 7.250, 14.250, 21.350, 28.450. For certificate, send QSL and an SASE to ***Mancorad RC, PO Box 204, Manitowoc WI 54221-0204.***

AUG 28

TRANSITION NIGHT QSO PARTY for 135 CM The Eastern VHF/UHF Society urges amateurs to join together on the 135 CM band on the eve of Tues. Aug. 27th, to honor our 135 CM past and open our new band and opportunities. This event is to be known as "The 220 QSY QSO Party." Phase A extends from 2200-2400 GMT Aug. 27th (the last few hours before the change). The entire band, 220 to 225 MHz can be used. Phase B, from 0000-0400 GMT on Aug. 28th, is the first 4 hours after the change. Use of the entire band is allowed. For complete instructions and rules, contact ***Eastern VHF/UHF Society, Thomas J. Kirby W1EJ, 1 Meadow Knoll, PO Box 455, Pelham NH 03076.***

AUG 28-SEP 2

MOUNT PLEASANT, IA The Mt. Pleasant ARC will operate W0MME during the 42nd annual Midwest Old Threshers Reunion. Operation will be in the General portion of the 80-10 meter phone bands. Club members will monitor their 444.95 and 147.39 repeaters for those attending. For a QSL send an SASE to ***Dave Schneider WD0ENR, 507 Vine, Mt. Pleasant IA 52641-2846.***

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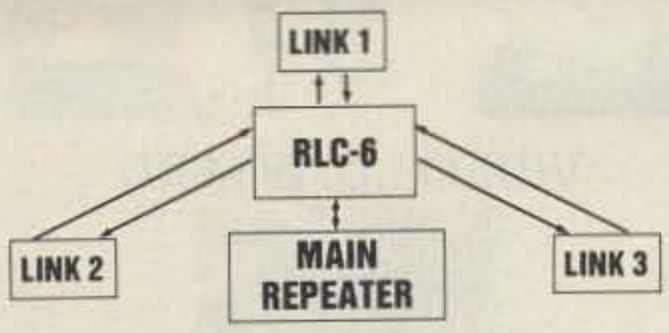

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Packet or RTTY—Which is Better?

Packet, packet, packet. . . .who's got the packet? As one of the newer forms of digital communication, packet circuits have certainly taken amateur circles by storm. Look around this magazine if you doubt this fact. Nevertheless, packet just might not be for everyone. To wit, consider this letter from Howard Evans W6IDS.

Howard writes, "I run a landline bulletin board named 'Amateur Radio CBCS' in Rancho Cordova, California. . . . What interests me is the number of users who have mentioned in the message areas (both local and national) that there seems to be a bit of disappointment regarding packet. It seems that the common line focuses on the apparent 'overload' of the packet systems in general.

"In the messages, I read comments about a pronounced delay in the forwarding/receipt of packet mail, and a marked comparison of RTTY to packet in through-put efficiency, with RTTY standing out.

"I have tested packet a couple of times and I must say I still prefer RTTY for general communications. I know the technology is in vogue, and it is chic to be a packeteer, but the amount of cost required to set up a reasonable packet station versus using a normal RTTY station, to me is not really justified. Of course, this is my own opinion, and frequently I am at odds with the vast majority on issues. I just can't get excited about packet, even if it is the in-thing to do today.

"For that reason, I am very disappointed at what appears to be a decline in active RTTY stations. Oh, I know they're there, but it *used* to be easy to find the critters lurking about, either monitoring for a call, or already engaged in a contact. I have spent some time tuning around, and it does seem to me that the general RTTY activity is declining. I think that is our loss.

"It is my contention that for HF communications, RTTY is the better way to go, overall. And yet, more people continue to focus on packet, only to reflect later on how 'slow' it is, and how entangled it has become in territorialism, intra-system bickering, and politics.

"I'm not trying to convince you of a particular point of view, rather I am trying to convey a sense of concern over what I perceive as an insufficient arrangement of priorities which has placed packet over RTTY."

AMTOR Hardware

Strong sentiments, Howard. I wonder how many others agree. Over the decade and a half this column has been running, I have seen many trends come and go. Will packet be just another fad, or does it have a true place in the scheme of things? I certainly look forward to other readers' thoughts and comments on this apparent schism in the digital world.

If packet has its critics, how about other non-Baudot forms of digital communication? Garry Hawkinson WAØRXB of Proctor, Minnesota, asks whether AMTOR is a software operation using a regular terminal unit, or if other hardware is required as well.

I guess the answer is yes. . . and no. One way to get onto AMTOR is with one of the newer multimode terminal units. These little wonders take care of all the work of encoding and decoding the various AMTOR modes, requiring only a dumb terminal on your end. We have mentioned AEA and Kantronics units in this column in the past, but other schemes are possible, including those that move all the smarts for the protocol into your computer, and rely only on the switching circuits of a terminal unit to complete the connection.

However, whatever technique you choose to get onto AMTOR, your transmitter and receiver have to be able to switch from transmit to receive and back again very quickly and cleanly. When using a mode which requests block-by-block confirmation, such as AMTOR or packet, efficient transmit/receive switching is a must.

One such problem was addressed in the July 1990 "RTTY Loop," in which a modification for the ICOM IC-740 transceiver was published. The transmit/receive timing was altered, allowing for more efficient and accurate AMTOR transmissions.

Hope this helps you sort out the alphabet soup of RTTY modes. We have covered AMTOR in depth in the past, and will continue to look into it in the future.

AMTOR and RTTY Bands

Once you get on AMTOR, though, the question of where to find QSOs comes up. This puzzles William Martin N7EU, who writes that he has "...been operating RTTY and AMTOR for about five years now, and wonders about the operating habits on this mode. Why is it most of the fellows seem to congregate on either 80 or 20 meters when there is so much other spectrum to try? It would seem to me that 40, and especially 30, meters would be an ideal band to use during the daytime period of operation. Since I don't have an 80 meter antenna yet, that leaves me only 20 meters to slug it out trying to make a contact on these two modes. On 20 it seems the boys really get crammed into a small portion of the band, making it difficult to make a contact. Thirty meters seems to be quiet most of the time, with a notable lack of activity on RTTY and AMTOR. Is it some unknown tradition that keeps the hams on RTTY in a certain band, or are they not interested in trying something new? Even on 10 meters, where you would expect some Novice to try RTTY, activity is nil.

"Maybe in one of your upcoming articles you could respond to my question and encourage some of the fellows to try 40 and 30 meters. After all, 30 is a CW/RTTY exclusive band, and seems well suited for this purpose. Is there a "calling" frequency on 30 that I am unaware of, or is everyone out to lunch on this one?

"I really enjoy the two modes, and find AMTOR to have a bit of an edge over RTTY at my power level (100 watts) and modest dipole antenna. I use the CP-1 with the MBA-TOR inserted into the back of the C-64, and find it quite adequate for my level of operating with these modes. I bought these items used, and they are quite adequate for the beginner.

The only disadvantage I can see is that this setup does not support packet. But I suspect that could be overlooked, considering the bargain price. You could always pick up a separate unit for packet later."

Well, William, I would say that the answer to your question about band use can be stated in one word: INERTIA! Hams congregate around these frequencies because that's where they started; they have always been there. Why those frequencies were chosen has to do with conditions no longer applicable, like crystal availability and VFO stability. That they were chosen remains quite applicable, because if you are looking for a QSO, you can tune where you know others are listening. And so the pile-up grows! There is nothing inherently wrong with staking out a new frequency, as long as it is in a valid RTTY band and you are not stomping on some net.

This is a good question, with valid arguments on both sides, and I look forward to hearing some other readers' comments on the topic.

As far as the hardware you are using, it is good to see that a shoestring system (by cost) does not have to be too limited. Great tips on the C-64 and accessories.

Check out those garage sales and flea markets, folks. After all, one man's trash may be another's terminal.

Drop me a note when you are on your terminal, or at your quill and pad. Either by mail, as these folks did, or on one of the online services: CompuServe (ppn 75036,2501) or Delphi (user name MARCWA3AJR). 73

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DRAKE

R. L. Drake's new R8 world-band shortwave receiver lets you hear world events as they happen. The R8 can be programmed to store up to 100 stations in memory for instant recall. A full complement of state-of-the-art filters and computer interface capability are also built in. It operates in the AM, LSB, USB, CW, RTTY and narrowband FM modes. The frequency range is 100 kHz–30 MHz, and covers all worldband frequencies as well as most amateur bands. With an optional module, the R8 can also cover fire, police, public service broadcasts, and additional amateur bands in VHF (35–55 MHz, 108–174 MHz).

The suggested retail price for the R8 is $979. For more information, contact *R. L. Drake Company, P.O. Box 112, Miamisburg OH 45342; (513) 866–2421.* Or circle Reader Service No. 201.

ICOM

ICOM has announced the new IC-2410A/H 144 and 440 MHz dual-band transceiver, which includes features such as simultaneous receive on the same band, microphone controllability and optional remote control. The IC-2410A/H is one of the smallest in its class: 5.5″ (W) x 1.6″ (H) x 6.9″ (D), and weighing just three pounds. In addition to receiving two bands simultaneously, it will receive two frequencies on the same band.

The IC-2410A/H comes in two versions. The IC-2410A puts out a maximum of 25 watts on both UHF and VHF; maximum output power for the IC-2410H is 45 watts on VHF and 35 watts on UHF. Both versions offer high, medium and low power settings. A variety of operations can be controlled with the HM-56 DTMF hand microphone and optional UT-55 DTMF encoder/decoder.

For prices and more information, contact *ICOM America, 2380 116th Ave. N.E., P.O. Box C-90029, Bellevue WA 98009-9029; (206) 454–8155.* Or circle Reader Service number 209.

RADIO SHACK

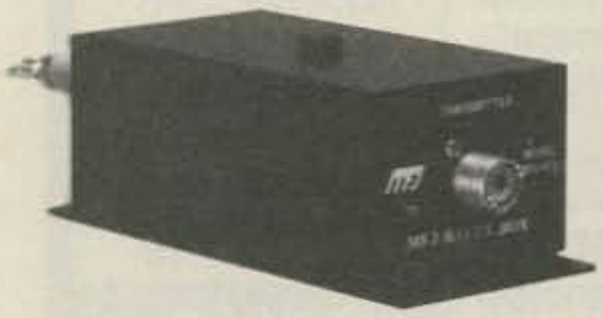
Radio Shack is now offering the Micronta® Ham Radio SWR/Power Meter (cat. no. 19-320). This compact meter is ideal for optimizing antenna settings for hand-held transceivers as well as mobile or fixed ham radios. It is specifically designed for use on two popular amateur radio bands: 2m (144 MHz) and 70cm (440 MHz). The SWR/Power Meter's main features include: low insertion loss, enabling it to remain connected at all times; wide-range accuracy that lets the user measure power up to 60 watts; and a sealed die-cast aluminum enclosure for durability.

The meter retails for $39.95 and is available at Radio Shack stores and participating dealers nationwide. For more information, contact *Radio Shack, 700 One Tandy Center, Fort Worth TX 76102; (817) 390–3300.* Or circle Reader Service No. 202.

GRACILIS, INC.

Gracilis, Inc. has introduced the PackeTwin™ data system, a dual-channel PC interface card, integrated radio modem, and radio transceiver, with TCP/IP and AX.25 software for PC/XT/AT systems. Both PackeTwin channels can operate at conventional speeds of 1200–9600 baud. Additionally, one channel is capable of 1 Mb/sec operation with existing 56K radio modems as well as future higher speed developments. Both channels support RS-232, RS-422, and TTL. Radio modems are available for 1200, 2400 and 9600 bps. KA9Q's TCP/IP system software is also available with the system for packet network applications.

PackeTwin prices range from $199 to $599, depending on the configuration. For more information, contact *Gracilis, Inc., 623 Palace Street, Aurora IL 60506; (708) 897–9346* Or circle Reader Service No. 205.



MFJ

MFJ has released two new products: a balun box and a world map clock. Mount the **MFJ-912 W9INN Balun Box** outside the building and connect it with coax from your wide-range T-network tuner. The MFJ-912 will convert the unbalanced coax to the balanced ladder-line transmission line, functioning like an internal balun even though it's located away from the tuner. It retains the flexibility and efficiency of the ladder line without bringing the line into the shack.

The **MFJ-110 DXers' World Map Clock** shows the time and date at any QTH in the world, and also lets you see the location of your contact. Easy-to-use push-buttons let you instantly move the display to a QTH in every time zone. The "recall" feature instantly moves the display back to local time. The clock shows the day of the week, month, date and year, and has an alarm.

The MFJ-912 W9INN Balun Box is $39.95; the MFJ-110 World Map Clock is $24.95. Both come with a one-year unconditional guarantee. Contact *MFJ Enterprises, Inc., P.O. Box 494, Mississippi State MS 39762; (601) 323–5869, (800) 647–1800, FAX (601) 323–6551, Telex 53 4590 MFJSTKV.* Or circle Reader Service No. 203.

RAI ENTERPRISES

RAI Enterprises has released a new PC software program, "Autolog Plus II." This program is a unique blend of a highly sophisticated station log and a fully programmable CW autokeyer. The log features four programmable on-screen time zone clocks, a 200-year calendar, a personal database and a notepad database to keep track of all personal data. Other features include a DXCC database, beam headings, QSL tracking, custom screen colors, on-screen "quick notes"to keep track of frequencies and calls in a pile-up, a programmable tracking cell with sort and print functions, and the ability to search and modify all log files. The only hardware requirements are a printer driver and 360K of free memory. An RS-232 interface is provided to drive the positive voltage CW key input of a solid-state receiver.

"Autolog Plus II," including the interface, sells for $45 and is available on both 5.25″ and 3.5″ floppies. For more information, contact *RAI Enterprises, 4508 N. 48th Drive, Phoenix AZ 85031.* Or circle Reader Service No. 204.

ALEXANDER BATTERIES

Alexander Batteries is offering several new made-in-the-USA batteries for Standard HX500 portable radios. The H26204 is a 7.5V/500 mAh nickel-cadmium battery. The H26205 is also rated at 7.5 VDC, but features longer run times and a 900 mAh capacity. The H26206 is 10 VDC, with a 425 mAh capacity; the H26207 is 10 VDC/700 mAh. Alexander's also has replacement batteries for the ICOM BP-83 and BP-84, and for Kenwood's TH-205A, TH-205AT, TH-215A, TH-215E, TH-315A, TH-415A and TH-415E radios.

For prices and more information, contact *Alexander Batteries, P.O. Box 1508, Mason City IA 50401; (515) 423–8955, FAX (515) 423–1644.* Or circle Reader Service No. 207.

HI-RES COMMUNICATIONS

Hi-Res Communications has released the KWM2 video, packed full of detailed information regarding almost every facet of the KWM2 and spotlighting world-renowned Collins Radio expert Dennis Brothers. The video begins with basic tools and equipment, then Dennis takes you through tune-up and operation, troubleshooting and repair, modification identification and installation, and complete alignment.

For the price and more information, contact *Hi-Res Communications, Inc., Floyd Soo KF8AT, 18464 Ash Creek Drive, Mt. Clemens MI 48044-1240; (313) 228–1600.* Or circle Reader Service No. 206.

OPTOELECTRONICS

Optoelectronics is offering a new, free (to people involved with radio broadcasting and reception from sub-audio to 3 GHz) 16-page brochure describing the firm's newest hand-held and bench-top instruments. The brochure includes descriptions, technical data and useful tips on how to use frequency-finding handi-counters, universal counter-timers for lab and field, PC-based counters with Windows 3.0 for control and display, active preselector bandpass filters, antennas and accessories.

Contact *Optoelectronics Inc., 5821 NE 14th Avenue, Fort Lauderdale FL 33334; (800) 327–5912, (305) 771–2050.*

GIEHL ELECTRONICS

Giehl Electronics is offering two software enhancement kits, one for the Kenwood TS-940 and one for the Ten-Tec Paragon. The TS-940 kit features tunable memories that allow you to change the frequency of a memory channel using the main tuning knob, memory bank selection using the "UP" and "DOWN" keys, and easily-set kHz per revolution. The Paragon kit offers band registers that store the last-used frequency, mode, and filter for all bands 160 through 10 meters; a 10-minute timer that reminds you to ID your station, a single key band selector that makes QSYing fast, and many other enhancements. Both kits include a new software chip, complete documentation, and installation instructions.

The kits cost $72 each, plus $3 S & H. For more information, contact *Giehl Electronics, P.O. Box 18335, Cincinnati OH 45218.* Or circle Reader Service number 208.

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Never Say Die

Continued from page 4

band and every mode, even a USA report which mentions *Radio Fun*. There's 20 pages of DX news!

About the only thing they don't seem to have is something along the lines of my endless editorials. Probably just as well.

It's a magazine packed with interesting information, aimed at rank beginners right on through to experts, with the latest news and circuits for every special interest.

For us to have a similar publication here we'd have to have about 300 pages of advertising. In order for the ham industry to support that much advertising they'd have to sell about five times as much ham gear as they do now. And that would mean that we'd have to have about four times as many active hams buying.

Yes, Japan is *that* far ahead of us. They're leaving us further and further behind in radio technology. It's a terrible blow to American pride to be left in the dust, fiddling around with CW and AM instead of exploring the microwaves.

Many Americans have suffered severe inferiority attacks as we've had to learn about quality, just-in-time production and other Japanese innovations. Now it's no-code and the Luddites are at it again.

Mini-Discs?

Sony, apparently unable to keep from challenging Matsushita (and losing), has announced a new recording technology, the mini-disc (MD). This was in response to Philips and Matsushita's Digital Compact Cassette (DCC) announcement in January.

So what's all this mean to amateur radio? Isn't this just of interest to music lovers? What do we care if the Japanese come up with something to replace the old audio cassette? It's about time anyway, right?

Since analog audio will soon be as dead as spark, our analog voice transmissions are going to be as antique as our beloved CW. Amateur radio is already so far behind today's technology that it's more a museum exhibit of the past than a practical communications service.

The only main drawback to digital audio is that it takes a much wider bandwidth than analog. Let me see some hands now . . . how many of you are prepared to get up in front of the group and explain the difference between analog and digital? Hmmm, not many hands. I was afraid of that.

What we do is pick up analog audio with a microphone. Then we set up an oscillator and have it trigger on a sampling circuit. The audio on our compact discs (CDs) is sampled 44,100 times a second. A 16-bit byte allows you to break down the sound into 65,000 sound levels and represent each by a number. This makes it possible to digitize frequencies from 0–20,000 Hz . . . up to half the sampling rate.

For ham use we might want to cut down to a 6 kHz sampling rate, which would give us 0–3,000 Hz, plenty for ham communications, yet too wide for most of our ham bands. This is where we want to start looking for ways to compact the data. We don't need anywhere near the 80 dB of dynamic range demanded by music, so we don't need music's 16-bit bytes. We can further cut down the data rate by using one-bit technology. This, instead of giving us the signal level from zero to 120 dB for every sample, just tells us whether the data number is lower or higher.

Okay, okay, it's complicated and, unless you've been keeping up with electronic technology, it's confusing. I just wanted to give you some idea of what's going on, not make you a digital scientist. Not that all this is beyond the grasp of an eleven year old . . . it just may be beyond the grasp of the average 59-year old ham who is bewildered about what a decibel actually is.

How long do you think Congress and the FCC are going to consider amateur radio a resource worthy of using our incredibly valuable bands if we keep falling further and further behind in technology? When will they stop and consider that maybe they don't need to provide quite so much museum space for us to insult and jam each other with our antique frequency-wasting technologies?

Up until about 25 years ago, amateurs were the leaders in communications technology. We pioneered NBFM, SSB, SSTV, RTTY and repeaters. Then everything almost completely stopped, leaving us with a hobby frozen in time at around 1963. Was it entirely a coincidence that the ARRL's Incentive Licensing proposal almost completely stopped the entry of young newcomers at this same time?

The increasing complexity of home construction using ICs didn't help. Oldtimers, brought up on tubes, got scared off by these little gadgets and the enormously complex circuits they could build with them. I still fondly remember building rigs with 815s, 826s, 832s and 813s. Sigh.

We *will* be going digital. It's just a question of if we have to wait for the Japanese to pioneer it for us. And as we are able to get our effective bandwidths down to a few hertz, we're going to find ourselves with wide open bands, with acres of space between contacts . . . more like 40m CW used to be 60 years ago. When Sony is able to knock out 80% of the data for hi-fi music and we're not able to hear the difference, the possibilities for ham communications quality voice are staggering.

If there's any real interest, we can start encouraging the writing of technical articles to help you cope with 1990's technology instead of living in the glorious 1940's technology as most of you have. Do you want to know more about digital audio?

Where Was Wayne?

A couple readers noticed my absence at the Dallas hamfest this year. I was over in Sedalia (MO) at the 11th International Scott Joplin Ragtime Festival—same weekend.

Since I've been pretty good at keeping my love of ragtime music a secret, it may surprise you that I would fly to Kansas City and then drive to Sedalia, just to hear ragtime music. Four glorious days (and nights) of ragtime, played by the world's top ragtime performers . . . nirvana.

It didn't hurt that two of my proteges were on the program this year for the first time. Scott Kirby, who I discovered in New Orleans, and Masanobu Ikemia, who I discovered at Sedalia last year, when he was just there as an attendee and not on the program. This year they were the big hits of the festival . . . with me sitting there glowing like a proud papa.

The festival drew about 350 attendees. I'll bet over a hundred of them played at one time or another in the after-hours ragtime jam sessions . . . which went on after the last evening concerts until as late as 6 a.m.

Last year I missed the last two days of the festival and flew up Saturday morning to give a talk at the Dallas hamfest. Only a couple dozen hams managed to break away from the flea market to listen, so I figured I'd do better to spend my time in Sedalia this year.

With two ragtime CDs already released on my Greener Pastures label and two more in the works . . . plus several more planned . . . the festival was a business investment too.

The lack of interest in my Dallas talk last year means either that most hams have had enough of me in my editorials—maybe too much—or that my talks have grown dull. Probably the latter. When I'm giving talks to hams I often feel like a cheerleader trying to get some enthusiasm from the inmates of a nursing home. When I ask for a showing of hands on how many in the audience have done *anything* of interest in amateur radio, a couple hands go up. The others all slouch down and look guilty.

I don't know what to say. It's like a bunch of starving people not quite able to touch the fabulous feast just beyond their reach. Have you tried OSCAR? RTTY? SSTV? These 20-year old technologies are still newfangled stuff to many hams. Even packet is new! Lordy. Whatcha done on 220? 900? 1296? 10 GHz? Maybe 50 MHz? They didn't need me as a cheerleader at Dallas this year, just as a funeral director.

One of the top American ragtime pianists is Dick Zimmerman. He's also a professional magician. Perhaps I should take some magic lessons from him and at least be able to entertain you old-timers with some magic, even if you don't want to hear about amateur radio.

Beating the Pile-Ups

If you're one of the thousands of ops devoting the rest of your life on this world to adding QRM to pile-ups chasing DX, I have a suggestion for you. Are you interested in a sneaky way to come out on top of the pile-ups, time after time?

Yes, I know, you already have a twelve-element beam and a ten kW linear . . . but so do all your competitors. You need something extra to make it through the QRM. It's odd that you haven't thought of this already, but then perhaps you haven't gone about solving this problem creatively. Your use of 10,000 watts is a hint that you tend to try and use brute force instead of brains to get your way. I hate to think about your family relations!

Okay, here's the edge which should make all the difference. Perhaps you've noticed that when you are transmitting, this tends to reduce your ability to hear what's happening on your channel. You know there are others in there, but you don't know exactly when they are transmitting or how much they've shifted off the frequency to try and be heard. You need a way to listen while you are talking.

Think how great it would be to be able to tune in and hear what's going on while you're calling! You'd be able to shift your frequency enough to be heard. You'd be able to wait until just the right moment and both jam your competitors so the rare DX station wouldn't be able to get their call . . . and sandwich your own call in the instant they shut up.

Now that I've told you what you need to do, I'm sure you're way ahead of me on how to do it. You need a remote receiver with a UHF link back. If it's a few miles away you'll be able to hear your own frequency and everything on it. We have enough garbage on 2m already, so put your intercom channel up on a higher band. You'll want to be able to remotely tune too. But that's easy with many modern receivers. Duck soup.

How about some construction articles on remote receiving systems?

Some Trivia

You might watch for "Mission of the Shark," a TV movie which is planned for broadcast around December 7th. I don't know how good the movie is, but it was shot on my old submarine, the *USS Drum* (SS-228), where I spent the war. The *Drum* is tied up in Battleship Park in Mobile, right next to the *Alabama*, in case you're down that way.

The movie stars Stacy Keach as Captain McVay, skipper of the *Indianapolis*, and Richard Thomas (John-Boy) as the ship's doctor. The *Indianapolis* was sunk by a Japanese submarine (played by the *Drum*), with Japanese-American actors. The cruiser was returning from having delivered an atomic bomb when it was sunk. Most of the crew survived the sinking, but were subsequently lost to sharks during their several days in the water because a Navy bureaucratic blunder prevented anyone looking for them.

American Cars

A couple Detroit union member readers got all upset over my put-down of American cars a few months ago. They told me how great American cars are now. Glad to hear that, even though it goes against everything I've experienced with rentals.

Thus it was with some interest that I read a report in *USA Today* on how U.S. car brands had improved their quality. Ford did the best, moving from the 18th to 8th best trouble-free brand. Out of the top eleven most trouble-free 1991 models, Pontiac placed 7th with their 6000. The other 10 were all foreign. In the trouble-free brand list the first seven were Lexus, Infiniti, Toyota, Mercedes, Acura, Honda, Subaru . . . and then Ford. You can't believe how distressed I am to be so wrong about American cars being clunkers . . . and my Detroit readers so right. Yes, I'm being sarcastic.

I don't suppose I've gotten you to read *The New Yorker* yet. Pity. Damned shame. They had a very interesting series on Chinatown recently that was worth reading. We seem to get mad at the Asians for coming over here and working incredibly hard to succeed. They aren't doing anything we can't do, they're just doing what we won't do . . . work.

Heck, a lot of hams are furious with me because I've worked so hard and have succeeded as a result. I was lucky to have good role models. My father worked hard, as did my grandfather, so it seemed normal to me. My grandfather was one of the founders of Citgo and my father helped start the first trans-Atlantic airline.

And how does this apply to amateur radio? Why am I bringing this up here? Because it's the same pattern I see in

amateur radio . . . we want to buy a rig, put up a manufactured beam and tower and work the world. Thousands of readers get mad at me when I suggest they actually learn electronic and radio theory. They are ready with a rope when I suggest that if they love the damned code so much they get good at it and prove it. They are starting the fire under the tar when I ask why they aren't on packet yet. Or OSCAR. Shoot the messenger. No, I'm not saying that American amateurs are a lazy, spoiled bunch of old-timers. I would never say that. You might say it, and I wouldn't deny it, but I'm certainly not going to say it.

Now, if our beloved and wealthy, uneducated and apparently unskilled Detroit car makers would make some extra effort to turn out cars without defects I'll be delighted to start checking my gourmet library for crow recipes. Perhaps cooked in Ripple?

Education

Did you miss the *Forbes* articles on education (May 27th)? Tsk. Milton Friedman (one of my heroes) said, "On the average it costs half as much to run anything privately as it does governmentally." Friedman says that our Ivy League colleges could cut their tuitions in half and still make money if they were exposed to the disciplines of the market rather than counting upon government subsidies and big private donors. He says "that universities are multiproduct enterprises. They produce three major products: schooling, research and monuments."

One shining success is the DeVry Institute of Technology, which provides a better education than even state colleges and at half the price. Yes, of course state educational authorities are fighting DeVry at every turn.

You know, if we could ever get Congress to allow private mail, we'd see twice as much service at half the cost. I'm old enough to remember two mail deliveries on weekdays and one on Saturdays . . . 2¢ first class mail and penny postcards.

IBM Dying?

Several years ago I predicted that IBM would eventually get killed by microcomputers. If you've been reading the business magazines you've been seeing IBM losing ground at an amazing rate. It's going to get worse.

Just as we've had a drop in the cost of computing of about a thousand to one in the last few years, the predictions are for a further million-fold rise in cost effectiveness within a few more years. To some degree IBM will be able to sell more of the lower priced computers, but there's no way they can sell a million times more.

IBM makes most of their really big bucks leasing software. The day of the three-thousand-dollar-a-month software lease is going away, right along with the need for $10 million computers.

Ten years ago I had to pay $15,000 for a 10 megabyte disk for my Prime minicomputer. Now they're building 40 megabyte drives into laptop portables.

So what does this mean to amateur radio? It means you ain't seen nothin' yet when it comes to computerized communications. It also means there are going to be an enormous number of opportunities to make big bucks with these new computer systems. Small entrepreneurial companies are going to have a field day with support products, running circles around the giants. Small companies can react much faster than big ones and drive them bananas.

Chip densities are moving towards billions of transistors on a single chip. That means they can put dozens of ultra-fast microcomputers all on one chip, working in tandem. This is going to force a similar expansion in communications. We have the choice of being spellbound, dumb bystanders . . . or plunging in and benefiting from the changes.

This explosion of communications is going to start making frequencies more valuable . . . particularly the microwaves. This means, in turn, that either we're up there earning our salt or we're going to gradually be left like our American Indians, on tiny, unwanted reservations.

Of course, if we had friends in high places, we might be able to stave off the inevitable. And how can we develop some friends in high places? The same way the big corporations who want our frequencies do . . . by bribing Congress. We have a democracy here, and that means you pay or you die. For as little as $100 each per year to your senator and representative (for their reelection funds), you'll help assure that you have a louder voice at that old radio spectrum pork barrel than Motorola, G.E. or Fujitsu.

73's To You, Too

Sevens and threes to ya good buddy, as the southern truck driver CBers put it. No, you don't have to puzzle about where "73" came from, you jist pay 'tention to your old Uncle Wayne, and he'll put ya straight.

It has to do with the very beginnings of amateur radio, away back near hunnert years ago. Some of the first hams were old Morse ops who'd worked on the telegraph lines out West. Out there a man's most precious possession was his gun, the good old Winchester 73, the gun which opened the West. The old ops used to end their messages with "I will you my 73." That got shortened, in true CB style, to "73," and meant "best wishes." You can tell if a ham is a lid if he pluralizes it. It ain't "best regardses," it's "73." Now aren't you glad you have old Uncle Wayne as a living link with the past . . . good buddy?

The next thing you'll be asking me where "88" came from. Git off the porch and let a cranky old man alone. Jeeze, these danged kids. Worse'n all those testy old men on CW bumbling along in 10 wpm horsecarts in a day of 25,000 wpm supersonic technology . . . and complaining about the fast drivers.

And while hams are fighting to keep bleeping at each other on CW, technology is moving ahead. In-flight phones in every seat are being tested on U.S. Air, Northwest and American Airlines. These phones use digital technology to encode the voice, plus they'll work with your laptop computer and even handle fax right there in your airline seat. You'll be able to make plane reservations, page friends on the ground, get stock quotes, read news headlines, look up flight schedules and so on. Now tell me again about how CW can get through when all else fails . . . I need to hear about that again to retain my failing faith.

Saudi Arabia

The Arabs, not just in Saudi Arabia but in all Arab countries, have one whale of a problem. And it's a problem which is going to make for wars for a long time to come.

If one asks how come the Arabs were way ahead in science and technology a thousand years ago and then stopped, I think the sad answer lies in their religion, Islam. Islam is against paying interest, which means that any fundamentalist Moslem society will never have the capital to grow. Few businesses can get started without borrowing money. We're talking about a religion which is anti-capitalist and thus dooms any country which is limited by it to failure . . . just as the communist countries failed.

And as if that weren't bad enough, Islam is also against technology. Science teachers in fundamentalist Islam countries find they must graduate Moslem students, whether they know anything or not. A ham visiting Saudi Arabia reports that the Aramco Saudi technicians spend their days in idle gossip and drinking tea. When something breaks they have to call an American supervisor.

I realize that it's blasphemous to question any aspect of a religion, even one which is a thousand years out of date and is keeping its believers in poverty . . . except for those families lucky enough to live on top of an oil field. I'm not suggesting that Moslems consider changing Islam, only that they stop being jealous of the wealth the rest of the world gains through technical education and using technology.

If you ever wondered why almost the only ham contacts you've made in the Middle East have been with Americans, now you know.

I've been interested in the growing number of articles about Kuwait and Saudi Arabia and their medieval societies . . . which we've just spent a few billion dollars rescuing from an old friend of theirs. I'm glad we lost fewer Americans doing it than we lose on a good night to crack-related killings.

I asked for some ham volunteers to follow our troops into Baghdad and set up some health and welfare stations. Several hams were ready to go. Alas, our troops stopped before entering Baghdad, a fact which General Schwartzkopf made plain was a bummer in his mind. It looks as though history has already backed him up. Anyway, I was very glad to see a few hams willing to pitch in to help out at their own cost.

Say, if you think I'm exaggerating about the hold religion has over there, just remember back to the Iranian mobs waving their fists at us on the evening news a few years ago. And the thousands of Iraqis doing ditto last year.

Free Cellular Calls

Well, free, if you don't get caught. I mentioned a couple years ago that most crooks were using cellular phones with altered serial numbered identification chips. The result is free phone calls . . . anywhere in the world.

A recent *Wall Street Journal* article tracked it all down to a computer hacker named Ken Bailey, who took a cellular phone apart and cracked the code. Ken, the *WSJ* claimed, was circumspect about it. He made bogus chips, but built in a security system so no one could make a copy of his chip and use it. They'd have to come to Ken for chips.

That worked fine until Ken's computer went on the fritz one night and he asked a friend, Bob Sutton, to help him fix it. In the process Bob came across the program and, being no fool, ran off a copy. Alas, he didn't copy the security check, so when he began popping chips for others, they had no problem making further copies. The cellular industry estimates they may lose around $600 million next year to these little buggers. Hmmm, now don't you wish you'd paid more attention when I told you to learn about computers a few years ago?

For those of my readers whose sense of humor rotted off through disuse, I'm not supportive of stealing phone services. But then I can't forget that America's wunderkind, Steve Jobs, got his start in business selling blue boxes to steal phone services from Ma Bell. And who's Jobs? He's the billionaire Apple computer alumnus. If it hadn't been for blue boxes and theft of services from Ma, we wouldn't have all those nice Macintoshes around. Who was it said crime doesn't pay? It wasn't the Mafia, that's for sure.

Zzzzzzzz . . .

Y'ever lay there awake, your mind churning, wishing you could saw zees? What would you pay for a dose of Old Doc Green's Insomnia Cure? Tell you what, if I give you the recipe and you find it works, all you owe me is one extra subscription to *73*. Fair enough?

Heck, this pound of cure is so powerful it'll put you to sleep in a dentist's waiting room. I use it to whup me into the Land of Nod on airplanes . . . something I never used to be able to do. We're talking industrial strength here.

No, it's not addictive. No, it doesn't have any bad side effects. No, it's not hypnotism . . . though that'll work pretty well too. Nope, what I've got is a system that's so simple and so incredibly obvious that you're going to be annoyed that you didn't think of it yourself.

Okay, I'll stop teasing you and let you in on the big secret . . . but don't forget the price. Once you've learned how to do this and you find it works like magic for you, which it will . . . heck, it can't fail . . . you owe me an extra *73* subscription. That means you're going to find another ham and get him or her to subscribe . . . or buy a gift subscription for a DX ham who can't afford one. If this is too hard a bargain, please stop reading right here. A deal is a deal, right?

Here's how it works. You're going to set up a habit pattern which will automatically put you to sleep. Yep, a simple Pavlovian stimulus/response deal. If you aren't up on Pavlov, it's because you have been poorly educated. And don't blame the schools, you're the main one responsible for your education, not our lousy schools.

From now on, every time you go to bed at night get into the same sleeping position. Find a comfortable position and use that every night. You're going to establish a habit. You're going to have your body recognize this position and start generating endorphins as soon as you assume the position.

No, that isn't all. That's not going to knock you out in an airline seat where you can't get into that position. But it's a way to get started with training your mind/body to go to sleep.

Step two is to choose a sound to repeat a few times every night as you go to sleep. Pick something euphonic like umm, oom, ooze, ahm, ease, or moo. Just say it a few times as you drift off to sleep. Hey, this isn't going to work if you try to use it to get to sleep when you are keyed up. Start breaking in the system when you are tired and will naturally go to sleep. We're building a habit pattern here.

After a few weeks the combination of falling asleep and the sound you've chosen as a mantra will be tied together and you'll find that your mantra will, more and more, help you fall asleep, even in circumstances where you'd ordinarily find it difficult or even impossible.

Continued on p. 77

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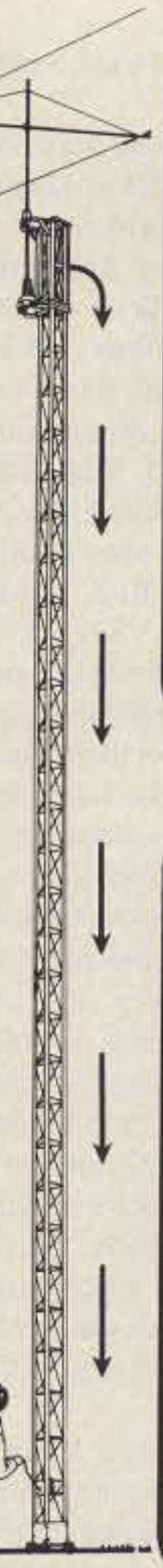

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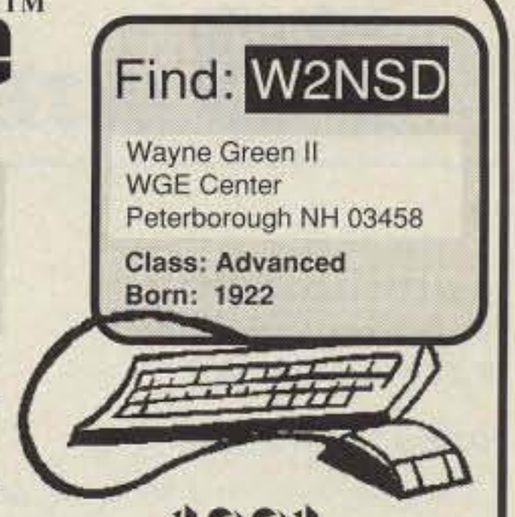

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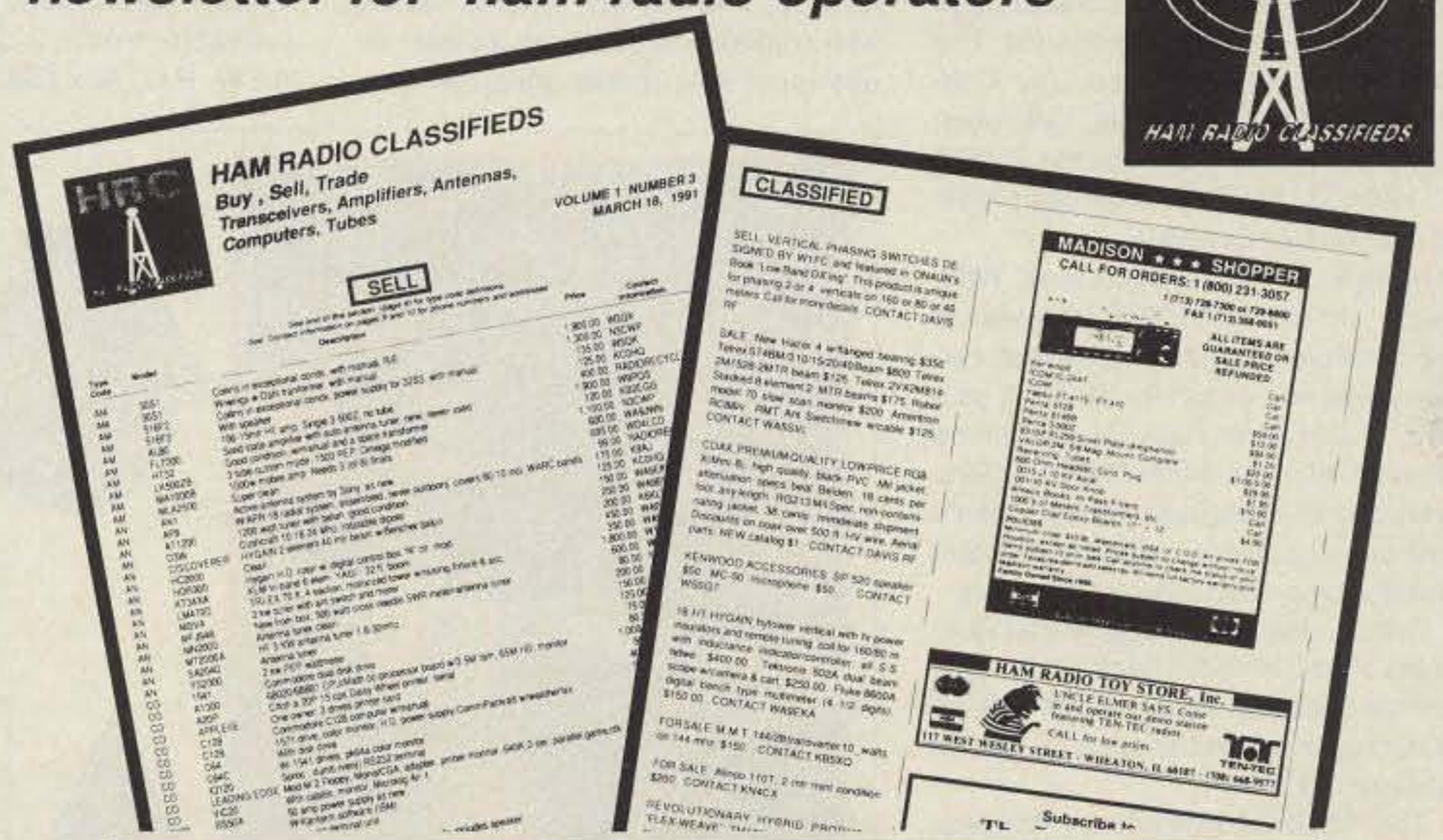

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73 INTERNATIONAL

Arnie Johnson N1BAC
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Notes from FN42

Field Day has come and gone, and I didn't make it to Colorado like I did last year. I did get an invitation, but I had to refuse because my schedule just wouldn't permit it, though I did make it to the High Country in July.

My big ham project for the summer was to make my one-legged 160m dipole into an honest two-legged 160m inverted vee. A very tall tree between my house and the property next door became available for the center support, so out came the bow and arrow, and it happened. What a difference!

It appears that we will start hearing from Australia again in the near future. David Horsfall VK2KFU has volunteered his services to bring us the news from Down Under. David is a member of the WIA, and during the last few years has served on Executive. He produces the weekly broadcasts for the WIA (VK2 Division). Welcome, David. We look forward to your contributions.—Arnie N1BAC.

Roundup

Colombia The Colombian League of Radio Amateurs is sponsoring The Colombian Independence Day Contest. The contest will be held between 0000 and 2400 UTC on Saturday of the third weekend in July (July 20, 1991). For further information, contact: Liga Colombiana de Radioaficionados, The Colombian Independence Day Contest, P.O. Box 584, Bogota, Colombia, South America OR see the the 73BBS 73 International SIG (Colombian Independence Day Contest).

India VU2RG is a Silent Key. Who, might you ask, is VU2RG? He was in the limelight for many years, but certainly was not known for his work as a ham. VU2RG was Rajiv Gandhi, prime minister of India from 1984 to 1989, grandson of Hawaharlal Nehru, India's first prime minister, and son of Indira Gandhi, who ruled India for 15 years.

Gandhi, leader of the powerful Congress Party in India, was killed by a female suicide assassin as he was attempting to regain the position that he had lost in 1989.

The National Institute of Amateur Radio (NIAR) and the Bangalore Club Station, VU2NRJ, are sponsoring the Garden City Award. This award is continuous after March 1, 1991, and further information may be received from NIAR-HQ at Hyderabad, by writing NAGESH (VU2NUD), P.O. Box 5624, Bangalore-560010, India; OR you can download the information from the 73 International SIG (Garden City Award).

Japan From the JARL News: The Amateur Radio Festival, popularly known as Ham Fair, will be held on August 23, 24, and 25 this year under the auspices of JARL at the Tokyo International Trade Center Annex in Harumi, Tokyo, the same location as last year.

The theme this year is "Freshen-up Ham Life" and the catch-phrase is "Let's meet at Harumi under the glittering sunshine." A special event will be "Multi-band Know-how." Bring along a friend and join in the fun and frolic!

Switzerland From the International Telecommunication Union (ITU) Press Release: The most recent press release published in connection with the 23rd World Communication Day includes a feature by the United Nations Disaster Relief Office (UNDRO) on disaster preparedness and relief telecommunications. Included were the views of the Secretary-General of the League of Red Cross and Red Crescent Societies on the need to enhance the quality of information in disaster relief operations.

Key issues concerned taking a critical look at the quality, as well as the quantity, of information; facing up to the general failure of disaster agencies to communicate adequately with disaster victims; appreciating the mass media's involvement in disaster situations and ensuring that the media reflects the nature of disasters accurately.

Information scientists stress six attributes of useful information: clarity, accuracy, significance, timeliness, adequacy, and validity. Those dealing with communications from disaster areas must keep these attributes foremost in their thoughts if their information is to do any good.

USSR A quick note came from Serge UA9SAW on some of his DXpedition activities. He mentioned two DXpeditions: on 6–16 September 1989 as UL1K/UA9SAW in OBL024, and on 4–21 September 1990 as UH1E/UA9SAW from OBL044. Please QSL direct: Serge P. Klyushnikov, UA9SAW, P.O. Box 13, Gaj, Orenb. Obl., 462630, Russia, USSR (CCCP).

The following letter was received from Ken Carpenter KC4UG: "I always enjoy '73 International.' Since I have learned to speak Russian I have made many friends there, and receive a great deal of information about their ham activity. I plan to attend the hamfests in Leningrad and Omsk in August of this year. *[Say hello to Gene (Gennady) UA9MA and all the other hams from all of us at 73. We loved the awards he sent to us several years ago which were printed in this column.—Arnie]*

"I received the following from Serge EKØKBZ, 4K4/UAØKBZ and UAØKBZ. Serge operated EKØKBZ for the Big Circle Dog Sled expedition in 1990. He made over 6,000 contacts, but only received 200 QSLs because he couldn't receive his cards via Box 88 in Moscow. He is located in remote Cape Schmidt in the Arctic.

"His card is a beautiful three-part QSL with scenes of the sled teams in the arctic, the best I have seen from the USSR. He wants QSLs direct with two IRCs or, better yet, one green stamp. His address is: Serge Tsybizov UAØKBZ, P.O. Box DX, Cape Schmidt, Magadan Oblast, 686830 USSR.

"He also sent me information about the Soviet callbook. It has over 20,000 addresses and more than 400 local Russian QSL bureau addresses. It is available from: Giusppe Iannuzzi I8IYW, P.O. Box 5083, 80144 Napoli, Italy. The cost is $6 US, postpaid airmail.

"The mail from Russia is getting slower each month, and a card via their bureau is almost impossible. At one time I was receiving mail from Russia in two weeks, but now it takes up to two months, air mail!

"I sent Mike UA9MI an MFJ packet TNC last year. He and Gene UA9MA are on HF packet from Omsk, Western Siberia. They are the only ones from that area on packet at this time. 73, Ken KC4UG."

SPAIN

Woodson Gannaway N5KVB/EA8
Apartado 11
35450 Santa Maria de Guia
(Las Palmas de G.C.)
Islas Canarias, Espana

Carnaval Gaditano

Hi to Arnie and All. Paco EA7CZR sends some QSL cards from the Carnaval de Cadiz, and an announcement he would like presented to our readers:

I am Francisco Ramos EA7CZR and EA7FR, from the city of Cadiz, southern Spain. *["Paco" is short for "Francisco."—Eds.]* I am enclosing some QSL cards from ED7TDP, a special call used during the Mardi Gras in Cadiz. The meaning of TDP is **T**acita **D**e **P**lata (silver cap), the nickname of Cadiz city.

The Union de Radioaficionados de Cadiz, Seccion Local de la URE, (the local section of the Cadiz Radio Club) is sponsored by the Fundacion Gaditana del Carnaval (Mardi Gras Fundation) from the EXCMO, Ayuntamiento de Cadiz (City Hall of Cadiz), since 1985. Every following year, the OMs

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PSE – QSL – TNX CORDIALES 73 Y DX's

Photo A. The 1991 QSL card sent to contacts with ED7TDP during the Carnaval Gaditano (Mardi Gras in Cadiz).

from Cadiz have used this special callsign on the air.

During 1991, we awarded the people who sent to us confirmation of contacts performed with ED7TDP, during three consecutive years in SSB/CW or mixed, an engraved medal to thank them for being with us every year during the Carnaval Gaditano. 73, Paco EA7CZR. *[Each year's QSL has a different beautiful poster."—Arnie]*

ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
D.N. Hanagev 85530
Israel
PACKET: 4X1MK@4X4SV.ISR.EU

Techsat I—Israel's First Hamsat

AMSAT-Israel, in cooperation with the Technion University of Haifa and the Asher Institute for Space Research, is building an amateur radio satellite. Most of those working on the bird are volunteers and students giving of their spare time in this on-going project to build smart satellites for the amateur radio community.

Techsat I is to support digital store-and-forward communications with an onboard packet BBS. The bird will fly in a polar low-earth-orbit (LEO) approximately 450 miles up. Because of the polar orbit (similar to the Microsats), everyone on earth will have a shot at the bird.

Two transmitters are planned for both telemetry and downlinking, and will work on 435 and 29 MHz. Uplink receivers will have five frequencies on 145 MHz, five channels on the 1260 MHz, and yet another five frequencies on 2400 MHz. As well as supporting PSK and FSK, the system will have FM AFSK capabilities, meaning that stations equipped with standard packet TNCs will be able to access the orbiting BBS. (PSK, Phase Shift Keying, which requires a special modem on the TNC, is much more efficient and effective for hamsat packeteering, but the FM AFSK mode is being provided to give "beginners" a taste!)

Hams involved in the project are Peleg Lapid 4X1GP, system designer, 'Oved Ben Aroya 4X4LS, software designer, and Shlomo Menuhin 4X1AS, IARC/AMSAT-IL coordinator.

Launch is planned for 1993 on an Ariane rocket. A scientific experiment, possibly in radio navigation, is also intended. Work at the present is still in the planning stage, but is reported to be in high gear. Wishes of Godspeed to the folks at the Technion University working on the project, with the hope that they will be successful in providing the international amateur community with another reliable hamsat. 73

Never Say Die

Continued from p. 74

Pavlov rang a bell every time he fed his dogs. After a while he found that just ringing the bell started their digestive juices flowing. So why not use this mechanism to help you go to sleep? It works! And it doesn't take very long to build this new and helpful habit pattern. There's no downside to this.

I used to hate long airline trips because I'd sit there wanting to sleep and just sit there hating every minute of it. Now I can doze off in seconds and wake up an hour later refreshed. Yes, I suppose I cheat a little. I do take along a sleeping mask to block out the bright lights or the movie. And I put in a pair of those foam yellow ear plugs to cut down the noise from the people talking across the aisle. And I take along an inflatable pillow that goes around my neck. The whole works fits into a small bag which I carry on with my laptop computer and reading material. The pillows are sold through several mail order houses for a few bucks and they work beautifully. I have the same travel package in my van so I can grab a few zees on trips. No, I'm not driving.

Most of us are able to get to sleep most of the time without any great problems. But every now and then we find that our mind is racing and we just lay there twisting and turning. This can be particularly frustrating if you've got an important day ahead and you really need that sleep.

Start building your sleep habit pattern so it'll be there when you need it. I've been taking afternoon naps for years. I find they make it possible for me to work smarter and harder late into the evening. This zonking system is priceless for getting me to sleep in a few seconds when I take a nap. I assume the position, say the word, and I'm out for almost exactly one hour.

By the way, you can train yourself to sleep exactly as long as you want too. The mind has an amazing ability to keep track of time. It works on a subconscious level. When I go to sleep I decide when I want to wake up. . . 45 minutes, an hour. . . and bingo, I'm awake. . . usually within the exact minute. It works for long naps too. When I have to be up at a specific time and set my alarm, I almost always wake up about a half minute before the alarm goes off.

How much sleep should you get? That's a habit too. Some people get along fine on four or five hours. Others are habituated to eight to ten hours. I've got too much I want to do to waste time sleeping that isn't needed, so I generally go about five hours at night and one in the afternoon. Works for me.

Try my system and it'll work. Then start looking for a ham or prospective ham who needs a monthly shot of enthusiasm and get him (or her) to subscribe to *73*. I positively refuse to get upset if you find this so helpful that you feel obliged to wrestle up two subscriptions. 73

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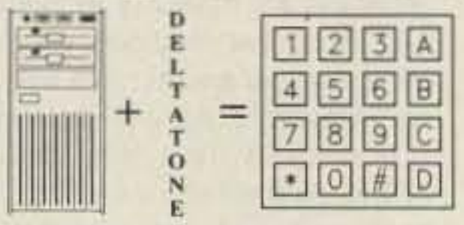

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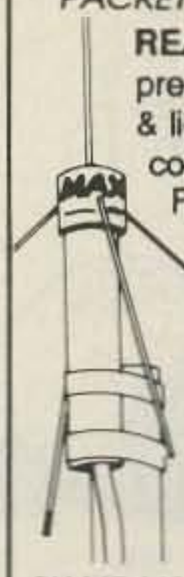

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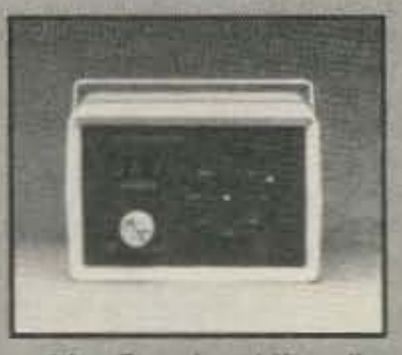

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ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
%73 Magazine
Forest Rd.
Hancock NH 03449

Keep on Switchin'

Last month, we were exploring switches and controls. Let's finish that up and move on to a new topic.

Microswitches really aren't all that small by today's standards. I suppose they must have seemed tiny compared to other switches when they were first introduced. We continue to call them microswitches, partly out of tradition, but also because a company called Microswitch, Inc., makes many of them.

The distinguishing characteristics of a microswitch are that it is rectangular and it is operated via a small plastic button near one end. Often, there is a lever arm mounted on the switch body, permitting a small force to operate the switch. This type of switch makes a distinctive "click" when it is pressed, and another when released.

The internal construction consists of several strips of metal arranged to provide a "snap" action which presses the contacts together. This action is what causes the click. I've seen a few microswitches with broken strips and a few with burned or corroded contacts. If there's no click, the strip is gone. If you hear the click but get no connection, suspect the contacts.

Although it is sometimes possible to break a switch open and clean burned contacts, it really isn't worth it. These switches are nearly all of one or two designs, and are easily replaced. In fact, Radio Shack sells two versions. And, of course, the mail order outlets have them. Don't waste your time—get a new switch!

You're Relay Switching Now

Relays, of course, are just magnetically operated switches. In my experience, they are among the most trouble-prone switching devices of all. Although coils can open now and then, the usual problem is poor connection at the switching contacts. The techniques for general contact cleaning I discussed last month apply here as well. Also, try soaking a piece of paper in contact cleaner (*not* the corrosive acidic kind) and pulling it between the contacts while you hold them closed. You may be surprised at how much gunk is deposited on the paper. In addition, check to make sure that the arms on which the contacts are mounted are not bent or sagging. Sometimes they just don't exert enough pressure.

I've had some frustrating times with relays. I've wasted more than a few hours trying to get an intermittent relay to work every time. Especially when low signal levels are involved, such as in TX/RX switching, the connection has to be very good, and some old relays just won't do it no matter how hard I work on them. If you run into this, try to get a new relay; it just isn't worth the misery to try to fix it.

By the way, always check the solder joints where the relay connects to the board. The heat-sinking effect of the large connections sometimes causes them to be soldered poorly at the factory. They may last for a few years, but they will eventually go. Unfortunately, the effect exactly mimics intermittent relay contacts, and it can drive you nuts.

Truly Micro

Among the smallest switches in use today are DIP switches, so-named because they conform to the Dual Inline Package specs for integrated circuits. Consequently, they look like ICs except that there's a row of switches on top. With the exception of some early CTCSS encoder applications, these switches will be found inside the rig, on the board.

They are intended for set-up parameters, so they don't see lots of switching action. Nonetheless, they occasionally can go bad. Some are slide switches while some are rockers, which are essentially toggle switches. In any case, these things are sealed, and they are just too small to mess with.

You can replace the slide type with a toggle unit, and vice versa, but always check *any* replacement with an ohmmeter, even if it has the same type of switches, to be sure the pinout is the same. Some DIPs may be wired quite differently and some may even have double-throw contacts.

Dits and Dahs

There is one kind of switch we hams are especially familiar with: the Morse code key. Its construction is obvious. Used with electronic keyer circuits and most solid-state rigs, the contacts handle only low power and rarely require more than a little cleaner-soaked paper pulled through them now and then.

Tube rigs (even those whose only tubes are in the driver and final stages), however, can put far more stress on the contacts, because they may be switching as much as 100 volts. If the rig won't key properly, or it sounds lousy on the air, check the key contacts before you dig into the circuitry. A good, low-resistance contact may be essential for proper transmitter operation, and even a few tens of ohms can cause trouble.

Louder, Please

Ah, potentiometers. I often wonder what sadist thought those up! No other kind of control causes as much trouble. Basically, a potentiometer (pot) is just a resistor. To make it variable, a wiper is rubbed across the resistance element. The closer it is to the element's connection, the lower the resistance.

Actually, pots have three connections, with one end of the element being ground and the other being the signal to be sampled. The wiper samples the signal and feeds the next circuit stage. When the pot is not working well, the symptoms can range from the obvious, such as a scratching sound in the audio, to the perplexing, such as an out-of-lock frequency synthesizer, depending upon the pot's intended function.

In fact, when you're faced with a difficult problem, it pays to check any pots or trimpots (small pots meant to be set and forgotten) with a scope to be sure they are not open. *Don't* turn them, though! Once you do, you have no way to set them back to their original positions.

Where's the Rub?

There are two basic kinds of pots: wire-wound and film. Wire-wounds, which have limited resolution (because the wiper can only make contact once per turn of the wire) as well as some inductance, are generally used only when their superior power-handling capabilities are required. The vast majority of pots is of the film variety.

In these units, the resistance element is a carbon-based film which is painted on a nonconductive substrate. The wiper, of course, rubs this film. Because the wiper rubs the resistance element, it is subject to the problem shared by other mechanical connections: poor contact. Unless the pot is being used in some power-handling situation, which is unlikely, the cause of the trouble is almost certainly *not* a burned contact! More likely, the problem is simple wearing away of the resistance element, or dirt or (gasp) cigarette residue clogging the works.

Unless the film is badly worn away, a shot of contact cleaner usually will restore the pot to fine condition. The trick is getting the spray into the pot. Most larger pots, such as volume and squelch controls, have slots near the solder contacts into which you can spray.

After spraying, rapidly twist the pot through its control range to disperse the cleaner and rub away the dirt. Although some smaller pots and trimpots can be sprayed, many are sealed. In that case, you are going to have to get a new part. Also, you'll be faced with the problem of setting it where it belongs. If you match the pointer visually with the old one, you should be close.

Of course, that won't work in the case of multi-turn trimpots, which have only a screw exposed. Unfortunately, you can't read the resistance of the wiper connection because that is what is not working in the first place! In any event, replacement of a trimpot is always going to entail readjustment. Luckily, trimpots rarely fail, because they rarely are moved.

Finally, before you suspect a pot, be sure it really is a pot! On some of the new rigs, the RIT, IF shift, and other controls may be optical encoders. This seems to be a trend in Japanese HF rigs, and it's a welcome one. The encoders are much more reliable than pots ever could be.

Well, I think that about does it for switches and controls. So now, let's turn our attention to a letter.

Dear Kaboom, *I have a Radio Shack HTX-100 mobile rig that I want to use as a base rig. I don't want to use a DC power supply. Is it possible to use a car battery at home, provided I charge it when it runs down? I tried to ask around, but I don't know any hams yet (I'm still studying for my license) and no one else seems to know.*

Signed,
Homin' In

Dear Homin,' Sure, why not? A charged car battery will run your 10-meter rig just fine. I can't imagine, though, why you would not prefer to use a power supply—it would be a lot easier. If you do use a car battery, be sure to properly ground the rig, just as you would if you were using a DC supply. And put a large electrolytic capacitor, say, a few thousand microfarad, in parallel with a 0.1 µf cap across the battery.

Of course, watch the electrolytic's polarity and be sure to use one rated for at least 25 volts. Also, beware of toxic (and possibly explosive) fumes from the battery. These things were never meant to be used indoors, and a spark, soldering iron, or cigarette lighter could set off the hydrogen they produce. The acid fumes can be toxic, too.

Finally, car batteries are not deep-cycle; they are meant for short starting periods followed by immediate recharge. If you run yours way down between charges, it will not live long. If you anticipate such use, get a deep-cycle marine battery, as it will be designed to withstand it. Best of luck and see you on the band!

Dear Kaboom, *My Yaesu FT-208R seems to have amnesia. It works fine, but when I shut it off, all the memories disappear. It's getting to be a pain to re-enter all my local repeaters. Where's my data going?*

Signed,
Forgetful

Dear Forgetful,

To that great databank in the sky, that's where! You have a classic case of "dead lithium battery-itis." '208s are old enough now that the batteries are finally starting to go. It's just a plain-Jane 3-volt lithium cell, but it has solder terminals on it, so you'd better order one from Yaesu, unless you know of a local source (I don't). The battery is located on the microprocessor board, just behind the speaker. You'll have to pull the board, so be careful not to break the wires going to the keypad. And naturally, be sure to get the polarity right—micros don't appreciate reversed voltage!

And see you all next month. 73

Number 24 on your Feedback card

HOMING IN

Radio Direction Finding

Joe Moell PE KØOV
PO Box 2508
Fullerton CA 92633

RDF Fights RFI

Even if you don't enjoy competitive transmitter hunting or search/rescue work, you will probably need to go DF-ing at some point. Most likely, your target will be some sort of non-ham RF interference (RFI).

Over the years, I have searched for dozens of noise sources, from aquarium heaters to gas oven thermostats. One of my most interesting (and frustrating) RFI adventures took place about two years ago in Stanton, California.

This story is true, but I'll leave out actual names, calls, and addresses. The victim (we'll call him W6XYZ) loved rag-chewing and daily nets on 75 meters. One day, a strange signal began to crowd him out. It was a very unstable carrier, moving up and down the band and occasionally disappearing. Most of the time, the signal was 20 dB over S9 and right on top of his favorite net frequency near 3900 kHz. By the time I got involved, W6XYZ's block had been checked out by the power and cable TV companies, who could not find the source of the signal in their lines.

Looking For Harmonics

The first rule of RFI-busting is to search on the highest practical frequency. At 80 and 40 meters, long power lines and other objects reradiate signals and distort RDF measurements. Null-type antennas are the norm. At VHF, gain antennas are practical, and long radiators are less common.

I set up a general coverage receiver and calibrated RF attenuator in W6XYZ's shack and tuned from 150 kHz up, making a chart of all RFI carriers by frequency and relative amplitude. There were a lot of them, but they all sounded different. The strongest (20 dB above the 3900 kHz spur) was at 3400 kHz.

Harmonics at varying levels (11 to 33 dB down) were present every 3400 kHz all the way up to 30 MHz, the top of the receiver range. I figured that the 15th harmonic at 51.05 MHz should be strong enough to detect. If so, my 6 meter T-hunt "Shrunken Quad" (see "Homing In" for January 1990) could DF the source.

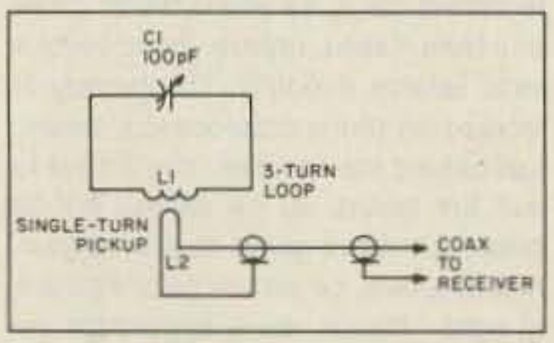

Figure 1. Schematic diagram of the 75/80 meter loop for RDF.

A few days later, my wife April and I were back with the van set up for 6 meter hunting. The 51 MHz harmonic dropped off rapidly as we drove away from W6XYZ's home. All the bearings pointed right back to his house. Using a Yaesu FT-690R and its whip, we sniffed around the house and found the source of the 51 MHz harmonic. It was the solar heating control unit in W6XYZ's own closet!

Gleefully, we turned off the controller and ran to the shack to check the HF bands. Sure enough, the noise at 3400 and its harmonics had stopped. In fact, the spectrum was very quiet—all except the signal at 3900 kHz. It was as strong as ever. Rats!

Building a Loop

So, the direction finding had to be done on 75 meters. We didn't have the time or the motivation to do anything fancy. All we needed was an indication of which way to go. A loop antenna was the clear choice.

The receiving loop (L1 in Figure 1) is three turns of #18 AWG solid enameled wire, resonated with a 100 pF air variable capacitor (C1). Signal snagged by this outer loop couples to the coax via single-turn inner loop L2. Inductive coupling works much better than direct coax connection to the outer loop, which would upset the balance and cause poor nulls.

Photo A shows the completed antenna on the T-hunt van. The frame is Class 125 (thin wall) PVC pipe, 3/4-inch trade size. That matches with my standard mast system for hunting on other bands (see "Homing In" for July 1989). Note that the coax bows slightly so it does not touch the bottom of L1.

To build this loop, cut the top and side PVC frame members and assemble them into a slip-type PVC cross-fitting. Bond them with PVC pipe glue. Use a 5/64-inch drill bit to make individual holes through the mast and cross pieces for the three large loop wires. Space the turns of the large loop about 3/16 inch apart. Holes for the large loop wires are 16 inches from the center of the cross, and holes for the inner pickup loop are eight inches out.

Tuning the antenna is easy—just connect it to the receiver and peak the background noise on the hunt frequency by adjusting C1 with an insulated tool. Keep yourself and any objects clear of the loop during tuning.

Check out your loop on a local (ground wave) signal before going RFI-hunting. The pattern of small (less than 0.08 wavelength) loops like this has two broad peaks (in the plane of the loop) and two sharp nulls (looking through the loop). The nulls are easiest to use and most accurate for RDF.

The ambiguous nulls 180 degrees apart would cause problems in a long distance T-hunt, but not in a neighborhood RFI search. Just take several "fixes" from well-spaced locations around the area and plot the lines of bearing on a map. They should intersect near the interference source. Follow the bearing lines and home in.

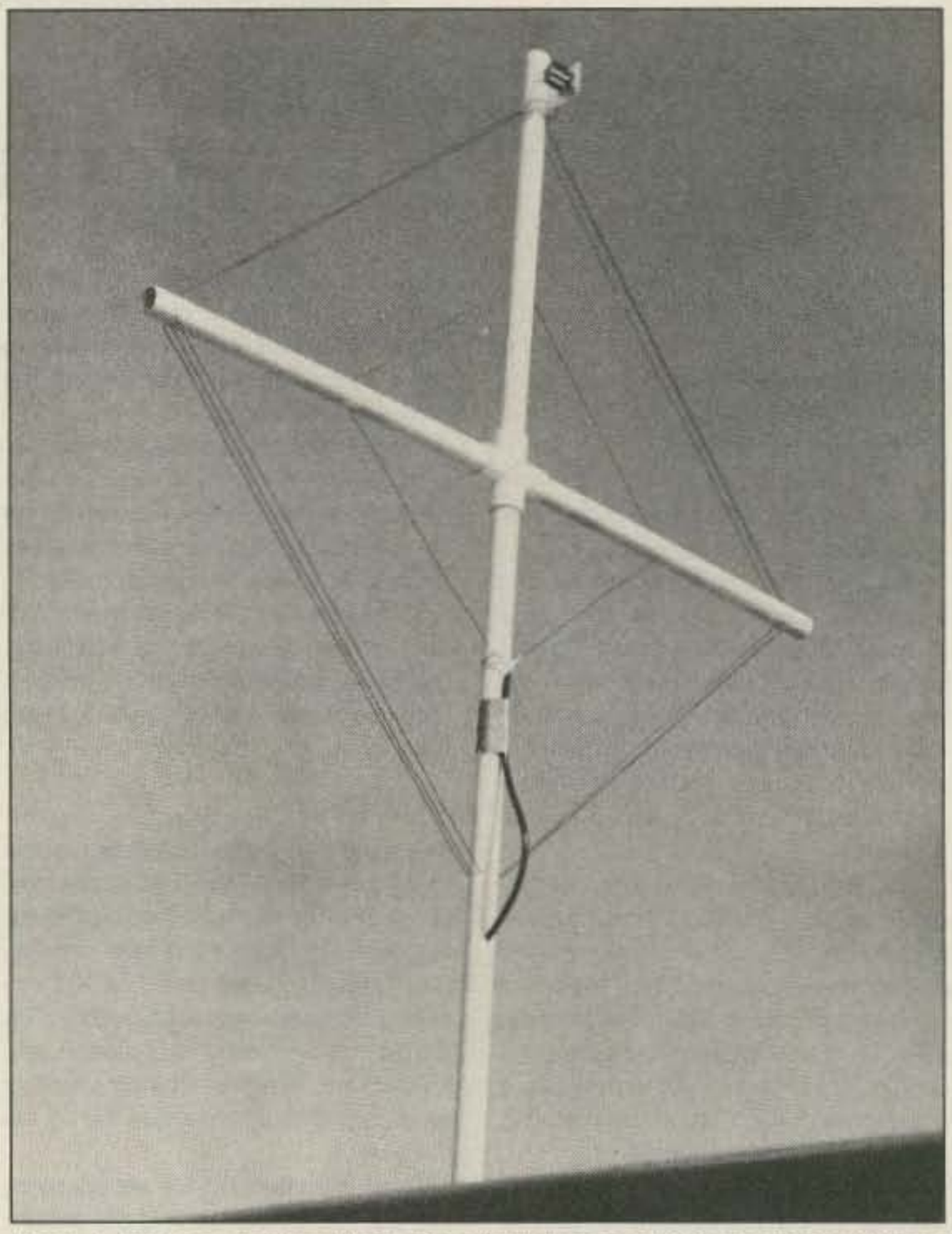

Photo A. Not fancy, but functional, this simple loop on a PVC pipe frame will ferret out interference sources on 75/80 meters.

If necessary, you can resolve the 180-degree ambiguity by using the directivity of a mobile whip on your vehicle. Typical 75-meter whip systems show higher S-meter readings in the direction of the greatest amount of ground plane. For example, if your whip is on the left rear bumper, it will give a slight amount of enhancement to signals coming from the right front.

Be sure to remove your 75-meter whip from the car while DFing with the loop. The proximity of a resonant whip causes inaccurate loop nulls. Similarly, avoid taking bearings when directly under power lines, etc.

If you expect to hunt very strong signals and your receiver does not have a wide range RF gain control, connect an RF attenuator between the antenna and the receiver. Do not transmit into the loop or attenuator. Unplug the mike and key to prevent accidents.

The loop will not give good nulls close-in if a long power line or the wiring of a house radiates the RFI. For example, let's say you are 200 feet away from the center of a radiating overhead power line 400 feet long. The difference in azimuth from the left end to the right end of the line is 90 degrees.

When you attempt to null the left end, the right end lies in the peak of the loop response. No matter which way you turn the loop in this case, there will be some signal to "fill" the null in the pattern. So, when you get too close to get good nulls, switch from the loop to a whip and move around, looking for the highest S-meter readings.

Closing In

A few days later, we went off to Stanton to snoop around with the loop. RDF bearings and S-meter readings showed the hottest area to be about two blocks away from W6XYZ in a cul-de-sac. The curbside signal was strongest in front of House A, and almost as strong in front of House B. Both were fed from one overhead power line in the rear.

House A's owner was not at home, so we rang the bell at House B. When I explained the problem, the family was very receptive and let me probe the back yard with a Sony ICF-7600 portable shortwave set. The power drop to the house and the breaker box were radiating plenty of 75 meter RF.

We found no obvious "hot spots" inside or outside. I asked if I could turn

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off the House B main breaker for a minute. They consented, I flipped the breaker, and the noise continued in the portable receiver.

By now, the owner of House A was home, but he was not interested in W6XYZ's plight. "Hams cause all the TV interference problems," he said, "so I don't care if I cause a problem for a ham."

I told him I just wanted to check the incoming power line in his back yard.

"Come back with the Edison Company," he replied, and asked us to leave.

When I told W6XYZ about our experience, he began to despair. He said that he was thinking of selling his house and taking a long trip in his RV. I wasn't ready to give up yet.

To be absolutely sure that House A was the culprit, I did a "porch light survey," reading the signal strength of the 3900 KHz radiation from the front porch light wiring of every house in the neighborhood on the Sony receiver. Sure enough, the light at House A radiated 20 dB more signal than any other.

I tried one more time at the door of House A, this time with W6XYZ along.

Despite our best efforts at diplomacy, the owner would not let us into his house or yard, nor would he turn off any breakers for tests.

FCC Gets Involved

I gathered all the RDF and porch light data. Then I put together some maps of the neighborhood, showing how House A was clearly the RFI source. I wrote a cover letter to the engineer-in-charge of the Los Angeles area FCC office, detailing the problem. I pointed out that the 3900 KHz radiation from House A was so great as to be a violation of FCC Part 15, that the owner was uncooperative, and that FCC intervention was needed.

Less than two weeks after I sent the letter and data, the FCC sent a letter by certified mail to the owner of House A, telling him that he was in violation of Part 15 and had 15 days to correct the problem.

Apparently, that really lit his fuse. I heard that he promptly drove to the FCC office and railed against W6XYZ and me. Fortunately, the FCC stood firm.

From that point on, my information is secondhand. I heard that circuit breaker checks showed the QRM definitely came from House A, and that a bad power line ground and loose cable TV hardware were found and fixed. But the 3900 kHz radiation continued.

Two months later, I heard that an FCC engineer had located the RFI source in the house, and ordered it to be repaired. But by that time, W6XYZ had sold his house and was moving out.

Apparently, the malfunctioning device never got fixed. I drove down W6XYZ's old street last week, and heard an unstable carrier on 3900 kHz. If you like 75 meters and are thinking of buying a home in Stanton, call me first. 73

Number 25 on your Feedback card

ATV

Ham Television

Bill Brown WB8ELK
%73 Magazine
Forest Road
Hancock NH 03449

Simulated ATV Satellites

Students at Franklin Community High School (Franklin, Indiana) have a very exciting course offering. Each year juniors and seniors have the opportunity to take an Aerospace Technology Class (wish I had one of these when I was in school!). One particularly fascinating part of the course is the satellite simulation experiment. They get to design, build and test their own satellite.

This year, they decided to design a weather observation satellite. Since launch opportunities are limited, they elected to send their satellite to the edge of space using a weather balloon. To study cloud patterns, they incorporated a live TV camera and ATV transmitter so they could receive live images directly in their classroom mission control center. In addition, they designed two different radar reflectors to test their visibility on FAA radar screens.

Using components donated by Bob McAuliffe W9PRD from one of his pioneering ATV balloon experiments (June 1988), and with guidance from Chuck Crist WB9IHS and teacher Doug Craig, the students designed the satellite payload for maximum stability. They even performed wind tunnel tests and drop tests of the parachute recovery system. A series of classes were held to discuss the theory behind the system, go over the design goals, and then proceed to build the payload.

The payload consisted of a Wyman Research ATV transmitter, a Uniden VM-110 TV camera, a 2m FM transmitter with CW ID and a 10 meter CW beacon. Callsigns on the payload were: ATV—WB9IHS, 2m—W9PRD, and 10m—WB8ELK.

The components were mounted in a hexagonal styrofoam package with a swivel mounted on top. This aerodynamic design helped maintain a very stable camera platform for excellent ground imaging. One nice touch that I particularly enjoyed was the TV camera lens protector—half of a pair of sunglasses!

Liftoff

After thoroughly testing their satellite, the class was ready to fly. After a couple of weather delays, they were finally able to launch their balloon satellite at 1:15 p.m. EST on April 21. The students gathered around their ATV receive station and had a blast riding along with their balloon as it provided them with spectacular aerial views of their school as it was rapidly left behind.

The package disappeared into the clouds and nothing could be seen for awhile from the video camera. Soon the balloon system was above the clouds and they could observe the cloud tops from an ever increasing altitude. They now had a functioning weather satellite!

Quite a few area amateurs pitched in to help make this a successful event. Ron Pogue KD9QB and pilot Ken Jessup actually circled over the launchsite in a small plane and transmitted the takeoff through the Indianapolis ATV repeater. Dozens of midwestern hams checked into the tracking net (operated by Emmett K9YKX) with direction reports throughout the 2 hour flight. Excellent video (although of cloud tops) was reported over a several state area. Although the 2m beacon died at about 12,000 feet, it was heard as far away as Wisconsin!

Success!

The Indianapolis foxhunt group also provided their headings as they drove along under the payload. The students took these beam headings and plotted them on a large map of Indiana. They learned a lot about direction finding and were quite accurate in locating the package during its journey. After reaching 95,000 feet, their weather satellite could see a large area of Indiana below. At this point the balloon burst and the package parachuted back to Earth. Their map plots were so accurate that the chase plane was able to actually see the package as it was parachuting down and watch it land in an open field near a small road. The package had drifted just over 28 miles to the southeast to land near the towns of Westport and Alert.

The Indianapolis foxhunters were so close that they could see the circling plane. Larry Oaks WB9YAJ and Paul Bohrer W9DUU (two veteran balloon trackers) arrived at the scene just a few minutes after it landed.

The radar reflector experiment was successful. They actually flew *two* balloons. One of the reflectors (The Pizza Hut design—named for the sign it was designed around) flew on the main payload. The other reflector (a very large garbage can design) flew on a small, very slow-rising balloon that was launched at the same time as the weather satellite balloon. Both reflectors were made out of metallized Mylar. Controllers at the Indianapolis FAA center successfully tracked both balloons during their flights. Although there was no radio beacon on the small balloon, the controllers followed it almost to the Kentucky border. It was later found and returned!

Photo B. The "Satellite" with piggyback 35mm film camera.

Photographs from the Edge of Space

In addition to the live video experiment, I sent the students a 35mm film camera to attach to the side of their satellite. Even though the temperatures could drop down below –60 degrees, I hoped the camera would survive to take some really spectacular high definition color photos.

After browsing through the local photo store (Peterborough Camera), I found the perfect candidate, the Samsung AF-SLIM. This little gem is a full-featured pocket camera with a built-in autowinder and timer (30s, 60s or 10m). Another nice feature was a lens system that would pop out of its lens cover to take a picture and safely retract back into its protective cover (ideal for the harsh environment in the stratosphere!).

The class programmed the camera to take a photograph every 10 minutes during the flight. Since the balloon ascended at about 1000 feet per minute, they snatched a photo every 10,000 feet.

The results? Let me put it this way: When the photoprocessor in Indiana handed the photos back to Chuck

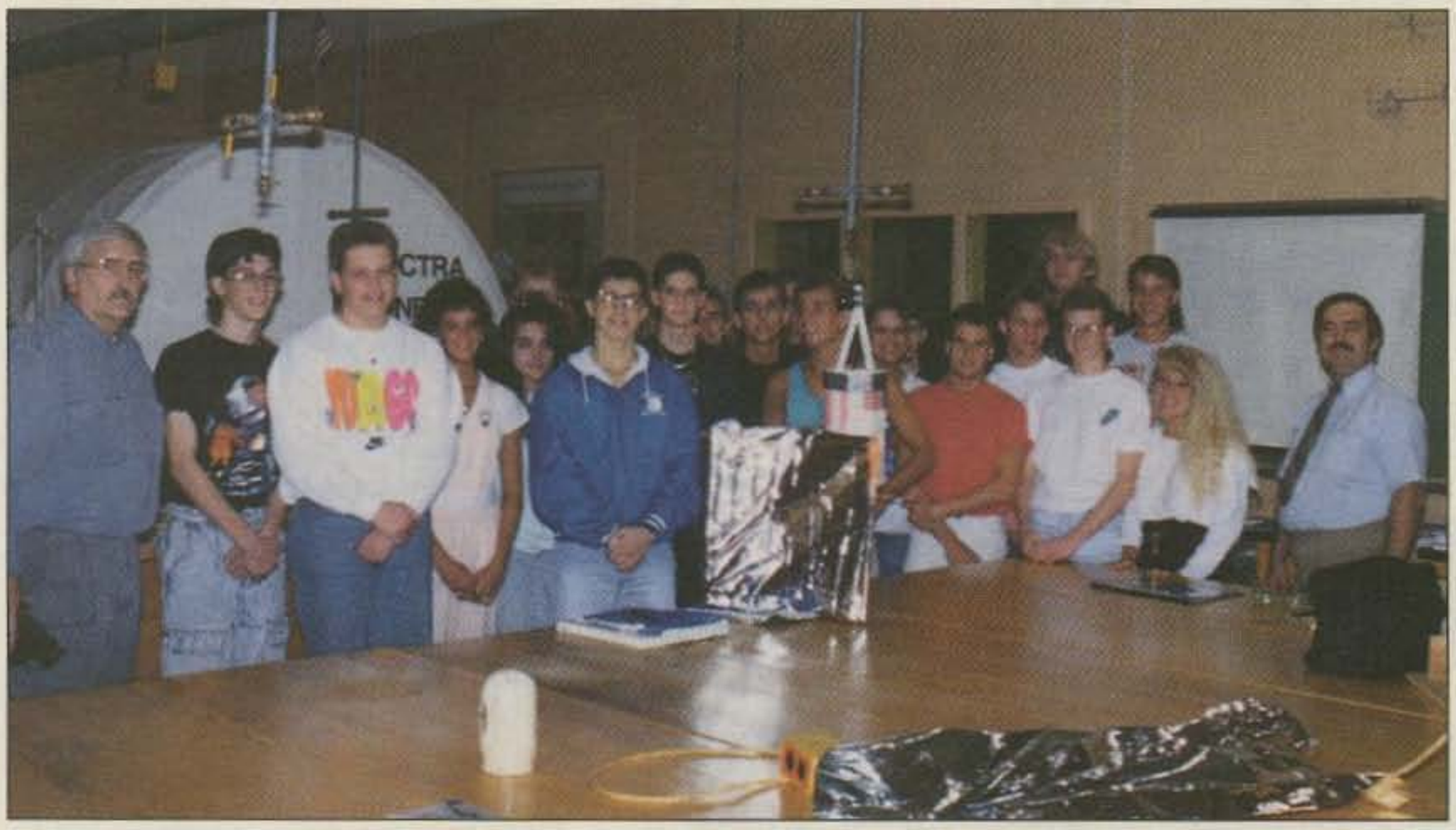

Photo A. The Franklin Community High School Aerospace Technology Class (with satellite and radar reflectors in foreground).

Photo C. The automatic camera takes a surprise picture of balloon tracker Paul W9DUU shortly after landing.

Photo D. The Samsung AF-SLIM pocket camera can take the rigors of the stratosphere!

Photo E. 45,000 feet over Indiana.

Photo F. Stratospheric views from 75,000 feet (visibility over 350 miles). The blue layer is the Earth's atmosphere.

Photo G. The top altitude of 95,000 feet. The atmosphere is just a thin blue haze from this vantage point at the very edge of space!

WB9IHS, he said, "How'd you take these pictures? From a spacecraft?" "*. . . Well, as a matter of fact . . .*". See photos E through G for the spectacular results. Photo E was taken at 45,000 feet, Photo F at 75,000 feet and Photo G at the top altitude of 95,000 feet.

The Next Step?

The Aerospace class plans another experiment this October. This time they will design a communications satellite. At least a dozen schools across the midwest plan to use this balloon satellite to communicate with each other via a cross-band FM repeater system. The cross-band repeater will be unique in that the audio uplink to the satellite will be on 2 meters, but the downlink will be on both the sound subcarrier and on-carrier of an ATV transmitter (with live TV camera). That way, even if one of the schools doesn't have an ATV receive setup, they can tune in to the ATV center carrier on an FM receiver. 73

Number 26 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

Cleveland Calling

She said she lived in the Cleveland area. She called the *73* offices to ask a few questions, offer a few suggestions and just to chat about amateur radio. (You'd be surprised at how many calls I get in a week from people who just want to talk about radio. They hardly ever ask for me by name, but Rose at the switchboard puts them through to me when she can't figure out who else to forward their calls to.)

We talked for a while, and I got to know a little about her. Her story is quite typical: a 1x3 callsign, licensed for almost 30 years, inactive for most of those 30 years (though always renewing the license), recently getting back into the radio hobby. She was stymied by the incredible changes in the last fifteen-or-so years. Shirt pocket-sized HTs, HF rigs costing a third of your annual salary that do everything but print the QSL card and lick the stamp, Novice voice privileges, the WARC bands, packet—all brand new to her. So many changes. So many things to catch up on.

She told me she had even lost her head and, in a fit of high tech euphoria, actually gone out and bought herself a computer.

She was easy to talk to. As good a listener as she was a talker, I found the conversation lengthening effortlessly to 10, 15, 20 minutes—sort of like those nice QSOs you have every once in a while when you actually feel you've gotten to know someone and maybe even made a new friend.

"Do you want to know the biggest change I've noticed?" she asked, as we got ready to say our goodbyes. "I can't believe the foul language and just plain rudeness you hear on the bands now. Don't these hams realize that there are people all over the world listening to them? Why isn't the FCC doing something about this?"

I explained that the FCC simply doesn't have the budget, staff or interest in acting as amateur radio's hall monitor. I told her that since amateur radio was supposed to be self-policing, it was up to her and me—and all licensed amateurs—to regulate ourselves.

There was a long silence, and I could feel the mood of the conversation turn, not to anger or self-righteous indignation, but to sadness. She and I, both of us licensed since our early teens, sharing a melancholy recollection of how things used to be.

"Do you remember when people were courteous to each other on the ham bands?" she asked.

I said yes.

"Do you remember when people actually talked to each other and got to know each other, instead of all this 'you're 5 and 9, thanks for the QSO' business?"

"Yes."

"Do you remember when you never EVER heard foul language or dirty jokes on the bands?"

"Yes, it wasn't all that long ago."

"So . . . what happened?"

The pleading in her voice indicated that this wasn't a rhetorical question. She really wanted an answer. I didn't have one for her.

"Couldn't you write something about this? You could ask people to clean up their acts. Write articles about how average hams could help clean up the bands."

I told her to go back over the last twelve issues and read Wayne's columns. He's addressed these issues over and over again.

"Don't you understand the power you have?" she asked. "Don't you understand that the ham magazines could get together and really help make amateur radio better by pointing out some of these problems?"

She became more and more insistant—more and more desperate. The conversation continued along the same lines for many minutes. The more she asked "why," the worse I felt for not being able to give her a satisfactory answer. I didn't know what to tell her, except that at least we could set a good example for newcomers by our own courteous practices. She told me she did indeed make a point of scanning the Novice portion of 10 meters and answering those young voices calling "CQ." I thanked her for that, and told her to keep it up.

The conversation was over. I could tell we both hung up with a sour feeling in our hearts: Hers for not getting the answers she was searching for, mine for not being able to provide those answers.

I sat at my desk, staring at my phone and thinking about what she had said. She had told me I had "power." She had used the old pen being mightier than the sword cliche and asked me—pleaded with me—to do something to change people's attitudes. We had both remembered when the ham bands were an island of courtesy in a brusque and brash world. She had hoped I could tell her how to return to this time. I could not. I do not have the "power" she thinks I have. Neither does Alan Dorhoffer . . . nor Dave Sumner . . . nor Wayne Green himself.

How can we get people to remember that if we do not clean up our own messes, pretty soon we will all be living in the same garbage pit?

Do any of you have an answer? There's a woman in Cleveland who needs to know. 73

Number 27 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 E. Chateau Circle
Payson AZ 85541

Winding Down

As I write (around the end of April), we have seen the solar flux dive from a 300+ value to a 130+ value in less than a month! Yes, Cycle 22 is on its way down. In August you can expect some good conditions and some fair-to-poor conditions as we move from summer to autumn. See the calendar below.

The poorest days for DX on the HF bands will be approximately the 5th–8th; the 16th–21st; and the 24th–27th. Otherwise, you may expect decent worldwide conditions—unless, of course, we get some unexpected solar flares in between these dates!

Ordinarily, the flares occur near or on the dates given as poor, so don't be too concerned about the other days . . . but be aware that Old Sol is often unpredictable.

The HF bands from 10 through 20 meters will be open on many days until well after local dark, and during the day you can expect everything from short skip to long skip. Long path DXing can take place in the early morning hours just after sunrise, and occasionally just after dark.

Use the band-time-country chart to plan your operating on the HF bands, and use the daily forecast to pick the best days for your efforts.

I've noticed plenty of times that stations will make futile calls for DX at times, and on days, when there is no hope of raising anyone! Perhaps that is because these operators are totally unaware of the forecasts or the reasons behind them. Don't try harder—just smarter! See you next month, and meanwhile, for the most up-to-date conditions in the ionosphere, listen to WWV at 18 minutes after any hour. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	—	—	—	—	—	20	20	—	—	—	—	15(1)/17
ARGENTINA	15/17	15/17	20	20	—	—	—	—	—	15/17	15/17	15/17
AUSTRALIA	15/17	15/17	—	20	20	—	15(1)/40	20	—	—	—	—
CANAL ZONE	20	20	20	20	20	20	20	15/17	15/17	15/17	15/17	15/17
ENGLAND	20	20	15/40	—	—	—	—	15/17	15/17	—	15/17	20
HAWAII	15/17	15/17	20	20	20	20	20	—	—	—	—	15/17
INDIA	20(1)	20(1)	—	20(1)	20(1)	—	—	—	—	—	—	15(1)/17
JAPAN	—	—	—	—	—	20	20	—	—	—	—	15/17
MEXICO	20	20	20	20	20	20	20	15/17	15/17	15/17	15/17	15/17
PHILIPPINES	—	—	20	—	—	20(1)	20(1)	15(1)/17	15(1)/17	—	—	—
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	15/40	15/40	—	—	—	—	—	—	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(1)/17	—	—	—	—	20	20	20	—	—	—	15(1)/17
ARGENTINA	15/17	15/17	20	—	—	20(1)	—	—	—	—	15/17	15/17
AUSTRALIA	15/17	15/17	—	20	20	—	20	—	—	—	15(1)/17	15(1)/17
CANAL ZONE	15/17	20	20	20	—	20	20	15/17	15/17	10(1)/12	10/12	10/12
ENGLAND	20	20	—	—	—	20(1)	—	—	—	—	15/17	15(1)/17
HAWAII	—	—	20	20	15/40	—	20	—	15/17	15/17	15/17	15/17
INDIA	15(1)/17	20(1)	—	—	—	20(1)	20(1)	—	—	—	—	15(1)/17
JAPAN	15(1)/17	—	—	—	—	20	20	20	—	—	—	15(1)/17
MEXICO	15/17	20	20	20	—	20	20	15/17	15/17	15/17	15/17	15/17
PHILIPPINES	15/17	—	20(1)	—	—	—	20(1)	20(1)	—	—	—	—
PUERTO RICO	15/17	20	20	20	—	20	20	20	15/17	15(1)/17	15/17	15/17
SOUTH AFRICA	—	—	15(1)/40	20(1)	—	—	—	15(1)/17	15(1)/17	20(1)	—	—
U.S.S.R.	20	20	20	20	—	20(1)	—	—	15(1)/17	15(1)/17	15(1)/17	20

WESTERN UNITED STATES TO:

ALASKA	15/17	20	20	20	20	20	—	20	15(1)/17	15(1)/17	15(1)/17	15/17
ARGENTINA	15/17	15/17	15/17	20	20	—	—	—	—	—	15/17	15/17
AUSTRALIA	15/17	15/17	15/17	20	20	15/40	15/40	20	—	—	—	15(1)/20
CANAL ZONE	15/17	15/17	20	20	20	—	—	—	—	15/17	15/17	15/17
ENGLAND	20	20	20	20	—	20(1)	—	15(1)/17	15(1)/17	—	—	20
HAWAII	15(1)/17	15/17	20	20	40	40	20	20	—	15/17	15(1)/17	15(1)/17
INDIA	—	15/17	15(1)/17	—	—	—	20(1)	20(1)	15(1)/17	15(1)/17	—	—
JAPAN	15/17	20	20	20	20	20	—	20	15(1)/17	15(1)/17	15(1)/17	15/17
MEXICO	15/17	15/17	20	20	20	—	—	—	—	15/17	15/17	15/17
PHILIPPINES	—	15(1)/17	15(1)/17	—	—	20	20	20	15/17	—	—	—
PUERTO RICO	15/17	15/17	20	20	20	—	—	—	—	15(1)/17	15/17	15/17
SOUTH AFRICA	—	—	—	20(1)	—	—	—	20(1)	15(1)/17	15(1)/17	—	—
U.S.S.R.	20	20	20	20	—	—	—	—	—	—	—	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.

AUGUST 1991

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

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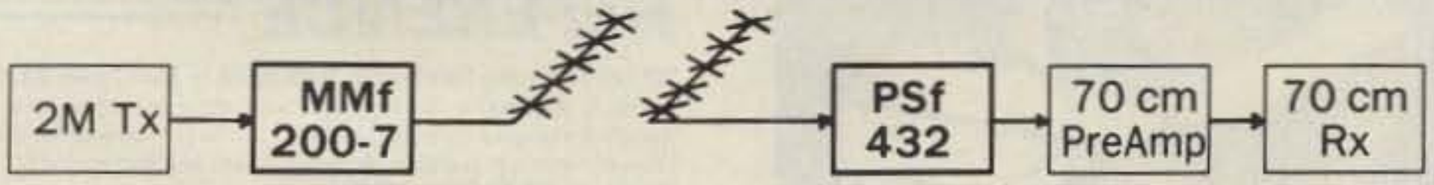

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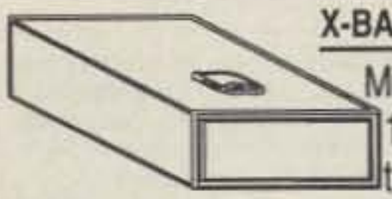

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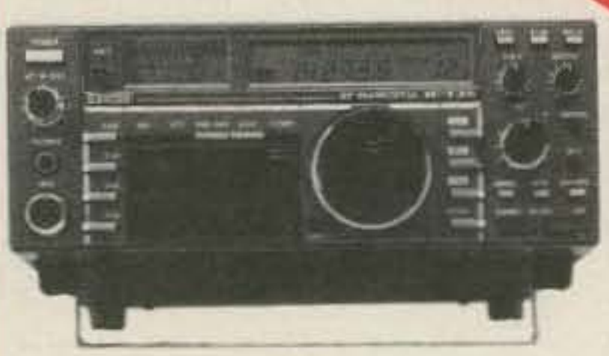

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